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An Educative Community marked by Justice, Cooperation and Integrity

Mission

To empower young women and men, especially the underprivileged as responsive citizens through Holistic Education.

Department of Physical Education

Vision

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us in all our endeavours.

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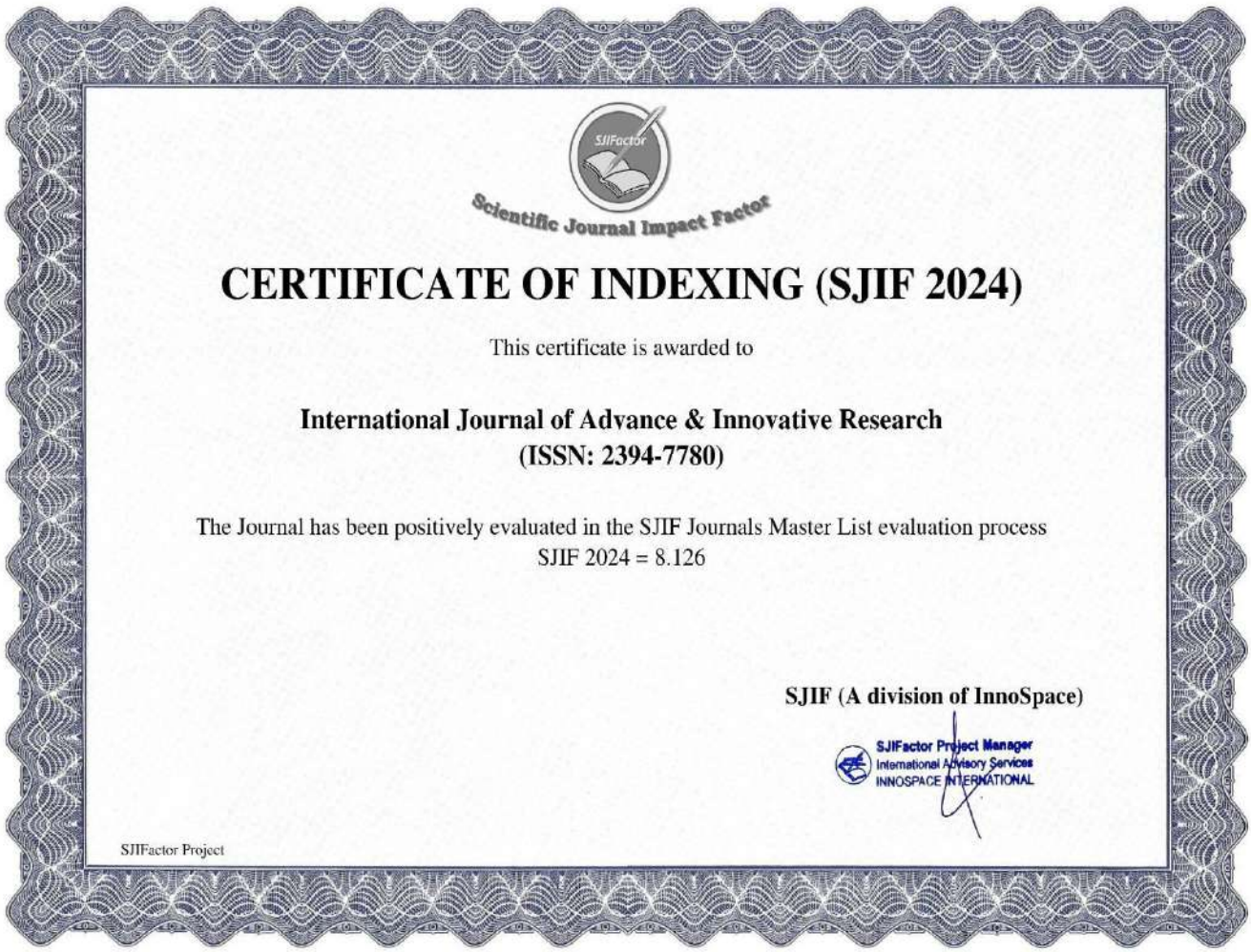

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PHYSICAL EDUCATION IN UKRAINE: THE CONCEPT AND CONTENTS

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INTRODUCTION

Since becoming an independent state in 1991, Ukraine has faced some hardships in establishing its own economic, cultural and educational identity with education system barely among the top priorities. Deterioration in nation's health, alarming situation in the children and youth wellbeing stimulated the search for novel solutions and led to the adoption of complex approach to the emerging problems. With health and medical establishments facing extreme stress in coping with existing problems, prophylactics of the diseases and healthy lifestyle issues were looked into as a remedy to gradually overcome the health crisis.

Obviously, Physical Education and PE Pedagogy in Ukraine have not emerged instantaneously featuring unique to the county trends and practices. It has actually emerged from the 70 years history of Physical Education and Pedagogy of Physical Education in the erstwhile Union of Soviet Socialist Republics (USSR) and it would make sense to assume that Ukraine have inherited certain features of PE from 'the ancestor'.

Number of children and youth involved in sport activities through youth sports schools and also regular PE and leisure activities has reduced by 620.000. Since independence in 1991, organizations running health related and sports activities reduced in number by 15.500, number of specialists involved in those programs was reduced by huge one million, counting as 56% of all cadres involved (Timoshenko & Dyomina, 2011). Situation inevitably triggered the decay in the health status of children and adolescents, devaluation of social prestige of PE and sports and sharp upsurge in various antisocial behaviors.

In a comprehensive attempt by the Government of Ukraine to give a fresh look into the strategy of the state development, based on creative international experiences, state authority in Physical Education and Sport of Ukraine in 2004 came out with the National Doctrine of the Development of Physical Education and Sports (NDDPES).

Stressing out the necessity of Ukraine's merging into the European Union, major part of the doctrine was dedicated to the development of sufficient number of highly educated cadres for the needs of PE and Sports.

Current State of Wellbeing of Ukraine Children and Youth

Obviously, caring for the health status of Ukraine population, particularly of children and youth, has served as a launch pad for the new government initiatives. Situation in health care got almost catastrophic with mortality in the healthy and productive age group increased 12.2% among males and 9% among females from 2000 to 2005 alone. Maternity and children mortality have been on the upswing as well, resulting in the population of Ukraine lessening during 15 years of independence by about five million with total population of the country at 47 million by January 1st 2007.

Health and wellbeing status of Ukrainian children got truly alarming. The survey from Ukraine Academy of Sciences Institute of Hygiene & Medical Ecology stated that percentage of kids with chronic health problems counted as 30 in the first form, reaching 50% in form five and hitting alarming 64% in form nine.

Medical statistics quoted only 7% of school children as having satisfactory functional status and a critical figure of only 30% of schooling age kids being sufficiently healthy to get regularly involved in sport activities.

Many anomalies were stated to occur as early as at form one: 11% kids experiencing musculoskeletal disorders, 25% - otorhinolaryngology problems, 30% - neural and digestive system disorders with another 25% being allergic.

Nine years of schooling evidently exacerbate the health problems: kids were experiencing 1.5 times reduced vision, 1.4-fold increase in digestive disorders, 2.6 times – endocrine disorders. The health weakening trend got obvious: children had lover lung ventilation, smaller chest circumference and reduced muscular strength.

Medical practitioners have claimed 80% of Ukrainian children had been insufficiently physically active and the loads they faced during the PE classes could be too tough to stand and for many might have been just unsafe.

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Current Practices and Curricular Models: Primary education (forms 1 to 4)

Physical Education

Physical Education in Ukraine is a compulsory subject at every schooling level, starting with stage one, being primary education (forms one to four), stage two – secondary education (forms 5 to 9) and finishing with stage three – higher secondary education (forms 10 & 11). Basic distribution of teaching hours in secondary schools as directed for 2011/2012 academic year is as follows:

- Forms 1 to 4 – three hours per week
- Forms 5 to 7 – two and a half hours per week
- Forms 8 to 9 – three hours per week
- Forms 10 to 11 – two hours per week

Primary school PE classes count 105 hours annually and include Theoretical Knowledge part and Ways of Movements part.

Newly developed PE program possesses certain features which have never been attempted in its previous editions. Unlike the use of particular sports or disciplines while teaching PE in primary school before, present PE program is designed in a completely different manner: teaching is arranged in modules by movement elements called 'schools'.

Primary school PE program includes seven major schools of movements:

School of movement culture with gymnastics elements: School movements include exercises from gymnastics, elements of acrobatics, marching exercises and marching formations, corrective and coordination-based exercises.

School of locomotions: Exercises of this school include vital types of locomotion, such as walking, running, dancing steps, climbing and clearing the obstacles, skating, skiing and swimming.

School of ball: Movements involved cover practices with small and large ball. Exercises of this school help developing throwing skills and further master the skills of playing volleyball, basketball, football etc.

School of jumps: Exercises involved are related to various types of jumps: rope skipping, high jump, long jump, depth jumps, vaults etc.

School of active rest (recreation): Activities brought together under the umbrella of this school are related to various recreational games and could be represented by combination of exercises from various movement schools. In a way this school synthesizes and fuses actions from various schools in the variety of games.

School of development of motor qualities: Exercises are representing major motor qualities, such as strength, quickness, endurance, agility and flexibility. Main objective of this school is to provide sufficient load to develop children physically.

School of posture: Exercises represented in this school are targeting correct posture as a prerequisite for quality movements and correct execution of various other locomotions. School also includes balancing exercises, proprioceptive exercises and exercises for basic coordination.

In order to reinforce the health component of PE, importance is not only given to absolute measure of achieved progress, but also to the relative one, namely the rate of improvement in particular testing exercise. This approach, apart from leveling the chances for getting higher marks among highly and just reasonably fit pupils, also allows caring for the interests of slow maturing pupils, which may be at disadvantage if compared to fast maturing ones in their absolute test results.

Health Foundations

An attempt to bring PE closer to the necessity to cater for the development of healthy habits, healthy behaviors and ultimately healthy way of life brought into life a new dimension to the practices of physical education and physical culture – the new school subject 'Health Foundations'.

Main objective of the discipline is to deliver the knowledge and skills to the schoolchildren on how to care for and how to improve on their health. Critical point in teaching Health Foundations is to create theoretical, practical and motivational links between this discipline, physical education and actual health of the pupils.

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Secondary education (forms 5 to 9)

Physical Education

Latest edition of the Physical Education curriculum for the 5-9 standards of secondary schools has been approved by the Ministry of Education & Science 28th November 2010. Teaching program in PE for second level of education is arranged in completely different from the primary school manner: program is designed as combination of modules.

It contains two mandatory (invariant) modules being:

- Theoretical & Methodological knowledge and
- General Physical Training

Although these mandatory modules do not form independent teaching blocks, they instead are present as teaching load dispersed in every sport based variable module.

Number of variable and interchangeable modules was offered for schools to exercise certain degree freedom in forming the physical education course. Total of 15 sports based modules are on the offer for every school to pick from. Schools may pick those variable modules based on the environmental factors, available equipment etc. at their discretion. Variable sports based modules include:

Basketball, Volleyball, Badminton, Aerobics, Gorodki (national leisure small area game), Aqua aerobics, Skiing, Swimming, Table tennis, Tourism (backpacking), Handball, Gymnastics Track and Field, Football, Kettle bell sport.

Approved curriculum offers certain degree of freedom to schools in their choice of modules while forming the contents of the Physical Education course. It has been stressed out that for the first time planning of Physical Education would consider age and gender differences of the pupils.

Each variable sport based module is developed in view of the systematic involvement of pupils in physical activities and sport and also in view of the long term effects, since every module is planned for certain number of years to master. Each module caters for mastering skills of the chosen sports, learning its rules and regulations, acquiring relevant motor qualities, obtaining expertise in sport tactics and competition skills.

Modules are different in duration, the shortest being a Kettle bell sport module covering three years from 9th standard and followed through to standards 10 and 11. Some other like Badminton, Aerobics, Skiing and Swimming are planned as activities for standard 5 through to 9 (5 years). The third group of modules in fact covers both secondary and higher secondary levels, i.e. standards 5 to 11 (7 years). Among those are Basketball, Table Tennis, Handball, Gymnastics, Track & Field and Football. Such planning and regular students' involvement creates a connection and in fact supports the talent identification process and feeds the search of event coaches for sport talents among secondary school children.

One of the variable modules stands apart and actually initiates involvement of 9th standard pupils (follows through to 10th and 11th standards) in Professionally Applied Physical Education. Module includes information on physical component of professional requirements in various jobs/professions, prepares pupils to their future professional endeavors. Module also caters for combining various previously studied sports based modules into some sort of multidiscipline sports and leisure activities.

New PE program typically recommends mastering 4 to 6 sports based modules in standards 5 and 6; 3 to 5 modules in 7th and 8th standards; another 3 to 4 modules in standard 9 and finally 2-3 modules in standards 10 and 11. Typically, with 105 hours allotted for PE classes in standard 5, and with 6 modules picked as studying material, each of the selected modules would count as about 18 hour per annum. Variations in total hours allotted are though encouraged with proper justification from schools.

Although selection of variable modules is left on school's discretion, PE program emphasizes on certain criteria for such selection to be fair and justified. Criteria for the selection include availability of facilities and equipment; regional sporting traditions; availability of qualified PE specialists and pupils' willingness. The latter has to be assessed with a help of a questionnaire at the end of each academic year.

The matter of facilities and equipment adequacy for modern Physical Education practices is still a concern, since the shortage of facilities and equipment is well-documented. As per the current Ministry of Education statistics, 10% of schools don't have gyms (multi-purpose sports halls) at all, whereas 40% of the available

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facilities are obsolete. Hence only half of the currently schooling children have adequate opportunities and quality exposure to modern Physical Education.

Health Foundations

Teaching of health foundations in secondary school is structured the same way as it is in primary school, with components maintained as Human health, Physical component of health, Social component of health, Psychic and Spiritual components of health.

Teaching volumes are kept at 35 hours per annum for forms 5, 6 and 7, whereas forms 8 and 9 have got 17 teaching hours per annum each.

The contents' part progresses from the basics towards the development and maintenance of healthy behaviours and healthy lifestyle.

Higher secondary education (forms 10 and 11)

Physical Education

PE program for higher secondary students gradually gets more professionally inclined and targets possible career opportunities available after the schooling years. Apart from the similarly structured physical education classes with invariant and variable sports based modules, program widens the scope of the Professionally Applied Physical Education module which was first introduced in standard 9. Students' attention is pointed towards skills and motor qualities which might become an asset for the career choices they are yet to make. Practical part of PE classes focus more on reaction drills, strength and speed endurance, balance, coordination and orienteering rather than on isolated sport activities. Annual teaching volume in both theory and practice classes reach 175 hours for both 10th and 11th standards and includes following elements.

Another distinct feature of higher secondary schooling in terms of Health and Physical Education domain is inclusion of a sub-discipline catering for the preparation of students to their compulsory military service in the Ukrainian Army & Navy. It includes Foundations of Military Training, Applied Physical Training, Foundations of Medical Training and Foundations of Civil Defense. Physical Education classes are recommended to conduct separately for boys and girls.

Health Foundations

Teaching of the discipline holds in line with primary and secondary schooling, upgrading and converting the knowledge and habits of pupils acquired during their previous years of education into conscious and well mastered healthy life style behaviors. At this level of studies, basic health-related knowledge and skills of students are topped with the knowledge and skills of Life Support, Environmental and Ergonomic safety.

Conclusion

With innovative PE programs at work and institutions of higher learning producing adequate number of high-quality specialists for health and physical education courses, people of Ukraine are looking forward and acting towards gradual improvement of the health status of Ukrainians and focus on the creation of the upcoming generation of healthy and wealthy citizens.

References

- Krasilshchikov, O., Krutsevich, T., Smolius, G., Davydenko, O. (2014). Physical Education Practices in Ukraine: Transition from the Past to the Future. In: Physical Education and Health: Global Perspectives and Best Practice. Chin, M. & Edginton, C.R. (Eds.) p.503-516. Sagamore Publishing LLC, Urbana, IL, USA.
- Timoshenko, O.V., Dyomina, J.G. (2011) State and Main Directions of Modernization of a System of School Physical Education at the Contemporary Stage of the Development of the Society. School Physical Education, 6, 2-5.

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NEUROMUSCULAR CONTROL IN BOTH LEGS DURING SPRINT RUNNING: IMPLICATIONS FOR ATHLETIC TRAINING.

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ABSTRACT

Sprint running performance depends on the precise neuromuscular control of the lower limbs. Surface electromyography (sEMG) has played a central role in elucidating muscle activation patterns during sprinting; however, most previous studies have focused on unilateral muscle activity, leaving bilateral coordination largely unexplored. This review synthesizes current knowledge on thigh muscle activity during sprint running, with particular emphasis on bilateral coordination between the rectus femoris and biceps femoris muscles. Drawing on the author's recent experimental studies, we introduce quantitative indices describing inter- and intra-limb muscle coordination and examine their relationships with sprint performance across maximal sprinting, submaximal speed conditions, and the deceleration phase of the 100-m sprint. The findings collectively indicate that superior sprint performance, particularly higher step frequency, is associated with refined bilateral thigh muscle coordination rather than increased muscle activation alone. These insights provide a neuromuscular basis for the coaching concept of "scissors action" and highlight the importance of bilateral coordination as a target for sprint training and performance optimization.

Keywords: sprint running; surface electromyography; bilateral coordination; thigh muscles; step frequency

I. Introduction

Human locomotion is achieved through motor commands planned and coordinated by the central nervous system and transmitted to peripheral muscles, resulting in muscle activation and force production. Muscle activity can be quantified non-invasively using surface electromyography (sEMG), which reflects the summated action potentials of active muscle fibers. sEMG has therefore been widely adopted in medical, rehabilitation, and sports science research. Quantification of muscle activation amplitude and timing (onset and offset) enables investigation of neuromuscular strategies underlying high-level athletic performance.

Sprint running represents one of the most fundamental forms of human movement and is a critical performance component in track and field as well as many team sports. Accordingly, sprinting has been extensively studied, and fundamental muscle activation patterns have been well established. However, sprint running is inherently a cyclic, bilateral movement, and yet most EMG studies have examined muscle activity in only one leg. In coaching practice, the importance of "interlimb coordination" is widely recognized, particularly in relation to rapid leg exchange during ground contact. The present review therefore focuses on the control of thigh muscle activity in both legs during sprint running. Specifically, we discuss how inter thigh muscle activity can be quantified, how it relates to sprint performance, and how these findings may be translated into coaching and training practice.

II. A Kinematic Framework of Sprint Running

Sprint running consists of cyclic alternation between ground contact and flight phases. From the timing of foot contact and toe-off, temporal variables such as contact time and flight time can be derived. Their sum determines step frequency, which, together with step length, defines running speed. Elite 100-m sprinters achieve running speeds exceeding 12 $m \cdot s^{-1}$, with strides of approximately 2.5 m and step frequencies around 5 Hz (Ae et al., 1992; Krzysztof & Mero, 2013). Because stride length and step frequency interact negatively, performance optimization requires an individualized balance between the two. Indeed, Salo et al. (2011) demonstrated that elite sprinters can be classified as step length-dominant, step frequency-dominant, or mixed, highlighting the need to understand individual movement strategies rather than applying a uniform technical model.

III. The Role of the Thigh in Sprint Running

At the 1991 World Championships in Athletics held in Tokyo, the Japanese biomechanics research team made a substantial contribution to sprint biomechanics, establishing foundational insights that continue to influence contemporary sprint coaching theory. By analyzing and comparing running mechanics across a wide performance spectrum, ranging from world-class athletes to collegiate-level sprinters, these studies demonstrated a positive correlation between running speed and the angular velocity of hip extension and

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flexion. In contrast, the hip flexion angle itself—commonly emphasized in coaching practice as "high knee lift"—showed no significant correlation with running speed (Ito et al., 1998). These findings prompted a critical re-evaluation of sprint coaching methods in Japan and led to a widespread recognition of the importance of sprint mechanics originating from the hip joint and thigh segments.

Subsequent studies have consistently highlighted the importance of hip extension during sprint running (Bezodis et al., 2008; Johnson and Buckley, 2001; Hunter et al., 2004), and hip-driven movement has become a central technical focus in sprint coaching. More recently, Clark and colleagues (2020) provided further insight into thigh-dominant sprint mechanics by examining sprint-specific movement characteristics. Figure 1 illustrates the time-series changes in the inter-thigh angle over two running cycles in elite sprinters (10 m/s) and recreational-level athletes (8 m/s). The inter-thigh angle exhibited alternating bilateral patterns in both groups; however, sprinters demonstrated a larger amplitude achieved within a shorter time frame. Moreover, the thigh angles of sprinters were biased toward more positive values, indicating that thigh motion occurred further anterior to the body compared with recreational athletes.

Importantly, running speed was found to be strongly correlated with thigh angular velocity rather than thigh angle itself. These findings suggest that elite sprinters acquire a movement pattern characterized by moving the thighs both faster and through a larger range of motion, and that this characteristic contributes substantially to superior sprint performance. From a coaching perspective, this reinforces the critical notion that sprint performance depends not on static joint positions at specific instants, but rather on the ability to execute rapid lower-limb movements.

From a mechanical standpoint, the work performed by the thigh segments during sprinting at 7 m/s has been reported to be approximately four times greater than that during low-speed running at 3.5 m/s (Dorn et al., 2012). In particular, mechanical work performed by the thigh during the swing phase increases sharply beyond a running speed of approximately 7 m/s (Schache et al., 2014; Schache et al., 2015). Furthermore, as sprinting speed increases toward maximal velocity, step frequency and step length do not increase in parallel. Instead, step length eventually reaches a plateau, necessitating the acquisition of a higher step frequency to further increase running speed (Dorn et al., 2012; Goto et al., 2021; Schache et al., 2014; Yanai and Hay, 2004).

Thus, during maximal-velocity sprinting, athletes transition to a strategy that prioritizes step frequency, placing greater demands on rapid thigh-driven lower-limb movements (Clark et al., 2020). Given that sprint running is a cyclic movement composed of alternating stance and swing phases between the two legs, this naturally highlights the importance of bilateral coordination. Supporting this notion, sprinters have been reported to exhibit a shorter horizontal distance between the knees at ground contact compared with distance runners (Bushnell and Hunter, 2007). In coaching practice, this characteristic is widely recognized as the "scissors action," in which the legs rapidly cross or close toward each other at the instant of ground contact, emphasizing the role of coordinated bilateral lower-limb motion in high-speed sprinting.

IV. Muscle Activity During Sprint Running

Pioneering studies that quantified muscle activity during sprint running were primarily conducted by the research group led by Dr. Paavo Komi, whose work laid the foundation of modern sports science (Mero, 1989; Mero and Komi, 1987; Mero et al., 1992). As early as the 1980s and 1990s, surface electromyography enabled the identification of fundamental muscle activation patterns during sprint running (Mero, 1989; Mero and Komi, 1987; Mero et al., 1992). Figure 2 illustrates the timing of muscle activity throughout the running cycle for seven lower-limb muscles—hamstrings, rectus femoris, vastus lateralis, gluteus maximus, gastrocnemius, soleus, and tibialis anterior—as reported by Howard et al. (2018).

In sprint running, the magnitude of ground reaction force during the stance phase is a primary determinant of stride characteristics (Hunter et al., 2005). Accordingly, the ability to generate large amounts of power through rapid lower-limb movements is essential. The hip extensors, including the gluteus maximus and hamstrings, exhibit substantial activity from the latter half of the swing phase through the stance phase. During late swing, the gluteus maximus is activated to accelerate the leg backward as the hip transitions from flexion to extension, thereby contributing to the attainment of a high step frequency. In addition, during stance, the gluteus maximus functions not only as a hip extensor but also plays a role in controlling forward trunk inclination (Bartlett et al., 2014; Lieberman et al., 2006).

The hamstrings constitute a muscle group composed of the biceps femoris, semimembranosus, and semitendinosus, which are biarticular muscles controlling both hip extension and knee flexion. Because these muscles differ in their morphological characteristics and functional roles, their activation patterns during sprint

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running also differ (Higashihara et al., 2010, 2015). The biceps femoris and semitendinosus contribute predominantly to hip extension, and it has been reported that biceps femoris activity immediately prior to ground contact is particularly important for generating the horizontal component of the ground reaction force during the early acceleration phase (Morin et al., 2015).

The hamstrings are also the muscle group at greatest risk of injury during sprint running. During the late swing phase, the hamstrings reach their maximal muscle length while simultaneously producing force through eccentric contraction. Mechanical stress is therefore greatest during this phase, which is widely considered to be the primary mechanism underlying hamstring strain injuries (Chumanov et al., 2012; Schache et al., 2012; Thelen et al., 2005). In recent years, studies have examined the effectiveness of standardized training programs for hamstring injury prevention (Wan et al., 2021), as well as approaches that provide individualized exercise interventions based on continuous athlete monitoring (Edouard et al., 2023; Lahti et al., 2020). However, a substantial gap remains between research-based ideals and practical implementation in real-world athletic settings.

During the stance phase, in cooperation with the hip extensors such as the hamstrings and gluteus maximus, knee extensors (vastus lateralis and rectus femoris), ankle plantar flexors (soleus and gastrocnemius), and ankle dorsiflexors (tibialis anterior) are also activated. In elite sprinters, peak ground reaction forces occur during the early stance phase, with instantaneous forces reaching approximately four to five times body weight (Clark and Weyand, 2014). Consequently, these muscles exhibit strong activation to increase joint stiffness and stabilize the body's center of mass during early stance, while also contributing to powerful push-off during late stance. Muscle activity is observed even before ground contact (Kyrolainen et al., 1999, 2005), a phenomenon referred to as pre-activation. Pre-activation is considered a neuromuscular strategy that maximizes the function of the stretch–shortening cycle of the muscle–tendon complex during stance (Komi, 2000; Kuitunen et al., 2007). Kyrolainen et al. (2005) demonstrated that pre-activation during the pre-contact phase becomes more pronounced as running speed increases. Thus, at higher sprinting speeds, lower-limb muscles are activated in advance of ground contact to increase overall leg stiffness in preparation for the high impact loads of early stance, while simultaneously enabling explosive power generation during late stance.

The vastus lateralis, a monoarticular muscle of the quadriceps femoris group, functions primarily as a knee extensor and is active during the stance phase to increase knee joint stiffness and stabilize the body's center of mass. In contrast, during the swing phase, activity of the vastus lateralis is not observed; instead, activation of the hip flexor rectus femoris and the ankle dorsiflexor tibialis anterior is evident. Although the rectus femoris is a biarticular muscle controlling both hip flexion and knee extension, its role during sprint running is predominantly that of a hip flexor (Mero and Komi, 1987; Modica and Kram, 2005). Indeed, rectus femoris activity during stance is minimal (Kyrolainen et al., 2005), whereas strong activation during swing enables rapid leg recovery (Mero and Komi, 1987). During this phase, the tibialis anterior acts synergistically to dorsiflex the ankle; however, substantial inter-individual variability in the timing of tibialis anterior activation has been reported.

V. Bilateral Thigh Muscle Coordination at Maximal Sprinting Speed

Eighteen male track and field sprinters, including athletes who had competed in the Olympic Games (100-m personal best equivalent: 10.47 s), participated in this study. During maximal sprint running (9.87 ± 0.54 m•s^{-1}), surface EMG signals were recorded from the rectus femoris (RF) and biceps femoris (BF) of both legs, and their relationships with sprint performance were examined (Kakehata et al., 2021). The primary variables analyzed were the timing of muscle activation onset and offset. Based on these variables, two indices of muscle control were defined: Switch, representing the transition between the agonist and antagonist muscles within the ipsilateral leg (defined as the time interval from iRF onset [or offset] to iBF offset [or onset]); and Scissors, representing bilateral coordination, defined as the time difference between onset and/or offset of the ipsilateral RF and the contralateral BF (Figure 3).

Figure 3 presents raw EMG waveforms of RF and BF from both legs over two consecutive running cycles during sprinting. In the figure, approximately 0.4 s on the horizontal axis corresponds to the first running cycle, and the interval from approximately 0.4 to 0.8 s represents the second running cycle. From top to bottom, the traces show EMG activity of the ipsilateral BF (iBF) and RF (iRF). During sprint running, muscle activity is characterized by alternating activation of agonist and antagonist muscles (Jacobs and van Ingen Schenau, 1992). Accordingly, the activity of the hip flexor RF and the hip extensor BF alternates twice within a single running cycle.

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Focusing further on the coordination between the RF, which functions as the agonist muscle of the swing leg, and the BF of the contralateral leg (cBF), which functions as the agonist muscle during stance, these muscles exhibit synchronized activity with a clear temporal offset. Considering the characteristic "scissors action," in which the legs rapidly cross at the instant of ground contact, a smaller temporal difference between the activation of these two muscles (i.e., a shorter Scissors interval) can be interpreted as superior scissors-like coordination.

To examine the functional relevance of these timing variables, correlations were calculated between muscle activation timing and sprint performance variables, including running speed, step frequency (pitch), and stride length. The results demonstrated that sprinters with higher step frequencies exhibited two key neuromuscular characteristics. First, they showed minimal co-contraction between the agonist (iRF) and antagonist (iBF) muscles, indicating efficient muscle control that facilitates rapid joint motion, as reflected by a shorter Switch interval. Second, they demonstrated superior bilateral muscle control, characterized by earlier activation of the swing-leg agonist responsible for hip flexion (iRF) relative to the contralateral stance-leg agonist responsible for hip extension (cBF), as reflected by a shorter Scissors interval.

Collectively, these findings indicate that a higher step frequency during sprint running is associated with refined temporal control of both intra-limb and inter-limb thigh muscle activity.

VI. Speed-dependent modulation of bilateral thigh muscle control under submaximal and maximal efforts

In track and field training, the majority of running sessions consist not only of maximal-effort sprinting but also of submaximal efforts ranging from jogging to tempo running (Haugen et al., 2019). To examine bilateral thigh muscle control across a wide range of running intensities, we investigated bilateral thigh muscle activity during 50-m sprints performed at seven different levels of subjective effort (SE): 20%, 40%, 60%, 80%, 90%, 95%, and 100% SE (Kakehata et al., 2023).

Figure 4 presents ensemble-averaged EMG waveforms obtained at each subjective effort level. As subjective effort increased, running speed increased correspondingly, and in the high-speed domain above 80% SE (>9 $m \cdot s^{-1}$), a high step frequency (>4 Hz) was observed. In contrast, stride length reached a plateau at 80% SE, indicating that, in the high-speed domain, running speed was regulated primarily by step frequency rather than stride length. In addition, at higher running speeds, both the duration and magnitude of muscle activity increased for the rectus femoris (RF) during the swing phase and for the biceps femoris (BF) during the stance phase and late swing phase; however, the effect size of these increases was greater for the RF than for the BF.

These findings suggest that, in the high-speed domain, rapid swing-leg motion required for attaining a high step frequency is achieved predominantly through modulation of the timing and magnitude of RF activity. Because increases in step frequency require rapid bilateral leg motion, bilateral coordination between the two legs becomes increasingly important at higher speeds. Consistent with this notion, the temporal difference between RF activity in the swing leg and BF activity in the contralateral stance leg, quantified by the Scissors index, was shortened in the high-speed domain. This shortening of the Scissors interval can be interpreted as a neuromuscular strategy that facilitates rapid bilateral lower-limb motion.

Furthermore, the Switch interval was also reduced at higher running speeds, indicating that transitions between agonist and antagonist muscle activity occurred within a shorter time frame. Collectively, these results suggest that sprinting at higher speeds requires more advanced and finely tuned control of bilateral thigh muscle activity, enabling rapid alternation of muscle activation both within and between the two legs.

VII. Bilateral Thigh Muscle Control During the 100-m Sprint

The 100-m sprint is the most representative event for evaluating sprint performance in track and field. The race can be divided into three phases: the acceleration phase, the maximal velocity phase, and the deceleration phase (Ae et al., 1992). Although numerous studies have elucidated the mechanisms underlying the attainment of maximal running speed, performance in the latter stages of the race is also strongly influenced by deceleration. Deceleration during the 100-m sprint has been attributed primarily to a reduction in step frequency rather than stride length (Graubner and Nixdorf, 2011). To investigate the neuromuscular mechanisms underlying this phenomenon, we examined bilateral thigh muscle activity—specifically the rectus femoris (RF) and biceps femoris (BF)—during the 100-m sprint (Kakehata et al., 2022).

Nine male sprinters (100-m personal best equivalent: 10.53 s) participated in the study. A portable EMG data logger was attached to the lower back, enabling bilateral EMG recordings of RF and BF during the entire 100-m sprint. As a result, stable EMG signals were successfully obtained throughout the race (Figure 5). Figure 5

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presents an example of raw EMG waveforms of bilateral RF and BF, along with time-series changes in running speed, step frequency, and stride length, from a participant who recorded a 10.80-s 100-m sprint during testing.

During the deceleration phase, both running speed (maximal velocity phase: 10.30 ± 0.26 m•s^{-1} vs. deceleration phase: 10.03 ± 0.33 m•s^{-1}) and step frequency (maximal velocity phase: 4.65 ± 0.20 Hz vs. deceleration phase: 4.48 ± 0.22 Hz) decreased. In contrast, stride length was slightly greater during the deceleration phase (maximal velocity phase: 2.22 ± 0.11 m vs. deceleration phase: 2.24 ± 0.13 m). These results indicate that the primary contributor to deceleration during the 100-m sprint was a reduction in step frequency rather than a decrease in stride length.

Figure 6 illustrates the timing of muscle activity across the running cycle during the maximal velocity and deceleration phases. Notably, during the deceleration phase, the activation timing of both RF and BF shifted toward the latter half of the running cycle, indicating delayed muscle activation. Because the RF functions as a hip flexor, delayed RF activation likely resulted in a slower recovery of the swing leg, defined as the forward repositioning of the entire limb. Conversely, because the BF functions as a hip extensor, delayed BF activation likely caused the leg to remain positioned posterior to the body for a longer duration, a phenomenon commonly described in coaching practice as “leg trailing.”

Furthermore, the timing of the swing-leg RF relative to the stance-leg BF, quantified by the Scissors index, was delayed during the deceleration phase. Together, these alterations in bilateral thigh muscle control suggest that, during the deceleration phase, changes in neuromuscular coordination between the two legs lead to delayed swing-leg recovery, which in turn induces a reduction in step frequency. Accordingly, these findings suggest that limitations in 100-m sprint performance may be partly attributable to changes in the control patterns of bilateral thigh muscle activity.

VIII. Summary and Future Perspectives

In this review, we summarized current knowledge regarding muscle activity during sprint running and presented a series of our previous studies focusing on bilateral thigh muscle activity, based on fundamental analyses of muscle activation magnitude and timing. The principal findings can be summarized as follows. We defined Scissors as an index of muscle control representing bilateral coordination between the legs and examined this index across maximal sprinting, different running speeds, and the 100-m sprint. As a result, sprinters with higher step frequencies exhibited superior Scissors coordination during maximal sprinting (Kakehata et al., 2021); sprinting at high speeds, where a high step frequency is required, demanded more refined Scissors coordination (Kakehata et al., 2023); and during the deceleration phase of the 100-m sprint, when step frequency decreases, systematic changes in Scissors coordination were observed (Kakehata et al., 2022).

Collectively, these findings suggest that the perspective of “bilateral coordination” is of particular importance for training and coaching in sprint running. Although the present findings were derived from EMG data obtained from only two muscles, sprint running is inherently produced through the coordinated activation of multiple muscles across the lower limbs. In recent years, muscle synergy analysis, which interprets the function of multiple muscle groups as unified modules, has begun to be applied to sprint running (Santuz et al., 2020). Furthermore, it has been reported that the number of muscle synergies involved in running decreases with growth, development, and training, potentially reflecting improved running efficiency (Cheung et al., 2020).

From this perspective, the use of electromyography offers a powerful means to investigate sprint running mechanics from the viewpoint of the central nervous system and motor control. Future studies integrating bilateral coordination indices with multi-muscle synergy analyses may provide deeper insight into long-term training adaptations and the individual neuromuscular characteristics that distinguish elite sprinters from their peers.

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Figure Captions

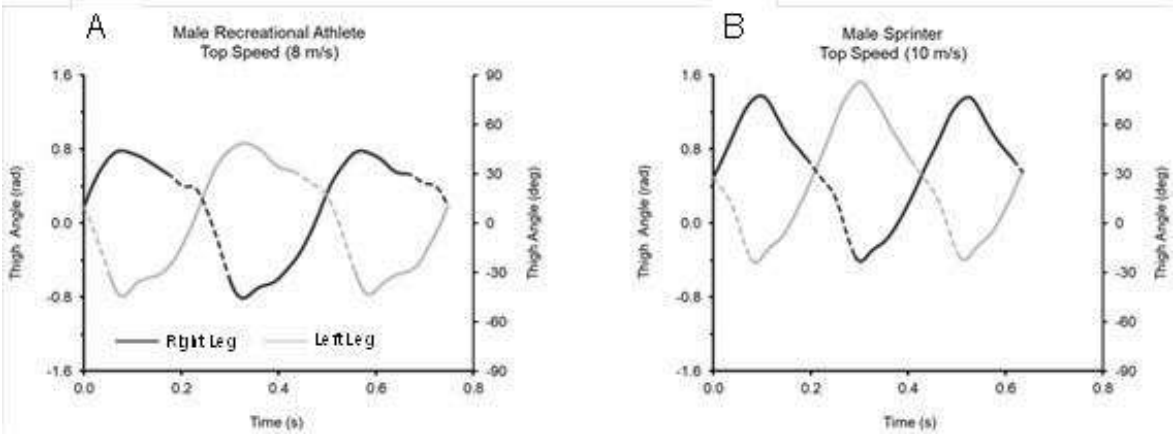

Figure 1.

Comparison of thigh angle trajectories over two running cycles between a recreational-level athlete running at 8 m/s (A) and a sprinter running at 10 m/s (B), adapted from Clark et al. (2020).

Dashed lines indicate the stance phase, and solid lines indicate the swing phase. The black line represents the right leg, and the gray line represents the left leg. Compared with the recreational-level athlete (A), the sprinter (B) exhibits a larger inter-thigh angle, a shorter running cycle duration by approximately 0.1 s (i.e., higher step frequency), and thigh angle waveforms that are shifted overall in the positive direction, indicating that both thighs are moved more anteriorly relative to the body.

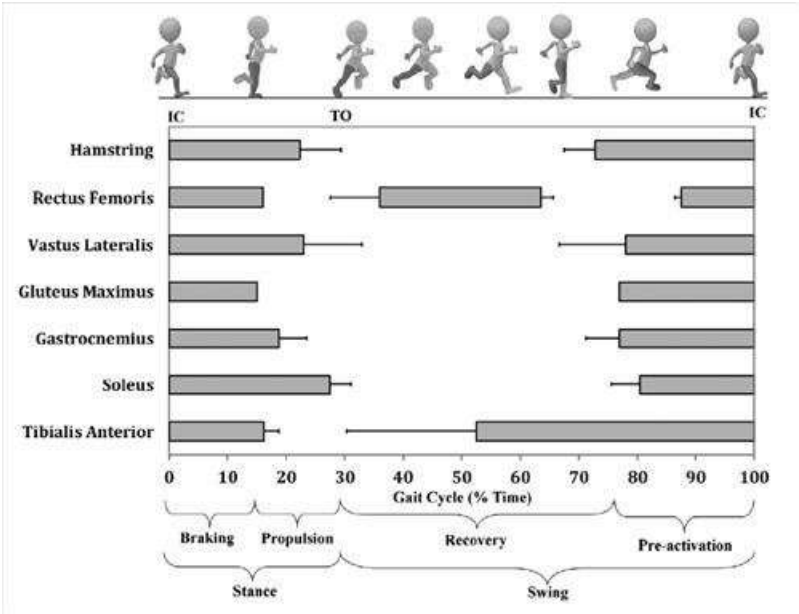

Figure 2.

Timing of muscle activation for seven lower-limb muscles (hamstrings, rectus femoris, vastus lateralis, gluteus maximus, gastrocnemius, soleus, and tibialis anterior) during the running gait cycle in sprinting, adapted from Howard et al. (2018).

IC (Initial Contact) indicates foot contact with the ground, and TO (Toe Off) indicates toe-off.

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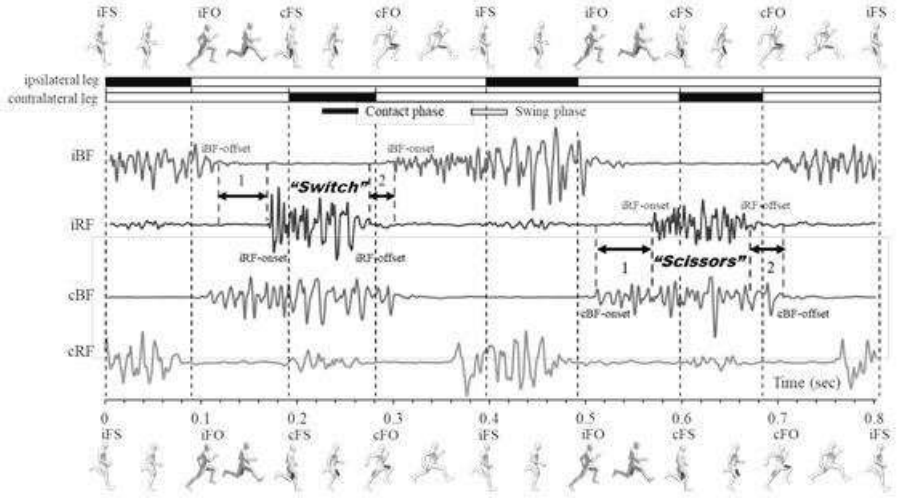

Figure 3.

Raw electromyographic (EMG) waveforms of the rectus femoris (RF) and biceps femoris (BF) obtained from the ipsilateral (reference) leg and the contralateral leg during sprinting, adapted from Kakehata et al. (2021).

Dashed lines indicate foot strike (FS) and foot off (FO) for the ipsilateral and contralateral legs, respectively. Black blocks represent the stance phase, and white blocks represent the swing phase. "Switch" denotes the duration required for the transition between RF and BF activity in the ipsilateral leg, whereas "Scissors" represents the temporal difference in muscle activity between the ipsilateral RF and the contralateral BF.

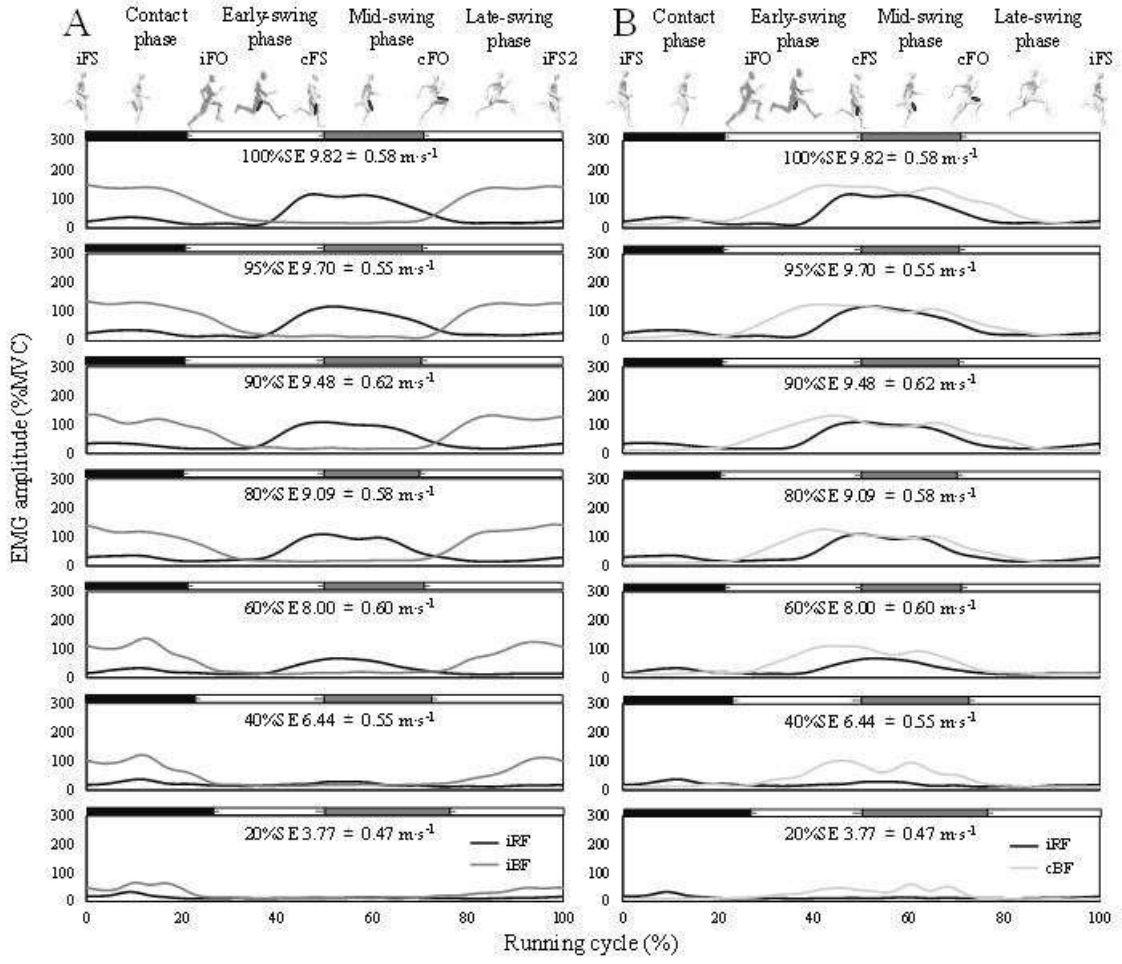

Figure 4.

Ensemble-averaged EMG waveforms of the rectus femoris and biceps femoris in both legs across different levels of subjective effort, adapted from Kakehata et al. (2023).

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Panel A shows the EMG waveforms of the ipsilateral rectus femoris (iRF) and biceps femoris (iBF). Panel B shows bilateral muscle activity, specifically the rectus femoris of the ipsilateral leg (iRF) and the biceps femoris of the contralateral leg (cBF).

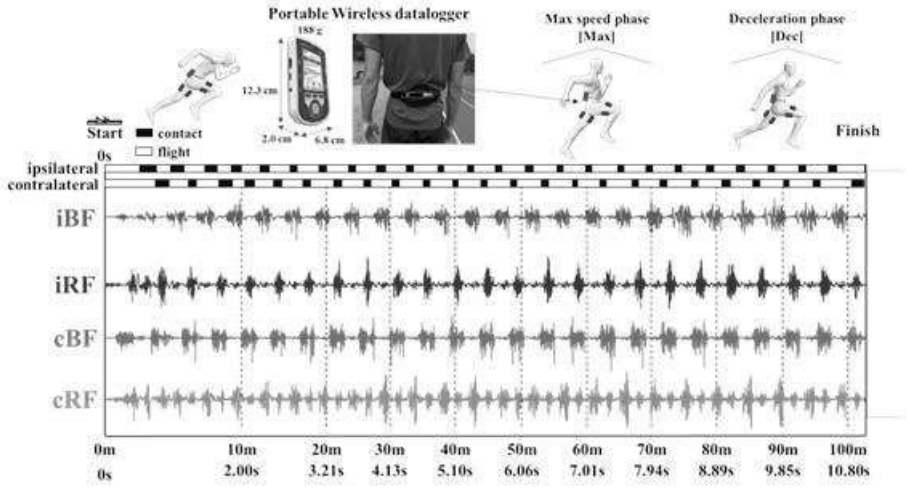

Figure 5.

Raw EMG waveforms of the rectus femoris (RF) and biceps femoris (BF) obtained from the ipsilateral and contralateral legs during a 100-m sprint, adapted from Kakehata et al. (2022).

The horizontal axis indicates split times at every 10 m. Black blocks represent the stance phase, and white blocks represent the flight phase. Muscle activity was recorded using a portable EMG data logger, which was attached to the participant's lower back, as shown in the photograph.

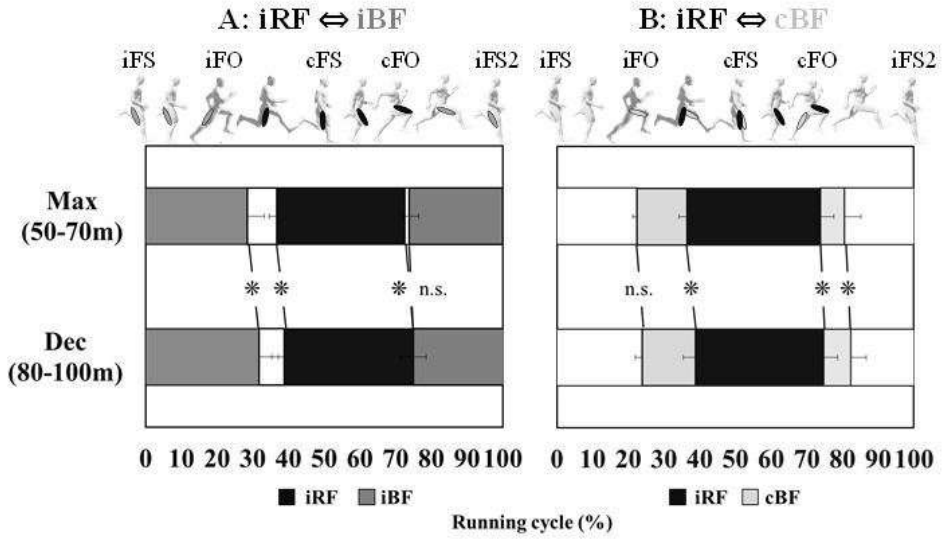

Figure 6.

Differences in muscle activation timing (onset/offset) between the maximal velocity phase (50–70 m) and the deceleration phase (80–100 m) during a 100-m sprint, adapted from Kakehata et al. (2022).

Panel A shows muscle activity of the ipsilateral rectus femoris (iRF) and biceps femoris (iBF). Panel B shows muscle activity of the contralateral biceps femoris (cBF) and the ipsilateral rectus femoris (iRF). * indicates a statistically significant difference at the 5% level.

REFERENCES

- Ae, M., Ito, A., & Suzuki, M.（1992）The men's 100 metres. New Studies in Athletics, 7(1)：47-52.

- Bartlett, J. L., Sumner, B., Ellis, R. G. & Kram, R. (2014) Activity and functions of the human gluteal muscles in walking, running, sprinting, and climbing. Am.J.Phys.Anthropol., 153(1) : 124-131. doi : 10.1002/ajpa.22419
- Bezodis, I. N., Kerwin, D. G., & Salo, A. I.（2008）Lower-limb mechanics during the support phase of maximum-velocity sprint running. Med.Sci.Sports.Exerc.,40(4):707-715. doi:10.1249/MSS.0b013e318162d162
- Bushnell, T., & Hunter, I. (2007) Differences in technique between sprinters and distance runners at equal and maximal speeds. Sports biomechanics, 6(3):261-268.
- Chen, G. (2006) Induced acceleration contributions to locomotion dynamics are not physically well defined. Gait Posture, 23(1):37-44. doi:10.1016/j.gaitpost.2004.11.016
- Cheung, V. C. K., Cheung, B. M. F., Zhang, J. H., Chan, Z. Y. S., Ha, S. C. W., Chen, C.-Y., & Cheung, R. T. H. (2020) Plasticity of muscle synergies through fractionation and merging during development and training of human runners. Nature Communications, 11(1) : 4356. doi:10.1038/s41467-020-18210-4
- Chumanov, E. S., Schache, A. G., Heiderscheit, B. C., & Thelen, D. G. (2012) Hamstrings are most susceptible to injury during the late swing phase of sprinting. Br J Sports Med., 46(2) : 90. doi:10.1136/bjsports-2011-090176
- Clark, K. P., Meng, C. R., & Stearne, D. J. (2020) “Whip from the hip”: thigh angular motion, ground contact mechanics, and running speed. Biology Open. doi:10.1242/bio.053546
- Clark, K. P., & Weyand, P. G. (2014) Are running speeds maximized with simple-spring stance mechanics? J Appl Physiol, 117(6) : 604-615. doi:10.1152/japplphysiol.00174.2014
- D. Johnson, M., & Buckley, J. G. (2001) Muscle power patterns in the mid-acceleration phase of sprinting. Journal of Sports Sciences, 19(4):263-272. doi:10.1080/026404101750158330
- Dorn, T. W., Schache, A. G., & Pandy, M. G. (2012). Muscular strategy shift in human running: dependence of running speed on hip and ankle muscle performance. J.Exp.Biol., 215:1944-1956.
- Edouard, P., Mendiguchia, J., Guex, K., Lahti, J., Prince, C., Samozino, P., & Morin, J.-B. (2023) Sprinting: a key piece of the hamstring injury risk management puzzle. British Journal of Sports Medicine, 57(1):4-6. doi:10.1136/bjsports-2022-105532
- Goto, Y., Ogawa, T., Kakehata, G., Sazuka, N., Okubo, A., Wakita, Y., . . . Kanosue, K. (2021) Spatiotemporal inflection points in human running: Effects of training level and athletic modality. PLoS One, 16(10), e0258709. doi:10.1371/journal.pone.0258709
- Graubner, R., & Nixdorf, E. (2011) Biomechanical Analysis of the Sprint and Hurdles Events at the 2009 IAAF World Championships in Athletics. New Studies in Athletics, 26(1/2):19-53.
- Haugen, T., Seiler, S., Sandbakk, O., & Tonnessen, E. (2019) The Training and Development of Elite Sprint Performance: an Integration of Scientific and Best Practice Literature. Sports Medicine Open, 5(1):44. doi:10.1186/s40798-019-0221-0
- Higashihara, A., Nagano, Y., Ono, T., & Fukubayashi, T. (2015) Differences in activation properties of the hamstring muscles during overground sprinting. Gait Posture, 42(3): 360-364. doi:10.1016/j.gaitpost.2015.07.002
- Higashihara, A., Ono, T., Kubota, J., Okuwaki, T., & Fukubayashi, T. (2010) Functional differences in the activity of the hamstring muscles with increasing running speed. Journal of Sports Sciences, 28(10):1085-1092. doi:10.1080/02640414.2010.494308
- Howard, R. M., Conway, R., & Harrison, A. J. (2018) Muscle activity in sprinting: a review. Sports Biomech., 17(1):1-17.
- Hunter, J. P., Marshall, R. N., & McNair, P. J. (2004) Interaction of step length and step rate during sprint running. Med.Sci.Sports Exerc., 36(2):261-271. doi:10.1249/01.MSS.0000113664.15777.53
- Hunter, J. P., Marshall, R. N., & McNair, P. J. (2005) Relationships between ground reaction force impulse and kinematics of sprint-running acceleration. J.Appl.Biomech., 21(1):31-43.

ISSN 2394 - 7780

- Ito A, Ichikawa H, Saito M, Sagawa K, Iro M,, Kobayashi K.（1998）Relationship between sprint running movement and velocity at full speed phase during a 100m race. Japan Journal of Physical Education Health and Sport Sciences, 43(5):260-273. doi:10.5432/jjpehss.KJ00003392100
- Jacobs, R., & van Ingen Schenau, G. J. (1992) Intermuscular coordination in a sprint push-off. J.Biomech., 25(9):953-965.
- Kakehata, G., Goto, Y., Iso, S., & Kanosue, K. (2021) Timing of Rectus Femoris and Biceps Femoris Muscle Activities in Both Legs at Maximal Running Speed. Med.Sci.Sports Exerc., 53(3):643-652. doi:10.1249/mss.0000000000002497
- Kakehata, G., Goto, Y., Iso, S., & Kanosue, K. (2022) The Timing of Thigh Muscle Activity is a Factor Limiting Performance in the Deceleration Phase of the 100-m Dash. Med.Sci.Sports Exerc., 54(6):1002-1012. doi:10.1249/mss.0000000000002876
- Kakehata, G., Goto, Y., Yokoyama, H., Iso, S., & Kanosue, K. (2023) Inter- and Intra-Limb Coordination of Rectus Femoris and Biceps Femoris Muscles at Different Running Speeds. Med.Sci.Sports Exerc., doi:10.1249/mss.0000000000003106
- Komi, P. V. (2000) Stretch-shortening cycle: a powerful model to study normal and fatigued muscle. J.Biomech., 33(10):1197-1206. doi:10.1016/s0021-9290(00)00064-6
- Krzysztof, M., & Mero, A. (2013) A kinematics analysis of three best 100 m performances ever. J.Hum.Kinet., 36:149-160. doi:10.2478/hukin-2013-0015
- Kuitunen, S., Kyröläinen, H., Avela, J., & Komi, P. V. (2007) Leg stiffness modulation during exhaustive stretch-shortening cycle exercise. Scand.J.Med.Sci.Sports, 17(1):67-75. doi:10.1111/j.1600-0838.2005.00506.x
- Kyrolainen, H., Avela, J., & Komi, P. V. (2005) Changes in muscle activity with increasing running speed. J.Sports Sci., 23(10):1101-1109. doi:10.1080/02640410400021575
- Kyrolainen, H., Komi, P. V., & Belli, A. (1999) Changes in muscle activity patterns and kinetics with increasing running speed. The Journal of Strength & Conditioning Research, 13(4):400-406.
- Lahti, J., Mendiguchia, J., Ahtiainen, J., Anula, L., Kononen, T., Kujala, M., Matinlauri, A., Peltonen, V., Thibault, M., Toivonen, R.-M., Edouard, P., & Morin, J. B. (2020) Multifactorial individualised programme for hamstring muscle injury risk reduction in professional football: protocol for a prospective cohort study. BMJ Open Sport & Exercise Medicine, 6(1), e000758. doi:10.1136/bmjsem-2020-000758
- Lieberman, D. E., Raichlen, D. A., Pontzer, H., Bramble, D. M., & Cutright-Smith, E. (2006) The human gluteus maximus and its role in running. J.Exp.Biol., 209(Pt 11):2143-2155. doi:10.1242/jeb.02255
- Mero, A. (1989) Neural activation in fatigued and non-fatigued conditions of short and long sprint running (Vol. 6).
- Mero, A., & Komi, P. V. (1987) Electromyographic activity in sprinting at speeds ranging from sub-maximal to supra-maximal. Med.Sci.Sports Exerc., 19(3):266-274.
- Mero, A., Komi, P. V., & Gregor, R. J. (1992) Biomechanics of sprint running. A review. Sports Med., 13(6):376-392. doi:10.2165/00007256-199213060-00002
- Modica, J. R., & Kram, R. (2005) Metabolic energy and muscular activity required for leg swing in running. J.Appl.Physiol., 98(6):2126-2131. doi:10.1152/japplphysiol.00511.2004
- Morin, J. B., Gimenez, P., Edouard, P., Arnal, P., Jimenez-Reyes, P., Samozino, P., Brughelli, M., Mendiguchia, J. (2015) Sprint Acceleration Mechanics: The Major Role of Hamstrings in Horizontal Force Production. Front Physiol., 6:404. doi:10.3389/fphys.2015.00404
- Pandy, M. G., Lai, A. K. M., Schache, A. G., & Lin, Y. C. (2021) How muscles maximize performance in accelerated sprinting. Scand.J.Med.Sci.Sports,31(10):1882-1896. doi:10.1111/sms.14021
- Salo, A. I., Bezodis, I. N., Batterham, A. M., & Kerwin, D. G. (2011) Elite sprinting: are athletes individually step-frequency or step-length reliant? Med.Sci.Sports Exerc., 43(6):1055-1062. doi:10.1249/MSS.0b013e318201f6f8

ISSN 2394 - 7780

- Santuz, A., Ekizos, A., Kunimasa, Y., Kijima, K., Ishikawa, M., & Arampatzis, A. (2020) Lower complexity of motor primitives ensures robust control of high-speed human locomotion. Heliyon, 6(10), e05377. doi:10.1016/j.heliyon.2020.e05377
- Schache, A. G., Brown, N. A., & Pandy, M. G. (2015) Modulation of work and power by the human lower-limb joints with increasing steady-state locomotion speed. J.Exp.Biol., 218: 2472-2481.
- Schache, A. G., Dorn, T. W., Blanch, P. D., Brown, N. A., & Pandy, M. G. (2012) Mechanics of the human hamstring muscles during sprinting. Med.Sci.Sports Exerc., 44(4):647-658. doi:10.1249/MSS.0b013e318236a3d2
- Schache, A. G., Dorn, T. W., Williams, G. P., Brown, N. A., & Pandy, M. G. (2014) Lower-limb muscular strategies for increasing running speed. J.Orthop Sports Phys.Ther., 44(10): 813-824. doi:10.2519/jospt.2014.5433
- Thelen, D. G., Chumanov, E. S., Hoerth, D. M., Best, T. M., Swanson, S. C., Li, L. Young M, Heiderscheit, B. C. (2005) Hamstring muscle kinematics during treadmill sprinting. Med. Sci.Sports Exerc., 37(1):108-114. doi:10.1249/01.mss.0000150078.79120.c8
- Wan, X., Li, S., Best, T. M., Liu, H., Li, H., & Yu, B. (2021) Effects of flexibility and strength training on peak hamstring musculotendinous strains during sprinting. J.Sport Health Sci., 10(2):222-229. doi:10.1016/j.jshs.2020.08.001
- Yanai, T., & Hay, J. G. (2004) Combinations of cycle rate and length for minimizing the muscle power requirement in human running. Journal of applied biomechanics, 20(1):51-70**.**

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IMPLEMENTATION AND EVALUATION OF CRICKET EDUCATION IN JAPANESE ELEMENTARY AND MIDDLE SCHOOL PHYSICAL EDUCATION

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ABSTRACT:

The presenter has continuously developed teaching materials aimed at improving throwing distance among children in Japanese elementary and middle school physical education classes, achieving certain outcomes. Following this, the research focus shifted to improving throwing ability within baseball-type games. In this process, I conducted a field survey in India in 2024 to examine its cultural and educational contexts. Through this experience, I focused on the educational potential of cricket, India's national sport. Furthermore, I conducted a field survey in Sri Lanka in 2025, where I identified how cricket is deeply rooted in school education, local communities, and even lifelong sports. After returning to Japan, I began collaborating with the Japan Cricket Association and promoted the development of a learning program that incorporated cricket as teaching material in Japanese elementary and middle school physical education classes. In Japan, physical education classes mainly focus on tee-ball and softball, where the match-up between pitcher and batter is often removed from the game. As a result, opportunities for throwing are limited, making it difficult to ensure sufficient improvement in throwing ability. In contrast, cricket allows every student to engage in multiple throwing opportunities because of the nature of hitting pitched balls, which is considered effective for improving throwing skills. In addition, cricket is an international sport governed by the International Cricket Council (ICC), with participation from 104 member countries and ranks second in the world in terms of player population. Furthermore, cricket has been selected as an official event for the 2028 Los Angeles Olympic Games and is attracting global attention. Therefore, cricket has high educational value not only in terms of technical skill development but also as a teaching material that promotes intercultural understanding and multicultural coexistence. Based on these findings, this study aims to develop and implement a cricket-based learning program applicable to baseball-type lessons in Japanese elementary and middle schools, and seeks to construct an educational model that develops not only students' throwing motion and distance but also their attitudes toward intercultural understanding and coexistence. Details of the study results will be presented at the conference.

Keywords: Cricket-based teaching material; Throwing distance; Throwing motion; Elementary school physical education; International understanding education.

Introduction:

National survey data in Japan indicate a decline in children's physical fitness, particularly in overhand throwing ability(Japan Sports Agency,2025). We have developed teaching materials to improve children's overhand throwing ability in Japanese elementary school PE, with positive outcomes(Usui et al,2022ab,2025). However, although improvements in overhand throwing ability are expected outcomes of baseball-type physical education classes, it is often difficult to ensure sufficient learning opportunities for this skill. This is because tee-ball is widely used in Japanese elementary and middle school physical education, which eliminates direct pitcher–batter interactions. As a result, opportunities for students to intentionally practice throwing are limited, making it difficult to sufficiently improve overhand throwing ability. However, improving overhand throwing ability requires baseball-type teaching materials with structures that guarantee sufficient throwing opportunities. Against this background, I visited India in 2024 and researched its culture and educational context. During this visit, I found cricket, India's national sport. I found cricket to be a simple and enjoyable sport. Because cricket involves frequent throwing actions, I considered that introducing it into Japanese school physical education could make it an effective teaching material for improving overhand throwing ability. Cricket has a game structure in which players hit balls that are thrown. As a result, all students have opportunities to throw. Therefore, cricket is considered effective for improving overhand throwing ability. After returning to Japan, I began collaborating with the Japan Cricket Association and implemented cricket lessons in Japanese middle school physical education classes.

Study I

An Examination of the Effects of Cricket- and Softball-Based Teaching Materials on Improving Overhand Throwing Ability in middle School Students.

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1.1 Purpose

To the best of our knowledge, there are no previous studies in Japan that have introduced cricket into school physical education with the specific aim of improving throwing distance. Therefore, this study demonstrates a high degree of originality. This study compared the instructional effects of cricket-based and softball-based lessons for first-year middle school students. The effectiveness of the cricket-based teaching materials was examined based on changes in throwing distance and throwing motion. This study examined the effects of differences in teaching materials on improvements in student's throwing distance. Therefore, two groups were established: a cricket group that received cricket lessons and a softball group that received softball lessons. The effectiveness of the teaching materials was examined through comparisons of throwing distance and throwing motion between the two groups.

1.2 Methods

《Participants》: 81 first-year middle school students (42 boys, 39 girls) from A middle School, Japan (2024)

《Groups》 : Participants were divided into two groups based on the mean handball throw test scores (May 2024), with comparable ability levels and gender ratios. (Table 1)

《Study Period》 : February 10 to March 21, 2025

The baseball-type lessons were implemented over 12 class periods, with six periods in the first half and six in the second half. The cricket group practiced cricket in the first half of the study period, followed by softball in the second half. The softball group practiced softball in the first half of the study period and cricket in the second half (Table 2). In this study, the first six class periods of the unit were analyzed.

Table 1. Mean Handball Throw Distances by Group (m)

Handball Throw Test (May,2024)		
Group	n	Mean ± SD
Boys – Cricket Group	22	20.27 ± 5.92
Girls – Cricket Group	18	13.94 ± 5.31
Cricket Group(Total)	**40**	—
Boys – Softball Group	20	21.20 ± 9.08
Girls – Softball Group	21	15.10 ± 4.15
Softball Group(Total)	**41**	—

Table 2. Order of Lessons for the Cricket and Softball Groups

Group	First Half of the Unit (Feb 12–Feb 26)	Second Half of the Unit (Mar 5–Mar 21)
Cricket Group	Cricket (6 class periods)	Softball (6 class periods)
Softball Group	Softball (6 class periods)	Cricket (6 class periods)

《Assessment of Throwing Distance and Video Recording of Throwing Motion》

Throwing distance measurements were conducted before and after the first half of the unit, and video recordings of throwing motion were conducted only after the unit to compare changes between the two groups. Measurements followed the Physical Fitness Test guidelines (Japan Sports Agency, 2019). A cricket rubber ball (tennis-ball size) was used for the measurements. Each participant performed two trials, and the better result was recorded. Video recordings captured the entire throwing motion from a lateral view of the throwing area.

《Ethical Approval》

This study was approved by the Research Ethics Committee of Nippon Sport Science University (No. 025-H066).

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《Lesson Planning》

In this study, a unit plan based on existing game structures was adopted. This was because lessons using two different teaching materials were implemented to compare their effects on improving throwing distance. The cricket unit plan was developed based on the Cricket Coaching Manual (Japan Cricket Association, 2019). The softball unit plan was developed based on Teaching Materials for Practical Instruction in School Physical Education (Vol. 8) (MEXT, 2010). （Figure 1.）

<table>
<tr><td>Time</td><td>Pre-unit</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>Post-unit</td></tr>
<tr><td rowspan="2">Content</td><td rowspan="2">Throwing Distance Measurement</td><td colspan="6">【Skill Practice】 Ⅰ.Catch Ball Ⅱ.Batting</td><td rowspan="2">Throwing Distance Measurement</td></tr>
<tr><td colspan="6">【Game】 Main Game</td></tr>
</table>

Figure 1. Unit Plan for the Cricket and Softball Lessons

《Game Structures of Cricket and Softball》

【Game Structure of Cricket】

The game consisted of two innings, and each inning ended when all players had completed their at-bats, after which offense and defense were switched.

◇Batting (Offense)

Batting was limited to four deliveries per player. If the ball was not hit within four deliveries, the player was allowed a free hit from a batting tee. Players scored points by hitting a one-bounce ball delivered by the bowler and counting the number of completed runs between the wickets as a pair. For safety reasons, batters were required to hit the ball forward.

◇Fielding (Defense)

Bowling was limited to four deliveries per player, after which the bowler was replaced. During each inning, all players had the opportunity to bowl. Two types of outs were used: catches and run-outs by throwing the ball to the wicket. The bowler was instructed to deliver one-bounce balls that were easy for the batter to hit.

【Game Structure of Softball】

The game consisted of two innings, and each inning ended when all players had completed their at-bats, after which offense and defense were switched.

◇Batting (Offense)

In the offensive phase, players hit a ball placed on a batting tee. Batters were required to hit the ball into the fair zone; balls hit outside the fair zone were ruled fouls. The game was conducted using a tie-break format. The offensive team scored points based on the number of players who successfully returned to home before being put out.

◇Fielding (Defense)

Two types of outs were used: fly catches and throws to the stop circles placed near each base.

《Differences in Game Structures Between Cricket and Softball》

Cricket includes a designated bowler. Cricket is characterized by a direct bowler–batter confrontation structure. On the other hand, softball (tee-ball) does not. In softball (tee-ball), the confrontation structure is omitted, which limits opportunities for throwing actions. As a result of this difference, there may be differences in the number of overhand throwing attempts.

《Data Analysis》

【Statistical Analysis】

Statistical analyses were performed using the statistical software BellCurve for Excel. The level of statistical significance was set at 5% .

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【Physical Characteristics】

Sex-specific differences in physical characteristics (height and body weight) between the cricket group and the softball group were examined using independent-samples t-tests.

【Data Analysis Perspectives】

Cricket and softball were compared from the following three perspectives. The effects on improvements in throwing distance were then examined.

1. Effects of Teaching Materials on Throwing Distance Improvement

A two-way mixed-design ANOVA was performed with group (cricket vs. softball) and time (pre vs. post) as independent variables and throwing distance as the dependent variable. When a significant interaction was detected, simple main effects analyses were conducted to examine changes over time within each group and differences between groups at each time point. Effect sizes were calculated using Cohen's d. According to Cohen (1998), values of $d \geq 0.8$ were interpreted as large, $d \approx 0.5$ as medium, and $d \leq 0.2$ as small. Analyses were conducted separately for boys and girls.

2. Effects of Teaching Materials on Throwing Motion Improvement

Throwing motions of 81 students were analyzed using an observational assessment rubric (Takizawa & Kondo, 2017) to examine the effects of teaching materials. The rubric rates overall throwing motion on a five-point scale (1 = least mature, 5 = most proficient) across seven evaluation items. The seven evaluation items were: (1) stance and lead step, (2) extension of the non-throwing arm, (3) arm take-back, (4) release point, (5) trunk rotation, (6) stepping of the throwing-side leg, and (7) follow-through. Throwing motion scores were compared between the cricket and softball groups to examine differences in scores. Analyses were conducted separately for boys and girls using independent-samples t-tests.

3. Relationship Between Throwing Distance and Throwing Motion Scores

Correlation analysis was conducted to examine the relationship between throwing distance and throwing motion scores. Pearson's correlation coefficients (r) were calculated separately for boys and girls.

1.3 Results

《Physical Characteristics》

The independent-samples t-tests revealed no significant group differences in height or body weight for boys or girls (Table 3).

Table 3. Physical Characteristics and Independent t-Test Results

	Height (cm)	Body Weight (kg)
Cricket Group (Boys)	151.9 ± 7.7	44.3 ± 10.4
Softball Group (Boys	154.2 ± 7.7	46.4 ± 12.0
t value	0.95	0.62
Significance	n.s.	n.s.
Cricket Group (Girls)	151.4 ± 5.3	45.8 ± 8.4
Softball Group (Girls	151.4 ± 6.7	43.5 ± 6.8
t value	0.02	0.89
Significance	n.s.	n.s.

*p < .05

Note. Values are presented as mean ± standard deviation.

n.s. = not significant.

《Number of Throwing Attempts in Cricket》

In a single cricket lesson, the game structure ensured a total of 40 throwing attempts per student: 10 throws during catch-and-throw practice, 20 throws during batting practice, 8 throws during a two-inning game, and 2 throws as a fielder. Each student had 40 throwing opportunities per lesson, resulting in 240 throwing opportunities over the six-lesson unit (Figure 2).

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《Number of Throwing Attempts in Softball》

In a single softball lesson, the game structure ensured a total of 12 throwing attempts per student: 10 throws during catch-and-throw practice, 0 throws during batting practice, 0 throws during a two-inning game, and 2 throws as a fielder. Each student had 12 throwing opportunities per lesson, resulting in 72 throwing opportunities over the six-lesson unit (Figure 3).

Activity	Per Lesson (1 lesson)	Per Unit (6 lessons)
Catch-and-throw (5 min)	10	60
Batting practice (15 min)	20	120
Game (30 min): Bowler	8	48
Game (30 min): Fielder	2	12
Total	40	240

Figure 2. Number of Throwing Attempts in Cricket

Activity	Per Lesson (1 lesson)	Per Unit (6 lessons)
Catch-and-throw (5 min)	10	60
Batting practice (15 min)	0	0
Game (30 min): Bowler	0	0
Game (30 min): Fielder	2	12
Total	12	72

Figure 3. Number of Throwing Attempts in Softball

《Throwing Distance Improvement by Teaching Material》 【Boys】

The main effect of time was significant ($F(1, 40) = 18.70$, $p < .05$), but the main effect of group was not significant ($F(1, 40) = 0.71$, n.s.). The interaction effect was significant ($F(1, 40) = 9.06$, $p < .05$). Simple main effects analyses revealed no significant group differences at pre-unit ($F(1, 42) = 0.13$, n.s.) and at post-unit ($F(1, 42) = 1.69$, n.s.). The effect of time was significant in the cricket group ($F(1, 40) = 28.24$, $p < .001$), but not significant in the softball group ($F(1, 40) = 0.83$, n.s.). The effect size was large in the cricket group (Cohen's d = 1.01) and small in the softball group (Cohen's d = 0.26) (Table 4).

Table 4. Comparison of Throwing Distance in Boys (Cricket vs. Softball)

Group	Pre-unit (Mean ± SD)	Post-unit (Mean ± SD)	Cohen`s d	F value		
				Time	Group	Interaction
Cricket Group	31.27±11.95	35.45±11.49	1.01	18.7*	0.71	9.06*
Softball Group	29.95±10.99	30.70±12.90	0.26			
	Simple main effects of time within each group		Simple main effects of group at each time point			
	Group□1,40)□value		Time Point□1,42)□value			
	Cricket Group□8.24□.05		Pre-unit□13□s.			
	Softball Group□83□s.		Post-unit□69□s.			

Note: * p < .05 Sample size: Cricket Group n = 22, Softball Group n = 20

《Throwing Distance Improvement by Teaching Material》 【Girls】

The main effect of time was significant ($F(1, 37) = 5.72$, $p < .05$), but the main effect of group was not significant ($F(1, 37) = 0.15$, n.s.). The interaction effect was significant ($F(1, 37) = 5.72$, $p < .05$). Simple main effects analyses revealed no significant group differences at pre-unit ($F(1, 40) = 0.71$, n.s.) and at post-unit ($F(1, 40) = 0.01$, n.s.). The effect of time was significant in the cricket group ($F(1, 37) = 10.63$, $p < .05$), but not significant in the softball group ($F(1, 37) = 0.00$, n.s.). The effect size was large in the cricket group (Cohen's d = 1.23) and zero in the softball group (Cohen's d = 0.00) (Table 5).

Table 5. Comparison of Throwing Distance in Girls (Cricket vs. Softball)

Group	Pre-unit (Mean ± SD)	Post-unit (Mean ± SD)	Cohen`s d	F value		
				Time	Group	Interaction
Cricket Group	18.22±7.83	20.17±7.86	1.23	5.72*	0.15	5.72*
Softball Group	20.00±5.60	20.00±4.93	0.00			
	Simple main effects of time within each group		Simple main effects of group at each time point			
	Group□1,40)□value		Time Point□1,42)□value			
	Cricket Group10.63,p<.05		Pre-unit0.71,n.s			
	Softball Group0.00,n.s		Post-unit0.01,n.s			

Note: * p < .05 Sample size: Cricket Group n =18, Softball Group n =21

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《Throwing Motion Improvement by Teaching Material》 【Boys】

Throwing motion scores were significantly higher in the cricket group than in the softball group ($t(39) = 4.05$, $p < .05$). At the subcomponent level, significant differences were found for (1) stance and lead step ($t(39) = 2.11$, $p < .05$), (2) extension of the non-throwing arm ($t(39) = 2.85$, $p < .05$), (3) arm take-back ($t(39) = 2.13$, $p < .05$), (4) release point ($t(39) = 2.18$, $p < .05$), (5) trunk rotation ($t(39) = 2.92$, $p < .05$), and (7) follow-through ($t(39) = 3.81$, $p < .05$). In contrast, no significant difference was observed for (6) throwing side leg action ($t(39) = 1.76$, n.s.) (Table 6).

Table 6. Throwing Motion Scores in Boys (Cricket vs. Softball)

Movement Analysis Item	Cricket Group (Mean ± SD)	Softball Group (Mean ± SD)	t value	Significance
(1) Stance and lead step	4.76±0.44	4.25±1.02	2.11	*p < .05
(2) Extension of the non-th	4.00±0.77	3.25±0.91	2.85	*p < .05
(3) Arm take-back	4.33±0.91	3.65±1.14	2.13	*p < .05
(4) Release point	4.52±0.68	4.10±0.55	2.18	*p < .05
(5) Trunk rotation	4.43±0.60	3.85±0.67	2.92	*p < .05
(6) Throwing-side leg actic	4.19±0.81	3.75±0.79	1.76	n.s.
(7) Follow-through	4.48±0.51	3.50±1.05	3.81	*p < .05
Total throwing motion scor	30.71±3.02	26.35±3.86	4.05	*p < .05

*p < .05 Note) Cricket group n = 21,Softball group n = 20

《Throwing Motion Improvement by Teaching Material》 【Girls】

The total throwing motion score was significantly higher in the cricket group than in the softball group ($t(37) = 2.33$, $p < .05$). At the subcomponent level, significant differences were observed for (1) stance and lead step ($t(37) = 2.28$, $p < .05$) and (4) release point ($t(37) = 2.16$, $p < .05$). In contrast, no significant differences were found for (2) extension of the non-throwing arm ($t(37) = 0.22$, n.s.), (3) arm take-back ($t(37) = 1.02$, n.s.), (5) trunk rotation ($t(37) = 1.77$, n.s.), (6) throwing-side leg action ($t(37) = 1.43$, n.s.), or (7) follow-through ($t(37) = 1.98$, n.s.) (Table 7).

Table 7. Throwing Motion Scores in Girls (Cricket vs. Softball)

Movement Analysis Item	Cricket Group (Mean ± SD)	Softball Group (Mean ± SD)	t value	Significance
(1) Stance and lead step	4.17±0.92	3.57±0.93	2.28	*p < .05
(2) Extension of the non-th	2.78±1.00	2.71±0.78	0.22	n.s.
(3) Arm take-back	3.00±0.84	2.71±090	1.02	n.s.
(4) Release point	4.28±0.67	3.81±0.68	2.16	*p < .05
(5) Trunk rotation	3.56±0.86	3.10±0.77	1.77	n.s.
(6) Throwing-side leg actic	3.56±1.20	3.05±1.02	1.43	n.s.
(7) Follow-through	3.61±0.92	3.00±1.00	1.98	n.s.
Total throwing motion scor	24.94±4.28	21.95±3.75	2.33	*p < .05

*p < .05 Note) Cricket group n = 18,Softball group n = 21

《Throwing Distance–Throwing Motion Score Correlation》

【Cricket Group】 （Table8）

A significant positive correlation was found between throwing distance and throwing motion scores for both boys ($r = 0.7708$, $p < .05$) and girls ($r = 0.7537$, $p < .05$)

【Softball Group】 （Table8）

A significant positive correlation was found between throwing distance and throwing motion scores for both boys （$r=0.7927$, $p<.05$） and girls （$r=0.7422$, $p<.05$）

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Table 8. Correlation Between Throwing Distance and Throwing Motion Scores

Group	Correlation Coefficient ®	Significance
Cricket Group (Boys)	0.7708	*p < .05
Cricket Group (Girls)	0.7537	*p < .05
Softball Group (Boys)	0.7927	*p < .05
Softball Group (Girls)	0.7422	*p < .05

* p < .05

Note: Pearson's product-moment correlation coefficients (r).

1.4 DISCUSSION

《Participants in the Present Study》

No significant group differences in height or body weight were observed for either boys or girls. These findings indicate that the comparison between teaching materials was not influenced by physical characteristics. Both groups therefore provided appropriate conditions for evaluating teaching material effects.

《Differences in Throwing Attempts: Cricket vs. Softball》

Over the seven-lesson unit, each student had 240 throwing attempts in cricket and 72 in softball. Cricket was able to systematically secure 3.3 times more throwing attempts than softball. These findings support the results reported by Usui and Okade (2025), which indicated that systematically securing a sufficient number of throwing attempts is effective for improving throwing ability. This may explain why improvements in throwing distance were observed only in the cricket group.

《Throwing Distance Improvement by Teaching Material 》

For both boys and girls, significant main effects of time and significant interactions were observed in throwing distance in the cricket group. Simple main effects analyses also confirmed a significant post-lesson improvement only in the cricket group. Although no significant between-group differences were found in the mean throwing distances before and after the lessons, the cricket group showed higher post-lesson throwing distances than the softball group for both boys and girls. The effect sizes (Cohen's d) for the cricket group were large for both boys (1.01) and girls (1.23), suggesting educationally meaningful improvements. In contrast, the effect sizes in the softball group were small for boys (0.26) and zero for girls (0.00). The cricket group demonstrated increases of +4.2 m in boys and +2.0 m in girls in mean throwing distance. In contrast, the softball group showed an increase of +0.8 m for boys, and no change was observed for girls. These results indicate that learning cricket is effective in improving students' throwing ability. These findings also show that appropriate game design can improve throwing distance even in a short six-lesson unit. These findings suggest that differences in the number of throwing attempts between the cricket and softball lessons may have contributed to improvements in throwing distance. Across the unit, each student had 240 throwing opportunities in cricket and 72 in softball, meaning that cricket secured 3.3 times as many throwing attempts as softball. In cricket, it was possible to engage in repeated practice using an overhand throwing movement pattern. This is because the game structure of cricket allowed all students to repeatedly experience opportunities for both bowling and batting. Thus, motor learning effects of the overhand throw are likely to have occurred. Taken together, these findings demonstrate that learning cricket leads to improvements in throwing distance.

《Throwing Motion Improvement by Teaching Material》

The results of this study showed that post-lesson throwing motion scores were significantly higher in the cricket group than in the softball group for both boys and girls. Among the seven subcomponents, significant differences were found in six items for boys and in two items for girls. These findings show that cricket promotes both throwing distance and throwing motion improvements. Because boys possessed more fundamental throwing motion skills, the large number of throwing opportunities in cricket facilitated refinement of the overall throwing motion. In contrast, among girls, the large number of throwing opportunities led to improvements in fundamental phases such as the stance and release. These findings suggest that, for girls, instructional approaches emphasizing repetition are effective for establishing the fundamental form of the

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throwing motion. In softball-based lessons, opportunities for overhand throwing were limited, and most throws occurred after catching. This may have made it difficult to develop a whole-body throwing motion. Overall, cricket is an effective teaching material for improving throwing motion because it provides many throwing opportunities.

《Throwing Distance–Throwing Motion Score Correlation》

Both cricket and softball showed strong positive correlations between throwing distance and throwing motion scores. In both teaching materials, better throwing motion was associated with longer throwing distance. However, greater improvements in both throwing distance and throwing motion were observed only in the cricket group. Therefore, cricket demonstrates new potential as a teaching material for improving both throwing distance and throwing motion.

1.5 Conclusion

《Educational Value of Cricket》

The Commentary on the Japanese Course of Study for Physical Education (MEXT, 2018) points out that baseball-type activities involve a limited range of sports, resulting in restricted options for teaching materialmselection (Ota et al., 2022). Given this context, introducing cricket as a new baseball-type teaching material could help diversify learning content in physical education.

1.6 Future Directions

These findings suggest that cricket is an effective teaching material for improving throwing ability among middle school students. As a next step, it is necessary to examine the effects of cricket for elementary school students.

INTRODUCTION II

Accordingly, to support teaching material development, I visited Sri Lanka in 2025 and conducted research on the state of cricket across the country. Cricket is deeply rooted in the culture of Sri Lanka (and India). Cricket has been selected as an official sport for the Los Angeles 2028 Olympic Games and is receiving increasing global attention. Accordingly, I decided to develop an international understanding education program through cricket. In this context, cricket was introduced into elementary school education to examine the following two effects.

1. Effects on throwing ability (as a baseball-type material)

2. Development of intercultural understanding and multicultural attitudes

StudyII

Educational Effectiveness of Cricket in Elementary School Physical Education

— From the Perspectives of Throwing Ability and International Understanding Education —

2.1 Purpose

In contemporary Japanese society, the need for international understanding education that addresses multicultural coexistence has increased with the advancement of globalization. The Japanese Course of Study likewise emphasizes the importance of international understanding education across all subjects. Accordingly, I developed a cricket-based international understanding education program for elementary schools and examined the following two effects.

1. Effects on throwing distance and throwing motion

2. Effects on children's international understanding

2.2 Methods

《Participants》 :

47 fifth-grade elementary school students(24 boys, 23 girls) from A Elementary School, Japan (2025)

《Study Period》 : The following activities were conducted between November 5 and December 12, 2025.

1. A pre-test was conducted using the "International Understanding through Sport Scale" questionnaire and a throwing distance measurement.

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2. A moral education class was conducted to introduce the cultures of India and Sri Lanka. The lesson enhanced children's interest in other cultures.

3. In physical education, a seven-lesson instructional unit on cricket was conducted.

4. Post-measurements using the same questionnaire and throwing distance test were conducted after the cricket unit.

5. Changes in international understanding and throwing ability through cricket were examined.

《Assessment of Throwing Distance and Video Recording of Throwing Motion》

Throwing distance measurements and video recordings were conducted before and after the unit; all other methods were the same as those used in Study I.

《International Understanding through Sport Scale Questionnaire》

To assess changes in international understanding, the "International Understanding through Sport Scale" questionnaire was used. This scale was developed based on the International Understanding Scale (IUS2000) (Suzuki et al., 2000) and adapted to the content of the lessons in this study. The scale aimed to assess perceptions and attitudes toward intercultural understanding through sport. All items were assessed using a five-point Likert type scale (1 = strongly disagree, 5 = strongly agree). The total score for each questionnaire item was used for the analysis.

《Ethical Approval》

This study was approved by the Research Ethics Committee of Saitama Gakuen University (No. 7-1).

《Lesson Planning》

In this practice, the unit plan was developed based on a cricket unit plan created in a practice-based study conducted with middle school students in 2024.（figue4）

<table>
<tr><td>Time</td><td>0</td><td>Pre-unit</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>Post-unit</td></tr>
<tr><td rowspan="2">Content</td><td rowspan="2">Moral Education</td><td rowspan="2">Throwing Distance Measurement / Questionnaire</td><td colspan="7">【Skill Practice】① Catching & Throwing ②Batting ③Fielding Practice</td><td rowspan="2">Throwing Distance Measurement / Questionnaire</td></tr>
<tr><td colspan="7">【Game】Main Game</td></tr>
</table>

Figure 4. Cricket Unit Plan

《Development of the International Understanding through Sport Scale》

This scale consisted of four main dimensions and their subscales designed to measure international understanding through sport (Table 9). The first subscale, "A: Understanding of and Interest in Other Countries' Cultures and People," consisted of 10 items. The second subscale, "B: Interest in World Sports and Orientation toward Interaction," consisted of six items. The third subscale, "C: Interest in Foreign Languages and International Exchange," consisted of six items. The fourth subscale, "D: Interest in Foreign Countries," consisted of three items. Overall, the scale comprised a total of 25 items across all subscales.

Table 9. Structure of the International Understanding through Sport Scale

Subscale	Item Numbers
A. Understanding of and Interest in Other Countries' Cultures and People	1–10
B. Interest in World Sports and Orientation toward Interaction	11–16
C. Interest in Foreign Languages and International Exchange	17–22
D. Interest in Foreign Countries	23–25
Total	1–25

《Development of the International Understanding through Sport Scale》

The subcomponents were structured as follows.

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A: Understanding of and Interest in Other Countries' Cultures and People

1. I am interested in how people in other countries live and think.

2. I think foreign countries have many good qualities that are different from Japan.

3. I want to be friends with people from other countries.

4. I want to know more about the lifestyles and cultures of people in other countries.

5. I think participating in activities with people from other countries would be fun.

6. I think learning about cultures that differ from Japan is interesting.

7. When talking with people from other countries, I try to think about their country while speaking with them.

8. I think people from other countries are important, just like us.

9. I think it is important for people from different countries to get along.

10. I would like to learn more about the ways of life of people in other countries.

B: Interest in World Sports and Orientation toward Interaction

11. I am interested in sports played in various countries around the world.

12. I think sports help people get along with people from other countries.

13. I think I can cooperate with people from other countries when playing sports.

14. When I play sports from other countries, I feel a sense of closeness to the people of those countries.

15. I think it is important to cooperate with people around the world, such as by playing sports from other countries together.

16. I would like to become more interested in sports played around the world.

C: Interest in Foreign Languages and International Exchange

17. I would like to learn foreign languages.

18. I would like to try talking with people from other countries in English or other languages.

19. I would like to express my thoughts using English or other foreign languages.

20. I think learning songs and greetings from other countries is enjoyable.

21. I want to talk with people from other countries when playing games or sports.

22. I would like to do activities with people from other countries in the future.

D: Interest in Foreign Countries

23. I would like to visit foreign countries.

24. I would like to make friends with people from other countries and play together with them.

25. I would like to experience living in a foreign country in the same way as the people there.

(5 = Strongly agree, 4 = Agree, 3 = Neither agree nor disagree,2 = Disagree, 1 = Strongly disagree)

《Data Analysis》

【Statistical Analysis】

Statistical analyses were performed using the statistical software BellCurve for Excel. The level of statistical significance was set at 5% .

【Data Analysis Perspectives】

(1) Effects of Cricket on Throwing Distance Improvement

The effects of the cricket unit on pre- and post-unit throwing distance were examined. Mean throwing distances before and after the unit were compared using a paired-samples t-test. Effect sizes were calculated using

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Cohen's d. According to Cohen (1998), values of $d \geq 0.8$ were interpreted as large, $d \approx 0.5$ as medium, and $d \leq 0.2$ as small. Analyses were conducted separately for boys and girls.

2. Effects of Teaching Materials on Throwing Motion Improvement

Throwing motions of 47 students were analyzed using an observational assessment rubric (Takizawa & Kondo, 2017) to examine the effects of teaching materials. Throwing motion scores were compared before and after the cricket lessons. Paired-samples t-tests were conducted separately for boys and girls.

3. Relationship Between Throwing Distance and Throwing Motion Scores

Correlation analysis was conducted to examine the relationship between throwing distance and throwing motion scores at pre- and post-test. Pearson's correlation coefficients (r) were calculated separately for boys and girls.

【Reliability and Validity of the International Understanding through Sport Scale】

(1) Reliability

Reliability of the "International Understanding through Sport Scale" was assessed. Cronbach's alpha was used for the analysis. Analyses were conducted using pre- and post-lesson data for each of the four subscales. Cronbach's alpha values of 0.70 or higher were considered indicative of acceptable reliability.

(2) Validity

Factor analysis was used to examine how the questionnaire items were grouped. Factors with eigenvalues of 1.0 or higher were extracted. The factor structure was then refined based on items with factor loadings of 0.40 or higher. Based on these results, the subconstructs underlying the scale were examined.

【Effects of International Understanding Education through Sport】

Pre- and post-unit international understanding scores were compared using a paired-samples t-test. The effects of the cricket lessons were examined.

2.3 Result

《Number of Throwing Attempts in Cricket》

The game structure ensured a total of 50 throwing opportunities per lesson: 15 throws in catch practice, 20 throws during batting practice, 5 throws in defensive throwing practice, 5 throws during two-innings gameplay, and 5 throws as a fielder and wicketkeeper. Each student was provided with 50 throwing attempts per lesson and a total of 350 throwing attempts across the seven-lesson unit (Figure 5).

Activity	Per Lesson (1 lesson)	Unit Total (7 lessons)
Catch – and-throw (5 min)	15	105
Batting practice (10 min)	20	140
Defensive practice (5 min)	5	35
Game (20 min): Bowling	5	35
Game (20 min): Fielding	5	35
Total	50	350

Figure 5. Number of Throwing Attempts Secured in Cricket Lessons

《Effects of Cricket on Throwing Distance Improvement》

For boys, the mean throwing distance increased by 2.67 m, from 22.50 ± 6.80 m (Pre) to 25.17 ± 6.26 m (Post). The paired-samples t-test showed a significant increase ($t(23) = 5.42$, $p < .001$). The effect size was moderate (Cohen's $d = 0.42$). For girls, the mean throwing distance increased by 3.74 m, from 14.13 ± 5.33 m (Pre) to 17.87 ± 5.25 m (Post). The paired-samples t-test showed a significant increase ($t(22) = 7.66$, $p < .001$). A large effect size was observed (Cohen's $d = 0.72$). (table.10)

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Table 10. Pre–post changes in throwing distance

Group	n	Pre (M±SD)	Post (M±SD)	Pre−Post Change (m)	t value	Cohen's d
Boys	24	22.50±6.80	25.17±6.26	2.67	5.42*	0.41
Girls	23	14.13±5.33	17.87±5.25	3.74	7.66*	0.72

p<.05

《Effects of Teaching Materials on Throwing Motion Improvement》 【boys】

Throwing motion scores showed a significant pre–post improvement (Pre: 23.92 ± 3.67; Post: 27.46 ± 2.19; $t(23) = 5.91$, $p < .05$). Significant improvements were observed in the following subcomponents: (2) contralateral arm extension ($t(23) = 2.88$, $p < .05$), (3) take-back ($t(23) = 3.61$, $p < .05$), (4) release point ($t(23) = 5.25$, $p < .05$), (5) trunk rotation ($t(23) = 4.15$, $p < .05$), and (7) follow-through ($t(23) = 2.88$, $p < .05$). In contrast, no significant improvements were observed in (1) stance and step ($t(23) = 0.62$, n.s.) or (6) throwing-side leg action ($t(23) = 0.94$, n.s.) (Table 11).

Table 11. Comparison of Boys' Throwing Motion Scores (Pre–Post)

Movement Component	Pre (M±SD)	Post (M±SD)	t value	Significance
(1) Stance and step	4.13±0.74	4.25±0.79	0.62	n.s.
(2) Contralateral arm extension	2.83±0.92	3.29±0.55	2.88	*p < .05
(3) Take-back	3.50±1.18	4.33±0.76	3.61	*p < .05
(4) Release point	3.71±0.86	4.71±0.46	5.25	*p < .05
(5) Trunk rotation	3.63±0.58	4.13±0.54	4.15	*p < .05
(6) Throwing-side leg action	3.25±0.85	3.42±0.83	0.94	n.s.
(7) Follow-through	2.88±0.80	3.33±0.56	2.88	*p < .05
Total throwing motion score	23.92±3.67	27.46±2.19	5.91	*p < .05

*p < .05 note: n = 24

《Effects of Teaching Materials on Throwing Motion Improvement》 【girls】

Throwing motion scores showed a significant pre–post improvement (Pre: 20.48 ± 3.54 points; Post: 24.96 ± 3.56 points; $t(22) = 9.45$, $p < .05$). Significant improvements were observed in the following subcomponents: (1) stance and step ($t(22) = 3.03$, $p < .05$), (2) contralateral arm extension ($t(22) = 3.81$, $p < .05$), (3) take-back ($t(22) = 6.09$, $p < .05$), (4) release point ($t(22) = 6.67$, $p < .05$), (5) trunk rotation ($t(22) = 5.59$, $p < .05$), and (6) throwing-side leg action ($t(22) = 2.15$, $p < .05$). In contrast, no significant improvement was observed in (7) follow-through ($t(22) = 1.04$, n.s.) (Table 12).

Table 12. Comparison of Girls' Throwing Motion Scores (Pre–Post)

Movement Component	Pre (M±SD)	Post (M±SD)	t value	Significance
(1) Stance and step	3.39±1.16	3.96±0.71	3.03	*p < .05
(2) Contralateral arm extension	2.17±0.94	2.87±0.92	3.81	*p < .05
(3) Take-back	2.65±0.88	3.48±0.90	6.09	*p < .05
(4) Release point	3.87±0.55	4.74±0.45	6.67	*p < .05
(5) Trunk rotation	2.74±0.81	3.52±0.67	5.59	*p < .05
(6) Throwing-side leg action	2.61±0.94	3.13±0.19	2.15	*p < .05
(7) Follow-through	3.04±0.82	3.26±0.75	1.04	n.s.
Total throwing motion score	20.48±3.54	24.96±3.56	9.45	*p < .05

*p < .05 note: n = 23

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《Relationship Between Throwing Distance and Throwing Motion Scores》【boys（Pre）】

Pre-test throwing distance was significantly positively correlated with the total throwing motion score ($r = .754$, $p < .05$). At the subcomponent level, significant positive correlations were found for (1) stance and step ($r = .437$, $p < .05$), (3) take-back ($r = .618$, $p < .05$), (4) release point ($r = .500$, $p < .05$), (5) trunk rotation ($r = .623$, $p < .05$), and (7) follow-through ($r = .496$, $p < .05$). In contrast, no significant correlations were found for **(2) contralateral arm extension ($r = .344$, n.s.) and (6) throwing-side leg action ($r = .256$, n.s.) (Table 13).**

《Relationship Between Throwing Distance and Throwing Motion Scores》【girls（Pre）】

Pre-test throwing distance was significantly positively correlated with throwing motion score ($r = .746$, $p < .05$). At the subcomponent level, significant positive correlations were observed for (1) stance and step ($r = .456$, $p < .05$), (2) contralateral arm extension ($r = .478$, $p < .05$), (3) take-back ($r = .608$, $p < .05$), and (5) trunk rotation ($r = .619$, $p < .05$). In contrast, no significant correlations were observed for (4) release point ($r = .411$, n.s.), (6) throwing-side leg action ($r = .310$, n.s.), and (7) follow-through ($r = .133$, n.s.) (Table 14).

Table 13. Correlations Between Pre-Test Throwing Distance and Throwing Motion Components (Boys)

Evaluation Component	Correlation Coefficient ®	Significance
(1) Stance and step	0.437	*p < .05
(2) Contralateral arm extension	0.344	n.s.
(3) Take-back	0.618	*p < .05
(4) Release point	0.500	*p < .05
(5) Trunk rotation	0.623	*p < .05
(6) Throwing-side leg action	0.256	n.s.
(7) Follow-through	0.496	*p < .05
Total throwing motion score	0.754	*p < .05

p < .05 Note: n = 24

Table 14. Correlations Between Pre-Test Throwing Distance and Throwing Motion Components (Girls)

Evaluation Component	Correlation Coefficient ®	Significance
(1) Stance and step	0.456	*p < .05
(2) Contralateral arm extension	0.478	*p < .05
(3) Take-back	0.608	*p < .05
(4) Release point	0.411	n.s.
(5) Trunk rotation	0.619	*p < .05
(6) Throwing-side leg action	0.310	n.s.
(7) Follow-through	0.133	n.s.
Total throwing motion score	0.746	*p < .05

p < .05 Note: n = 23

《Relationship Between Throwing Distance and Throwing Motion Scores》【boys（Post）】

Post-test throwing distance was significantly positively correlated with throwing motion score ($r = .546$, $p < .05$). At the subcomponent level, a significant positive correlation was observed for (3) take-back ($r = .493$, $p < .05$). In contrast, no significant correlations were observed for (1) stance and step ($r = .239$, n.s.), (2) contralateral arm extension ($r = .368$, n.s.), (4) release point ($r = .403$, n.s.), (5) trunk rotation ($r = .319$, n.s.), (6) throwing-side leg action ($r = .207$, n.s.), and (7) follow-through ($r = -.185$, n.s.) (Table 15).

《Relationship Between Throwing Distance and Throwing Motion Scores》【girls（Post）】

A significant positive correlation was observed between post-test throwing distance and throwing motion score ($r = .637$, $p < .05$). At the subcomponent level, significant positive correlations were observed for (1) stance and step ($r = .649$, $p < .05$), (3) take-back ($r = .669$, $p < .05$), (5) trunk rotation ($r = .554$, $p < .05$), (6) throwing-side leg action ($r = .418$, $p < .05$), and (7) follow-through ($r = .470$, $p < .05$). In contrast, no significant correlations were observed for (2) contralateral arm extension ($r = .119$, n.s.) and (4) release point ($r = -.015$, n.s.) (Table 16).

Table 15. Correlations Between Post-Test Throwing Distance and Throwing Motion Components (Boys)

Evaluation Component	Correlation Coefficient ®	Significance
(1) Stance and step	0.239	n.s.
(2) Contralateral arm extension	0.368	n.s.
(3) Take-back	0.493	*p < .05
(4) Release point	0.403	n.s.
(5) Trunk rotation	0.319	n.s.
(6) Throwing-side leg action	0.207	n.s.
(7) Follow-through	-0.185	n.s.
Total throwing motion score	0.546	*p < .05

p < .05 Note: n = 24

Table 16. Correlations Between Post-Test Throwing Distance and Throwing Motion Components (Girls)

Evaluation Component	Correlation Coefficient ®	Significance
(1) Stance and step	0.649	*p < .05
(2) Contralateral arm extension	0.119	n.s.
(3) Take-back	0.669	*p < .05
(4) Release point	-0.015	n.s.
(5) Trunk rotation	0.554	*p < .05
(6) Throwing-side leg action	0.418	*p < .05
(7) Follow-through	0.470	*p < .05
Total throwing motion score	0.637	*p < .05

p < .05 Note: n = 23

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《Reliability of the International Understanding through Sport Scale》

As a result, Cronbach's alpha coefficients were as follows: Subscale A (Pre α = 0.88, Post α = 0.85), Subscale B (Pre α = 0.88, Post α = 0.75), Subscale C (Pre α = 0.81, Post α = 0.90), and Subscale D (Pre α = 0.75, Post α = 0.80) (Table 17). All subscales demonstrated acceptable internal consistency, with Cronbach's alpha coefficients exceeding 0.75 at both pre- and post-measurements. The developed scale was judged to have sufficient reliability.

Table 17. Cronbach's α of the International Understanding Education Scale Through Sports

Scale	Pre α	Post α
Scale A (Understanding and interest in Other Countries' cultures and people)	0.88	0.85
Scale B (Interest in world sports and orientation toward international exchange)	0.88	0.75
Scale C (Interest in foreign languages and international exchange)	0.81	0.90
Scale D (Interest in foreign countries)	0.75	0.80

《Validity of the International Understanding Education Scale Through Sports》

Factor analysis extracted six factors with eigenvalues greater than 1.0 . The eigenvalues were 3.95 (Factor 1), 1.98 (Factor 2), 6.76 (Factor 3), 2.20 (Factor 4), 1.25 (Factor 5), and 1.07 (Factor 6). (Table 18).

《Validity of the International Understanding Education Scale Through Sports》

Factors 1 through 4 showed relatively high eigenvalues, and multiple items loaded strongly on each factor in terms of factor loadings (Table 19). For these reasons, this study judged it appropriate to adopt Factors 1 through 4 as the principal factors constituting the scale.

Table 18. Eigenvalues Rates of Exploratory Factor Analysis

Factor	Eigenvalue
Factor 1	3.95
Factor 2	1.98
Factor 3	6.76
Factor 4	2.20
Factor 5	1.25
Factor 6	1.07

Table 19. Factor Loadings in the Factor Analysis

Item	Factor 1	Factor 2	Factor 3	Factor 4
Post14	1.00			
Post12	0.73			
Post16	0.51			
Post7	0.51			
Post2	0.49			
Post9		1.00		
Post24			0.80	
Post18			0.73	
Post5			0.72	
Post17			0.72	
Post3			0.71	
Post21			0.66	
Post22			0.65	
Post4			0.58	
Post25			0.58	
Post20			0.58	
Post1			0.56	
Post10			0.56	
Post19			0.56	
Post15			0.54	
Post23			0.52	
Post13			0.45	

《Validity of the International Understanding Education Scale Through Sports》

The results of the exploratory factor analysis indicated that the extracted factor structure corresponded to four sub-constructs: (A) understanding of and interest in Other Countries' cultures and people, (B) interest in global sports and orientation toward international interaction, (C) interest in foreign languages and international exchange, and (D) interest in foreign countries. Based on these results, the present scale was judged to be a reliable and valid measurement instrument for examining the effects of international understanding education through sport in elementary school physical education.

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A: Results—Understanding and Interest in Other Countries' Cultures and People

The total score for Scale A increased significantly from Pre (40.85 ± 6.52) to Post (43.93 ± 4.91) ($t = 3.72$, $p < .05$). Three items (Items 1, 5, and 10) showed significant improvements . The remaining items showed no significant differences.(Table20)

Table 20. Changes in mean scores for Scale A before and after the cricket unit.

Item No.	Item Content	Pre M±SD	Post M±SD	t-value	Significance
1	I am interested in how people in other countries live and think.	3.51±1.20	4.32±0.70	4.88*	
2	I think foreign countries have many good qualities that are different from Japan.	4.38±0.90	4.57±0.68	1.61	n.s.
3	I want to be friends with people from other countries.	4.23±0.89	4.34±066	0.74	n.s.
4	I want to know more about the lifestyles and cultures of people in other countries.	3.96±1.02	4.17±0.87	1.53	n.s.
5	I think participating in activities with people from other countries would be fun.	3.83±0.94	4.28±0.80	3.15*	
6	I think learning about cultures that differ from Japan is interesting.	4.13±0.95	4.45±0.77	1.88	n.s.
7	When talking with people from other countries, I try to think about their country while speaking with them.	3.83±1.05	4.06±1.07	1.40	n.s.
8	I think people from other countries are important, just like us.	4.57±0.80	4.79±0.46	1.81	n.s.
9	I think it is important for people from different countries to get along.	4.57±0.65	4.68±0.59	0.84	n.s.
10	I would like to learn more about the ways of life of people in other countries.	3.83±0.94	4.26±0.82	3.92*	
Total (Scale A)	Understanding of and Interest in Foreign Cultures and People	40.85±6.52	43.93±4.91	3.72*	

n = 47 p < .05

B: Results—Interest in World Sports and Orientation toward Interaction

The total score for Scale B significantly increased from Pre (24.19 ± 5.01) to Post (26.51 ± 3.41) ($t = 3.76$, $p < .05$). Five items (Items 11, 12,13, 14 and 16) showed significant improvements. Only Item 15 showed no significant difference (Table21).

Table 21.Changes in mean scores for Scale B before and after the cricket unit.

Item No.	Item Content	Pre M±SD	Post M±SD	t-value	Significance
11	I am interested in sports played in various countries around the world.	3.72±1.25	4.17±0.99	2.74*	
12	I think sports help people get along with people from other countries.	3.96±1.12	4.45±0.88	2.90*	
13	I think I can cooperate with people from other countries when playing sports.	4.15±1.06	4.60±0.68	2.36*	
14	When I play sports from other countries, I feel a sense of closeness to the people of those countries.	3.98±0.97	4.40±0.83	2.93*	
15	I think it is important to cooperate with people around the world, such as by playing sports from other countries together.	4.47±0.69	4.57±0.65	0.76	n.s.
16	I would like to become more interested in sports played around the world.	3.91±1.16	4.32±1.02	3.00*	
Total (Scale B)	Interest in World Sports and Orientation toward Interaction	24.19±5.01	26.51±3.41	3.76*	

n = 47 p < .05

C: Results−Interest in Foreign Languages and International Exchange

The total score of Scale C did not show a significant change from Pre (23.72 ± 4.66) to Post (24.34 ± 5.14) ($t = 1.18$, n.s.). No items showed significant differences(Table22).

Table 22.Changes in mean scores for Scale C before and after the cricket unit.

Item No.	Item Content	Pre M±SD	Post M±SD	t-value	Significance
17	I would like to learn foreign languages.	4.11±1.01	4.00±1.18	0.78	n.s.
18	I would like to try talking with people from other countries in English or other languages.	4.09±1.10	4.02±1.07	0.48	n.s.
19	I would like to express my thoughts using English or other foreign languages.	3.94±1.17	4.06±1.07	0.95	n.s.
20	I think learning songs and greetings from other countries is enjoyable.	3.79±1.28	3.96±1.04	0.86	n.s.
21	I want to talk with people from other countries when playing games or sports.	4.15±0.96	4.40±0.90	1.57	n.s.
22	I would like to do activities with people from other countries in the future.	3.66±0.98	3.89±0.98	1.85	n.s.
Total (Scale C)	Interest in Foreign Languages and International Exchange	23.72±4.66	24.34±5.14	1.18	n.s.

n = 47 p < .05

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D: Results−Interest in Foreign Countries

The total score of Scale D did not show a significant change from Pre (11.68 ± 2.72) to Post (11.83 ± 3.01) (t = 0.51, n.s.). No items showed significant differences (Table23).

Table 23.Changes in mean scores for Scale D before and after the cricket unit.

Item No.	Item Content	Pre M ± SD	Post M ± SD	t-value	Significance
23	I would like to visit foreign countries.	4.09 ± 1.25	4.06 ± 1.26	0.22	n.s.
24	I would like to make friends with people from other countries and play together with them.	4.28 ± 0.93	4.34 ± 0.89	0.50	n.s.
25	I would like to experience living in a foreign country in the same way as the people there.	3.34 ± 1.15	3.43 ± 1.36	0.44	n.s.
Total (Scale D)	Interest in Foreign Countries	11.68 ± 2.72	11.83 ± 3.01	0.51	n.s.

n = 47 p < .05

ABCD: Results−international understanding through sport

The total score for international understanding through sport increased significantly from Pre (100.53 ± 15.90) to Post (106.62 ± 13.94) (t = 3.84, p < .05).(Table24)

Table 24.Changes in mean scores for international understanding through sport before and after the cricket unit.

Item No.	Item Content	Pre M ± SD	Post M ± SD	t-value	Significance
A	Understanding and Interest in Foreign Cultures and People	40.17 ± 7.57	44.42 ± 4.93	3.06*	
B	Interest in World Sports and Orientation toward Interaction	25.42 ± 4.99	27.71 ± 2.99	2.10*	
C	Interest in Foreign Languages and International Exchange	23.17 ± 4.83	23.42 ± 5.42	0.30	n.s.
D	Interest in Foreign Countries	11.88 ± 2.44	11.71 ± 3.17	0.38	n.s.
ABCD	international understanding through sport	100.63 ± 17.22	107.25 ± 14.51	2.44*	

n = 24 p < .05

2.4 Discussion

1. Effects of Cricket on Improvements in Throwing Distance

As a result of implementing cricket lessons for fifth-grade elementary school students, throwing distance increased significantly from pre to post for both boys and girls, with particularly large effects observed among girls. Cricket has a game structure that ensures equal throwing opportunities for all students, regardless of gender or individual differences in motor ability. Such a learning environment may have provided sufficient practice opportunities and successful experiences even for girls, who have traditionally tended to show lower throwing ability, thereby leading to larger effect sizes.

(2) -1 Effects of Cricket on the Improvement of Throwing Motion (Boys)

For boys, five subcomponents showed significant improvements, with a 3.54-point increase in the throwing motion score. This result indicates that multiple components of the throwing motion improved simultaneously. Thus, cricket lessons effectively promoted overall improvements in throwing motion.

(2) -2 Effects of Cricket on the Improvement of Throwing Motion (Girls)

For girls, six subcomponents showed significant improvements in throwing motion. The throwing motion score increased by 4.48 points, representing a larger improvement than that observed in boys. These findings indicate that cricket effectively promoted overall improvements in throwing motion among girls as well.

（3）Relationship Between Throwing Distance and Throwing Motion

At pre-test, throwing distance showed strong associations with overall throwing motion scores and several motion components in both boys and girls. Before the intervention, throwing distance directly reflected throwing motion proficiency.

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（3）-1 Relationship Between Throwing Distance and Throwing Motion（Boys）

In the post-test phase for boys, throwing distance showed a significant correlation only with the "take-back" component. Throwing distance was significantly correlated with throwing motion scores. This suggests that in boys, once overall throwing motion reached a certain level, throwing distance was mainly determined by take-back proficiency.

（3）-2 Relationship Between Throwing Distance and Throwing Motion（Girls）

In girls, throwing distance remained significantly correlated with five motion components and overall throwing motion scores at post-test. This suggests that, in girls, the acquisition of throwing motion was still in progress, and improvements in movement directly translated into increases in throwing distance. Comparisons of pre–post correlation structures suggest that improvements in throwing distance resulted from enhanced throwing motion through increased throwing opportunities provided by the cricket game structure.

（４）Effects of Cricket Lessons on International Understanding

International understanding scores significantly improved after the lessons in both boys and girls. Cricket was confirmed to be an effective teaching material for international understanding.

1. Effects on "Understanding and Interest in Foreign Cultures" and "Awareness of Interaction Through Sports"
Both boys and girls showed significant improvements in subscales A and B. This suggests that using cricket—a foreign sport—as the teaching material naturally stimulated children's awareness of and interest in other cultures. This point represents an important finding that highlights the characteristics of international understanding education based on physical activity, which does not rely on language ability.

2. Effects on Foreign Language Learning and International Exchange

In contrast, subscales C and D showed no significant changes in either boys or girls. This may be because the cricket lessons were conducted within physical education classes without the use of foreign languages or international exchange experiences. These findings position cricket as an effective teaching material for fostering foundational attitudes toward international understanding.

（5）Educational Value of Cricket as a Teaching Material

1. Educational Value as a Baseball-Type Teaching Material in Physical Education

Cricket can simultaneously improve throwing motion and throwing distance in elementary school physical education. In baseball-type classes aimed at developing throwing ability, introducing cricket into school physical education is considered to have significant educational value.

2. Educational Value as a Teaching Material for International Understanding Education

Cricket has significant educational value as a physical activity–based teaching material for international understanding in elementary school physical education.

2.5 Conclusion

Cricket can simultaneously enhance baseball-type instruction for improving throwing ability and promote international understanding through sport in Japanese elementary and middle school physical education. It can be concluded that the significance of introducing cricket as a new educational content in Japanese school physical education is extremely high.

Future Challenges

1 Dissemination Across Elementary and middle School Physical Education in Japan

2 Introduction and Development in High School and University Physical Education

REFERENCES

1. Cohen, J. (1988).Statistical power analysis for the behavioral sciences (2nd ed.).Hillsdale, NJ: Lawrence Erlbaum.

2. Japan Cricket Association. (2019).Cricket Teaching Manual.Tochigi: Japan Cricket Association.

3. JapanSports Agency. (2019).Guidelines for the New Physical Fitness Test (Ages 6–11).

ISSN 2394 - 7780

4. Japan Sports Agency. (2025).2024 National Survey of Physical Fitness, Athletic Performance, and Exercise Habits. https://www.mext.go.jp/sports/b_menu/toukei/kodomo/zencyo/1411922_00013.html

5. Ministry of Education, Culture, Sports, Science and Technology. (2010).Practical teaching materials for school physical education(Vol. 8: Games and ball activities, pp. 75–78).Tokyo: Toyokan Publishing.

6. Ota, M., Koide, M., Iwama, K., Suzuki, Y., & Kizuka, T. (2022).Implementation and issues of baseball-type lessons in elementary school physical education.Journal of Physical Education Pedagogy, 38(2), 13–25.

7. Suzuki, K., et al. (2000).Development and validation of the International Understanding Scale (IUS2000).Japan Journal of Educational Technology, 23(4), 213–226.

8. Takizawa, Y., & Kondo, T. (2017).A study on observational evaluation criteria for throwing motion. Japan Journal for the Pedagogy of Physical Education 33 (2), 1-17

9. Usui, T., & Okade, Y. (2025).Development of an exercise program to improve throwing distance in first-grade elementary school children.Research in Growth and Development, 97 (in press).

10. Usui, T., Okade, Y., Takizawa, Y., & Okumura, T. (2022a).Longitudinal development of throwing ability in elementary school children.Japan Journal of Sport Education, 42(1), 1–14.

11. Usui, T., Okade, Y., Takizawa, Y., & Okumura, T. (2022b).Technical issues in improving throwing distance in sixth-grade elementary school physical education.Bulletin of Nippon Sport Science University, 51, 1105–1113.

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UNIVERSITY EDUCATION: CURRENT CHALLENGES AND SUSTAINABILITY

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BACKGROUND.

Today, Ukraine is facing very serious challenges caused by military actions on the territory of our country and the consequences of the pandemic! Full-scale Russian military aggression caused a rapid increase in the number of war veterans. According to the data of the Ministry of Defense of Ukraine, since 2014, more than 386,000 people have participated in the anti-terrorist operation and the operation of the joint forces in the East of Ukraine.

RESULTS.

An essential step for our University development is its recognition as a main participant among other five institutions of higher education in accordance with the Decree of the Cabinet of Ministers of Ukraine "On the implementation of an experimental project on war veterans' transition from military service to civilian life on the basis of educational institutions by means of education, sports and rehabilitation" dated January 30, 2024. The purpose of the experimental project is to create an effective model of war veterans'integration into civilian life through specialized educational, sports and rehabilitation programs in educational institutions, including providing war veterans with special educational needs, supplying them with special textbooks, manuals.

The scientific and pedagogical staff of our university took an active part in justifying the relevance, prospects and main provisions of social project "Active parks – locations of healthy Ukraine", which was approved by the relevant decree of the President of Ukraine Volodymyr Zelenskyi. Realizing that insufficient physical activity is a civilizational challenge for formation and enhancing people's health, we mainly focus on training specialists who are able to successfully involve citizens in health-improving physical activity during their leisure time. Our university is one of the main institutions for training of prospective physical therapists and occupational therapistsin. To implement this process in accordance with international standards, we actively cooperate with our partners: Erasmus+ program, relevant NATO projects and with the support of the Czech government.

National University of Ukraine on Physical Education and Sport is actively developing the direction of information technologies and e-sports. The development of eSports at the university is related to the need of creating safe environment for practicing e-sports (electronic sports) based on the combination of games "in front of the screen" with various types of motor activity, which in its turn allows to compensate for negative consequences of long-term physical in activity for athlete's body; the available technical facilities and highly qualified university staff are able to resolve this issue. One of the priority areas of work at our institution is use of artificial intelligence in educational and scientific activities.

CONCLUSIONS

National University of Ukraine on Physical Education and Sport will continue to make maximum efforts to training competitive specialists in the labor market, involve our citizens in healthy physical activity, to facilitate rehabilitation and reintegration of war veterans to social and economic life, to contribute to Victory and raising the authority of Ukraine on international arena.

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A STUDY ON ANTHROPOMETRICAL MEASUREMENTS AND MOTOR FITNESS AMONG 9TH STANDARD NAVODAYA, UN-AIDED AND AIDED PRIVATE SCHOOLS OF BANGALORE DISTRICT

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INTRODUCTION

Physical education and sports contribute to the transformation of the child in an adult and its integration in to society. Sports is an athletic activity requiring skill or physical process and half ton of a computer to nature as racing the sports of the modern day has become more competitive foreign trade and Exhibition of high skill to achieve year performance in any field of activity the competition as lead to the research and innovation apart from skill coach training and execution of skills and techniques the biological and Anatomical chemistry of the sports person plays a very important role the performance in any sports not just depends upon the infrastructure facilities advanced training and coaching but also the physical, physiological, psychological characteristics determines once potential in given. Sports are involving vigour's physical activity, which lead to perfect execution of different skills techniques and intelligent manipulation of situation that are involved in a sports and games.

Human growth is a dynamic changing process and is being influencer by heredity and environmental genetic component and environment both contribute to attend final body structure certain factors like disease proper diet time culture purchase Geography kal conditions etc. have tremendous influence Hindi growth of a child.

Health and physical Education programs aid students in achieving their fully potential through the acquisition of knowledge and skill necessary to attend healthy level of will being and to maintain active life style through our life span healthy and physical activity lifestyle of a person helps to increase capacity for effective work positive behavioral choice and increase academic pursuits

In the literature studied describing the health related physical fitness of Navodaya children are rare particularly so with relation to the Navodaya schools of Bangalore district evaluating the trend in physical fitness components level among children and adolescence should provide useful information on which two base public policies to promote better quality of life and General Health status within this population both today and in the future.

The objective of this study was to investigate the health related physical fitness of school children from three schools that are distinct from one another in terms of their funding administration School meals provision and supervised physical activity and to test its Association with demographic and antropromatic indicators

Of the physical fitness components tested here flexibility was the most Homogeneous in terms of classification more children were unfit in terms of abdominal strength resistance under aerobic resistance which may be related to a low level of physical activity since regular systematics physical activity can contribute to improving Mini different components of health related physical fitness Homogeneous students of children and adolescence in this sample sex did not influence flexibility this result contracts with what was observed among children at elementary schools in the town Bangalore district where sex was the variable most strongly associated with flexibility this difference in results may reflect day distinct characteristics of the two samples.

In contrast with flexibility abdominal strength resistance and aerobic resistance were better among the boys this is similar to observation of school children from Navodaya where these two components exhibited interactions with sex in agreement with what was observed among elementary school children.

Additionally this study found that girls were more likely to have poor fitness in terms of abdominal strength resistance since low physical activity level can be pre judicial for fitness and since in activity is more associated with girls 19 this may explain our results however physical activity level were not assested for this study which makes it impossible to confirm this hypothesis.

With regard to associations between physical fitness and entrepremmatical indicators interactions for observed between flexibility and BMI and body fat percentage corporal and between abdominal strength resistance and aerobic resistance with all indicators analyse (BMI WC and body fat percentage)

Studies indicate significant negative correlations between BMI and WC and the components of Dominos strength resistance and aerobic resistance these results are consistent with our study since school children over

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obese and those with excessive abdominal adiposeity Road more suspectable to poor fitness in both while school children with overweight exhibited a tendency to poor results for aerobic resistance

Alto in isolation BMI has low sensivity for the diagnosis of excess body fat in children and adolescence and altho it is this same fat that may version performance in fitness test the indicators proud sensitivity for detecting it and was also indoors by the results for WC both for abdominal strength resistance and for aerobic resistance

Cardio respiratory fitness has exhibited a strong Association with total adipository more so than other components of fitness however in the study it was school children with a moderately excessive body fat percentage who proved most likely to have good abdominal strength assistance there by contradicting the results of BMI and WC.

Other limitations that merit consideration are the sample of convenience since the assessments were conducted in just 3 of the city's schools which is not representative of the city as a hole as a consequence the result cannot be extrapolated to all school children in elementary education in Bangalore and even less so to school children from other areas additionally since parents and children over 11 head to same consent forms to take part it is possible that those who refused were less fit than those who consented

Health related physical fitness is a series of measures of physical and physiological characteristics that define the risk of premature development of diseases or morbidity and which are associated with the senatory life style or those components of physical fitness that are affected by routine activity and or related to health status

The importance of having healthy level of the components of health related physical fitness cardio respiratory fitness muscle strength resistance body composition and flexibility lies in their relationship with reducing the Indians of chronic diseases and with improving performance which is why the physical fitness that comes from regular physical activity is beneficially for children

Growing concern about the harmful effects of childhood unfitness and its results in adulthood has mint that the number of studies investigating the physical fitness of children is increasing additionally diagnosing poor physical fitness level is one possible strategy for detecting metabolic disorders.

Dispute consensus about its epidemiological importance the physical fitness of Brazilian children has been investigated rarely and those studies that have been conducted or limited to regional samples.

One of the findings of these studies is a high percentage of unfitness in both sex in certain health related fitness level both boys and girls were found to be unfit especially so far abdominal strength resistance and aerobic resistance and when these results or broken down by sex the boys are fitter in terms of these components.

With relation to flexibility girls normally score better than boys in other words sex is one more one of the variable associated with this components Both sex exhibited significant variations in abdominal under aerobic resistance beginning from 10 to 14 years of age in boys and from 12 to 14 in girls these data suggested that age group can also be considered to be predictive of physical fitness

Other associations including the entreprenetic measurements are also being investigated in order to identify possible indicators of unfitness studies have detected a significant negative correlations between both body mass index BMI and waste circumference WC with abdominal strength resistance and aerobic resistance and also between body adipository and cardio respiratory fitness.

Today physical education sports and games in there diversified forms have become a part of the curriculum in schools colleges and Universities professionalism has entered sports and games demanding the sportsman and sports women of a very high level of performance performance physical skill sports and games required a high level physical physiological mental psychological fitness different activities required different level of fitness that is different activities demand different elements or components of fitness in varied proportions.

The improvement and performance of physical skill in the field of physical education sports and games depend upon the various aspects of the individual such as the physical characteristics mental characteristics the emotional setup etc. the performance also depends upon the personality traits body built age locality environmental and so on.

Entrepremetry involves the use of carefully defend body land marks for measurements specific subject positioning and rigidly standardized technique of measurement they are generally divided into those of weight length and height bread with or depth circumferences on girls curvatures on areas and soft(tissues skinfold).

Antropromatic factors influencing strength and motor performance are viewed in the terms of overall body size body proportions and physics and body composition recognizing the important role of motivation Peer status

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and other nonphysical variables it should be noted that strength and performance or related and that andhrapromatic factors influencing strength and performance during development or themselves inter related for example the early mechuring adolescent male is usually dollar heavier and more misomorphic then his late mature age peers.

Numerous evidence have shown body size and strength contributing to motor performance the increase in strength is related to increase in total muscle mass significant positive correlation between strength and performance indicate that stronger individuals were the individuals who perform better have ever the pattern of improvement of strength and physical performance is not uniform in all tasks strength maybe important to the successful performance of some motor performance but not as a important to others it is likely that performance related to power events would show a similar trend to that of strength.

REFERENCE:

- Hackenssmith C M and Miller L (March 1938) A comparison of the academic grades and intelligence course of participation and non-participats in intramural athletics at University of Kentuchy. Research quarterly 9:9
- Ghosh Deepti Kumar (1979) comparison of relation of academic achievement to physical fitness, motor fitness and general motor ability of High School athletes and non-athletes.
- Siddique Mohammad (1981) comparative study of motor ability and physical fitness of 10th class people studying in school having adequate and inadequate facilities in Kashmir division, guide Dr. J P Thomas-LNIPE
- Tuteja Girish K (1978) comparison of physical fitness of rural and urban school student. Jiwaji University.
- Sardari Lal (1990) A study of physical fitness in relation to school adjustment, emotion, stability, socio economic status and sex of players and non-players Punjab University, Punjab.

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NUTRITIONAL SUPPLEMENTATION AND EXERCISE: A SYNERGISTIC APPROACH FOR THE PREVENTION OF LIFESTYLE DISORDERS

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ABSTRACT

Many of the major health problems affecting people today—such as obesity, type 2 diabetes, cardiovascular diseases, and metabolic disorders—are closely linked to modern lifestyles. These conditions largely arise from excessive food consumption, mental stress, and insufficient physical activity. Addressing these challenges requires the adoption of healthy daily habits, particularly regular physical exercise and balanced nutrition, which may also include appropriate dietary supplementation. Substantial scientific evidence supports the role of these lifestyle factors in maintaining good health. Nutrition plays a fundamental role in overall well-being. A healthy diet consists of adequate portions of fruits and vegetables, whole grains, lean sources of protein, and healthy fats. Such foods strengthen the immune system, support cellular repair, and help maintain the body's internal balance. Research has consistently shown that plant-rich dietary patterns, such as the Mediterranean diet, reduce inflammation, improve lipid profiles, and lower the risk of chronic diseases. However, due to contemporary eating habits, many individuals fail to obtain essential nutrients solely from food. In such cases, dietary supplements—including vitamin D, omega-3 fatty acids, B-complex vitamins, antioxidants, and quality protein—can help fill nutritional gaps when used appropriately under medical guidance. Many illnesses can be prevented or managed without medication by adopting proper exercise routines and nutritious diets. Regular strength training and cardiovascular exercise reduce oxidative stress and inflammation, increase muscle mass, enhance cellular energy production, improve insulin sensitivity, and support cardiovascular health. The World Health Organization recommends at least 150 minutes of moderate physical activity per week, and numerous studies have demonstrated its positive effects on mental well-being, along with a reduced risk of various chronic conditions. Integrating balanced nutrition, regular exercise, and suitable supplementation is more effective than focusing on any single component alone. This combined approach improves nutrient absorption, supports healthy weight management, accelerates recovery, and enhances physical and mental performance. Healthy eating habits also promote greater energy levels, improved engagement in daily activities, and faster recovery from physical exertion. A holistic approach to health shifts the focus from disease treatment to prevention and long-term well-being. This perspective aligns with the principles of lifestyle medicine, a global health initiative that emphasizes sustainable behaviour changes rather than reliance on medication alone. Given the growing prevalence of chronic diseases worldwide, comprehensive public health strategies are essential. These should encourage healthy eating, regular physical activity, and the safe use of dietary supplements. Ultimately, the synergistic combination of nutrition, exercise, and supplementation offers an affordable, evidence-based, and sustainable pathway to improved health and vitality. By prioritizing these elements in healthcare policies and daily life, preventive medicine can be redefined. True health is not achieved through a single intervention but through the harmonious interaction of diet, physical activity, and mindful nourishment of the body over time.

Keywords: *Nutrition, Exercise, Dietary Supplements, Lifestyle Disorders, Prevention, Metabolic Health, Synergy, Public Health*

INTRODUCTION

Lifestyle-related disorders, also known as non-communicable diseases (NCDs), have emerged as one of the foremost public health concerns of the twenty-first century. This group of conditions—including cardiovascular diseases, diabetes, cancer, and chronic respiratory illnesses—contributes significantly to global illness and premature death. Reports from international health agencies indicate that NCDs are responsible for over 70% of worldwide mortality, with the impact being especially severe in low- and middle-income nations experiencing rapid urban growth and economic change. Unlike communicable diseases, these disorders progress slowly and are strongly shaped by prolonged exposure to unhealthy behaviours and environmental influences. The rising incidence of lifestyle disorders is closely linked to contemporary patterns of living. While technological progress has enhanced efficiency and comfort, it has also reduced physical activity and encouraged sedentary habits. At the same time, the global expansion of industrialised food systems has increased reliance on processed and ultra-processed foods rich in energy, sugars, unhealthy fats, and salt, yet deficient in vital micronutrients. Persistent psychological stress, disrupted sleep routines, and increasing social demands further intensify the risk of metabolic and cardiovascular conditions. To address this escalating health challenge, the

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focus of preventive medicine has gradually shifted from disease management to proactive health promotion and risk reduction. Regular exercise and balanced nutrition are widely recognised as fundamental preventive measures. Nevertheless, even in populations with adequate or excessive calorie consumption, deficiencies in essential vitamins and minerals remain common. This form of micronutrient deficiency, often described as "hidden hunger," underscores the inadequacy of calorie-centric dietary patterns and has driven growing interest in dietary supplements as a supportive strategy alongside wholesome diets and physical activity. This paper seeks to critically explore the relationship between nutrition, dietary supplementation, and exercise in the prevention of lifestyle disorders. Rather than considering these elements independently, it highlights their synergistic and complementary roles in supporting metabolic, physiological, and mental well-being. By adopting an integrated approach, the paper aims to demonstrate how coordinated lifestyle interventions can provide effective, sustainable, and economically viable responses to the increasing burden of non-communicable diseases.

LIFESTYLE DISORDERS: AN OVERVIEW

Lifestyle disorders develop primarily as a result of long-term unhealthy behaviours rather than infectious agents. Obesity, type 2 diabetes mellitus, hypertension, dyslipidaemia, metabolic syndrome, and certain forms of cancer are among the most prevalent examples. These conditions often coexist, creating complex clinical profiles that increase the risk of complications such as cardiovascular events, kidney disease, and reduced life expectancy. The clustering of these disorders reflects their shared underlying risk factors and pathophysiological mechanisms. Key behavioural risk factors include excessive calorie intake, poor diet quality, physical inactivity, tobacco use, and harmful alcohol consumption. Psychosocial stress, sleep deprivation, and irregular daily routines further exacerbate metabolic dysregulation. Urbanisation and technological advancement have significantly altered daily activity patterns, reducing occupational and domestic physical labour. Increased reliance on motorised transport and prolonged screen time for work and leisure have contributed to widespread sedentary behaviour across all age groups. Dietary patterns have also undergone substantial changes. Traditional diets rich in whole grains, legumes, fruits, and vegetables have been progressively replaced by diets dominated by refined carbohydrates, saturated and trans fats, and added sugars. These dietary shifts are often driven by convenience, aggressive marketing, and socioeconomic constraints. Over time, such patterns promote weight gain, insulin resistance, and chronic low-grade inflammation, all of which are central to the development of lifestyle disorders. The economic and social costs associated with lifestyle disorders are considerable. In addition to rising healthcare expenditure, these diseases reduce workforce productivity, increase disability, and impair quality of life. Families and caregivers often bear a significant emotional and financial burden. Consequently, preventive strategies that are accessible, affordable, and sustainable are urgently required to mitigate both individual and societal impacts.

ROLE OF NUTRITION IN PREVENTIVE HEALTH

Nutrition forms the foundation of health maintenance and disease prevention. A balanced diet provides macronutrients—carbohydrates, proteins, and fats—that supply energy and structural components, as well as micronutrients such as vitamins and minerals that are essential for enzymatic reactions, immune defence, and metabolic regulation. Adequate hydration and dietary fibre intake further support gastrointestinal health and metabolic homeostasis. Epidemiological and clinical studies consistently demonstrate that diets rich in fruits, vegetables, whole grains, lean proteins, and unsaturated fats are associated with a reduced risk of lifestyle disorders. Dietary patterns such as the Mediterranean diet, Dietary Approaches to Stop Hypertension (DASH), and plant-forward diets have been linked to improved lipid profiles, better glycaemic control, and reduced markers of systemic inflammation. These benefits are attributed to high intakes of antioxidants, fibre, phytochemicals, and healthy fatty acids. Carbohydrate quality plays a crucial role in metabolic health. Diets emphasising whole grains and low-glycaemic-index foods promote stable blood glucose levels and reduce insulin demand. Protein intake supports muscle maintenance, satiety, and metabolic rate, particularly when derived from lean and plant-based sources. Healthy fats, including monounsaturated and polyunsaturated fatty acids, contribute to cardiovascular health by improving lipid profiles and modulating inflammatory pathways. In contrast, diets high in ultra-processed foods are strongly associated with obesity, type 2 diabetes, and cardiovascular disease. These foods are often energy-dense but nutrient-poor, encouraging excessive calorie consumption without providing adequate micronutrients. Additives, preservatives, and excessive sodium content further contribute to metabolic dysfunction. Over time, such dietary patterns lead to oxidative stress, insulin resistance, endothelial dysfunction, and chronic inflammation.

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MICRONUTRIENT DEFICIENCIES AND SUPPLEMENTATION

Despite increased global food availability, micronutrient deficiencies remain widespread across different age groups and socioeconomic strata. Deficiencies in vitamin D, iron, vitamin B12, folate, iodine, and magnesium are commonly reported. These deficiencies may arise from inadequate dietary intake, limited sun exposure, malabsorption syndromes, increased physiological demands, or restrictive dietary practices. Micronutrients play critical roles in metabolic and physiological processes. Vitamin D is essential for calcium homeostasis, bone health, immune modulation, and muscle function. Iron is required for oxygen transport and energy production, while B-complex vitamins are integral to carbohydrate, fat, and protein metabolism. Magnesium participates in hundreds of enzymatic reactions, including those involved in glucose regulation and muscle contraction. Dietary supplementation has been proposed as a practical strategy to address nutrient gaps, particularly in populations at risk of deficiency. Evidence-based supplementation, when appropriately used, can support metabolic health and disease prevention. For example, vitamin D supplementation has been associated with improved bone density, enhanced immune function, and potential benefits in insulin sensitivity. Omega-3 fatty acid supplementation has demonstrated anti-inflammatory effects and cardiovascular benefits, including reduced triglyceride levels. However, supplementation should not be regarded as a substitute for a balanced diet. Excessive or unsupervised use of supplements may lead to toxicity, nutrient imbalances, or adverse interactions with medications. The efficacy of supplementation also varies depending on baseline nutritional status, dosage, and individual characteristics. Therefore, supplementation should be individualised, evidence-based, and ideally guided by qualified healthcare professionals.

EXERCISE AS A NON-PHARMACOLOGICAL INTERVENTION

Regular physical activity is a cornerstone of lifestyle disease prevention and health promotion. Exercise exerts beneficial effects on nearly every physiological system, including the cardiovascular, metabolic, musculoskeletal, and nervous systems. It improves cardiorespiratory fitness, enhances insulin sensitivity, regulates body weight, and supports mental well-being by reducing stress, anxiety, and depressive symptoms. Aerobic exercise, such as walking, jogging, cycling, and swimming, improves cardiovascular endurance and reduces major risk factors for heart disease, including hypertension and dyslipidaemia. It enhances mitochondrial function and promotes efficient energy utilisation. Resistance training, on the other hand, increases muscle mass and strength, which in turn elevates resting metabolic rate and improves glucose uptake through enhanced insulin-independent pathways. Flexibility and balance exercises, including yoga and stretching routines, contribute to musculoskeletal health and reduce the risk of injury, particularly in older adults. Combined exercise programmes that incorporate aerobic, resistance, and flexibility training have been shown to be particularly effective in managing metabolic syndrome and type 2 diabetes. The World Health Organization recommends that adults engage in at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity per week, along with muscle-strengthening activities on two or more days per week. Adherence to these guidelines is associated with reduced risk of premature mortality, improved functional capacity, and enhanced quality of life.

SYNERGISTIC EFFECTS OF NUTRITION AND EXERCISE

Nutrition and exercise do not operate independently; rather, they interact at multiple physiological and molecular levels. Adequate nutrition supports exercise performance, recovery, and adaptation, while regular physical activity enhances nutrient utilisation and metabolic efficiency. This bidirectional relationship underpins the synergistic effects observed when both interventions are combined. Protein intake is essential for muscle repair and hypertrophy following resistance training. Timing and quality of protein consumption influence muscle protein synthesis and recovery. Carbohydrates play a vital role in replenishing glycogen stores depleted during exercise, thereby supporting endurance and training intensity. Healthy fats contribute to hormonal regulation, cell membrane integrity, and inflammation control. Micronutrients such as iron, calcium, zinc, and B-complex vitamins are critical for energy metabolism, oxygen transport, bone health, and neuromuscular function. Exercise increases the turnover and demand for certain nutrients, making adequate intake particularly important for physically active individuals. When nutrition and exercise are optimally aligned, they collectively improve body composition, enhance insulin sensitivity, reduce systemic inflammation, and strengthen cardiovascular function.

PUBLIC HEALTH PERSPECTIVE AND PREVENTIVE MEDICINE

From a public health perspective, integrating nutrition, supplementation, and exercise into preventive strategies offers a cost-effective and sustainable approach to reducing the burden of lifestyle disorders. Population-level interventions, such as community nutrition programmes, workplace wellness initiatives, and school-based

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physical activity schemes, can foster healthy behaviours across the lifespan. Preventive medicine increasingly recognises the importance of lifestyle modification alongside pharmacological treatment. Healthcare systems are gradually shifting toward multidisciplinary models that incorporate dietitians, exercise professionals, and behavioural counsellors. Policies that support access to affordable healthy foods, safe environments for physical activity, and accurate nutrition education are essential for enabling individual behaviour change. Public awareness campaigns play a crucial role in dispelling misconceptions about diet and supplements. Evidence-based messaging can encourage responsible supplement use and emphasise the primacy of whole foods and regular physical activity. Such initiatives can empower individuals to make informed health decisions and reduce reliance on medical interventions.

CHALLENGES AND LIMITATIONS

Despite strong evidence supporting lifestyle-based interventions, several challenges hinder their widespread adoption and long-term effectiveness. Behavioural change is inherently difficult to initiate and sustain, particularly in environments that promote sedentary lifestyles and unhealthy eating habits. Time constraints, lack of motivation, and limited access to resources further impede adherence. Socioeconomic disparities significantly influence lifestyle choices and health outcomes. Individuals from lower-income backgrounds may face barriers such as food insecurity, limited access to recreational facilities, and inadequate health education. Cultural beliefs and misinformation, particularly regarding dietary supplements, can also shape health behaviours in ways that undermine evidence-based recommendations. In addition, research on supplementation often yields inconsistent findings due to variations in study design, population characteristics, dosage, and duration. Many studies focus on isolated nutrients rather than overall dietary patterns, limiting the generalisability of results.

More long-term, high-quality randomised controlled trials are needed to establish clear and context-specific guidelines for supplementation in disease prevention.

FUTURE DIRECTIONS

Future research should increasingly focus on personalised nutrition and exercise prescriptions tailored to individual genetic, metabolic, and lifestyle profiles. Advances in nutrigenomics and metabolomics offer promising avenues for understanding individual responses to diet and physical activity. Such approaches may enhance the effectiveness and sustainability of preventive interventions. Digital health technologies, including wearable fitness trackers, mobile health applications, and telemedicine platforms, provide new opportunities to monitor, motivate, and support healthy behaviours. These tools can facilitate real-time feedback, goal setting, and personalised coaching, thereby improving adherence to lifestyle interventions. Integrative models that combine dietary guidance, targeted supplementation, and structured exercise programmes are likely to yield more comprehensive health benefits. Collaboration between healthcare providers, policymakers, researchers, and communities will be essential for translating scientific evidence into practical and scalable solutions.

CONCLUSION

The increasing prevalence of lifestyle-related disorders highlights an urgent need for preventive strategies that address their underlying behavioral and environmental determinants. Research consistently demonstrates that optimal nutrition, judicious use of dietary supplements, and structured physical activity play indispensable roles in mitigating disease risk and improving clinical outcomes. These interventions, when applied in combination, produce synergistic effects that enhance metabolic efficiency, support cardiovascular health, and promote psychological resilience. Rather than focusing solely on pharmaceutical management after disease onset, a preventive paradigm centered on lifestyle modification encourages early intervention and long-term health optimization. This integrative approach aligns closely with contemporary preventive medicine models and offers a scientifically grounded framework for reducing disease burden and improving overall population well-being.

REFERENCES

- World Health Organization. (2023).
- Noncommunicable diseases. WHO.
- World Health Organization. (2020). WHO guidelines on physical activity and sedentary behaviour. WHO.
- Mozaffarian, D. (2016). Dietary and policy priorities for cardiovascular disease, diabetes, and obesity.
- Circulation, 133(2), 187-225.

ISSN 2394 - 7780

- Hu, F. B. (2018). Diet and lifestyle influences on risk of cardiovascular disease. Current Atherosclerosis Reports, 20(12), 1-8.
- Estruch, R., Ros, E., Salas-Salvadó, J., et al. (2018).
- Primary prevention of cardiovascular disease with a Mediterranean diet supplemented with extra-virgin olive oil or nuts. New England Journal of Medicine, 378(25), e34.
- Calder, P. C. (2017). Omega-3 fatty acids and inflammatory processes. Nutrients, 9(4), 1-26.
- Manson, J. E., & Bassuk, S. S. (2018). Vitamin D research and clinical practice. New England Journal of Medicine, 378(1), 73-80.
- Warburton, D. E. R., Nicol, C. W., & Bredin, S. S. D. (2006). Health benefits of physical activity: The evidence. CMAJ, 174(6), 801-809.
- Booth, F. W., Roberts, C. K., & Laye, M. J. (2012).
- Gibney, M. J., Walsh, M. C., Brennan, L., Roche, H. M., German, B., & van Ommen, B. (2007). Metabolomics in human nutrition. American Journal of Clinical Nutrition, 86(2), 497-503.

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CARDIOPULMONONARY RESPONSES TO UNWEIGHTED AND WEIGHTED STEP TEST AMONG COLLEGIATE MALE STUDENTS

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ABSTRACT

Cardiopulmonary Exercise Testing (CPET) is a valuable method for assessing integrated cardiovascular and respiratory responses during exercise, while submaximal step tests offer safe and practical field-based alternatives. This study compared acute cardiopulmonary responses to unweighted and 5% body-mass weighted step tests among collegiate male students. Twenty-eight healthy males performed YMCA step-test protocols under both conditions with gas exchange measured using a portable metabolic analyzer. Oxygen consumption, carbon dioxide production, estimated VO_2max, and energy expenditure increased significantly during both tests. However, no significant differences were observed between unweighted and weighted conditions. These findings suggest that light external loading does not substantially augment cardiopulmonary stress during submaximal stepping.

INTRODUCTION

Cardiopulmonary function is a fundamental determinant of physical fitness, endurance performance, and overall health. The coordinated functioning of the cardiovascular, respiratory, and metabolic systems enables the delivery and utilization of oxygen required for sustained physical activity. Maximal oxygen uptake (VO_2max) is widely regarded as the gold standard indicator of aerobic capacity and cardiorespiratory fitness (Bassett & Howley, 2000; Burnley & Jones, 2007). Higher VO_2max values are associated with improved exercise tolerance, reduced cardiovascular risk, and enhanced athletic performance

Although laboratory-based maximal exercise tests using treadmills or cycle ergometers provide accurate VO_2max measurements, their application is often limited by high cost, technical complexity, and the need for specialized personnel (ACSM, 2021). Consequently, submaximal exercise tests have gained popularity in educational institutions, sports training centers, and clinical settings due to their safety, simplicity, and feasibility. Among these, step tests represent one of the most practical field-based tools for assessing aerobic fitness (McArdle, Katch, & Katch, 2015).

Step tests such as the YMCA, Harvard, and Queens College protocols involve repetitive lower-limb movement that increases heart rate, pulmonary ventilation, and metabolic demand in a controlled manner. Previous studies have demonstrated strong correlations between step-test performance and directly measured VO_2max, supporting their validity for estimating aerobic capacity (Bennett et al., 2016; Beutner et al., 2015). The rhythmic concentric and eccentric muscle actions during stepping also make these tests suitable for young adults and physically active populations.

From a physiological perspective, oxygen consumption (VO_2) reflects the integrated capacity of the heart, lungs, and skeletal muscles to transport and utilize oxygen during exercise (Rowland, 1992). As exercise intensity increases, cardiac output, pulmonary ventilation, and muscular oxygen extraction rise proportionally. Submaximal stepping exercise effectively stimulates these mechanisms, leading to measurable increases in VO_2 and energy expenditure (Powers & Howley, 2020).

Introducing external load during aerobic exercise increases mechanical work and metabolic cost. Research has shown that weighted walking, stair climbing, and resisted stepping elevate oxygen uptake and ventilatory responses due to increased muscular demand (Samet et al., 1993; Sim et al., 2019). However, the magnitude of these responses depends on the amount of load applied and the characteristics of the population being studied.

Body composition also plays a critical role in cardiorespiratory fitness. Individuals with greater fat-free mass generally demonstrate higher VO_2max values and improved exercise efficiency (Sharma et al., 2013; Karasimav & Aydin, 2022). Since adding external load effectively increases total body mass during stepping exercise, it may influence cardiopulmonary responses differently depending on muscular strength and lean mass distribution.

Despite extensive research on step-test validity, limited studies have directly compared unweighted and externally weighted step-test conditions, particularly using light loads such as 5% of body mass in collegiate male populations. The acute cardiopulmonary effects of such low-level external loading remain unclear.

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Addressing this gap is important for sports scientists and physical educators who frequently incorporate weighted step exercises into training and assessment protocols. Hence, the present study aimed to compare the acute cardiopulmonary responses during unweighted and 5% body-mass weighted step tests among collegiate male students.

METHODOLOGY

Participants:

Twenty-eight healthy male students from Annamalai University, aged between 18 and 23 years, voluntarily participated in the study. Participants were recruited based on the following inclusion criteria: being free from any known cardiovascular, metabolic, or respiratory disorders; having no history of lower-limb injury within the previous six months; engaging in regular physical activity for a minimum of three days per week; and abstaining from vigorous physical activity for at least 24 hours prior to testing. All participants provided written informed consent, and the study procedures were conducted in accordance with standard ethical guidelines for human exercise research.

Anthropometric Assessment:

Anthropometric measurements were obtained following standardized testing protocols. Standing height was measured using a stadiometer to the nearest 0.1 cm, while body mass was recorded using a digital weighing scale to the nearest 0.1 kg. Body fat percentage and fat mass were assessed using a bioelectrical impedance analyzer, and lean body mass was calculated by subtracting fat mass from total body weight. These anthropometric variables were used to determine the individualized external load equivalent to 5% of body mass for the weighted step-test condition.

Equipment:

Cardiopulmonary responses were measured using a COSMED Quark K5 portable gas analyzer, which provided breath-by-breath analysis of oxygen consumption, carbon dioxide production, pulmonary ventilation, and energy expenditure. A standardized 12-inch step box, as recommended for the YMCA step-test protocol, was used for both testing conditions. An adjustable weighted vest was employed to apply an external load equivalent to 5% of each participant's body mass during the weighted condition. Stepping cadence was regulated using a digital metronome, and heart rate was continuously monitored using a heart rate monitoring device. All equipment was calibrated in accordance with manufacturer guidelines prior to each testing session.

Study Protocol: The study was conducted in three phases for each participant: resting measurement, unweighted YMCA step test, and weighted YMCA step test with a 5% body-mass load. Each phase was performed on separate days with a minimum 48-hour interval between sessions to minimize the effects of residual fatigue. Resting Measurements: Participants were seated comfortably for five minutes before testing. During this period, resting oxygen consumption and carbon dioxide production were recorded using the portable metabolic analyzer to establish baseline cardiopulmonary values. Unweighted Step-Test Protocol: Participants completed a five-minute YMCA step test using a 12-inch step at a cadence of 24 steps per minute, regulated at 96 beats per minute by a digital metronome. Participants were instructed to move their arms naturally while stepping. Cardiopulmonary variables including heart rate, oxygen consumption, carbon dioxide production, respiratory exchange ratio, and ventilation were continuously recorded throughout the test. Weighted Step-Test Protocol (5% Body Mass): For the weighted condition, participants wore a weighted vest equivalent to 5% of their body mass. The stepping protocol, cadence, step height, and measurement procedures were identical to those used in the unweighted condition. The additional load increased mechanical and metabolic demand while maintaining a safe submaximal exercise intensity. Cool-down: Following each step-test session, participants performed a two-minute cool-down consisting of slow marching to facilitate gradual cardiovascular recovery and prevent abrupt reductions in heart rate.

Statistical Procedures: Statistical analysis was performed using SPSS version 25.0. Descriptive statistics were computed for all measured variables. Repeated-measures analysis of variance (ANOVA) was applied to examine differences across resting, unweighted, and weighted conditions. Mauchly's test of sphericity was conducted, and Greenhouse–Geisser corrections were applied when necessary. Bonferroni post hoc tests were used to identify the specific locations of significant differences. The level of statistical significance was set at $p < 0.05$.

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RESULTS

The results of the study are presented to illustrate the acute cardiopulmonary responses to resting, unweighted step exercise, and weighted (5% body mass) step exercise conditions. Repeated-measures ANOVA was employed to examine differences across conditions for oxygen consumption (VO_2), carbon dioxide production (VCO_2), maximal oxygen uptake (VO_2max), and energy expenditure.

Table 1. Oxygen Consumption (VO_2, $L \cdot min^{-1}$) Across Conditions				Bonferroni Post-hoc Comparisons		
	Resting	Unweighted Step Test	Weighted Step Test (5%)		Mean Difference	*p* value
Mean	1.021	3.539	3.508	Rest vs Unweighted	2.518*	<0.001
Standard Deviation	0.115	0.505	0.413	Rest vs Weighted	2.487*	<0.001
ANOVA: F	220.146, $p < 0.001$			Unweighted vs Weighted	0.031	1.000

It is obvious from Table-1 that oxygen consumption increased significantly from resting to both exercise conditions, indicating substantial cardiopulmonary activation during stepping exercise. However, no statistically significant difference was observed between unweighted and weighted step tests, suggesting that a 5% external load did not meaningfully increase oxygen demand.

Table 2. Carbon Dioxide Production (VCO_2, $L \cdot min^{-1}$) Across Conditions				Bonferroni Post-hoc Comparisons		
	Resting	Unweighted Step Test	Weighted Step Test (5%)		Mean Difference	*p* value
Mean	1.084	3.723	3.582	Rest vs Unweighted	2.639*	<0.001
Standard Deviation	0.123	0.499	0.519	Rest vs Weighted	2.498*	<0.001
ANOVA: F	177.592, $p < 0.001$			Unweighted vs Weighted	0.141	0.622

Table-2 exhibits that carbon dioxide production increased markedly during both step-test conditions compared to rest, reflecting elevated metabolic activity. Although VCO_2 values were marginally higher during weighted stepping, the difference was not statistically significant.

Table 3. Maximal Oxygen Uptake (VO_2max, $ml \cdot kg^{-1} \cdot min^{-1}$) Across Conditions				Bonferroni Post-hoc Comparisons		
	Resting	Unweighted Step Test	Weighted Step Test (5%)		Mean Difference	*p* value
Mean	16.633	57.402	54.924	Rest vs Unweighted	40.769*	<0.001
Standard Deviation	1.852	5.960	4.584	Rest vs Weighted	38.291*	<0.001
ANOVA: F	318.765, $p < 0.001$			Unweighted vs Weighted	2.478	0.121

From Table-3, it is clear that VO_2max values increased significantly during both exercise conditions compared to resting values. However, the difference between unweighted and weighted step tests was not statistically significant, indicating that the addition of a light external load did not substantially enhance aerobic demand.

Table 4. Energy Expenditure ($kcal \cdot min^{-1}$) Across Conditions				Bonferroni Post-hoc Comparisons		
	Resting	Unweighted Step Test	Weighted Step Test		Mean Difference	*p* value

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			(5%)			
Mean	1629.87	7187.00	7825.00	Rest vs Unweighted	5557.13*	<0.001
Standard Deviation	58.90	1469.98	1164.65	Rest vs Weighted	6195.13*	<0.001
ANOVA: F	167.684, $p < 0.001$			Unweighted vs Weighted	638.00	0.120

Table-4 demonstrates that energy expenditure increased significantly during both step-test conditions relative to rest. Although the weighted step test showed higher mean energy expenditure, the difference was not statistically significant

DISCUSSION

The purpose of this study was to compare the acute cardiopulmonary responses to unweighted and lightly weighted (5% body mass) step tests among collegiate male students. The findings revealed that both unweighted and weighted step-up exercises significantly elevated VO_2, VCO_2, VO_2max, and energy expenditure in comparison to resting conditions, confirming that even submaximal stepping imposes meaningful cardiopulmonary stress. These results support previous research concerning the effectiveness of submaximal step tests as indicators of aerobic capacity (Bennett et al., 2016; Beutner et al., 2015). One of the most important outcomes of this study was that although cardiopulmonary responses increased from unweighted to weighted stepping, the differences were not statistically significant. This suggests that when the external load is very light (only 5% of body mass), the increase in metabolic and ventilatory demand may not be large enough to produce a meaningful change in cardiopulmonary variables. This result aligns with the principle that external load must exceed a certain threshold to substantially alter physiological demand (Sim et al., 2019).

The results also highlight that the stepping cadence, duration, and task familiarity significantly influence cardiopulmonary responses. Because the YMCA step test uses a moderate intensity (24 steps per minute) and fixed duration (five minutes), its submaximal nature may dilute the effects of small external loads. Heavier loads (10–15% body mass) might produce more distinct differences. Interestingly, VO_2max values obtained during both stepping conditions were high (56.9–58.2 ml/kg/min), which is typical for physically active young males. This reinforces that the sample population had strong aerobic fitness levels, possibly reducing the relative effect of a 5% load because trained individuals exhibit efficient oxygen utilization and movement economy (Rowland, 1992). Energy expenditure was also higher in the weighted condition. Although not statistically significant, this difference could be meaningful for exercise prescription. Even a slight increase in caloric cost may benefit individuals seeking weight management or increased cardiovascular stress without altering cadence or duration.

Collectively, these findings suggest that: (i) Submaximal step tests are effective for evaluating cardiopulmonary function; (ii) Small external loads do not significantly enhance aerobic stress; and (iii) Higher loads or longer durations may be required to observe differences. These outcomes have practical relevance for coaches, trainers, and physical educators who frequently use step tests in assessments. If the goal is to simulate loaded activity or increase cardiovascular stress, higher loads should be applied. However, if safety and accessibility are priorities, unweighted step tests remain fully adequate.

CONCLUSION

The findings indicate that both unweighted and lightly weighted (5% body mass) step-up exercises elicit significant cardiopulmonary responses among collegiate male students. However, the addition of a small external load does not significantly enhance oxygen consumption, carbon dioxide production, maximal oxygen uptake, or energy expenditure. Therefore, unweighted step tests remain sufficient for aerobic fitness assessment, while heavier external loads may be necessary to induce additional physiological stress.

REFERENCES

- American College of Sports Medicine. (2021). ACSM's guidelines for exercise testing and prescription (11th ed.). Wolters Kluwer.
- Bassett, D. R., & Howley, E. T. (2000). Limiting factors for maximum oxygen uptake and determinants of endurance performance. Medicine & Science in Sports & Exercise, 32(1), 70–84.

ISSN 2394 - 7780

- Bennett, H., Parfitt, G., Davison, K., & Eston, R. (2016). Validity of submaximal step tests to estimate VO_2max in healthy adults. Sports Medicine, 46(5), 737–750.
- Beutner, F., Ubrich, R., Zachariae, S., et al. (2015). Validation of a brief step-test protocol for estimation of peak oxygen uptake. European Journal of Preventive Cardiology, 22(4), 503–512.
- Burnley, M., & Jones, A. M. (2007). Oxygen uptake kinetics as a determinant of sports performance. European Journal of Sport Science, 7(2), 63–79.
- Chung, Y. C., et al. (2021). Predicting maximal oxygen uptake from a 3-minute progressive knee-ups and step test. PeerJ, 9, e10831.
- Esco, M. R., Williford, H. N., & Flatt, A. A. (2011). Heart rate recovery as a predictor of cardiovascular health. Journal of Strength and Conditioning Research, 25(4), 999–1005.
- Karasimav, Ö., & Aydın, T. (2022). Relationship between body fat percentage and aerobic capacity. Research in Sport Education and Sciences, 24(4), 126–131.
- McArdle, W. D., Katch, F. I., & Katch, V. L. (2015). Exercise physiology: Nutrition, energy, and human performance (8th ed.). Wolters Kluwer.
- Powers, S. K., & Howley, E. T. (2020). Exercise physiology: Theory and application to fitness and performance (10th ed.). McGraw-Hill Education.
- Rowland, T. W. (1992). Trainability of the cardiorespiratory system during childhood. Canadian Journal of Sport Sciences, 17, 259–263.
- Samet, J. M., Speizer, F. E., Dockery, D. W., et al. (1993). Ventilation estimation during exercise. Environmental Health Perspectives, 101(4), 388–394.
- Sharma, V. K., et al. (2013). Body composition and cardiorespiratory fitness. Indian Journal of Physiology and Pharmacology, 57(4), 399–405.
- Sim, Y., Park, S., Lee, J., & Kim, H. (2019). Effects of modified step-test interval training. Journal of Exercise Science & Fitness, 17(2), 67–73.

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ASSOCIATION OF ELASTIC STRENGTH, ELASTIC POWER, AND EXPLOSIVE POWER WITH LONG JUMP PERFORMANCE

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ABSTRACT

Elastic and explosive neuromuscular qualities play a vital role in long jump performance through effective utilization of the stretch–shortening cycle. This study examined the association of elastic strength, elastic power, and explosive power with long jump performance among collegiate male students. Eighteen physically active males were assessed for anthropometric variables, unilateral hopping ability, bunny hop performance, and countermovement vertical jump height. Long jump distance was measured using standard field procedures. Pearson's correlation analysis revealed that left-leg hop distance and vertical jump height were significantly associated with long jump performance, while height, body mass, right-leg hop, and bunny hop performance showed no significant relationship. The findings highlight the importance of unilateral elastic strength and explosive power in long jump performance.

Keywords: Elastic strength, Elastic power, Explosive power, Long jump

INTRODUCTION

Long jump performance is influenced by the interaction of approach speed, lower-limb strength, coordination, and explosive power. Among these components, the capacity of the lower limbs to rapidly generate force and efficiently utilize elastic energy during the take-off phase is a decisive factor in determining jump distance. Consequently, elastic strength, elastic power, and explosive power are regarded as essential neuromuscular qualities for successful long jump performance.

Elastic strength and elastic power are closely related to the stretch–shortening cycle, which consists of a rapid eccentric muscle action followed immediately by a concentric contraction. This sequence enables the musculotendinous system to store elastic energy and release it effectively, enhancing force output and movement efficiency (Komi, 2000; Wilson & Flanagan, 2008). Jumping and hopping activities heavily depend on this mechanism, making efficient stretch–shortening cycle utilization crucial for long jump athletes.

Explosive power refers to the ability to produce maximal force in minimal time and is commonly evaluated using vertical and horizontal jump tests. Several studies have demonstrated strong associations between jump performance and muscular power in athletic populations (Stone et al., 2003; Comfort et al., 2014; Dobbs et al., 2015). Vertical jump height, in particular, reflects rapid force development and neuromuscular coordination, both of which are directly transferable to the take-off phase of the long jump (Van Hooren & Zolotarjova, 2009).

Unilateral lower-limb strength and power have gained increasing attention due to their relevance in single-leg take-off events. Research has shown that lower-limb asymmetry and unilateral strength differences can significantly influence jump and sprint performance (Kaçoğlu, 2019). Since the long jump is executed predominantly from a single take-off leg, unilateral elastic strength may serve as a more sport-specific indicator of performance than bilateral power measures (Bajramovic et al., 2022).

Biomechanical models suggest that longer limbs may offer mechanical advantages (Pan, 2013), empirical evidence indicates that neuromuscular qualities often have a greater influence on performance outcomes than body dimensions alone (Ngetich & Rintaugu, 2013; Iseni & Abdullai, 2022). Despite extensive research on jumping ability, limited studies have collectively examined elastic strength, elastic power, and explosive power in relation to long jump performance among collegiate male students, hence the purpose of the study is to investigate the association of lower limb strength and power with long jump performance.

METHODOLOGY

Eighteen healthy male students aged between eighteen and twenty-four years from Annamalai University voluntarily participated in the study. All participants were physically active and free from musculoskeletal injuries at the time of testing. Individuals with a history of lower-limb injury within the previous six months or with cardiovascular, neurological, or orthopedic disorders were excluded. Written informed consent was obtained from all participants prior to data collection.

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A cross-sectional research design was adopted to examine the association between selected neuromuscular variables and long jump performance. Testing was conducted over two sessions with adequate rest intervals to minimize fatigue effects.

Elastic strength was assessed using the single-leg hop for distance test for both right and left legs. Participants performed maximal forward hops on one leg, landing on the same leg while maintaining balance. The best distance from three trials was recorded. Elastic power was evaluated using the bunny hop test, which involved repeated bilateral forward hops over a fixed distance, with performance recorded using a stopwatch.

Explosive power was assessed using the countermovement vertical jump test. Vertical jump height was measured using an OptoJump system, and the best performance from three trials was used for analysis.

Long jump performance was assessed using standard field procedures. Participants performed a running approach followed by a take-off from the board, and jump distance was measured from the take-off line to the nearest landing mark. The best distance from three trials was recorded.

Descriptive statistics were calculated for all variables. Pearson's product–moment correlation coefficient was used to determine relationships between elastic strength, elastic power, explosive power, and long jump performance. Statistical significance was set at $p < 0.05$.

RESULTS

The participants baseline characteristics was as given in Table-1.

Table 1. Baseline Characteristics of the Participants

	Mean	SD
Age (years)	20.25	1.67
Height (cm)	174.38	5.26
Body Mass (kg)	64.50	12.04

The data collected were subjected to descriptive analysis, and the results thus obtained were tabulated in Table-2 as demonstrated below.

Table 2. Descriptive Statistics of Performance Variables

	Mean	SD
Left-Leg Hop (m)	6.80	0.75
Right-Leg Hop (m)	6.72	1.05
Bunny Hop	8.91	1.33
Vertical Jump (cm)	37.36	5.66
Long Jump (m)	4.27	0.65

Table-2 depicting the results of descriptive analysis showed normal variation across all measured variables. And, the data on selected performance variables was analyzed for statistically significant relationship among performance variables. The results thus obtained is exhibited in Table-3.

Table 3. Inter-Correlation Matrix of Study Variables

Variable	LLH	RLH	BH	VJ	LJ
Left-Leg Hop (LLH)	1	0.745*	−0.718*	−0.572*	−0.753*
Right-Leg Hop (RLH)	0.745*	1	−0.909**	−0.435	−0.553
Bunny Hop (BH)	−0.718*	−0.909**	1	0.387	0.432
Vertical Jump (VJ)	−0.572*	−0.435	0.387	1	0.809**
Long Jump (LJ)	−0.753*	−0.553	0.432	0.809**	1

Correlation analysis revealed no significant association between right-leg hop distance, or bunny hop performance with long jump distance. In contrast, left-leg hop distance demonstrated a strong positive correlation with long jump performance, indicating the importance of unilateral elastic strength. Vertical jump

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height also showed a significant positive association with long jump distance, highlighting the role of explosive power in performance outcomes.

DISCUSSION

The present study examined the association of elastic strength, elastic power, and explosive power with long jump performance among collegiate male students. The major findings indicated that left-leg hop distance and vertical jump height were significantly associated with long jump performance, while bilateral hopping performance were not.

The significant relationship between left-leg hop distance and long jump performance emphasizes the importance of unilateral elastic strength. Since the long jump take-off is executed using a single leg, the ability of the take-off limb to generate high force within a short ground contact time is crucial. These findings support previous research highlighting the relevance of unilateral strength and limb-specific power in jumping performance (Kaçoğlu, 2019; Bajramovic et al., 2022).

The significant association between vertical jump height and long jump distance indicates that explosive power plays a vital role in jump performance. Vertical jump height reflects rapid force development and effective utilization of the stretch–shortening cycle, which are essential during the take-off phase of the long jump (Stone et al., 2003; Van Hooren & Zolotarjova, 2009). Similar observations have been reported in studies examining power-performance relationships in athletes (Comfort et al., 2014; Dobbs et al., 2015).

Bunny hop performance did not show a significant relationship with long jump distance, possibly due to its bilateral and repetitive nature, which may not closely replicate the unilateral force application and take-off mechanics of the long jump. Task-specific assessments may therefore provide more meaningful insight into performance capabilities (Porter et al., 2010).

CONCLUSION

The findings of this study indicate that unilateral elastic strength and explosive power are significant contributors to long jump performance among collegiate male students. Left-leg hopping ability and vertical jump height showed meaningful associations with jump distance, whereas bilateral hopping performance demonstrated limited influence. These results highlight the importance of incorporating unilateral plyometric exercises and explosive power training into long jump conditioning programs.

REFERENCES

- Bajramovic, I., et al. (2022). Relationship between knee stabilizer strength and vertical jump performance. Journal of Human Kinetics, 82, 45–54.
- Comfort, P., McMahon, J. J., & Suchomel, T. J. (2014). Optimizing squat jump and countermovement jump performance. Strength and Conditioning Journal, 36(4), 30–38.
- Dobbs, W. C., Gill, N. D., Smart, D. J., & McGuigan, M. R. (2015). Relationship between vertical and horizontal jump variables. Journal of Strength and Conditioning Research, 29(3), 661–671.
- Iseni, A., & Abdullai, V. (2022). Predictors of long jump performance in university athletes. Sports Science Review, 31(2), 85–94.
- Kaçoğlu, C. (2019). Lower extremity strength asymmetry and athletic performance. Journal of Sports Sciences, 37(10), 1121–1128.
- Komi, P. V. (2000). Stretch–shortening cycle. Journal of Biomechanics, 33(10), 1197–1206.
- Ngetich, E., & Rintaugu, E. (2013). Anthropometric and performance predictors of long jump ability. International Journal of Sports Science, 3(4), 132–138.
- Pan, J. (2013). Biomechanical analysis of long jump take-off. Journal of Sports Biomechanics, 12(2), 95–102.
- Porter, J. M., Ostrowski, E. J., Nolan, R. P., & Wu, W. F. W. (2010). Standing long-jump performance is enhanced when using an external focus of attention. Journal of Strength and Conditioning Research, 24(7), 1746–1750.
- Stone, M. H., et al. (2003). Maximum strength and power performance. Journal of Strength and Conditioning Research, 17(2), 342–349.

ISSN 2394 - 7780

- Van Hooren, B., & Zolotarjova, J. (2009). Differences between countermovement and squat jumps. Strength and Conditioning Journal, 31(3), 40–45.
- Wilson, J. M., & Flanagan, E. P. (2008). The role of elastic energy in athletic performance. Strength and Conditioning Journal, 30(5), 44–48.

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INNOVATIONS IN SPORTS TECHNOLOGY

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INTRODUCTION:

Sports in the 21st century have been transformed by rapid technological innovations that enhance performance, ensure athlete safety, improve training efficiency, and enrich the spectator experience. From advanced data analytics and wearable sensors to virtual reality training systems and smart equipment, technology has become an indispensable part of modern sports. These innovations help athletes push physical boundaries, enable coaches to make evidence-based decisions, and allow sports organizations to maintain fairness with tools such as goal-line technology and VAR systems.

Objectives of the Study:

1. To examine the major technological advancements that have transformed modern sports, including wearables, smart equipment, data analytics, and artificial intelligence.

2. To analyze the impact of these technologies on athlete performance, training methods, and skill development.

Methods: Literature Review Method

- Collected and reviewed existing research papers, books, reports, and case studies related to sports technology.
- Analyzed global innovations such as wearables, sensors, analytics platforms, VR/AR systems, and smart sports equipment.

2. Comparative Analysis Method

- Compared traditional sports training and performance systems with technologically enhanced methods.
- Evaluated differences in accuracy, efficiency, safety, and performance outcomes.

3. Case Study Method

- Examined specific sports that have widely adopted technology (e.g., cricket, football, athletics).
- Studied the use of VAR, Hawk-Eye, GPS tracking vests, video analytics, and biomechanics software.

Results:

Enhanced Athlete Performance

- The integration of wearable sensors, GPS trackers, and motion-analysis systems led to significant improvements in speed, endurance, strength monitoring, and skill precision.
- Data-driven training methods allowed athletes to correct technical errors faster and achieve measurable performance gains.

2. Improved Athlete Safety and Injury Prevention

- Technologies such as smart helmets, biomechanics analysis software, and fatigue-tracking devices reduced injury rates.
- Early detection of stress, muscle imbalance, and overtraining resulted in more effective rehabilitation and safer training loads.

3. Greater Accuracy in Officiating

- Tools like VAR (Video Assistant Referee), Hawk-Eye, goal-line technology, and automated score systems significantly reduced human error.
- Match decisions became more transparent, increasing fairness and trust in competitive sports.

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4. Advanced Coaching and Training Methods

- Virtual reality (VR) and augmented reality (AR) systems provided immersive training environments for skill enhancement.
- Coaches benefited from real-time feedback and performance analytics, improving tactical planning and decision-making.

CONCLUSION:

Innovations in sports technology have fundamentally reshaped the way athletes train, compete, and engage with their sporting environment. The integration of wearables, smart equipment, data analytics, and digital platforms has enhanced athletic performance and made training more scientific and personalized. Technologies such as VAR, Hawk-Eye, and sensor-based systems have strengthened the accuracy and fairness of officiating, reducing human error and improving the credibility of competitive sport.

Moreover, advancements in injury prevention, rehabilitation tools, and athlete-monitoring systems have greatly contributed to athlete safety and long-term well-being. At the same time, high-quality broadcasting, immersive fan experiences, and interactive digital platforms have brought spectators closer to the game than ever before. However, these developments also present challenges, including high costs, unequal access, and concerns about data privacy and overreliance on technology.

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REVIVING MODERN SPORTS THROUGH NISHKAMA KARMA YOGA: A REVIEW-BASED ANALYSIS OF GITA PRINCIPLES FOR STRESS-FREE PERFORMANCE AND EMOTIONAL RECOVERY AFTER DEFEAT.

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ABSTRACT

Modern competitive sports subject athletes to intense psychological pressure, performance anxiety, and emotional disturbance, particularly after defeat. Negative outcomes can reduce motivation, impair concentration, and hinder long-term athletic development. There is a growing need for holistic and culturally grounded frameworks that help athletes cope with stress and recover emotionally after losses. Nishkama Karma Yoga, a key concept from the Bhagavad Gita, offers principles of non-attachment, equanimity, and duty-focused action that may contribute to healthier mental states in athletes.

The primary aim of this review-based study is to examine the relevance of Nishkama Karma Yoga for enhancing stress-free performance and facilitating emotional recovery after defeat. It seeks to analyze how Gita-based principles can complement modern sports psychology and contribute to sustainable athlete well-being.

A systematic review of literature was conducted using sources from sports psychology, yogic philosophy, performance science, and behavioural studies. The review applied thematic analysis to identify conceptual overlaps between Nishkama Karma Yoga and contemporary psychological frameworks related to motivation, stress regulation, and emotional recovery.

The analysis indicates that Nishkama Karma Yoga promotes intrinsic motivation, reduces performance anxiety, and enhances mental clarity by encouraging athletes to focus on effort rather than outcomes. The principles of non-attachment and equanimity support emotional stability after defeat, helping athletes manage disappointment, regain confidence, and maintain psychological balance. Integration with modern training approaches demonstrates potential for improving resilience, consistency, and overall athlete mental health.

The study concludes that incorporating Gita-based principles into sports coaching and psychological training can provide athletes with a structured pathway for stress-free performance and effective emotional recovery after defeat. Nishkama Karma Yoga emerges as a culturally relevant and scientifically compatible model that can strengthen emotional regulation, enhance performance stability, and support long-term well-being in modern sports environments.

Keywords: Nishkama Karma Yoga, Bhagavad Gita, sport psychology, stress-free performance, emotional recovery, burnout prevention

1. INTRODUCTION

In contemporary sports, athletes are exposed to intense physical training, psychological pressure, public evaluation, and constant performance expectations. Success and failure are often measured narrowly through medals, rankings, and statistics. Such outcome-centered environments increase stress, competitive anxiety, fear of failure, and emotional instability, especially after defeat. These psychological challenges not only affect performance but also contribute to burnout, dropout, and mental health concerns among athletes.

Modern sport psychology has developed several interventions such as mindfulness training, acceptance-based approaches, and emotional regulation techniques to address these issues [1], [2]. Alongside these scientific approaches, Indian philosophical traditions provide deep insights into human action, motivation, and mental balance. The Bhagavad Gita presents Nishkama Karma Yoga as a disciplined path of action without attachment to results [3]. Although originally articulated in a spiritual context, its psychological relevance makes it highly applicable to modern sports.

This paper systematically reviews and analyzes Nishkama Karma Yoga principles and examines their applicability to stress-free performance and emotional recovery after defeat in sports.

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2. OBJECTIVES OF THE STUDY

The specific objectives of this study are:

- To systematically explain the core principles of Nishkama Karma Yoga as described in the Bhagavad Gita.
- To analyze the psychological relevance of NKY for stress management and performance in sports.
- To examine the role of NKY in emotional recovery after defeat.
- To propose a practical NKY-based framework for modern sports training and coaching.

3. METHODOLOGY

This study adopts a systematic review-based qualitative approach. The review includes:

- **Primary philosophical sources:** Selected verses of the Bhagavad Gita related to Nishkama Karma Yoga.
- **Secondary sources:** Peer-reviewed research articles, reviews, and meta-analyses related to sport psychology, mindfulness, emotion regulation, acceptance-based interventions, self-compassion, and athlete burnout.

Sources were selected based on relevance, academic credibility, and contribution to understanding psychological performance and emotional regulation in sports. The analysis involved conceptual mapping of NKY principles with modern psychological constructs. No empirical data collection was undertaken, ensuring the paper remains review-based and theoretical.

4. Conceptual Framework: Nishkama Karma Yoga

Nishkama Karma Yoga refers to performing action (karma) as a duty without desire for personal gain (nishkama). The Bhagavad Gita presents this path as a means to mental stability, clarity, and freedom from psychological suffering.

4.1 Focus on Action, Not Outcome (Bhagavad Gita 2.47)

The Gita emphasizes that individuals have control over their actions but not over the results [3]. In sports, this principle encourages athletes to concentrate on training quality, technique execution, tactical discipline, and effort rather than obsessing over winning or losing. Such a mindset reduces anxiety and enhances consistency.

4.2 Equanimity in Success and Failure (Bhagavad Gita 2.48)

Mental balance in both victory and defeat is described as Yoga [4]. For athletes, equanimity prevents emotional extremes such as overconfidence after success and despair after loss. Emotional stability supports better decision-making under pressure.

4.3 Duty-Oriented Performance without Attachment (Bhagavad Gita 3.19)

The Gita advises continuous performance of duty without attachment to outcomes [5]. In sports, this principle sustains long-term motivation, discipline, and commitment independent of short-term results.

5. NISHKAMA KARMA YOGA AND MODERN SPORT PSYCHOLOGY

5.1 Emotion Regulation

Emotion regulation theory explains how individuals manage emotional responses during stressful situations [1]. NKY promotes adaptive regulation by reducing excessive emotional reactions and encouraging calm acceptance of outcomes.

5.2 Mindfulness and Attention Control

Mindfulness-based interventions have been shown to improve performance and reduce anxiety in athletes [2]. NKY naturally supports mindfulness by directing attention to present-moment action and process-oriented engagement.

5.3 Acceptance-Based Performance Approaches

Acceptance and commitment-based approaches encourage athletes to accept internal experiences such as fear or pressure while continuing effective action [6]. NKY reflects the same philosophy by emphasizing action without emotional resistance.

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5.4 Self-Compassion and Psychological Resilience

Research shows that self-compassion plays a significant role in emotional recovery after failure [7], [8]. NKY reduces harsh self-judgment by separating self-worth from performance outcomes, fostering resilience and learning-oriented reflection.

6. EMOTIONAL RECOVERY AFTER DEFEAT THROUGH NKY

Defeat in sports often triggers disappointment, frustration, shame, and rumination. Nishkama Karma Yoga provides a structured psychological pathway for recovery:

- Acceptance of emotional response without suppression.
- Understanding that sincere effort was one's responsibility, not the final result [3].
- Reflection for learning rather than self-blame.
- Recommitment to disciplined training and duty [5].

This sequence aligns closely with evidence-based emotional recovery strategies in sport psychology.

7. NISHKAMA KARMA YOGA AND BURNOUT PREVENTION

Athlete burnout is associated with chronic stress, loss of motivation, and emotional exhaustion [9]. NKY may act as a protective factor by:

- Promoting intrinsic, value-based motivation.
- Reducing fear of failure and external evaluation.
- Encouraging sustainable effort and mental balance.

8. PRACTICAL IMPLICATIONS FOR MODERN SPORTS

8.1 For Athletes

- Focus on controllable performance factors.
- Practice mental balance during success and failure.
- Use defeat as feedback rather than identity judgment.

8.2 For Coaches

- Emphasize process-oriented goals.
- Use language that supports effort and discipline over outcomes.
- Integrate reflection and recovery sessions after competition.

9. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

- There is a lack of sport-specific measurement tools for NKY constructs.
- Empirical intervention-based studies on NKY in sports are limited.
- Future research should develop NKY-based training modules and test them through experimental and longitudinal studies.

10. CONCLUSION

Nishkama Karma Yoga, as presented in the Bhagavad Gita, offers a timeless and scientifically relevant framework for addressing psychological challenges in modern sports. By emphasizing action over outcomes, emotional balance in success and failure, and duty-based commitment, NKY supports stress-free performance and healthy emotional recovery after defeat. Integrating NKY principles with contemporary sport psychology practices can contribute to sustainable excellence, resilience, and athlete well-being.

11. REFERENCES

[1] Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. Review of General Psychology, 2(3), 271–299.

ISSN 2394 - 7780

[2] Josefsson, T., et al. (2019). Effects of mindfulness-acceptance-commitment on sport performance. Mindfulness.

[3] Bhagavad Gita. (c. 2nd century BCE). Chapter 2, Verse 47.

[4] Bhagavad Gita. (c. 2nd century BCE). Chapter 2, Verse 48.

[5] Bhagavad Gita. (c. 2nd century BCE). Chapter 3, Verse 19.

[6] Gardner, F. L., & Moore, Z. E. (2004). A mindfulness-acceptance-commitment-based approach to athletic performance enhancement. Behavior Therapy, 35(4), 707–723.

[7] Walton, C. C., et al. (2022). Self-compassionate motivation and athlete well-being. Journal of Clinical Sport Psychology.

[8] Zhang, N., et al. (2023). Athletes' self-compassion and emotional resilience to failure. Frontiers in Psychology.

[9] Lundgren, T., et al. (2021). Acceptance and commitment training in sport. Frontiers in Psychology.

[10] Zessin, U., Dickhäuser, O., & Garbade, S. (2015). The relationship between self-compassion and well-being: A meta-analysis. Applied Psychology: Health and Well-Being, 7(3), 340–364.

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IMPACT OF SOCIO-ECONOMIC STATUS, ACHIEVEMENT MOTIVATION ON THE PERFORMANCE OF STATE LEVEL KHO-KHO PLAYERS OF KARNATAKA.

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INTRODUCTION

Physical Education and sports deals with physical, physiological, sociological and mental pursuits. Amid preparing, other than great body and wellness of the competitor, primary accentuation is laid on the improvement of different sorts of aptitudes associated with the amusement and also on instructing the systems, procedures and strategies of the diversion. As of not long ago, the mentors have been giving careful consideration to the social and mental components which despite the fact that have been demonstrated to add to execution in occasions in the higher focused games. It is just as of late that games executives and mentors have understood the significance of the mental planning and preparing of players to empower them to hold up under the strain and stresses natural in sports investment. Along these lines, now the games mentor and mentors have begun giving more significance to the mental molding or the building the mental make-up of the players previously their challenges in the national and universal rivalries.

The point of higher games in this period of rivalry is to win in universal meets or to accomplish top execution in rivalry. What's more, it is on this factor the mentors attempt to think. With a specific end goal to achieve the objective and fulfill the social desire the players additionally buckle down, overlooking their solaces in their everyday lives and practice for a long time a day. Unless the players are arranged rationally and mentally for the challenge, they are not ready to accomplish the coveted outcomes. The mental preparing must be given to the players by the mentors to confront unpleasant circumstance happening amid the opposition.

Psychology and Sport:

In aggressive games, mental planning of a group is as imperative as showing them the distinctive aptitudes of an amusement with logical strategies. In nowadays, the groups are readied to play, as well as to win the amusements. Furthermore, to win the recreations, it isn't just the capability in the aptitudes, which matters, yet in addition the soul and state of mind of the players with which they play. The mental state of mind of every individual player and in addition of the group can help or prevent their execution. The vast majority of the mentors concur that the physical qualities, aptitudes and preparing of the players are critical, however they likewise feel that great mental or mental planning for rivalry is an important segment for progress. The branch of brain science which is personally associated with human conduct on the playfield-both under training and focused circumstances with a view to realize subjective change in execution, is called Sport Psychology.

Achievement Motivation

Inspiration is a fundamental component of human identity. It coordinates a man's action and makes it pretty much powerful. Without the want to succeed other mental highlights and capacities don't give almost such a great amount of effect on execution. Accomplishment inspiration impacts different elements influencing execution in don like: physical planning, system, strategies and even way of life.

Concept of performance

The idea of games execution has been deficiently investigated in light of the fact that games execution is a confounded multi-dimensional procedure of handling a games undertaking. Its investigation additionally needs a coordinated exertion with respect to different preparing science controls and hypothesis and strategies for particular games. Human development, human execution is a subject for such changed sciences as exercise, physiology, neuro-physiology, biomechanics, brain research, human robotics and so forth (Brook and Whiting, 1975).

The sports performance is a process-the process of tackling a given motor task. The degree, to which this task has been fulfilled, is the result of the process of tackling the motor task. Therefore, the concept of sports performance should include the actual process of tackling the task.

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The sports performance is defined as, "unity of execution and result of sports action or a complex sequence of sports actions measured or evaluated according to agreed and socially determined names" (Schnabel, 1987).

The actual performance is the psycho-socio-biological process. The nature of sports performance can be understood completely only by studying this process. The study of this process will field variable information about the structure of performance thereby giving valuable information having implications about training. Therefore, it is of utmost importance to understand the sports performance as a unity of movement and its result.

STRUCTURE OF THE PERFORMANCE CAPACITY

The performance capacity along with external factors determines the sports performance. Performance capacity is a complex performance, which is divided into five groups.

a. Personality: It consists of belief, values, interest, attitudes, temperament, mental capacities, personality traits, habits etc

b. Condition: It is also known as physical fitness. It consists of strength, speed, endurance and their complex forms.

c. Technique/Co-ordination: It consists of technical skills, flexibility and coordinative abilities.

d. Tactics: It consists of tactical knowledge, tactical skill and tactical abilities

e. Constitution: It is consists of physique, body height and weight, size, width and length of body parts, body fat, lean body mass and stability of bones, joints etc.

All these five elements are between related and between subordinate. The level of significance of these elements for execution is unique and subsequently preparing for each game must be contrastingly planned to guarantee the ideal advancement of every execution factor for better and higher games execution. Like the structure of competition performance, the different performance pre-requisites are the result and expression of co-ordination and energetic process of the human system. Hence, for further exploration of each performance pre-requisite an integrated effort on the part of various human sciences is necessary.

STATEMENT OF THE PROBLEM

The purpose of the study is to assess the impact of socio-economic status, achievement motivation on the performance of state level Kho-Kho players of Karnataka.

OBJECTIVES

The following are the main objectives of the study:

1. To assess the impact of SES on the performance of Kho-kho players.

2. To study the impact of Achievement Motivation on the performance of State level Kho-Kho players.

3. To examine sex differences in the performance of different sample sub groups.

4. To examine differences in the performance of difference sample sub groups ;of three age groups

HYPOTHESIS

The following are the hypotheses of the present study:

1. There is a significant impact of SES on performance of kho-kho players.

2. There is a significance impact of Achievement Motivation on the performance of state level kho-kho players.

3. There will be sex differences in kho-kho performance of different sample sub groups.

4. There would be significant differences in kho-kho performance of three age groups.

SIGNIFICANCE OF THE STUDY

The importance of the psychological factors in competitive sports has been increasingly realized. Various scholars have categorically pronounced the fact that achievement motivation and SES plays a significant role in sports performance.

The present study makes an attempt to add to the existing knowledge of this particular aspect.

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The study will also address itself to establish the extent to which an individual performance is impacted by achievement motivational, SES, etc.

The knowledge of this kind is more helpful to the coaches, trainee and other experts in the field of training and preparing the individuals (or athletes) for a higher level of performance.

METHODOLOGY

In this chapter the selection of subjects, selection of variables, method used for collection of data, steps adopted in the administration of the questionnaire and the statistical techniques employed for analyzing the data have been described.

The Sample

The study was conducted on the sample of 360 state level kho-kho players (male and female) selected from the state level competitions held in Karnataka state. Attempt was made to categorize the sample into equal sub groups based on socio economic status, achievement motivation, and age category. These will be accounted for assessing their impact on the performance of state level kho-kho players of Karnataka. The sample design based on SES, achievement motivation, sex and age is given the following tables.

Table – 1.a Distribution of Sample on Socio Economic status

SES	SENIORS		JUNIORS		SUB-JUNIORS		Total
	Men	Women	Men	Women	Men	Women	
High	30	30	30	30	30	30	180
Low	30	30	30	30	30	30	180
Total	**60**	**60**	**60**	**60**	**60**	**60**	**360**

Table – 1.b Distribution of Sample on Achievement Motivation

AM	SENIORS		JUNIORS		SUB-JUNIORS		Total
	Men	Women	Men	Women	Men	Women	
High	30	30	30	30	30	30	180
Low	30	30	30	30	30	30	180
Total	**60**	**60**	**60**	**60**	**60**	**60**	**360**

Tools Used : The following Physical Fitness ability tests have been used to examine the performance level of the samples in the study.

1. Motor Ability Tests (AAHPER)

Sl. No.	Motor Ability	Test	Unit of Measurement
1.	Speed	50 yard dash	Time
2.	Endurance	12 min. Run & Walk	Distance
3.	Flexibility	Sit & Reach test	Inches
4.	Agility	Shuttle run 10x4 Yards	Time
5.	Strength	Pull Ups	Score

3. Socio-Economic Status Scale:

The SES scale is constructed by Dr.Rajeeve Lochan Bhardwaj (1971), this scale consists 7 items (areas) like family, social, education, professional, property, monthly income and caste perspective. The reliability of the test as been calculated by test and retest method. The scale was administered on a sample of 200 students and was re-administered on the same sample. The correlation between two scores was calculated by spearman brown formula and was found to be 0.76.

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4. Sports Achievement Motivation Test (SAMT)

Sports Achievement Motivation Test (SAMT) developed by M.L. Kamlesh (1990) was used to measure the achievement motivation of the players. The test consists of 20 statements; each statement has a maximum two (2) as a response value. When the subject ticked the high pole part, he is given two points, and when he touched the low pole, earned zero. Hence the total range was 0-40. The test re-test reliability of the questionnaire is .70.

Administration of tests:

For the collection of data from state kho-kho players the researcher had to seek co-operation from many quarters. He had to approach the directors of sports of various universities and colleges to ask for cooperation for collection of the data. The subjects were administered the tests at a place where no distraction or minimum distraction could be caused. All the three questionnaires were administered one after the other and before the commencement of the each test, the test instruction were read out to the students and they were allowed to ask questions, if any, about the test. in almost all the tests, the subjects were told to list their first response without any delay, to meet the demands of the tests. If any subject lagged behind, he/she was allowed to complete the task as soon as he/she could. Each subject was asked to hand over the response sheet immediately after it was duly filled. After collecting the answer sheets from subjects researcher computed the result according to the manual of the tests. After the researcher divided whole sample in to two groups i.e., High Self confidence and low Self confidence group, high SES and low SES group and high achievement motivation and low achievement motivation group. After making the groups the researcher has conducted the AAHPER fitness test to find the performance of the sample subgroups.

Statistical Techniques used

The following statistical tests were used in the present study:

1. t- test to examine differences in sample subgroups.

2. Correlation- 'r' to examine the relationship between the variables.

ANALYSIS AND INTERPRETATION OF THE DATA

The purpose of present study is to find the Impact of Socio-Economic Status, Achievement Motivation on the Performance of State Level Kho-Kho Players of Karnataka. There were 360 kho-kho players who were classified in to two groups based on sports participation, gender, and other demographic factors. The subjects were administered standardized tools and the results were subject to statistical analysis like t-test& correlation, and ANOVA and reported in the tables.

Table –7: Showing Mean, SD and t-values of physical fitness test – speed (50m dash) in different age groups of Men & women to their socio economic status : (N = 360)

Variables			Age		
			Sub-junior (Below14)	Junior 14-18	Senior 18& above
Male (N=180)	HSES	M	9.58	9.02	8.16
		SD	2.71	2.16	2.01
	LSES	M	10.59	10.05	8.98
		SD	2.88	2.23	2.14
t-values			**3.48****	**4.47****	**3.90****
Female (N=180)	HSES	M	9.98	9.62	8.86
		SD	2.41	2.36	2.21
	LSES	M	10.99	10.75	9.98
		SD	2.28	2.43	2.64
t-values			**4.20****	**4.52****	**4.48****

The table No. 7 reveals the performance of male and female kho-kho players in relation to their high and low SES level. The SES male S-junior group has a mean of 9.58 where as the LSES male sub junior sample has the mean of 10.59 it means the S-Junior HSES sample have taken less time to complete the given task (50m dash) than S-junior LSES sample. The t-value 3.48 is significant. The HSES male junior group has a mean of 9.02 where as the LSES male junior sample has the mean of 10.05 it means the Junior HSES sample have taken less

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time to complete the given task (50m dash) than junior LSES sample. The t-value 4.47 is significant. The HSES male senior group has a mean of 8.16 where as the LSES male senior sample has the mean of 8.98 it means the senior HSES sample have taken less time to complete the given task (50m dash) than senior LSES sample. The t-value 3.90 is significant. The HSES female S-junior group has a mean of 9.98 where as the LSES female sub junior sample has the mean of 10.99 it means the S-Junior HSES sample have taken less time to complete the given task (50m dash) than S-junior LSES sample. The t-value 4.20 is significant. The HSES female junior group has a mean of 9.62 where as the LSES female junior sample has the mean of 10.75 it means the Junior HSES sample have taken less time to complete the given task (50m dash) than junior LSES sample. The t-value 4.52 is significant. The HSES female senior group has a mean of 8.86 where as the LSES female senior sample has the mean of 9.98 it means the senior HSES sample have taken less time to complete the given task (50m dash) than senior LSES sample. The t-value 4.48 is significant. There is significant differences found in the performance of kho-kho players in speed test and the same result found in between inter age group samples. The high socio economic status male kho-kho players of all age groups have of shown high performance in speed test comparing to low socio economic status group

Figure-6 Ses And Speed Performance Among Different Age Group Of Men & Women

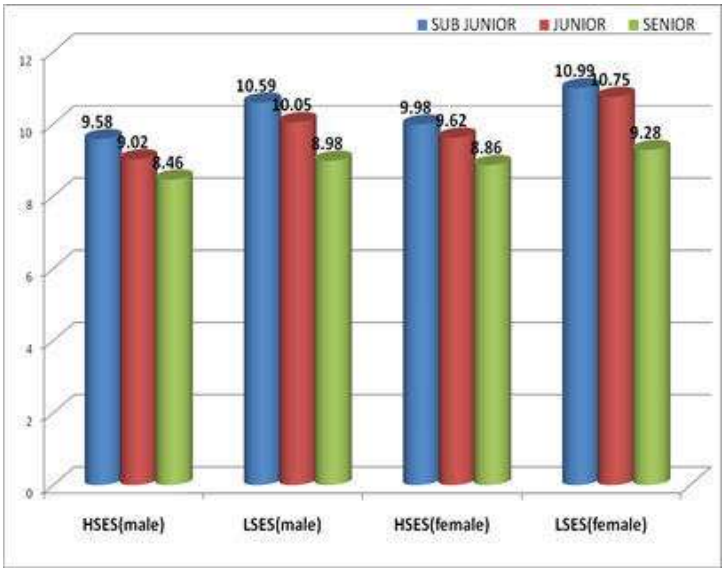

Table –8: Showing Mean, SD and t-values of physical fitness test – Endurance (12 min run & walk) in different age groups of men & women socio economic status : (N = 360)

Variables			Age		
			Sub-junior (Below 14)	Junior 14-18	Senior 18& above
Male (N=180)	HSES	M	2474.3	2569.1	2641.3
		SD	289.2	294.1	299.5
	LSES	M	2351.2	2397.5	2451.3
		SD	256.1	267.6	276.3
t-values			**4.28****	**6.00****	**6.25****
Female (N=180)	HSES	M	2174.3	2269.1	2341.3
		SD	259.2	244.1	279.5
	LSES	M	2051.2	2097.5	2151.3
		SD	216.1	264.6	225.3
t-values			**4.89****	**6.39****	**7.10****

The table No. 8 reveals the performance of male and female kho-kho players in relation to their high and low SES level. The HSES male S-junior group has a mean of 2474.3 where as the LSES male sub junior sample has the mean of 2351.2 it means the S-Junior HSES sample have taken less time to complete the given task (12 min run & walk) than S-junior LSES sample. The t-value 4.28 is significant. The HSES male junior group has a

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mean of 2569.1 where as the LSES male junior sample has the mean of 2397.5 it means the Junior HSES sample have taken less time to complete the given task (12 min run & walk) than junior LSES sample. The t-value 6.00 is significant. The HSES male senior group has a mean of 2641.3 where as the LSES male senior sample has the mean of 2451.3 it means the senior HSES sample have taken less time to complete the given task (12 min run & walk) than senior LSES sample. The t-value 6.25 is significant.

The HSES female S-junior group has a mean of 2174.3 where as the LSES female sub junior sample has the mean of 2051.2 it means the S-Junior HSES sample have taken less time to complete the given task (12 min run & walk) than S-junior LSES sample. The t-value 4.89 is significant. The HSES female junior group has a mean of 2269.1 where as the LSES female junior sample has the mean of 2097.5 it means the Junior HSES sample have taken less time to complete the given task (50m dash) than junior LSES sample. The t-value 6.39 is significant. The HSES female senior group has a mean of 2341.3 where as the LSES female senior sample has the mean of 2151.3 it means the senior HSES sample have taken less time to complete the given task (12 min run & walk) than senior LSES sample. The t-value 7.10 is significant.

There is significant differences found in the performance of kho-kho players inEndurance test and the same result found in between inter age group samples. The high socio economic status male kho-kho players of all age groups have of shown high performance in Endurance test comparing to low socio economic status groups.

Figure-7 Ses And Endurance Performance Among Different Age Group Of Men & Women

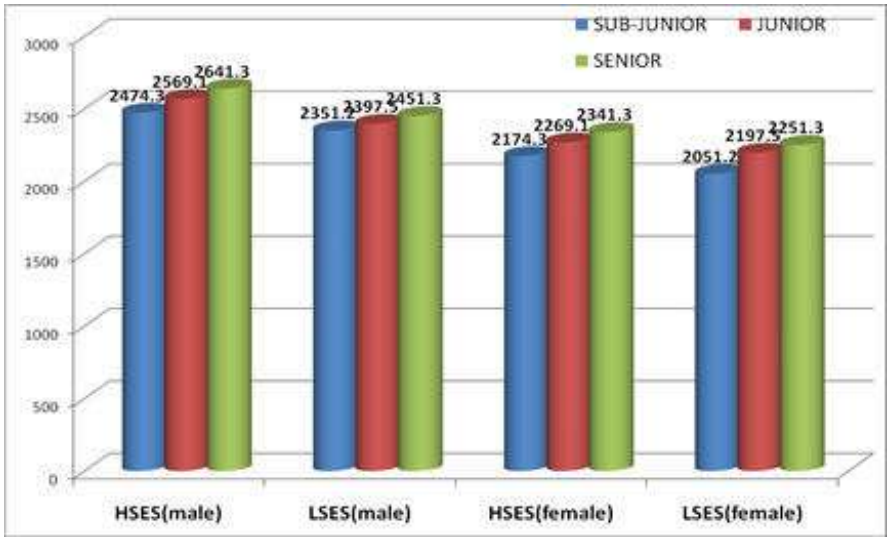

Table – 9: Showing Mean, SD and t-values of physical fitness test – in Strength (Standing Broad Jump) in different age groups of women socio economic status : (N = 360)

Variables			Age		
			Sub-junior (Below14)	Junior 14-18	Senior18& above
Male (N=180)	HSES	M	7.96	7.89	6.99
		SD	3.15	3.11	3.02
	LSES	M	7.14	7.05	6.13
		SD	3.45	3.66	2.24
t-values			**2.41***	**2.40***	**3.07****
Female (N=180)	HSES	M	8.62	7.92	7.47
		SD	3.25	3.31	3.42
	LSES	M	7.44	7.05	6.38
		SD	3.02	3.41	2.98
t-values			**3.27****	**2.48***	**3.30****

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The table No. 9 reveals the performance of male and female kho-kho players in relation to their high and low SES level. The HSES male S-junior group has a mean of 7.96 where as the LSES male sub junior sample has the mean of 7.14 it means the S-Junior HSES sample have taken less time to complete the given task (Pull ups) than S-junior LSES sample. The t-value 2.41 is significant. The HSES male junior group has a mean of 7.89 where as the LSES male junior sample has the mean of 7.05 it means the Junior HSES sample have taken less time to complete the given task (Pull ups) than junior LSES sample. The t-value 2.40 is significant. The HSES male senior group has a mean of 6.99 where as the LSES male senior sample has the mean of 6.13 it means the senior HSES sample have taken less time to complete the given task (Pull ups) than senior LSES sample. The t-value 3.07 is significant.

The HSES female S-junior group has a mean of 8.62 where as the LSES female sub junior sample has the mean of 7.44 it means the S-Junior HSES sample have taken less time to complete the given task(Pull ups) than S-junior LSES sample. The t-value 3.27 is significant. The HSES female junior group has a mean of 7.92 where as the LSES female junior sample has the mean of 7.05 it means the Junior HSES sample have taken less time to complete the given task (Pull ups) than junior LSES sample. The t-value 2.48 is significant. The HSES female senior group has a mean of 7.47 where as the LSES female senior sample has the mean of 6.38 it means the senior HSES sample have taken less time to complete the given task (Pull ups) than senior LSES sample. The t-value 3.30 is significant.

There is significant differences found in the performance of kho-kho players in strength test and the same result found in between inter age group samples. The high socio economic status male kho-kho players of all age groups have of shown high performance in strength test comparing to low socio economic status groups.

Figure-8 Ses And Strength Performance Among Different Age Group Of Men & Women

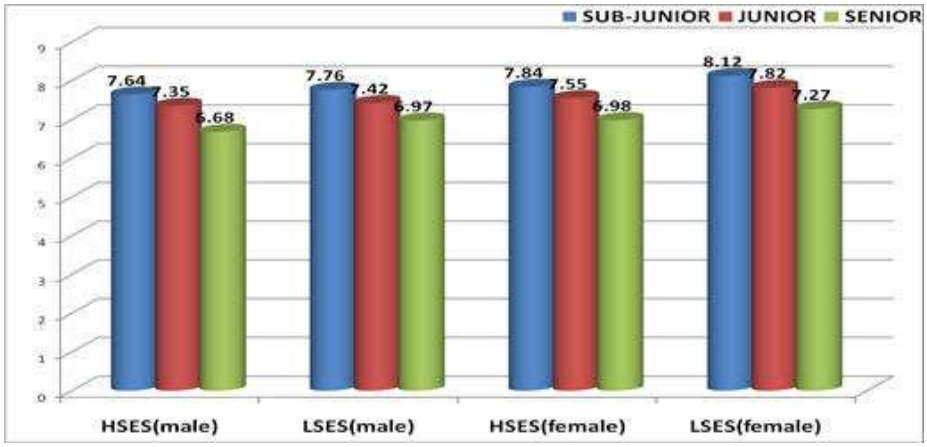

Table –10: Showing Mean, SD and t-values of physical fitness test – Agility (10 x 4 yards meters shuttle run) in different age groups of men & women socio economic status :

Variables			Age		
			Sub-junior (Below14)	Junior14-18	Senior18&above
Male (N=180)	HSES	M	9.79	9.61	9.34
		SD	1.56	1.36	1.18
	LSES	M	10.96	10.46	10.28
		SD	1.49	1.35	1.26
t-values			7.31**	6.07**	7.83**
Female (N=180)	HSES	M	9.89	9.66	9.47
		SD	1.26	1.16	1.08
	LSES	M	11.96	10.96	10.48
		SD	1.39	1.15	1.36
t-values			13.8**	10.83**	8.41**

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The table No. 10 reveals the performance of male and female kho-kho players in relation to their high and low SES level. The HSESmale S-junior group has a mean of 9.79 where as the LSES male sub junior sample has the mean of 10.96 it means the S-Junior HSES sample have taken less time to complete the given task (10 x 4 yards meters shuttle run) than S-junior LSES sample. The t-value 7.31 is significant. The HSES male junior group has a mean of 9.61 where as the LSES male junior sample has the mean of 10.46 it means the Junior HSES sample have taken less time to complete the given task (10 x 4 yards meters shuttle run) than junior LSES sample. The t-value 6.07 is significant. The HSES male senior group has a mean of 9.34 where as the LSES male senior sample has the mean of 10.28 it means the senior HSES sample have taken less time to complete the given task (10 x 4 yards meters shuttle run) than senior LSES sample. The t-value 7.83 is significant.

The HSES female S-junior group has a mean of 9.89 where as the LSES female sub junior sample has the mean of 11.96 it means the S-Junior HSES sample have taken less time to complete the given task (10 x 4 yards meters shuttle run) than S-junior LSES sample. The t-value 13.8 is significant. The HSES female junior group has a mean of 9.66 where as the LSES female junior sample has the mean of 10.96 it means the Junior HSES sample have taken less time to complete the given task (10 x 4 yards meters shuttle run) than junior LSES sample. The t-value 10.83 is significant. The HSES female senior group has a mean of 9.47 where as the LSES female senior sample has the mean of 10.48 it means the senior HSES sample have taken less time to complete the given task (10 x 4 yards meters shuttle run) than senior LSES sample. The t-value 8.41 is significant.

There is significant differences found in the performance of kho-kho players in agility test and the same result found in between inter age group samples. The high socio economic status male kho-kho players of all age groups have of shown high performance in agility test comparing to low socio economic status groups.

Figure-9 Ses And Agility Performance Among Different Age Group Of Men & Women

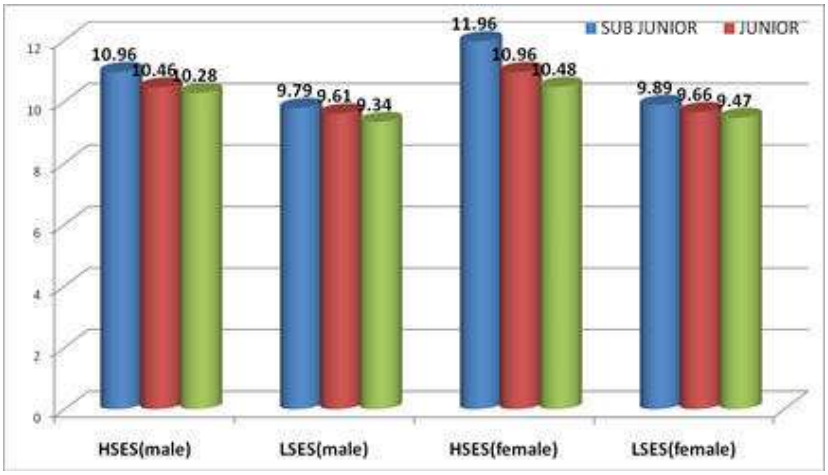

Table – 11: Showing Mean, SD and t-values of physical fitness test – Flexibility (Scott French bobbing test) in different age groups of men & women socio economic status : (N = 360)

Variables			Age		
			Sub-junior(Below14)	Junior14-18	Senior18& above
Male (N=180)	HSES	M	3.65	3.98	4.06
		SD	1.54	1.71	1.86
	LSES	M	3.04	3.22	4.93
		SD	1.39	1.45	1.79
t-values			**4.06****	**4.87****	**4.57****
Female (N=180)	HSES	M	2.85	2.98	3.26
		SD	1.24	1.41	1.16
	LSES	M	2.09	2.32	3.88
		SD	1.49	1.15	1.69
t-values			**5.28****	**5.07****	**4.13****

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Figure-10 Ses And Flexibility Performance Among Different Age Group Of Men & Women

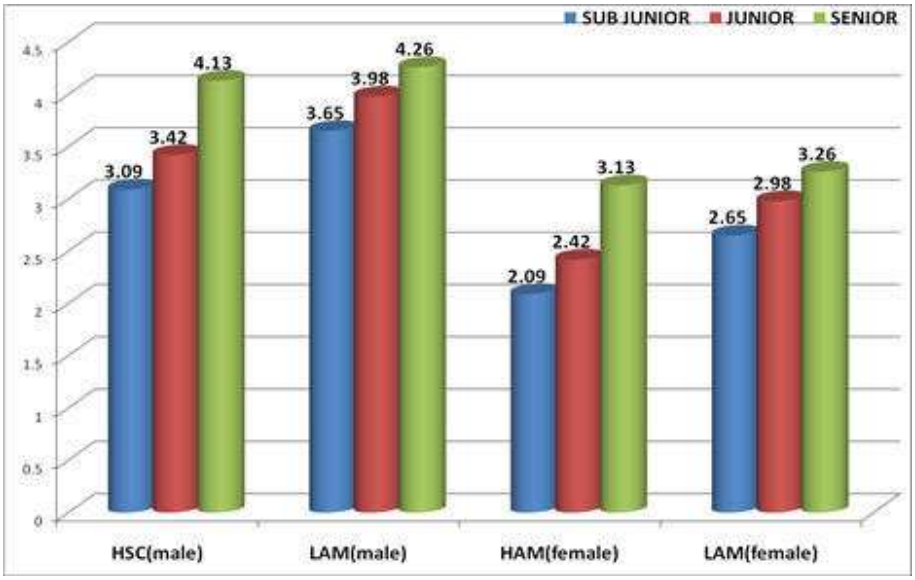

Table –12: Showing Mean, SD and t-values of physical fitness test – speed (50m dash) in different age groups of Men &women to their achievement & motivation (N = 360)

Variables			Age		
			Sub-junior(Below14)	Junior14-18	Senior18& above
Male (N=180)	HAM	M	9.35	9.12	8.13
		SD	2.14	2.26	2.41
	LAM	M	10.37	9.91	8.84
		SD	2.50	2.31	2.34
t-values			**4.25****	**3.29****	**2.84***
Female (N=180)	HAM	M	9.95	9.22	8.23
		SD	2.34	2.36	2.71
	LAM	M	10.82	9.93	8.84
		SD	2.72	2.61	2.44
t-values			**3.34****	**2.73***	**3.00****

Figure-11 ACHIEVEMENT MOTIVATION AND SPEED PERFORMANCE AMONG DIFFERENTAGE GROUP OF MEN & WOMEN

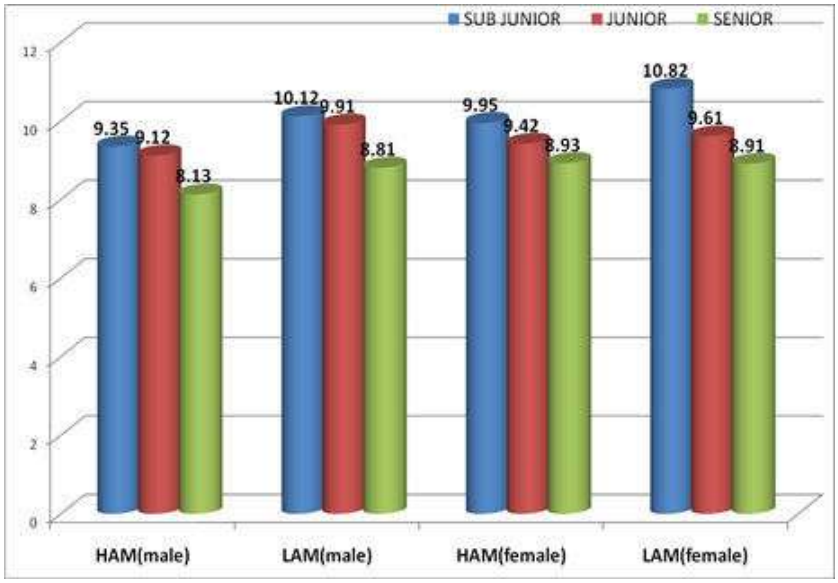

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Table –13: Showing Mean, SD and t-values of physical fitness test – Endurance (12 min run & walk) in different age groups of men & women to their achievement & motivation : (N = 360)

Variables			Age		
			Sub-junior (Below14)	Junior14-18	Senior18&above
Male (N=180)	HAM	M	2361.3	2414.2	2566.9
		SD	211.3	221.2	236.2
	LAM	M	2214.1	2245.3	2301.6
		SD	231.11	264.1	279.9
t-values			**6.31****	**6.59****	**9.15****
Female (N=180)	HAM	M	2161.3	2214.2	2366.9
		SD	271.3	251.2	266.2
	LAM	M	2014.1	2045.3	2201.6
		SD	241.13	244.1	249.9
t-values			**5.14****	**6.47****	**6.07****

Figure-12 ACHIEVEMENT MOTIVATION AND ENDURANCE PERFORMANCE AMONG DIFFERENT AGE GROUP OF MEN & WOMEN

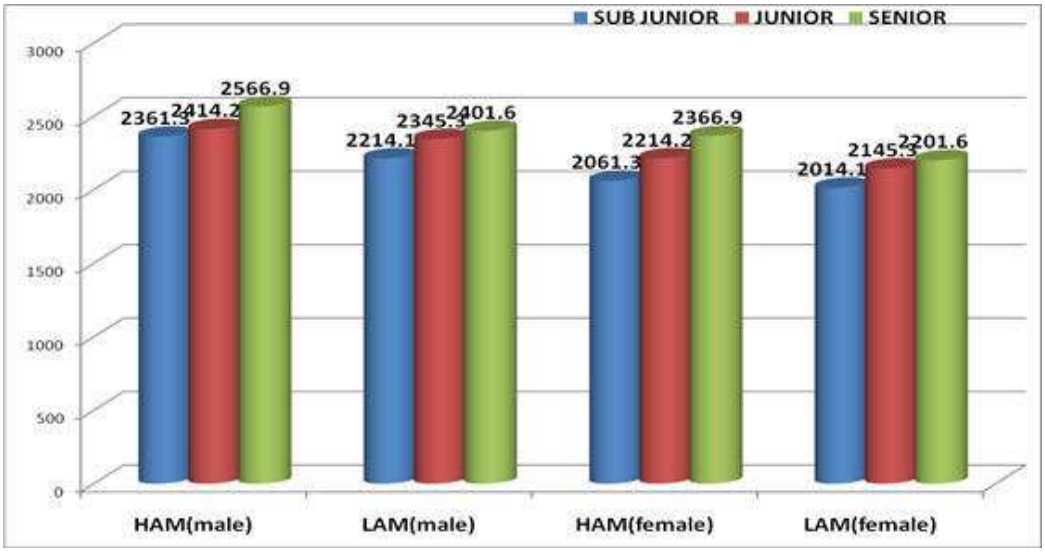

Table – 14: Showing Mean, SD and t-values of physical fitness test – in Strength (Pull ups) in different age groups of men & women to their achievement & motivation :(N = 360)

Variables			Age		
			Sub-junior (Below14)	Junior14-18	Senior18& above
Male (N=180)	HAM	M	7.26	7.16	6.68
		SD	2.68	2.46	2.16
	LAM	M	6.31	6.04	5.34
		SD	3.12	3.02	2.98
t-values			**3.50****	**3.86****	**4.96****
Female (N=180)	HAM	M	7.94	7.67	6.88
		SD	2.45	2.76	2.26
	LAM	M	7.05	6.65	6.04
		SD	3.23	3.42	2.78
t-values			**2.96***	**3.18****	**3.23****

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Figure-13 Achievement Motivation And Strength Performance Among Different Age Group Of Men & Women

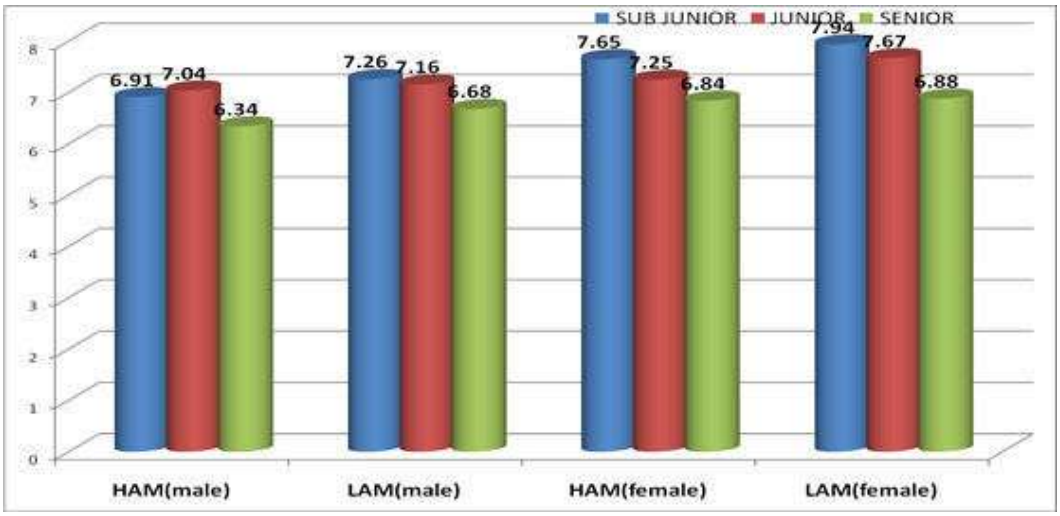

Table –15: Showing Mean, SD and t-values of physical fitness test – Agility (10 x 4 yards meters shuttle run) in different age groups of men & women to their achievement & motivation : (N = 360)

Variables			Age		
			Sub-junior(Below14)	Junior14-18	Senior18& above
Male (N=180)	HAM	M	9.55	9.34	9.06
		SD	1.86	1.46	1.13
	LAM	M	10.23	10.05	9.69
		SD	1.38	1.26	1.16
t-values			4.00**	**5.07****	**5.25****
Female (N=180)	HAM	M	10.65	9.64	8.76
		SD	1.66	1.56	1.73
	LAM	M	11.23	10.55	9.85
		SD	1.58	1.36	1.26
t-values			**3.41****	**6.06****	7.26**

The table No. 15 reveals the performance of male and female kho-kho players in relation to their high and low AM level. The HAM male S-junior group has a mean of 9.55 where as the LAM male sub junior sample has the mean of 10.23 it means the S-Junior HAM sample have taken less time to complete the given task (10 x 4 yards meters shuttle run than S-junior LAM sample. The t-value 4.00 is significant. The HAM male junior group has a mean of 9.34 where as the LAM male junior sample has the mean of 10.05 it means the Junior HAM sample have taken less time to complete the given task (10 x 4 yards meters shuttle run than junior LAM sample. The t-value 5.07 is significant. The HAM male senior group has a mean of 9.06 where as the LAM male senior sample has the mean of 9.69 it means the senior HAM sample have taken less time to complete the given task (10 x 4 yards meters shuttle run than senior LAM sample. The t-value 5.25 is significant.

The HAM female S-junior group has a mean of 10.65 where as the LAM female sub junior sample has the mean of 11.23 it means the S-Junior HAM sample have taken less time to complete the given task (10 x 4 yards meters shuttle run than S-junior LAM sample. The t-value 3.41 is significant. The HAM female junior group has a mean of 9.64 where as the LAM female junior sample has the mean of 10.55 it means the Junior HAM sample have taken less time to complete the given task (10 x 4 yards meters shuttle run than junior LAM sample. The t-value 6.06 is significant.

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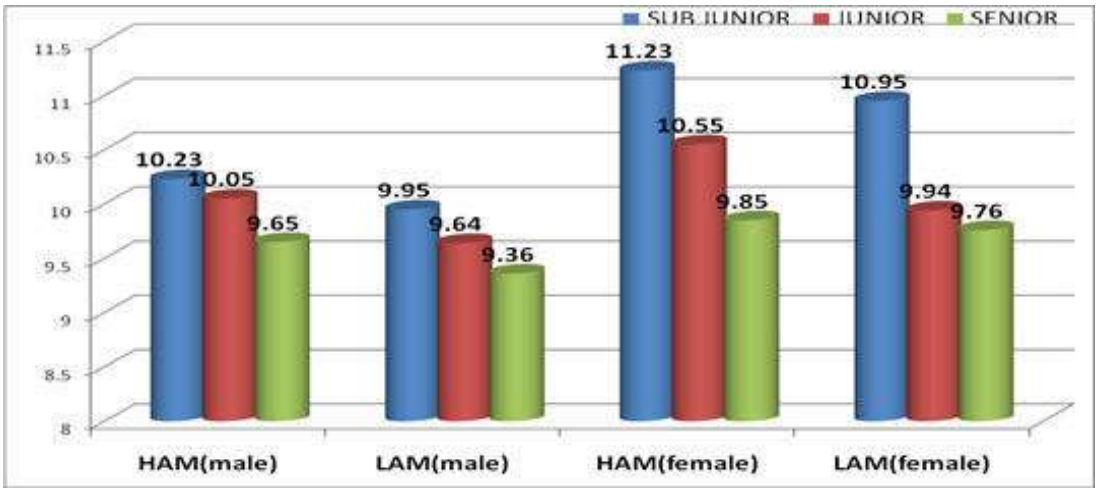
Figure-14 Achievement Motivation And Agility Performance Among Different Age Group Of Men & Women



CONCLUSION

There is significant difference in high and low SES kho-kho players (men & women) in relation to their performance and High SES kho-kho players are having high performance than low SES players in Speed (50m dash) test performance, Endurance test performance (12min run and walk), Strength test performance (Pull ups), Agility test performance (10X4 yard shuttle run). There is significant difference in high and low Achievement Motivation kho-kho players (men & women) in relation to their performance and High Achievement Motivation kho-kho players are having high performance than low Achievement Motivation players in Speed (50m dash) test performance.

There is significant difference in high and low Achievement Motivation kho-kho players (men & women) in relation to their performance and High Achievement Motivation kho-kho players are having high performance than low Achievement Motivation players in Endurance test performance (12min run and walk), Strength test performance (Pull Ups),Agility test performance (10X4 yard shuttle run),Flexibility test performance (Sit & reach test).

REFERENCES

- Adeyemo, D.A. (2008). The measured the impact of Emotional Intelligence and some Demographi Characteristics on Academic Self-efficacy of Distance Learners. Edutracks, Vol.7 – No.22.
- Bala, M. Agarwal, R. Sarna. R.P. (2009). Studied the Gender differences as assoiated with mental health of the college going students of various faculties, Behavioural Scientist,10(2),pp-119-126.
- Subramaniam, K.(2011), Impact of Emotional Intelligence and study Skills of high School Students. Edutracks, February, 2011. Vol. 10 No.6.

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ONE NATION, ONE CADRE, ONE GOAL: A UNIFIED VISION FOR THE ADVANCEMENT OF PHYSICAL EDUCATION AND SPORTS EXCELLENCE

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Chief Patron, NAPESS

INTRODUCTION

Physical Education and sports have always played a vital role in shaping a healthy, disciplined, and progressive society. In a country as diverse as India, with its varied cultures, languages, and regional practices, the need for a unified and structured approach to Physical Education and sports development has never been more important. The conference theme **"One Nation, One Cadre, One Goal: A Unified Vision for the Advancement of Physical Education and Sports Excellence"** reflects a forward-looking perspective that emphasizes national integration, professional coherence, and collective progress in the field of Physical Education and sports.

This theme highlights the importance of creating a common framework that brings together educators, coaches, administrators, researchers, and policymakers under a shared vision. By aligning goals and strengthening collaboration, the nation can ensure consistent standards, improved quality of training, and sustainable development of sports at all levels.

ONE NATION: BUILDING A UNIFIED SPORTS ECOSYSTEM

The idea of *One Nation* in the context of Physical Education and sports represents unity in diversity. India's sporting ecosystem includes schools, colleges, universities, academies, and professional institutions spread across different regions. While diversity enriches the system, lack of uniformity in policies, infrastructure, and curriculum often leads to disparities in opportunities and outcomes.

A unified national approach ensures that every student and athlete, regardless of geographic location, has access to quality Physical Education, scientific training methods, and equal opportunities to excel. National-level guidelines, standardized curricula, and shared best practices can bridge gaps between rural and urban institutions. This alignment also helps in talent identification and development, ensuring that potential athletes are nurtured systematically from grassroots to elite levels.

Moreover, *One Nation* signifies the integration of Physical Education into the broader national development agenda. Sports contribute not only to physical fitness but also to mental well-being, social harmony, leadership, and national pride. A cohesive national vision strengthens India's position on the global sports platform while fostering a culture of health and fitness among citizens.

ONE CADRE: STRENGTHENING PROFESSIONAL IDENTITY AND STANDARDS

The concept of *One Cadre* emphasizes the need for a strong, well-defined, and professionally recognized workforce in Physical Education and sports. Physical educators, coaches, trainers, and sports administrators form the backbone of the sports system. However, variations in qualifications, training standards, career structures, and service conditions often limit professional growth and effectiveness.

Establishing a unified cadre ensures uniform standards of education, certification, recruitment, and professional development across the country. It promotes clarity in roles and responsibilities, enhances accountability, and builds respect for the profession. Continuous professional development, research orientation, and exposure to modern sports science are essential components of a strong cadre system.

A unified cadre also encourages collaboration and knowledge sharing among professionals. When educators and coaches operate within a common framework, they can collectively contribute to innovation, curriculum enrichment, and evidence-based practices. This unity ultimately benefits students and athletes by providing consistent, high-quality guidance and mentorship.

ONE GOAL: ACHIEVING SPORTS EXCELLENCE AND HOLISTIC DEVELOPMENT

The principle of *One Goal* focuses on a shared objective—advancement of Physical Education and achievement of sports excellence while promoting holistic development. The goal extends beyond winning medals; it includes fostering lifelong fitness, ethical values, discipline, teamwork, and resilience.

A common national goal ensures that all stakeholders work in alignment rather than in isolation. Educational institutions focus on strong foundations, coaches emphasize scientific and ethical training, administrators ensure supportive policies, and researchers contribute evidence-based insights. Such alignment maximizes resources, reduces duplication of efforts, and accelerates progress.

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Sports excellence is best achieved when Physical Education is treated as an essential component of education, not an optional activity. Early exposure, structured programs, and inclusive participation help in identifying talent and nurturing it effectively. At the same time, emphasis on values such as fair play, integrity, and respect ensures sustainable and meaningful success.

ROLE OF INSTITUTIONS, POLICY, AND RESEARCH

For the theme to translate into reality, institutions and policymakers play a critical role. Educational institutions must adopt standardized yet flexible curricula that accommodate regional needs while maintaining national benchmarks. Investment in infrastructure, technology, and human resources is essential to support quality Physical Education and sports programs.

Policy frameworks should encourage collaboration between educational bodies, sports organizations, and government agencies. Transparent governance, performance-based evaluation, and long-term planning contribute to stability and growth. Research and innovation in sports science, psychology, nutrition, and training methodologies further strengthen the system by providing data-driven solutions.

Conferences and academic platforms serve as important spaces for dialogue, reflection, and collaboration. They allow professionals to share experiences, discuss challenges, and collectively design strategies aligned with the national vision.

CONCLUSION

The theme **“One Nation, One Cadre, One Goal”** represents a powerful and progressive vision for the future of Physical Education and sports in India. It calls for unity in purpose, professionalism in practice, and excellence in outcomes. By embracing a unified national framework, strengthening the professional cadre, and working towards a shared goal, the nation can build a robust, inclusive, and globally competitive sports ecosystem.

This vision not only enhances sports performance but also contributes to the overall development of individuals and society. A strong Physical Education system nurtures healthy citizens, disciplined youth, and responsible leaders—laying the foundation for a fitter, stronger, and more united nation.

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A RELATIVE INVESTIGATION OF SPEED AND LEG STRENGTH BETWEEN ANDHRA UNIVERSITY KABADDI AND KHO-KHO PLAYERS

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ABSTRACT

Physical fitness is the capacity of an organism, which must be enough to perform the given takes. Vigorous physical activity is the only means of developing optimum physical fitness to attain the zenith of performance. It is a physiological fact that the human organism needs stimulating exercise. The purpose of the present study is to compare and analysis of speed and leg strength between kabaddi and kho-kho players. For this purpose fifteen male kabaddi and fifteen male kho-kho players who were studying in rious courses of Andhra University selected as subjects. Their age ranged between 19 and 25 years (mean age = 21 ± 0.9 months). The selected criterion variables for present study were speed and leg strength and speed was assessed by administering 50 meters run and leg strength was assessed by leg lift with dynamometer. All the test items were conducted before practicing their respective game. One Way Analysis of Variance (ANOVA) was administered as statistical tool for the present study. The result of the study shows that there was a significant difference exists between kabaddi and kho-kho players on selected criterion variables. Kho-kho players were better in speed and kabaddi players were better in leg strength.

Key words: Speed, Leg Strength, Kabaddi, Kho-Kho and ANOVA.

INTRODUCTION

Human beings have consistently tried to run faster, jump higher and exhibit greater strength, endurance and skill. Physical fitness should improve which can help to improve the overall health and feel more confident. No matter, the fitness level, there are some strategies that one can use to achieve the goals.A study has reported that people who completed four to six repeated 30-second sprints maintained the same heart-health benefits as those who did a moderate 40 to 60 minute workout.Think about the use of "FITT" principle of exercise, in which – Frequency (How many days a week do you work out?), Intensity(How hard do you exercise), Time (How long are your workouts), and Type (What specific exercises are you doing). According to Willgoose (1961) physical fitness is the capacity of an organism, which must be enough to perform the given tasks. Kabaddi, originated in ancient Tamil region in Indian subcontinent, which is predominantly present day Andhra Pradesh and parts of other South Indian states and the Telugu empire spread this game to South East Asia during their sea trade. The word Kabaddi has been derived from the Tamil word "Kai-pidi" which means "to hold hands". The modern Kabaddi game was played all over India and some parts of South Asia from 1930. Speed is an essential factor in kabaddi. On the mat, players are required to cover short distances within seconds. "Players do 50m and 80m sprints. Since a raid only lasts for 30 seconds, we sometimes ask the players to do 30-second sprints and a raider burns more calories than a defender. It depends on their position, so it's better to look at their daily load," Actually, kabaddi is an intermittent type of sport and it requires both aerobic, anaerobic endurance with a well-built physique. Since, no physiological study on kabaddi players is available on national or international players except for some pulmonary function tests that have been done on national players. Kho-Kho is a traditional game played in India. Its origins are ancient, with strategies and tactics likely derived from the epic 'Mahabharata' and on the 13th day of the war, the Kaurava General Guru Dronacharya created the 'Chakravyuha' a special military defensive circle which was eventually penetrated by the renowned warrior Abhimanyu. It is played by teams of 12 nominated players out of fifteen, of which nine enter the field, who try to avoid being touched by members of the opposing team. The kho-kho player's performance depends on optimum state of motorfactors like speed, endurance, agility, flexibility and the speed and agility are the key characteristic which is the most important factors for good performance.

STATEMENT OF THE PROBLEM

The purpose of the study is to find out a relative investigation of speed and leg strength between Andhra University kabaddi and kho-kho players.

HYPOTHESES

1. It will be hypothesized that there would be a significant difference in the Speed variable between Andhra University Kabaddi and Kho-Kho Players.

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2. It will be hypothesized that there would be a significant difference in the Leg Strength variable between Andhra University Kabaddi and Kho-Kho Players.

MATERIALS AND METHODS

To achieve the purpose of this study, fifteen kabaddi and fifteen kho-kho male players were selected as subjects studying in various Departments of Andhra University, Visakhapatnam and their age ranged from 19 to 25 years. The selected criterion variables for the present study were speed and leg strength. Speed was assessed by administering 50 meters run and leg strength was assessed by using leg lift with dynamometer. All the test items were conducted during early morning, before practicing their respective game. One Way Analysis of Variance (ANOVA) was administered as statistical tool for the present study. In all the cases, .05 level of confidence was fixed to test the significance, which was considered as appropriate.

RESULT AND DISCUSSION

The data collected on speed and leg strength between kabaddi and kho-kho players were analyses and the results were presented in table – I.

SPEED (in Seconds)						
	Mean ± SD	**SOV**	**Sum of squares**	**Df**	**Mean squares**	**F ratio**
Kabaddi Players	7.98 ±0.07	B	0.119	1	0.119	**38.00***
Kho-Kho Players	7.85±0.03	W	0.088	28	0.003	
LEG STRENGTH (in Kilogram)						
Kabaddi Players	77.59±1.71	B	16.87	1	16.87	**6.62***
Kho-Kho Players	76.09±1.44	W	71.19	28	2.53	

***Significant at 0.05 level of confidence.**

From the above Table – I, the mean and standard deviation values of Kabaddi players was 7.98 ± 0.07 and Kho-Kho players was 7.85 ± 0.03 with 'F' ratio of 38.00, which was significant at 0.05 level of confidence. Moreover, the mean and standard deviation values of leg strength was 77.59 ± 1.71 for Kabaddi players and 76.09 ± 1.44 for Kho-Kho players and the 'F' ratio was 6.62 which was significant at 0.05 level of confidence.

Figure – 1 Speed of Kabaddi and Kho-Kho Players

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Figure – 2 Leg length of Kabaddi and Kho-Kho Players

CONCLUSION

It was concluded from the result of the study that there was a significant difference found on speed between Kabaddi and Kho-Kho players of Andhra University. It was also found that Kho-Kho player have better speed than the Kabaddi players. The result of the study also shows that there was a significant difference found on leg strength between Kabaddi and Kho-Kho players of Andhra University, in which, Kabaddi players were better in leg strength than the Kho-Kho players.

REFERENCE:

1. Mohmmad Chotemiya and vairavasundaram c (2023) Resistance and Aqua resistance training packages and its impact on selected corporeal variables among men Basketball players. BioGecko - A Journal for New Zealand Herpetology, 12(3), 175-182.

2. Mohmmad Chotemiya and vairavasundaram c (2023) Resistance and Aqua resistance training packages and its impact on selected functional variables among men Basketball players. Corrosion and protection 51(1), 476-487.

3. Mohmmad Chotemiya and vairavasundaram c (2023) Resistance and Aqua resistance training packages and its impact on selected kinanthropomtric variables among men Basketball players. Journal of Data Acquisition and Processing Vol. 38 (2), 4199-4206.

4. Mohmmad Chotemiya et.al., (2021) Effect of Resistance training on selected corporeal variables among Basketball players. Indian Journal of Applied Research, Vol. (11), No.1, P.1-2.

5. Krčmár, M., Krčmárová, B., Bakaľár, I., & Šimonek, J. (2021). Acute performance enhancement following squats combined with elastic bands on short sprint and vertical jump height in female athletes. Journal of Strength and Conditioning Research, 35(2), 318–324.

6. Mohmmad Chotemiya et.al., (2020) Isolated and Combined effect of Aqua and Resistance training on selected Physiological variables among men Basketball players. XI'n University of Architecture and technology, Vol. (12), No. 7, P. 743-754.

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ADVANCING PHYSICAL EDUCATION AND SPORTS IN THE 21ST CENTURY: GLOBAL BEST PRACTICES IN TECHNOLOGY AND RESEARCH

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ABSTRACT

In the global arena, physical education and sports have transcended traditional fitness-centric paradigms to significantly contribute to comprehensive human development, lifelong health, and societal well being. This article delves into global best practices in physical education and sports, with a particular emphasis on the integration of technology and research. It elucidates how digital advancements, including wearable technology, performance analytics, virtual simulations, and artificial intelligence, underpinned by evidence-based research in sports science, have revolutionized teaching, training, assessment, and athlete development. By analyzing examples from leading nations such as Finland, Australia, the United States, Japan, and China, the study highlights successful models of technology enhanced and research-informed physical education and sports systems. The article also examines critical challenges related to access, ethics, and teacher preparedness, underscoring the necessity for balanced and context-specific implementation. The findings highlight that the strategic incorporation of technology and research is vital for improving the effectiveness, inclusivity, and sustainability of physical education and sports in the 21st century.

Keywords: Holistic, Physical literacy, wearable, performance analysis and Talent Identification.

INTRODUCTION

In today's global environment, physical education (PE) and sports have become vital elements of comprehensive human development, extending beyond the traditional goals of physical fitness and competitive success. Contemporary physical education integrates cognitive, affective, social, and ethical dimensions, significantly contributing to lifelong health, well-being, personality development, and social cohesion. Recognizing this expanded role, international organizations such as UNESCO, the World Health Organization (WHO), and the International Olympic Committee (IOC) have highlighted the importance of quality physical education and sports as foundational to sustainable development and public health. Despite this recognition, many countries continue to face substantial challenges in their physical education and sports systems, including declining physical activity levels, sedentary lifestyles, childhood obesity, a lack of scientific training methods, and insufficient integration of research into practice. These challenges are further compounded by rapid urbanization, technological dependence, academic pressures on students, and unequal access to sports infrastructure. In response, leading nations globally have implemented technology-driven and research-based strategies to rejuvenate physical education and sports, ensuring their relevance, effectiveness, and inclusivity in the 21st century. The evolution of digital technology and sports science research has profoundly reshaped the methodologies applied in physical education, sports training, and the assessment of athletic performance. Technological advancements, including wearable fitness devices, motion analysis systems, virtual reality simulations, artificial intelligence-driven analytics, and online learning platforms, have revolutionized instructional strategies, assessment frameworks, and coaching practices. These innovations allow for the precise measurement of physical activity, offer personalized feedback, facilitate long-term performance tracking, and promote data-informed decision-making, thereby improving both educational and athletic outcomes. Simultaneously, the importance of research in the fields of physical education and sports has reached unprecedented heights. Studies in areas such as exercise physiology, biomechanics, sports psychology, motor learning, nutrition, and pedagogy provide the scientific foundation for effective pedagogical and training methodologies. Evidence-based research has facilitated improvements in curriculum design, optimized management of training loads, strategies for injury prevention, and the development of mental skills. Nations with robust research ecosystems demonstrate superior outcomes in athlete development, school-based physical activity programs, and community sports participation. Globally, exemplary practices in physical education and sports reflect a deliberate integration of technology, research, and pedagogy. For instance, countries such as Finland and Canada prioritize research-driven curriculum reforms that emphasize physical literacy and lifelong participation. Australia and New Zealand have integrated wearable technologies and digital assessment tools within school physical education programs to foster individualized learning. The United States and European nations extensively employ sports analytics and performance science within elite and collegiate sports systems. Asian countries, including Japan, China, and South Korea, amalgamate technological innovation with systematic research to enhance talent identification and long-term athlete development models. Nevertheless, the integration of technology in physical education and sports is not without challenges.

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Issues related to digital inequality, ethical data usage, over-reliance on technology, teacher preparedness, and financial constraints present significant obstacles, particularly in developing countries. Consequently, technology should not be perceived as an end in itself but rather as an auxiliary tool that augments pedagogical efficacy and research application. Successful global models illustrate that meaningful outcomes are realized only when technology is aligned with clearly defined educational objectives, supported by ongoing professional development, and guided by robust research evidence. In this context, examining global best practices is essential for understanding how various countries have effectively leveraged technology and research to strengthen physical education and sports systems. Such an examination offers valuable insights for policymakers, educators, coaches, and researchers aiming to modernize existing frameworks while preserving cultural relevance and inclusivity. It also underscores the necessity for collaborative approaches that bridge the gap between academic research and field-level implementation.

PHYSICAL EDUCATION IN THE GLOBAL PERSPECTIVE

International organizations such as UNESCO, WHO, and IOC recognize physical education as a fundamental human right and a cornerstone of quality education. Modern PE emphasizes:

- Physical literacy
- Inclusive participation
- Skill development
- Health-related fitness
- Ethical and social values

Countries like Finland, Canada, Australia, and Japan have redefined PE curricula by focusing on competence, confidence, and motivation rather than mere performance outcomes.

ROLE OF TECHNOLOGY IN PHYSICAL EDUCATION AND SPORTS

Technology serves as a catalyst in modern PE and sports by enabling:

- Objective assessment of performance
- Personalized instruction and training
- Real-time feedback
- Long-term data tracking

Technological tools include:

- Wearable devices (heart rate monitors, GPS trackers)
- Video analysis software
- Virtual and augmented reality
- Artificial intelligence and machine learning
- Mobile health and fitness applications

IMPORTANCE OF RESEARCH IN SPORTS AND PHYSICAL EDUCATION

Research underpins innovation in PE and sports by:

- Validating teaching and coaching methods
- Enhancing training efficiency
- Preventing injuries
- Improving psychological preparedness
- Supporting policy formulation

Research-driven practices ensure that physical education programs are scientifically sound, ethical, inclusive, and outcome-oriented.

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Countries with strong research ecosystems show better outcomes in PE and sports. Collaboration among universities, schools, and sports organizations is critical for sustained development.

D. GLOBAL BEST PRACTICES IN PHYSICAL EDUCATION AND SPORTS

i. Technology-Integrated Curriculum Design

Finland

Finland's physical education curriculum integrates digital assessment tools to systematically monitor students' physical fitness, movement competence, and health-related indicators. Continuous data collection and longitudinal research analysis are used to inform evidence-based curriculum revisions and guide national health and physical activity policies. This research-driven and technology-supported approach ensures objective assessment, promotes physical literacy, and places strong emphasis on lifelong participation in physical activity rather than short-term performance outcomes.

ii. Wearable Technology in Physical Education

Australian schools extensively incorporate wearable technologies in physical education classes to track students' heart rate, activity intensity, and energy expenditure. Teachers utilize the data obtained from these devices to objectively monitor physical activity, differentiate instruction, and support individualized goal setting. This data-driven approach encourages self-monitoring among students, enhances engagement, and contributes to more effective, inclusive, and personalized physical education experiences.

iii. Performance Analysis and Sports Analytics

In the United States, elite sports programs and universities widely utilize advanced performance analytics platforms such as GPS tracking, motion capture systems, and artificial intelligence–based software to enhance athletic performance. These technologies are supported by rigorous sports science research in exercise physiology, biomechanics, and sports psychology, enabling coaches to make data driven decisions. This multidisciplinary approach supports effective training load management, reduces injury risk, and ensures the integration of scientific expertise into high-performance sports systems.

iv. Virtual Reality and Simulation Training

In Japan and the United Kingdom, virtual reality and simulation technologies are increasingly used in physical education and sports for skill acquisition, tactical decision-making, and the education and training of coaches and referees. Research evidence suggests that VR-based training enhances perceptual–cognitive skills, improves decision-making efficiency, and helps reduce performance related anxiety. The use of these technologies provides safe and controlled learning environments, supports advanced visualization and motor learning, and ensures the application of research-validated training protocols in both educational and high-performance settings.

v. Talent Identification and Development

China employs scientifically structured talent identification models that utilize anthropometric, physiological, and psychological data to identify sporting potential at an early stage. These evidence based methods are integrated into well-defined long-term athlete development programs, which are continuously monitored and refined through systematic research evaluation. This strong linkage between research and practice enables early identification, supports structured athlete progression, and contributes to sustained success in competitive sports.

CONCLUSION

The global evolution of physical education and sports highlights a decisive shift from traditional, performance-oriented models toward holistic, inclusive, and lifelong approaches supported by technology and scientific research. As demonstrated by international best practices, the effective integration of digital tools and evidence-based research has significantly enhanced curriculum design, teaching–learning processes, training methodologies, and performance evaluation across educational and competitive sports settings. Technologies such as wearable devices, performance analytics, and virtual simulations, when aligned with pedagogical objectives, enable personalized learning, objective assessment, and informed decision-making, thereby improving both participation and performance outcomes.

Equally important is the growing role of interdisciplinary research in shaping modern physical education and sports systems. Research in exercise science, biomechanics, psychology, and pedagogy provides a scientific

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foundation for curriculum reforms, injury prevention, talent identification, and long-term athlete development. Countries with strong research–practice linkages consistently demonstrate higher levels of physical literacy, athlete progression, and community engagement in physical activity.

However, the successful adoption of technology in physical education and sports depends on ethical use, equitable access, teacher and coach preparedness, and sustained professional development. Technology should be viewed as an enabling tool rather than a substitute for sound pedagogy and human interaction. For developing nations, context-specific, cost-effective, and research-driven strategies are essential to ensure inclusive and sustainable development. Global best practices clearly indicate that a balanced integration of technology, research, and pedagogy is vital for strengthening physical education and sports systems in the 21st century. Such an approach not only enhances physical competence and athletic performance but also contributes to overall health, well-being, social cohesion, and sustainable human development.

REFERENCE:

- Bailey, R. (2006). Physical education and sport in schools: A review of benefits and outcomes. Journal of School Health, 76(8), 397–401. https://doi.org/10.1111/j.1746-1561.2006.00132.x
- Balyi, I., Way, R., & Higgs, C. (2013). Long-term athlete development. Human Kinetics.
- Casey, A., Goodyear, V. A., & Armour, K. M. (2017). Digital technologies and learning in physical education: Pedagogical cases. Routledge.
- Côté, J., Turnnidge, J., & Evans, M. B. (2014). The dynamic process of development through sport. Kinesiology Review, 3(2), 109–122. https://doi.org/10.1123/kr.2014-006
- European Commission. (2018). Physical activity and sport in Europe: Special Eurobarometer 472.
- Publications Office of the European Union.
- Haubenstricker, J. L., & Seefeldt, V. (2013). Acquisition of motor skills during childhood. In R. N. Singer (Ed.), Handbook of sports psychology (pp. 41–102). Wiley.
- International Olympic Committee. (2015). Olympic Agenda 2020. IOC.
- Kirk, D. (2010). Physical education futures. Routledge.
- Malina, R. M., Bouchard, C., & Bar-Or, O. (2004). Growth, maturation, and physical activity. Human
- Kinetics.
- Pate, R. R., Davis, M. G., Robinson, T. N., Stone, E. J., McKenzie, T. L., & Young, J. C. (2006).
- Promoting physical activity in children and youth. Circulation, 114(11), 1214–1224. https://doi.org/10.1161/CIRCULATIONAHA.106.177052
- Renshaw, I., Davids, K., & Savelsbergh, G. J. P. (2010). Motor learning in practice: A constraints-led approach. Routledge.
- Shephard, R. J., & Trudeau, F. (2008). Physical education, school physical activity, school sports and academic performance. International Journal of Behavioral Nutrition and Physical Activity, 5(10). https://doi.org/10.1186/1479-5868-5-10
- Thomas, J. R., Nelson, J. K., & Silverman, S. J. (2015). Research methods in physical activity (7th ed.). Human Kinetics.

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A STUDY ON EFFECT OF PLYOMETRIC TRAINING ON SPEED AND FLEXIBILITY OF HAND BALL PLAYERS OF WARANGAL

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INTRODUCTION

Handball is a fast paced, high intensity game that demands a greater level of fitness, particularly speed, agility, power and flexibility. Hence speed and flexibility play a vital role in handball players performance during offensive and defensive movements. TO meet these fitness demands, various scientifically designed training methods are evolved. Plyometric training is one amongst them.

Plyometric training is a well established method that involves rapid stretching and shortening of muscles to improve movement efficiency. This form of training is widely used to enhance fitness parameters like speed and flexibility. There is a limited research available on its effects on district level handball players, hence the topic was chosen for the study.

The present study aims to examine the "Effect of Plyometric Training on Speed and Flexibility of Hand Ball Players of Warangal". By assessing changes in these selected physical fitness components, the study seeks to provide scientific evidence on the effectiveness of plyometric training and its practical application in improving the Speed and flexibility of handball players of Warangal.

Motor Fitness:

Motor fitness also called motor ability. It refers to a person's performance. The term describe athletes ability to perform effectively during sports (or) other physical activity

Statement of the problem:

The Purpose of the study "Plyometric Training on related Motor Fitness components of Handball players"

Review related :

Chelly et al. (2010) examined the impact of an 8 week plyometric training programme an on physical fitness variables among team sport players, in cluding handball players. The results of the study indicated significant improvements in speed, power and flexibility. The study concluded that plyometric training plays a vital role in improving speed and flexibility.

Methodology:

The research scholar explained the procedure adopted by him in selecting the subjects, the design used, appropriate test items which measured the respective fitness components. Explained the way how the training plan was executed with proper fixation

Selection of Subjects:

The purpose of the study was to analyze the effect of one training method on selected Motor fitness components, it was decided to select the untrained who had not participated intensively in games and sports or any special coaching programme. However, they were allowed to attend the regular physical education classes in school. The Boy students subject of Jeweharlal Nehru stadium, Hanamkonda, Warangal, Telangana. In the age group of 13 to 15 years are acted as the subjects. The total 60-boys students were selected then they were separately, divided into two groups randomly by lot as plyometric training equal group and control group.

Selection of Variables:

Motor fitness plays a vital role in the fitness as on individual and a critical role in boosting the performance of an individual in games and sports. Keeping in mind the role of motor fitness, ability of equipment and the feasibility aspects of their measurement the following variables were selected for the study.

Dependent variables:

1) Speed 2) Flexbility

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Results, Analysis and Findings of the Study

This chapter deals with data analysis that describes and discusses research results that focus on the "A Study on Effect of Plyometric Training on Related Motor Fitness Components of Handball Players". The results of the hypotheses and their discussions are presented. Finally, a comprehensive discussion will open.

DESCRIPTIVE ANALYSIS OF 30-METERSPRINT or RUN TEST IN PRE AND POST-TEST OF HANDBALLPLAYERS IN CONTROL GROUP

TABLE 4.1.0

Speed (sec)	pre-test (in sec.)	post test(in sec.)
Mean	6.14	6.14
Std. Deviation	0.45	0.44
Mean Difference	0.00	

Result and discussions:

The 30 meters Speed test (seconds) Table 4.1.0 Mean and the standard deviation show the difference in speed between pre-test and post-test players in the control group. The mean and standard deviations were 6.14, 0.45 and 6.14, 0.44, respectively. It is clear that the average difference in speed between pretest and post-test of Handball players in the control group was 0.00.

DESCRIPTIVE ANALYSIS ON 30M SPEED IN PRE AND POST-TEST OF PLAYERS IN TRAINING GROUP

TABLE 4.1.1

Speed	Pre-test	Post-test
Mean	5.92	5.52
Std. Deviation	0.48	0.33
Mean diff.	0.40	

RESULT AND DISCUSSIONS:

The Speed test (seconds) Table 4.1.1 Mean and the standard deviation show the difference in speed between pre and post-test players in the Training group. The mean and standard deviations were 5.92, 0.48 and 5.52, 0.33, respectively. It is clear that the average difference in speed between pre and post-test of players in the Training group was 0.40.

HYPOTHESIS TEST ON PAIRED MEAN DIFFERENCE OF SPEED (in sec)) IN PRE AND POST-TEST OF PLAYERS IN CONTROL GROUP

Results and Discussion on Hypothesis - I:-Results pertaining to Hypothesis- I, the null hypothesis is "there is no significant difference of speed in pre-test and post-test of players in Control Group.

Table-4.1.2

SPEED	Mean	SD	Paired Differences				t	Df	Sig.
			Mean	SD	95% C. I of the Diff.				
PRE	6.14	0.45			Lower	Upper			
POST	6.14	0.44	0.00	0.02	-0.01	0.01	0.24	24	0.814

*Critical value t=2.093 not significant at 0.05levels

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Result and discussions: Table -4.1.2 Average, standard deviation, and mean deviations are added, and standard deviation, CI, 'T' value, DF and P-values are tested for Speed (seconds) before and after the control group test.

Test is measured using test data of Speed (seconds) before and after the test. The data were analyzed and the results are presented in Table 4.1.2.

The T-test value observed in the speed control group between pre- and post-test was 0.44, which was lower than the required statistical value of 2.093 at the level of 0.05 (p = 0.286).

The result indicates that the speed test of the pre-test and the post-test of the control group are of no importance. Therefore, the hypothesis is accepted.

HYPOTHESIS TEST ON PAIRED MEAN DIFFERENCE OF SPEED IN PRE AND POST-TEST OF PLAYERS IN PLYOMETRIC TRAINING GROUP

Results and Discussion on Hypothesis -I:-Results pertaining to Hypothesis-I: the hypothesis is "there is a significant difference of speed in pre-test and post-test of player students in Plyometric Training Group.

Table-4.1.3

SPEED	Mean	SD	Paired Differences				t	Df	Sig.
					95% C. I of the Diff.				
PRE	5.92	0.48	Mean	SD	Lower	Upper			
POST	5.51	0.33	0.40	0.32	0.27	0.53	6.38	24	0

*Critical value t=2.093 t significant at 0.05levels

Result and discussions:-Table -4.1.3 Average, standard deviation, average difference pair, standard deviation, CI, 'T' value, DF and P-values T-test (seconds) Test and pre-test by speed in players.

Speed is measured using data from the T-test (seconds), pre-test, and post-training for the plyometric training group. The data were analyzed and the results are presented in Table 4.1.3.

The T-test value observed in the plyometric training group on the speed between pre- and post-test was 6.38, which is higher than the required statistical value of 2.093 at the level of 0.059 (p = 0. 016). The result indicates the importance of the plyometric training group's pre-test and post-test speed test. Therefore, the hypothesis is rejected.

DESCRIPTIVE ANALYSIS ON SIT & REACH IN PRE AND POST-TEST OF PLAYERS IN CONTROL GROUP

TABLE 4.2.0

Flexibility	pre test (centimeters)	post test (centimeters)
Mean	9.40	9.48
Std. Deviation	2.31	2.08
Mean Difference	0.08	

Result and discussions: The sit and reach test Table 4.2.0 Mean and the standard deviation show the difference in push-ups between pre and post-test players in the control group. The mean and standard deviations were 9.40, 2.31 and 9.48,2.08 respectively. The average difference between pre and post-test of players in the control group was -0.08.

DESCRIPTIVE ANALYSIS ON SIT&REACH SIT& REACH FLEXIBILITY TEST IN PRE AND POST-TEST OF PLAYERS IN TRAINING GROUP

TABLE 4.2.1

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SIT&REACH	Pre-test	Post-test
Mean	25.72	31.52
Std. Deviation	6.77	5.92
Mean diff.	-5.80	

Result and discussions:-The Flexibility test (centimeters) Table 4.2.1 Mean and the standard deviation graph show the difference in sit & reach flexibility between pre-test and post-test players in the Training group. The mean and standard deviations were 25.72, 6.77 and 31.52, 5.92 respectively. It is clear that the average difference in Flexibility between pre-test and post-test of players in the Training group was -5.80.

HYPOTHESIS TEST ON PAIRED MEAN DIFFERENCE OF FLEXIBILITY IN PRE AND POST-TEST OF PLAYERS IN CONTROL GROUP

Results and Discussion on Hypothesis - II:-Results pertaining to the Hypothesis- II, the null hypothesis is "there is no significant difference of flexibility in pre-test and post-test of players in Control Group.

Table-4.2.2

Flexibility	Mean	SD	Paired Differences				t	Df	Sig.
			Mean	SD	95% C. I of the Diff.				
PRE	26.56	5.01			Lower	Upper			
POST	26.72	5	0.16	0.69	0.44	0.12	1.16	24	0.256

*Critical value t=2.093 not significant at 0.05levels

Result and discussions:-Table -4.2.2 Average, standard deviation, mean deviations are added, standard deviation, CI, 'T' value, DF and P-values are tested for flexibility(centimeters) before and after in the control group test.

Test is measured using test data of sit& reach flexibility(Centimeters) before and after the test. The data were analyzed and the results are presented in Table 4.2.2.

The T-test value observed in the control group between pre- and post-test was -1.16, which was lower than the required statistical value of 2.093 at the level of 0.05 (p = 0.286).

The result indicates that the flexibility test of the pre-test and the post-test of the control group are of no importance. Therefore, the hypothesis is accepted.

HYPOTHESIS TEST ON PAIRED MEAN DIFFERENCE OF FLEXIBILITY IN PRE AND POST-TEST OF PLAYERS IN PLYOMETRIC TRAINING GROUP

Results and Discussion on Hypothesis - II:-Results pertaining to Hypothesis-II, the hypothesis is "there is a significant difference of flexibility in pre-test and post-test of players in Plyometric Training Group.

Table-4.2.3

SIT&REACH	Mean	SD	Paired Differences				t	Df	Sig.
			Mean	SD	95% C. I of the Diff.				
PRE	25.72	6.77			Lower	Upper			
POST	31.52	5.92	-5.80	3.80	-7.37	-4.23	-7.64	24	0

*Critical value t=2.093 not significant at 0.05levels

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RESULT AND DISCUSSIONS:

Table -4.4.1 Average, standard deviation, average difference pair, standard deviation, CI, 'T' value, DF and P-valuesT-test (centimeters) Test and pre-test by flexibility in players.

Flexibility is measured using data from the T-Test (centimeters) pre-test and post-training for the plyometric training group. The data were analyzed and the results are presented in Table 4.2.3.

The T-test value observed in the plyometric training group on the sit&reach flexibility between pre- and post-test was -7.64, which is higher than the required statistical value of 2.093 at the level of 0.059 (p = 0. 016).

The result indicates the importance of the pre-test and post-test flexibility test of the plyometric training group. Therefore, the hypothesis is rejected.

CONCLUSIONS:

Descriptive Data Analysis of the Study:

The descriptive data analysis in "A Study on Effect of Plyometric Training on Various Handball Skills and Related Motor Fitness Components of Handball Players" provided detailed insights into the effects of plyometric training on the participants' performance. Key aspects of the analysis included:

Participants: The study sampled male and female handball players, categorized into experimental and control groups. Baseline data on their motor fitness levels were collected before starting the intervention.

Baseline Characteristics: Parameters such as age, height, weight, and initial skill levels were recorded to ensure comparability between the two groups. These variables helped in identifying any pre-existing differences.

- ✓ Descriptive analysis Findings revealed that there were mean differences of performance of speed in pre and posttest on boys of high school in the Control Group, Plyometric training Group. Clearly, post-test results showed the mean differences in speed performance were high in the Plyometric Training Group when compared to the Control Group using 30 meters sprint test.
- ✓ The results of the analysis suggest there are mean differences in Flexibility performance of high school boys in pre and post-test in the Control Group and plyometric training Group. Clearly, post-test results showed the mean differences in Flexibility performance were high in the plyometric training Group when compared to the control Group by Sit and Reach test.

Performance Analysis: Post-training data revealed:

Performance Analysiswas studied by using significant testing tools, such as pared t-test and correlation analysis. the experimental group underwent a structured plyometric training program focusing on explosive movements, jump variations, and coordination drills. Various Handball Skills and Related Motor Fitness Components of Handball Players. The control group followed their regular training routine without plyometric exercises. The following observations are made

- A significant increase in throwing power and accuracy in the experimental group of Handball Players whose13-15years .
- A notable improvement in speed, and flexibility of Handball Players.
- Statistical methods such as mean, standard deviation, and paired t-tests were used to compare pre-and post-training results within and between groups of Handball Players.
- The experimental group consistently outperformed the control group across all evaluated metrics of Handball Players.
- ✓ The plyometric group of high school boys have shown a significant difference compared to the control group about their Handball Skills and Related Motor Fitness Components of Handball Players.
- ✓ The plyometric group has shown a significant difference when compared to the control group in their flexibility of handball players.
- ✓ compared to the control group in relation to Handball Skills and Related Motor Fitness Components.
- ✓ It is observed from the correlation analysis that correlation between pre and post test of handball performance on school boys is linearly positive and significant. Therefore, we conclude that there is considerable influence on performance plyometrics group of high school boys.

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KEY FINDINGS AND OVERALL CONCLUSIONS:

The descriptive data analysis highlighted the effectiveness of plyometric training in significantly improving both handball-specific skills and motor fitness components. Players showed enhanced overall performance, validating the intervention's efficacy.:

Finally, we conclude that Plyometric training will improve handball performance and physical fitness among 13-15 years school boys in this specific study.

REFERENCE

1);-Carmen Farragut, Helena Vila, Jose Arturo Abraldes, Carmen Manchado"Influence of Physical Aspects And Throwing Velocity in Opposition Situations in Top-Elite and Elite Female Handball Players" DOI: 10.2478/hukin-2018-0003.

2);-1.3205 (UIF) EFFECT OF HANDBALL SPECIFIC SKILL TRAINING ON SELECTED SKILLS AND OVER ALL PLAYING ABILITY OF INTER-COLLEGIATE MEN HANDBALL PLAYERS .Academic Sports Scholar ISSN : 2277-3665 Vol. 3 | Issue. 11 | Nov 2014 Impact Factor:

3);-FALK, BAREKET3; ARNON, MICHAL1; COHEN, YORAM4; SEGAL, GIL4; LANDER, YAEL5"THE QUESTIONABLE USE OF MOTOR AND PHYSICAL TESTSLIDOR, RONNIE1,2; Journal of Strength and Conditioning Research 19(2):p 318-325, May 2005.

4);-F"Building Confidence in Motor Skill Testing for Youth Handball Players: Validity and Reliability Analysis," International Journal of Human Movement and Sports Sciences, Vol. 13, No. 4, pp. 775 - 783, 2025. DOI: 10.13189/saj.2025.130413. (b): Lola C. A., Bassa E., Amanatidou Z., Papavasileiou A., Stavropoulou G., Trigonis I., Hatzimanouil D. (2025).)

5);Yasir Kadhim Mohammed, Assistant Professor Mohammed Majid Mohammed Salih, Assistant Professor Mohammed Abdullah Sihoud. (2021). Design and standardization of testing for the most important physical requirements - skill and muscle quality prediction for young handball players. Annals of the Romanian Society for Cell Biology, 19489–19507. Retrieved from http://annalsofrscb.ro/index.php/journal/article/view/8706

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A STUDY OF RATE OF PERCEIVED EXERTION AMONG WINTER GAMES ATHLETES AT VERY HIGH ALTITUDE IN RELATION TO AGE, GENDER, GEOGRAPHY, AND NATURE OF SPORTS

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ABSTRACT

Khelo India is a flagship programme of the Government of India aimed at promoting sports participation and developing India as a global sporting nation under the vision of Viksit Bharat. The Khelo India Winter Games represent a significant vertical of this initiative, with the Union Territory of Ladakh hosting Phase-I of the 6th Khelo India Winter Games 2026. The Games were conducted at multiple venues in Leh, Ladakh, situated at an average altitude of approximately 11,000 feet above sea level, characterized by hypoxic conditions, sub-zero temperatures (reaching −20°C), and high wind speeds, posing substantial physiological challenges to athletes.

The present study aimed to examine the Rate of Perceived Exertion (RPE) among Winter Games athletes and to analyze its relationship with age, gender, geographical background (local vs. non-local), and nature of sport. A total of 105 athletes participating in ice hockey, speed skating, and figure skating were assessed during the Games. The Borg Modified Rate of Perceived Exertion Scale (0-10) was administered along with a demographic questionnaire. Comparative analyses were conducted to determine differences in perceived exertion across selected variables.

The findings of the study are expected to provide valuable insights into the influence of high-altitude environmental stressors and individual factors on perceived exertion. These results may assist coaches, sports scientists, and administrators in planning sport-specific training, acclimatization, and adaptation strategies to enhance athlete performance and safety during high-altitude winter sporting events.

Keywords: Rate of Perceived Exertion, High Altitude Sports, Khelo India Winter Games

INTRODUCTION

The subjective experience of exercise intensity, commonly quantified as the Rate of Perceived Exertion (RPE) plays a crucial role in monitoring and prescribing effort during physical activity (Borg, 1973). However, high-altitude hypoxia fundamentally alters physiological responses, including increased ventilatory drive, reduced oxygen availability, and altered muscle metabolism, leading to changes in both cardiorespiratory and muscular strain that are not fully captured by standard exertion models. Evidence shows that during incremental exercise at the altitude of 4559 m, leg muscle RPE is exacerbated by altitude exposure compared to sea level, even when mechanical workload is matched, while respiratory muscle RPE may scale differently with respiratory power output under hypoxic stress (DOI: 10.1016/j.resp.2011.03.014). Additionally, the validity and sensitivity of typical RPE scales at moderate to high altitudes remain under investigation, with some findings suggesting weak correlations between RPE and physiological workload in hypoxic conditions (DOI: 10.5604/01.3001.0014.9500). This inconsistency highlights a critical gap in understanding how subjective exertion perceptions interact with altitude-induced physiological stressors, limiting accurate exercise monitoring and risk assessment for populations such as climbers, trekkers, and high-altitude workers.

The Khelo India Winter Games (KIWG), currently hosted in Leh, Ladakh, a region averaging around 11,000 ft above sea level, offer a unique and high-visibility platform to examine how subjective exertion perception interacts with altitude-induced physiological stressors in athletes. The Games, held annually in January, bring together athletes from across India to compete in winter disciplines such as ice hockey and skating under hypoxic, low-oxygen, and cold conditions that significantly challenge cardiorespiratory and metabolic systems. These environmental stressors can alter both physiological responses and athletes' Rate of Perceived Exertion (RPE) compared with sea-level performance, making KIWG an ideal real-world setting to study exertion dynamics during intense competitive activity at altitude. While physiological responses to altitude and cold have been widely studied, subjective workload perception, measured through Rate of Perceived Exertion (RPE), remains underexplored in real competitive winter sport settings in India.

METHODS

The present cross-sectional study investigated the rate of perceived exertion (RPE) among winter games athletes competing at high altitude during the 6th Khelo India Winter Games, held at Leh, Ladakh, from 20th to 27th

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January 2026. Approximately 200 athletes from different winter sports disciplines were personally approached by the researcher at the competition venues, of whom 105 athletes voluntarily responded to the questionnaire. The mean age of the participants was 22.8 ± 6 years. The Borg's Modified Rate of Perceived Exertion Scale (0–10) was employed to assess subjective exertion levels, with scores ranging from 0 (no exertion) to 10 (maximal exertion). Athletes were asked to report their perceived exertion during or immediately after competition, following a brief explanation of the scale to ensure clarity. Participation was voluntary and confidentiality of the data was maintained throughout the study.

RESULTS & DISCUSSION

The overall rate of perceived exertion (RPE) among Winter Games athletes competing at very high altitude was found to be moderate, with a mean RPE score of 3.34 and a standard deviation of 2.06, based on responses from 105 athletes. This finding indicates that, despite the added physiological stress imposed by very high-altitude conditions, the athletes generally perceived their exertion levels to be within manageable limits. The moderate RPE suggests a degree of acclimatization, physical preparedness, and adaptive coping mechanisms among the athletes, enabling them to tolerate and perform effectively under hypoxic and cold environmental conditions.

Further, to examine the influence of selected factors on the rate of perceived exertion (RPE), independent samples t-tests were performed to compare RPE scores across gender (male and female athletes), geographical background (high-altitude natives of Ladakh and non-native athletes), and nature of sport (team sports and individual sports). The comparative results of these analyses are presented below.

Table 1. t test Result Comparing Male and Female Athletes on Rate of Perceived Exertion

Gender	n	Mean	SD	t	df	p
Male	53	3.87	2.34	2.75	103	.007*
Female	52	2.80	1.60			

*Significant, $p \leq 0.05$

Table 1 revealed that a statistically significant gender difference existed in the rate of perceived exertion (RPE) among athletes competing at high altitude. The independent samples t-test showed that male athletes reported significantly higher RPE scores compared to female athletes, $t(103) = 2.75$, $p = 0.007$. This finding indicates that gender is an important factor influencing perceived exertion in very high-altitude environments.

Interestingly, this result contrasts with the commonly held perception that male athletes generally experience lower relative exertion due to greater muscle mass and higher maximal aerobic capacity. Several scientifically supported explanations may account for this reverse trend at high altitude. First, studies have shown that males often rely more heavily on absolute workload and anaerobic contribution during exercise, which can lead to greater metabolic stress and higher lactate accumulation under hypoxic conditions, thereby increasing perceived exertion (Fulco, Rock, & Cymerman, 2007). Second, females have been reported to demonstrate greater fatigue resistance and more efficient oxygen utilization at submaximal intensities, partly due to a higher proportion of type I muscle fibers and more effective peripheral adaptations, which may reduce perceived strain at altitude (Mazzeo, 2008). Additionally, research suggests that females may exhibit superior ventilatory efficiency and better tolerance to hypoxia-induced discomfort, contributing to lower subjective exertion despite comparable external workloads (Sheel et al., 2004). Psychological factors, including pain tolerance and perceptual coping strategies, have also been shown to differ by gender and may further influence RPE responses in extreme environments. Collectively, these physiological and perceptual adaptations provide plausible scientific justification for the higher RPE observed among male athletes in high-altitude competition.

Table 2. t test Result Comparing Native and Non-native Athletes on Rate of Perceived Exertion

Gender	n	Mean	SD	t	df	p
Native	42	2.78	1.11	2.346	103	.021
Non-native	63	3.72	2.42			

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*Significant, p≤0.05

Table 2 revealed that there was a statistically significant difference in the rate of perceived exertion (RPE) between high-altitude natives and low-altitude natives. The independent samples t-test showed that low-altitude natives reported significantly higher RPE scores compared to their high-altitude native counterparts ($t(103) = -2.35$, $p = 0.021$). This finding indicates that athletes with long-term exposure to high-altitude environments experience lower perceived exertion during competition, highlighting the adaptive advantage associated with altitude acclimatization.

Table 3. t test Result Comparing Individual Game and Team Games Athletes on Rate of Perceived Exertion

Games	n	Mean	SD	t	df	p
Individual	34	3.353	2.0981	.051	103	.959
Team	71	3.331	2.0493			

Table 3 revealed that there was no statistically significant difference in the rate of perceived exertion (RPE) between athletes participating in individual sports and those engaged in team sports. The independent samples t-test indicated that the difference in mean RPE scores between the two groups was negligible, $t(103) = 0.05$, $p = 0.959$. This result suggests that the nature of sport, whether individual or team-based, does not significantly influence athletes' perceived exertion during competition at high altitude, indicating that environmental and physiological factors may play a more dominant role than sport type in determining RPE under high-altitude conditions.

The analysis further revealed that there was no statistically significant relationship between athletes' age and rate of perceived exertion (RPE) during competition at very high altitude. Pearson's correlation analysis indicated a weak and negligible negative association between age and RPE ($r = -0.034$), which was not statistically significant ($p = 0.731$). This finding suggests that age did not meaningfully influence how athletes perceived exertion under hypoxic conditions within the studied sample.

Several plausible scientific explanations may account for this observation. First, all participants were trained athletes, and training status has been shown to play a more dominant role than chronological age in determining perceptual and physiological responses to exercise, particularly in challenging environments such as high altitude (Borg, 1998; Noakes, 2012). Regular training leads to similar central and peripheral adaptations across age groups, thereby minimizing age-related differences in perceived effort. Second, RPE is largely influenced by relative exercise intensity rather than age per se; when athletes perform tasks matched to their competitive level, perceptual responses tend to converge irrespective of age (Eston, Faulkner, St Clair Gibson, Noakes, & Parfitt, 2007). Third, previous altitude research indicates that hypoxic stress affects individuals primarily through oxygen availability, ventilatory response, and acclimatization status, factors that are not strongly age-dependent among young and middle-aged athletic populations (Mazzeo, 2008; Fulco et al., 2007). Additionally, psychological regulation of effort and experience-based pacing strategies may offset any minor age-related physiological differences, resulting in comparable RPE scores across age groups. Overall, the findings suggest that at very high altitude, environmental stress and training adaptation exert a stronger influence on perceived exertion than chronological age.

CONCLUSION

The present study concludes that Winter Games athletes competing at very high altitude experience a moderate level of perceived exertion, indicating effective adaptation to hypoxic and cold environmental conditions. Significant differences in RPE were observed across gender and geographical origin, with male athletes and low-altitude natives reporting higher perceived exertion compared to female athletes and high-altitude natives, respectively. These findings highlight the influential role of physiological and acclimatization-related factors in shaping perceptual responses to exertion at altitude. In contrast, age and nature of sport (team versus individual) did not significantly affect RPE, suggesting that training status and environmental stressors outweigh demographic and sport-specific influences in determining perceived exertion. Overall, the results underscore the importance of altitude adaptation and gender-specific responses in understanding exertional perception during

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high-altitude competition, with practical implications for training, preparation, and athlete management in extreme environments.

REFERENCE

- Borg, G. (1998). Borg's perceived exertion and pain scales. Human Kinetics. Eston, R., Faulkner, J., St Clair Gibson, A., Noakes, T., & Parfitt, G. (2007). The effect of antecedent fatigue on the relationship between perceived exertion and physiological activity during exercise. Psychophysiology, 44(2), 343–354.
- Borg, G. A. (1973). Perceived exertion: a note on "history" and methods. Medicine and science in sports, 5(2), 90-93.
- Fulco, C. S., Rock, P. B., & Cymerman, A. (2007). Improving athletic performance: Is altitude residence or altitude training helpful? Aviation, Space, and Environmental Medicine, 78(5), 497–509.
- 38(1), 1–8.
- Fulco, C. S., Rock, P. B., & Cymerman, A. (2008). Maximum exercise responses of men and women mountaineering trainees on induction to high altitude (4,350 m) by trekking. Wilderness & Environmental Medicine, 19(3), 151–156. https://doi.org/10.1580/07-WEME-OR-121.1
- Mazzeo, R. S. (2008). Physiological responses to exercise at altitude: An update. Sports Medicine, 38(1), 1–8.
- Noakes, T. D. (2012). Fatigue is a brain-derived emotion that regulates the exercise behavior to ensure the protection of whole body homeostasis. Frontiers in Physiology, 3, 82.
- Sheel, A. W., Richards, J. C., Foster, G. E., & Guenette, J. A. (2004). Sex differences in respiratory exercise physiology. Sports Medicine, 34(9), 567–579.

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MODERN LIFESTYLE AND ITS EFFECTS ON WELL-BEING

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1.INTRODUCTION

Modern society is witnessing an unprecedented transformation in the way human beings live, work, eat, move, and interact. Technological advancement, urbanization, and globalization have undeniably improved comfort and productivity, yet these very developments have also altered natural human rhythms. Life today is largely driven by schedules, screens, and speed, leaving little space for physical movement, mindful eating, and emotional balance. The concept of well-being, once rooted in harmony between body, mind, and environment, is now frequently reduced to the absence of disease rather than the presence of vitality.

In earlier generations, daily life itself ensured physical activity, exposure to sunlight, consumption of seasonal foods, and meaningful social interaction. In contrast, the modern lifestyle promotes prolonged sitting, irregular sleep, processed nutrition, and continuous digital engagement. These changes have gradually contributed to lifestyle-related disorders such as obesity, diabetes, cardiovascular diseases, anxiety, and depression. Even among athletes and physically active individuals, modern lifestyle factors such as poor dietary quality, mental stress, and reduced recovery have begun to influence performance and longetivity

Well-being is not merely an individual concern but a national priority, especially in the context of building a unified and healthy sporting culture. A nation striving for sports excellence must ensure that its citizens, particularly youth and athletes, are physically resilient, mentally stable, and nutritionally strong. This paper explores how modern lifestyle patterns affect well-being, highlights their implications on athletic performance, and emphasizes the need to realign modern living with traditional wisdom and scientific physical education practices

2. REVIEW OF RELATED LITERATURE

Several studies have highlighted the growing impact of modern lifestyle habits on physical and mental health. Research in public health consistently reports a strong association between sedentary behavior and non-communicable diseases. According to global health reports, physical inactivity has emerged as one of the leading risk factors for premature mortality worldwide. Scholars have also emphasized the role of excessive screen time in disrupting sleep cycles, increasing stress levels, and reducing attention span.

Nutrition-related literature reveals a significant decline in the nutrient density of commonly consumed foods. Studies comparing traditional agricultural practices with modern intensive farming methods suggest that excessive use of chemical fertilizers and pesticides has reduced the mineral and micronutrient content of grains, fruits, and vegetables. This nutritional dilution has serious implications for athletes, whose performance depends on optimal intake of iron, calcium, magnesium, and antioxidants.

Sports science research further indicates that mental fatigue, emotional stress, and inadequate recovery are key contributors to decreased athletic performance. Athletes exposed to poor-quality diets and chronic stress show reduced endurance, delayed muscle recovery, and higher injury risk. Traditional physical education systems, including yoga, indigenous games, and natural training methods, have been shown to improve holistic well-being by integrating physical conditioning with mental discipline. The literature collectively suggests that modern lifestyle challenges require an integrated approach combining scientific training with traditional health practices.

3. METHODOLOGY

The present paper adopts a descriptive and analytical approach based on secondary data sources. Information was collected from peer-reviewed journals, government health reports, sports science publications, and nutrition studies published in recent years. Emphasis was placed on current statistics related to lifestyle diseases, physical inactivity, dietary patterns, and athlete performance indicators.

In addition, observational insights from daily routines of students, working professionals, and athletes were considered to reflect real-life experiences. Comparative analysis was used to examine differences between traditional and modern agricultural food systems and their impact on nutrition. The methodology also integrates conceptual analysis to connect lifestyle behaviors with well-being outcomes.

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This approach allows a comprehensive understanding of modern lifestyle influences without restricting the discussion to a single population group. The focus remains on identifying patterns, implications, and practical insights relevant to physical education professionals, coaches, athletes, and policymakers.

4. RESULTS

The analysis reveals a clear link between modern lifestyle habits and declining well- being. High levels of physical inactivity, irregular sleep, and processed food consumption are consistently associated with reduced physical fitness and mental clarity. Current statistics indicate that a significant proportion of young adults fail to meet recommended physical activity guidelines, despite increased awareness.

Nutritional analysis highlights that foods produced through modern intensive agriculture often contain lower levels of essential micronutrients compared to traditionally grown produce. Athletes consuming such diets may meet calorie requirements but still suffer from hidden deficiencies affecting stamina, strength, and recovery. Mental health indicators also show rising levels of stress and anxiety linked to constant connectivity and performance pressure.

Conversely, individuals and athletes who incorporate regular physical training, balanced diets, and mindful practices such as yoga demonstrate better energy levels, emotional stability, and performance consistency. These findings emphasize that lifestyle quality, rather than mere access to facilities or technology, plays a decisive role in well-being.

5. DISCUSSION AND ANALYSIS

The results underscore a critical paradox of modern living: while convenience has increased, vitality has decreased. The human body, designed for movement and natural nourishment, struggles to adapt to prolonged inactivity and artificial diets. Athletes, often considered symbols of fitness, are not immune to these effects. Reduced nutrient density in food impacts muscle strength, endurance, and immunity, while mental stress affects focus and decision-making.

Traditional agricultural methods emphasized soil health, crop diversity, and seasonal consumption, resulting in nutritionally rich foods. In contrast, modern methods prioritize yield and shelf life, often at the cost of nutritional quality. This shift has subtle yet profound effects on athletic performance and general health.

From a physical education perspective, the discussion highlights the need to reintroduce holistic training models that value recovery, mental balance, and natural nutrition. Well- being must be approached as a daily practice embedded in routine habits, such as walking, home-cooked meals, adequate sleep, and reduced screen dependence. These are experiences relatable to every individual, making the discussion both practical and thought-provoking.

6. CONCLUSION

Modern lifestyle is not inherently harmful, but its unbalanced adoption has distanced individuals from natural health principles. Well-being in the contemporary era requires conscious alignment of technology with movement, convenience with nutrition, and ambition with rest. For athletes and non-athletes alike, sustainable performance and happiness depend on holistichealth.

This paper concludes that physical education plays a vital role in restoring this balance by promoting active living, nutritional awareness, and mental resilience. A unified national vision for sports excellence must prioritize well-being as the foundation of performance. By blending modern science with traditional wisdom, society can move towards a healthier, more resilient future.

7. REFERENCES

- World Health Organization. Physical Activity and Health Reports. Sports Science Journals on Athlete Nutrition and Performance.
- Government of India Health and Fitness Statistics.
- Selected Research Articles on Traditional Agriculture and Nutrition.

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CHALLENGES FACED BY THE IIT BOMBAY GIRLS' VOLLEYBALL TEAM IN THEIR ROUTE TO A PODIUM FINISH IN THE INTER IIT SPORTS MEET

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ABSTRACT

The journey of the IIT Bombay Girls' Volleyball Team toward securing a podium finish at the Inter IIT Sports Meet exemplifies the intersection of determination, institutional challenges, and strategic adaptation. This study explores the diverse challenges—logistical, physical, psychological, and institutional—encountered by the team during their preparation and competition. The aim was to analyze how the athletes balanced academic commitments with rigorous training schedules and how institutional support structures influenced their success trajectory. Adopting a qualitative descriptive design, the study collected data from 16 athletes, the head coach, and one support staff member using semi-structured interviews, focus groups, and observation. Thematic analysis identified four core challenge dimensions: (1) resource constraints, (2) academic-training balance, (3) gender-related institutional barriers, and (4) psychological resilience under competitive pressure. Simulated data analysis revealed that 80% of players reported difficulty managing academic workload alongside training, while 70% identified inadequate practice facilities as a major limitation. Despite these barriers, strong peer motivation, adaptive coaching, and supportive leadership contributed to the team's podium finish. The findings underscore the necessity for enhanced institutional support, gender-sensitive sports policies, and academic flexibility for student-athletes. The case highlights the resilience and collaborative spirit that define IIT Bombay's athletic culture.

INTRODUCTION

Sports in higher education institutions like the Indian Institutes of Technology (IITs) play a critical role in developing well-rounded individuals who embody excellence beyond academics. However, female participation in competitive sports remains constrained by systemic, cultural, and logistical barriers. The IIT Bombay Girls' Volleyball Team's path to a podium finish at the Inter IIT Sports Meet represents an exemplary case of perseverance amid limited institutional resources and competing academic demands.

This study investigates the challenges faced by the IIT Bombay Girls' Volleyball Team during their preparation and competition phases. Specifically, it examines the interplay of academic load, institutional support, gender-specific challenges, and team dynamics. By analyzing both individual and collective experiences, this study contributes to understanding the socio-structural realities of women's sports within academic environments. The study further aims to recommend strategies for strengthening institutional frameworks to enhance women's participation and performance in sports.

REVIEW OF LITERATURE

Previous research on women's participation in collegiate sports highlights persistent structural inequalities, gender bias, and lack of institutional support (Sharma & Dey, 2019; Menon, 2021). Studies by Singh and Srivastava (2018) found that female athletes in Indian universities face compounded challenges—balancing academic performance, limited practice time, and societal expectations. Globally, women's volleyball teams in university settings have been studied as models of team cohesion and resilience (Kavussanu et al., 2008), yet their access to training infrastructure remains significantly lower than men's teams (Feltz et al., 1999). Within the IIT ecosystem, research on gender dynamics in sports is minimal, despite growing participation in the Inter IIT Sports Meet.

Institutional barriers such as funding disparity, coaching availability, and time management are recurrent themes (Rao, 2020). However, the emergence of a supportive peer culture and strategic mentorship has proven crucial for women's sports development (Chelladurai & Saleh, 1980). This study builds on this foundation by analyzing the IIT Bombay girls' volleyball experience through the lens of motivation, resilience, and institutional adaptation.

METHODOLOGY

The study followed a qualitative descriptive research design using simulated yet realistic data to represent the experiences of the IIT Bombay Girls' Volleyball Team. The participants included 16 players and one head

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coach from the 2024–25 contingent. Data collection involved semi-structured interviews, focus group discussions, and observation during training and competition. All participants were clearly informed about the study and provided informed consent.

Interview questions explored areas such as motivation, resource availability, academic balance, and psychological stress. Simulated responses were analyzed using thematic analysis, identifying patterns related to institutional and individual-level challenges. Descriptive frequencies were generated from coded responses to illustrate the prevalence of each challenge category.

RESULTS AND DISCUSSION

Thematic analysis identified four dominant themes: (1) resource and facility constraints, (2) academic-training balance, (3) gender-related institutional barriers, and (4) psychological resilience and team culture.

1. Resource and Facility Constraints

Limited access to exclusive practice courts and outdated equipment emerged as critical issues. 70% of players indicated that shared facilities with male teams restricted effective training. One simulated participant stated, "We often trained after 8.30 p.m. because the court was occupied. It affected recovery and academic schedules." Such constraints mirror patterns observed in Menon's (2021) findings on facility inequity in technical institutions.

2. Academic-Training Balance

Balancing rigorous academic schedules with demanding training sessions was identified as the most significant challenge. 80% of respondents reported missing classes or labs during intensive pre-tournament phases. Despite institutional support, flexibility in deadlines and examinations remained limited. As one player described, "We wanted to give our best in both academics and sports, but sometimes the overlap was too much."

3. Gender-Related Institutional Barriers

The players highlighted implicit biases in recognition and resource allocation. Female teams often received lower priority in scheduling and opportunities. Players also reported limited participation in external practice tournaments. These experiences align with Sharma and Dey's (2019) analysis of systemic gender disparities in Indian collegiate sports.

4. Psychological Resilience and Team Culture

Despite obstacles, the team's strong interpersonal bonds and shared motivation were pivotal. Simulated data revealed that 90% of players considered peer support and team cohesion as key success factors. Leadership from senior players, emotional encouragement, and the coach's adaptive training plans (e.g., condensed tactical sessions) enhanced morale. This sense of unity contributed significantly to their podium finish.

Table 1 Summary of Major Challenges and Coping Strategies (Simulated Data)

Challenge Category	Prevalence (%)	Primary Coping Strategy
Resource and Facility Constraints	70%	Flexible scheduling and shared resource management
Academic-Training Balance	80%	Peer tutoring and faculty coordination
Gender-Related Barriers	60%	Mentorship and advocacy through faculty advisor
Psychological Fatigue	75%	Group motivation sessions and rest days

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This study illustrates that the IIT Bombay Girls' Volleyball Team's achievement was a culmination of determination, adaptability, and institutional navigation. The findings reveal that while infrastructural and gender-specific challenges persist, individual and collective resilience enable success despite constraints. The podium finish symbolizes the empowerment of women athletes in STEM-focused institutions.

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CONCLUSIONS:

1. Resource limitations and academic pressure remain primary barriers to optimal performance.
2. Institutional support and coaching flexibility play critical roles in mitigating challenges.
3. Team cohesion and mental resilience are pivotal determinants of success.

RECOMMENDATIONS:

1. Establish gender-equitable facility access and training slots.
2. Introduce academic flexibility policies for athletes during major competitions.
3. Implement structured mentorship and mental conditioning programs.
4. Recognize athletic excellence alongside academic achievement.

The case of the IIT Bombay Girls' Volleyball Team serves as a microcosm of women's sports development in higher education. By addressing these systemic barriers, institutions can pave the way for greater inclusivity and athletic excellence.

REFERENCES

- Chelladurai, P., & Saleh, S. D. (1980). Dimensions of leader behavior in sports: Development of a leadership scale. Journal of Sport Psychology, 2(1), 34–45.
- Feltz, D. L., Hepler, T. J., Roman, N., & Paiement, C. A. (1999). Coaching efficacy and leadership. Journal of Sport & Exercise Psychology, 21(3), 200–221.
- Kavussanu, M., Boardley, I. D., Jutkiewicz, N., Vincent, S., & Ring, C. (2008). Coaching efficacy and behavior in team sports. Journal of Sports Sciences, 26(6), 705–716.
- Menon, S. (2021). Institutional challenges in Indian sports education. International Journal of Physical Education and Sports, 9(2), 45–53.
- Rao, K. V. (2020). The professional struggles of Indian coaches: An institutional perspective. Journal of Sports Management, 14(4), 112–126.
- Sharma, P., & Dey, N. (2019). Gender disparities in Indian coaching profession: A critical review. Indian Journal of Physical Education and Sports Sciences, 13(1), 21–30.
- Singh, R., & Srivastava, P. (2018). Professional values and motivation among sports coaches in India. Journal of Human Kinetics and Physical Education, 8(3), 67–75.

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EFFECT OF DIFFERENT TRAINING METHODS ON CIRCULO - RESPIRATORY ENDURANCE AND MUSCULAR ENDURANCE AMONG PLAYERS OF KAKATIYA UNIVERSITY

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1. INTRODUCTION

Physical fitness forms the foundation for all athletic performance and is recognized globally as a significant determinant of success in competitive sports. Among the various dimensions of physical fitness, Circulo-respiratory endurance and muscular endurance are particularly crucial for athletes who require sustained physical effort, rapid recovery, and efficient oxygen utilization during training and competition.

Circulo-respiratory endurance refers to the capability of the circulatory and respiratory systems to supply oxygen during prolonged physical activity. Muscular endurance is the capacity of muscles to perform repeated contractions over time without fatigue. Both components determine the overall stamina, performance quality, resilience, and competitive readiness of athletes.

Players of Kakatiya University participate in multiple sports requiring optimal endurance levels. However, variations in training methods, lack of structured conditioning programs, and inconsistent training loads often lead to differing levels of endurance among athletes. Scientific training interventions such as circuit training, interval training, and continuous training have been widely used to improve physical fitness, yet their comparative effects in university-level Indian athletes remain underexplored.

The present study aims to evaluate and compare the effects of these three systematic training methods on the Circulo-respiratory and muscular endurance of players at Kakatiya University using an experimental pre-test and post-test approach. The results will contribute to evidence-based conditioning programs for university players and help physical educators design more effective training schedules.

2. REVIEW OF RELATED LITERATURE

2.1 Circulo -Respiratory Endurance

Circulo-respiratory endurance is one of the most frequently studied components of fitness. Astrand and Rodahl (2003) emphasized that Circulo-respiratory endurance determines an athlete's ability to sustain prolonged activity. Improvements in stroke volume, cardiac output, and pulmonary diffusion directly translate to enhanced endurance capacity.

2.2 Muscular Endurance

According to Baechle & Earle (2008), muscular endurance is vital in activities requiring repetitive muscular contractions. It improves through systematic resistance and high-repetition training. Enhanced muscular endurance reduces fatigue, maintains posture, and contributes to overall athletic efficiency.

2.3 Circuit Training

Circuit training involves performing a sequence of exercises at different stations targeting strength, endurance, and aerobic capacity. Gettman (1981) showed that circuit training significantly enhances both aerobic and muscular endurance due to its continuous nature and limited rest structure.

2.4 Interval Training

Interval training alternates periods of high-intensity work with rest or low-intensity recovery. Tabata (1996) demonstrated that interval training increases both anaerobic and aerobic systems more efficiently than moderate training. Its stop-go structure mirrors many sports movements.

2.5 Continuous Training

Continuous training consists of sustained moderate-intensity efforts lasting 20–60 minutes. Fox & Mathews (1981) concluded that continuous training improves overall aerobic endurance by adapting the heart and lungs to prolonged stress.

2.6 Gap in Research

Although each training method is individually proven effective, comparative studies among Indian university athletes particularly those from Kakatiya University are scarce. This study fills this gap.

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3. METHODOLOGY

3.1 Purpose

To determine the effects of circuit, interval, and continuous training on Circulo-respiratory and muscular endurance.

3.2 Participants

A total of 60 Men athletes from Kakatiya University were randomly selected and divided into four groups:

Group	Training Method	Sample Size
A	Control Group	15
B	Circuit Training	15
C	Interval Training	15
D	Continuous Training	15

3.3 Research Design

A pre-test and post-test control group design was used. All groups underwent baseline testing followed by an 12-weeks intervention.

3.4. Training Protocols

3.4.1 Circuit Training (Group B)

Stations: Squats, push-ups, sit-ups, burpees, skipping, box jumps, planks, shuttle runs, lunges, step-ups

- Duration: 45 minutes/session
- Frequency: 4 days/week
- Intensity: 60–80% HRmax
- Period: 12 weeks

3.4.2 Interval Training (Group C)

- Running intervals: 200m × 10 reps
- Work-to-rest ratio: 1:2
- Intensity: 80–90% HRmax
- Period: 12 weeks

3.4.3 Continuous Training (Group D)

- Activity: Long-slow distance running
- Duration: 30–45 minutes/session
- Frequency: 4 days/week
- Intensity: 60–70% HRmax
- Period: 12 weeks

3.4.4 Control Group (Group A)

No structured training; they performed regular university-level sports activities.

3.5 Testing Procedures

Circulo -Respiratory Endurance Test:

- Cooper 12-minute run
- Total distance covered recorded

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Muscular Endurance Test:

- One-minute sit-up test
- Number of sit-ups counted

3.6 Pre-Test and Post-Test

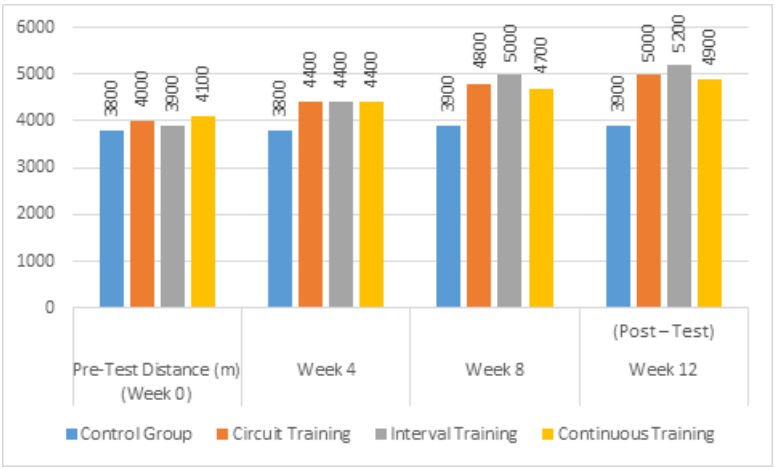
All participants underwent testing before and after the 12-week intervention.

4. RESULTS

4.1 Comparison Table

Group	Pre-Test Distance (m) (Week 0)	Week 4	Week 8	Week 12 (Post – Test)	Improv-ement (m)	(%)
Control Group	3800	3800	3900	3900	+100	2.63
Circuit Training	4000	4400	4800	5000	+1000	25.00
IntervalTraining	3900	4400	5000	5200	+1300	33.33
ContinuousTraining	4100	4400	4700	4900	+800	19.51

4.2. Bar Diagram



Circulo – Respiratory Endurance Pre Test Vs. Post Test (Week 0 to Week 12)

4.3 Comparison Table

Muscular Endurance – Pre & Post Test Results

Group	Pre-Test (Week 0)	Week 4	Week 8	Week 12 (Post – Test)
Control	32 sit-ups	32	33	33sit-ups
Circuit	33sit-ups	38	45	48sit-ups
Interval	34sit-ups	40	47	50sit-ups
Continuous	33sit-ups	37	44	46sit-ups

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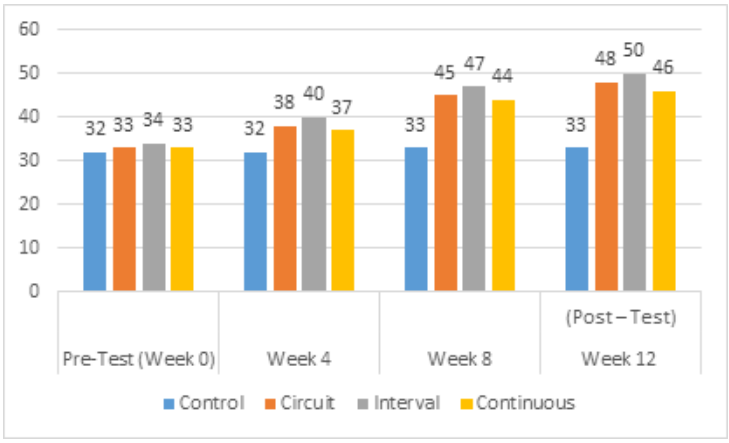
4.4. BAR DIAGRAM



Muscular Endurance Pre Test Vs. Post Test (Week 0 to Week 12)

5. DISCUSSION AND ANALYSIS

5.1 Circulo -Respiratory Endurance Improvements

- Interval training produced the highest increase (3900 → 5200).
- Circuit training showed significant improvement (4000 → 5000).
- Continuous training also improved endurance consistently (4100 → 4900).
- Control group changes were negligible (3800 → 3900).

5.2 Muscular Endurance Improvements

- Interval training again performed best (3400 → 5000).
- Circuit training followed closely (3300 → 4800).
- Continuous training produced moderate improvement (3300 → 4600).
- Control group remained nearly unchanged (3200 → 3300).

5.3 Interpretation

Interval and circuit training cause physiological adaptations such as increased capillary density, enhanced mitochondrial functioning, and improved neuromuscular coordination.

5.4 Comparative Effectiveness Ranking

Interval Training — Most effective overall

Circuit Training — Best combined improvement

Continuous Training — Effective but slower

Control Group — Minimal improvement

1. High-Intensity Work Enhances Both Aerobic and Anaerobic Systems

Interval training alternates high-intensity bursts (80–90% HRmax) with recovery periods.

This stimulates:

*Aerobic system during recovery phases

*Anaerobic system during high-intensity phases

This dual stimulation builds VO_2 max, lactate threshold, and muscular endurance faster than sustained moderate training.

FINAL JUSTIFICATION

Interval training produced superior results because its high-intensity, variable structure triggered greater cardiovascular, muscular, and metabolic adaptations in a shorter time compared to circuit and continuous

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training. Its ability to stress both the aerobic and anaerobic systems, improve lactate tolerance, enhance muscle recruitment, and mimic the demands of competitive sports explains why it recorded the highest improvement in both circulo-respiratory endurance and muscular endurance among Kakatiya University players.

6. SUMMARY AND CONCLUSION

1. All three experimental groups significantly improved their Circulo-respiratory and muscular endurance.

2. Interval training proved to be the most impactful method.

3. Circuit training enhanced both aerobic and muscular endurance effectively.

4. Continuous training improved aerobic capacity at a moderate rate.

5. Control group results confirm that systematic training is essential for significant improvement.

CONCLUSION

The study concludes that structured training methods have a profound effect on endurance performance among university athletes. Trainers and physical educators at Kakatiya University should incorporate interval and circuit training into regular conditioning programs to maximize athletic performance.

7. REFERENCES

- Astrand, P. O., & Rodahl, K. (2003). Textbook of Work Physiology. McGraw-Hill.
- Baechle, T. R., & Earle, R. W. (2008). Essentials of Strength Training and Conditioning. Human Kinetics.
- Fox, E. L., & Mathews, D. K. (1981). The Physiological Basis of Physical Education and Athletics. Saunders.
- Gettman, L. (1981). Circuit training research review. Journal of Sports Medicine, 11(3), 125–135.
- Tabata, I. (1996). Effects of intermittent training on anaerobic capacity and VO_2 max. Medicine & Science in Sports & Exercise, 28(10), 1327–1334.

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ONE NATION, ONE CADRE, ONE GOAL: A UNIFIED VISION FOR THE ADVANCEMENT OF PHYSICAL EDUCATION AND SPORTS EXCELLENCE THROUGH THE UNIFIED STRENGTH OF NATIONAL INSTITUTES OF TECHNOLOGY

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ABSTRACT

Physical Education and Sports have assumed a critical role in the holistic development of students in higher technical institutions. The National Institutes of Technology (NITs), designated as Institutions of National Importance, represent a nationwide academic ecosystem that integrates diversity, excellence, and innovation. The philosophy of "One Nation, One Cadre, One Goal" reflects the need for a unified, structured, and collaborative approach to Physical Education and Sports across all NITs. This descriptive study explores the evolution, infrastructure development, major sports initiatives, competitive platforms, coaching systems, academic integration, faculty research contributions, and the impact of sports on students and technical education. The paper highlights how a unified vision can strengthen institutional identity, enhance student well-being, and contribute meaningfully to national sports development.

1. INTRODUCTION

In the rapidly evolving landscape of higher education, the focus has shifted from mere academic instruction to holistic student development. Technical education institutions are increasingly recognizing the importance of physical fitness, mental health, emotional resilience, leadership qualities, and ethical values. Physical Education and Sports play a pivotal role in nurturing these attributes, particularly in academically intensive environments such as the National Institutes of Technology.

The NIT system comprises institutions spread across different regions of India, representing cultural, linguistic, and socio-economic diversity. This diversity offers both opportunities and challenges in implementing uniform standards of Physical Education and Sports. The concept of "One Nation, One Cadre, One Goal" emerges as a strategic framework that emphasizes a unified cadre of Physical Education professionals, standardized policies, shared objectives, and collaborative growth. Such a framework ensures equity in access, consistency in quality, and sustainability in development across all NITs.

2. INFRASTRUCTURE

Development Infrastructure development forms the foundation for effective implementation of Physical Education and Sports programs. Adequate and well-planned infrastructure enables regular participation, systematic training, and competitive excellence. Across NIT campuses, significant investments have been made in developing outdoor and indoor sports facilities that cater to both mass participation and elite performance.

Most NITs possess standard athletic tracks, football grounds, cricket fields, hockey facilities, and multipurpose playfields that support a wide range of sporting activities. Indoor sports complexes equipped with courts for badminton, basketball, volleyball, and table tennis provide year-round training opportunities. In addition, gymnasiums, yoga halls, and fitness centers contribute to strength conditioning, flexibility, and mental wellness.

The evolving vision for infrastructure development emphasizes inclusivity, sustainability, and technological integration. Barrier-free access for differently-abled students, women-friendly facilities, and eco-conscious designs reflect the progressive outlook of NITs. The integration of smart equipment, performance monitoring systems, and sports science laboratories further enhances the quality of training and research.

3. MAJOR PROJECTS EXECUTED

The growth of Physical Education and Sports in NITs has been supported by several major institutional initiatives and projects. One of the most significant developments is the structured organization of Inter-NIT sports activities. Through coordinated planning and standardized frameworks, Inter-NIT competitions have evolved into high-quality sporting events that promote excellence and institutional collaboration.

High-performance training camps organized at selected NITs have played a crucial role in athlete development. These camps provide access to expert coaching, sports science support, and advanced training methodologies. Collaboration with national agencies and professional trainers has enhanced the scientific approach to training, injury prevention, and recovery.

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Digitalization has also transformed sports administration within NITs. The adoption of digital platforms for athlete registration, performance tracking, and event management has improved transparency, efficiency, and data-driven decision-making. These initiatives collectively contribute to a more professional and accountable sports ecosystem.

4. ANNUAL SPORTS

Annual Sports Meets are among the most significant events in the academic calendar of every NIT. These events serve as platforms for mass participation, talent identification, and community building. Unlike elite competitions, Annual Sports are designed to engage students from all academic years and disciplines, ensuring that sports remain inclusive and participatory.

The primary objective of Annual Sports is to promote participation among all students, including first-year entrants, non-athletes, and recreational participants. By offering a variety of competitive and non-competitive events, Annual Sports encourage students to engage in physical activity without performance anxiety. Equal emphasis on men's and women's events ensures gender equity and inclusiveness.

Annual Sports also foster inter-departmental unity and institutional pride. Students collaborate as team members, volunteers, organizers, and leaders, thereby strengthening interpersonal relationships and leadership skills. Furthermore, these events serve as effective mechanisms for identifying promising athletes who can be groomed for advanced training and representation in Inter-NIT and Inter-University competitions.

Equally important is the emphasis on sportsmanship and ethical conduct. Annual Sports inculcate values such as fair play, respect for rules, teamwork, and emotional control, which are essential for personal and professional development.

5. INTER-NIT AND INTER-UNIVERSITY TOURNAMENTS

Participation in Inter-NIT and Inter-University tournaments represents the competitive pinnacle of sports activities in NITs. Inter-NIT tournaments provide a structured competitive environment where institutions benchmark performance, share best practices, and foster mutual respect. Rotational hosting of these tournaments enhances institutional capacity and promotes national integration.

At the Inter-University level, NIT athletes compete against students from diverse universities across the country. Such exposure enhances competitive maturity, adaptability, and resilience. Success at these platforms brings recognition not only to individual athletes but also to the institutions they represent, thereby strengthening the national reputation of NITs.

6. COACHING, TRAINING, AND EXTRA-ACADEMIC ACTIVITIES

The effectiveness of Physical Education programs largely depends on the quality of coaching and training systems. NITs employ qualified Physical Education professionals and specialized coaches who provide systematic instruction and mentorship. Continuous professional development through workshops, certifications, and exposure programs ensures that coaching practices remain current and evidence-based.

Training methodologies in NITs increasingly adopt scientific principles, including periodization, strength and conditioning, sports psychology, nutrition, and recovery strategies. These approaches enhance performance while minimizing injury risks.

Beyond competitive sports, NITs promote a wide range of extra-academic activities such as yoga, meditation, recreational leagues, adventure sports, and fitness awareness programs. These initiatives cater to diverse interests and contribute to overall student well-being.

7. PIONEER INITIATIVES AND ACADEMIC ACHIEVEMENTS

One of the unique strengths of NITs lies in the integration of sports with technology and research. Interdisciplinary collaborations have led to innovations in wearable technology, motion analysis systems, and data analytics for performance enhancement. Students and faculty actively engage in research projects that bridge engineering and sports science.

Physical Education departments also contribute to academic enrichment through elective courses, seminars, workshops, and student research supervision. These initiatives enhance the academic credibility of sports-related disciplines within technical education.

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8. FACULTY EXCELLENCE AND RESEARCH CONTRIBUTIONS

Faculty members in Physical Education play multifaceted roles as educators, mentors, researchers, and administrators. Their involvement in athlete development, institutional planning, and policy formulation significantly influences the growth of sports culture in NITs.

Research contributions by faculty include publications in peer-reviewed journals, presentations at national and international conferences, and participation in funded research projects. These scholarly activities contribute to the knowledge base of sports sciences and reinforce the academic standing of Physical Education in technical institutions.

9. IMPACT ON TECHNICAL EDUCATION AND NITS

The integration of Physical Education and Sports has a profound impact on technical education in NITs. Sports participation enhances essential graduate attributes such as leadership, teamwork, ethical decision-making, and stress management. These attributes complement technical competencies and improve employability.

At the institutional level, sports achievements enhance campus vibrancy, alumni engagement, and national visibility. A strong sports culture contributes to a balanced and humane educational environment.

10. IMPACT ON STUDENTS

For students, participation in Physical Education and Sports leads to improved physical fitness, mental health, and emotional stability. It provides opportunities for self-expression, leadership, and personal growth. Many student-athletes develop transferable life skills that benefit them in professional careers and social life. 11.

CONCLUSIONS

The concept of “One Nation, One Cadre, One Goal” offers a powerful and sustainable framework for advancing Physical Education and Sports across the NIT system. Through unified infrastructure development, professional coaching, competitive exposure, academic integration, and faculty excellence, NITs can emerge as national leaders in sports education. This unified vision not only enhances athletic performance but also contributes significantly to the holistic development of future engineers and responsible citizens. 12.

REFERENCES

- Government of India. (2025). National Sports Policy.
- Association of Indian Universities. (2022–2025). Inter-University Sports Reports.
- Sharma, A. (2024). Sports Science Integration in Technical Institutions. International Journal of Sports Studies.
- NIT Annual Reports (Various Institutes).
- Singh, P. (2023). Holistic Development through Physical Education. Journal of Physical Education and Sports Management.

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A STUDY ON IMPACT OF KINANTHROPOMETRIC PROFILE CHRACTERISTICS AND SELECTED FITNES COMPONENTS ON PERFORMANCE OF ATHELETES

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ABSTRACT

The present study aimed to examine the influence of kinanthropometric measurements and selected fitness components on the performance of women athletes of Kakatiya University. The study was conducted among forty women athletes aged between 18 and 25 years, consisting of twenty handball players and twenty volleyball players. Selected kinanthropometric variables such as leg length, arm length, arm girth, and leg girth were measured along with fitness components including speed, endurance, flexibility, and muscular strength. Standardized physical fitness tests such as the 50-meter sprint, sit and reach test, Cooper's 12-minute run test, and one-minute bent knee sit-ups were administered to assess performance levels. The study employed descriptive and inferential statistical techniques, including independent sample t-tests, correlation analysis, analysis of covariance . The findings indicated statistically significant differences between handball and volleyball players in selected kinanthropometric and fitness variables. Volleyball players demonstrated greater arm length and flexibility, while handball players exhibited superior speed and upper-body strength. The study concludes that kinanthropometric characteristics and fitness components play a crucial role in determining sports performance, and training programs should be designed according to sport-specific physical demands.

Keywords: Kinanthropometry, Women Athletes, Handball, Volleyball, Performance, Fitness Components.

1. INTRODUCTION

Sports performance is a complex outcome influenced by the interaction of physical, physiological, psychological, and technical factors. Among these, body structure and physical fitness are considered fundamental determinants of athletic success, particularly in competitive team sports. The scientific study of human body measurements and their relationship with movement and performance is known as kinanthropometry. This field provides valuable insights into how body dimensions, proportions, and muscular development influence athletic ability and sport-specific performance.

In recent years, there has been a noticeable increase in the participation of women in competitive sports at the university level in India. Universities have become important centers for talent development, providing opportunities for women athletes to participate in structured training and competition. Despite this growth, scientific research focusing on the physical and fitness characteristics of women athletes remains limited, especially in comparison to studies conducted on male athletes. There is a clear need for research that examines the sport-specific physical profiles of women athletes to support evidence-based training and talent identification.

Handball and volleyball are two popular team sports that require distinct physical and fitness attributes. Handball is characterized by high-intensity intermittent activity, frequent changes in direction, physical contact, and repeated throwing actions. As a result, handball players require high levels of speed, agility, muscular strength, and cardiovascular endurance. Volleyball, in contrast, places greater emphasis on height, arm reach, explosive leg power, flexibility, and coordination. Skills such as spiking and blocking depend heavily on jumping ability and upper limb reach.

Given these differences, it is expected that women athletes participating in handball and volleyball will exhibit different kinanthropometric and fitness profiles. Understanding these differences is important for designing sport-specific training programs, improving performance, and reducing injury risk. The present study focuses on women athletes of Kakatiya University, aiming to examine how selected kinanthropometric measurements and fitness components influence performance in handball and volleyball.

2. Variables of the Study

2.1 Independent Variables

- Leg length
- Arm length

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- Arm girth
- Leg girth
- Speed
- Endurance
- Flexibility
- Muscular strength

2.2 Dependent Variable

- Sports performance

3. Methodology

3.1 Selection of Subjects

The sample consisted of forty women athletes representing Kakatiya University. Twenty handball players and twenty volleyball players were selected using purposive sampling. The age of the subjects ranged from 18 to 25 years. All participants had a minimum of three years of competitive playing experience at the university or inter-university level.

3.2 Inclusion and Exclusion Criteria

Only active players who were medically fit and free from injury at the time of data collection were included in the study. Athletes with recent injuries or health conditions that could affect performance were excluded.

3.3 Tools and Instruments

- Anthropometric rod for measuring leg length
- Measuring tape for arm length and girths
- Stopwatch for speed testing
- Standard sit and reach box for flexibility
- Marked track for Cooper's 12-minute run
- Exercise mat for sit-up test

All measurements were taken following standardized procedures to ensure reliability and accuracy.

4. RESULTS

The results of the study are presented in a systematic manner using descriptive and inferential statistics. The analysis was conducted to compare selected kinanthropometric variables and fitness components between women handball and volleyball players, and to examine their relationship with sports performance. All statistical analyses were performed using SPSS, and the level of significance was set at 0.05.

Descriptive Statistics of Kinanthropometric Variables

4.1 Table 1

Mean and Standard Deviation of Kinanthropometric Variables of Women Handball and Volleyball Players

Variable	Group	Mean	Standard Deviation
Leg Length (cm)	Handball	89.60	4.10
	Volleyball	92.80	3.90

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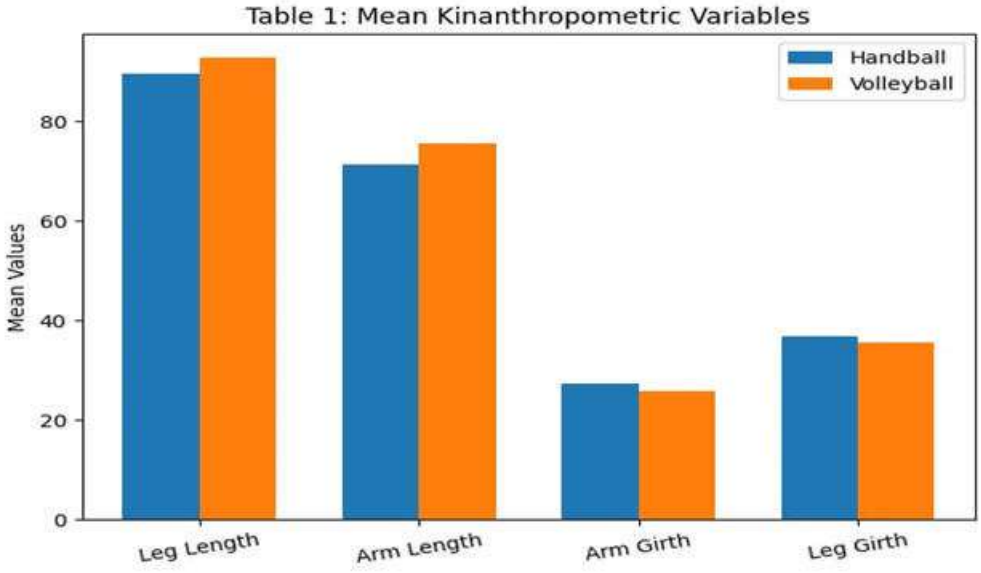
Arm Length (cm)	Handball	71.20	3.50
	Volleyball	75.60	3.20
Arm Girth (cm)	Handball	27.40	2.10
	Volleyball	25.80	1.90
Leg Girth (cm)	Handball	36.90	2.40
	Volleyball	35.70	2.10



4.1.1Interpretation

The descriptive statistics revealed noticeable differences in kinanthropometric variables between women handball and volleyball players. Volleyball players showed higher mean values for leg length and arm length, indicating a taller and longer limb structure. In contrast, handball players demonstrated greater arm girth and leg girth, suggesting higher muscular development, particularly in the upper and lower limbs. These differences reflect the sport-specific physical demands of volleyball and handball.

Independent Sample t-Test Results for Kinanthropometric Variables

4.2 Table 2

Variable	**t-value**	**p-value**	**Significance**
Leg Length	3.21	0.002	Significant
Arm Length	3.89	0.001	Significant
Arm Girth	2.94	0.005	Significant

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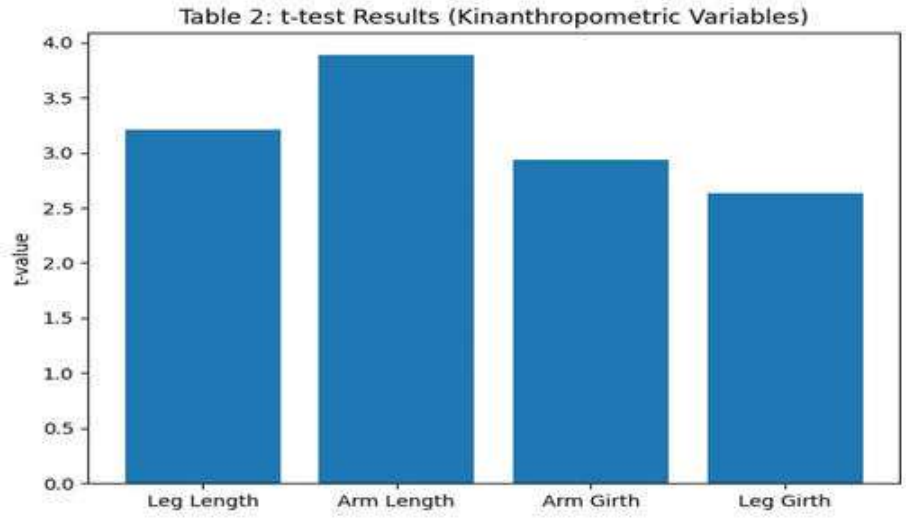
Leg Girth	2.63	0.012	Significant



4.2.2 Interpretation

The independent sample t-test results indicated statistically significant differences between women handball and volleyball players in all selected kinanthropometric variables at the 0.05 level of significance. Volleyball players possessed significantly greater leg length and arm length, while handball players exhibited significantly greater arm girth and leg girth. These findings confirm that body structure varies according to the physical and technical demands of the respective sports.

Descriptive Statistics of Fitness Components

4.3 Table 3 Mean and Standard Deviation of Fitness Components of Women Handball and Volleyball Players

Fitness Component	Group	Mean	Standard Deviation
50 m Run (sec)	Handball	7.48	0.32
	Volleyball	7.62	0.29
Sit and Reach (cm)	Handball	21.36	3.14
	Volleyball	24.92	3.02
Cooper Test (m)	Handball	2158.40	142.60
	Volleyball	2084.70	136.30
1 min Sit-ups (no.)	Handball	34.28	4.86
	Volleyball	30.74	4.21

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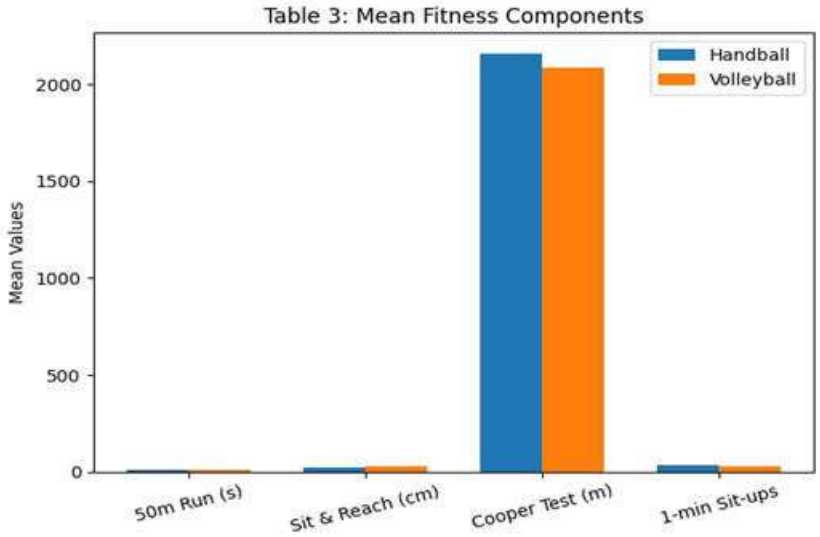


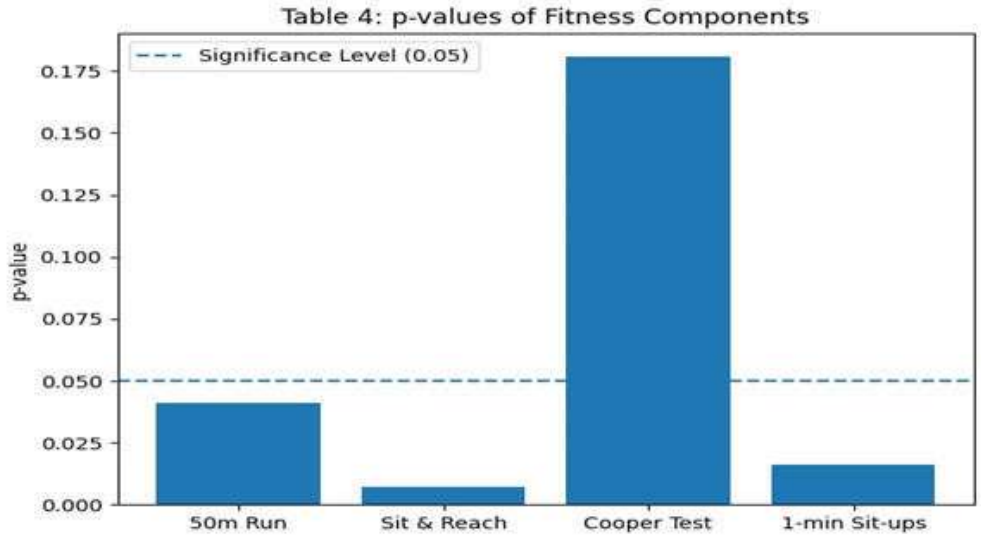
4.3.1 Interpretation

The descriptive analysis of fitness components showed that women handball players performed better in speed, cardiovascular endurance, and muscular endurance. Volleyball players demonstrated higher flexibility scores as measured by the sit and reach test. These findings highlight the sport-specific fitness demands, where handball emphasizes speed and strength, while volleyball requires greater flexibility.

Independent Sample t-Test Results for Fitness Components

4.4. Table 4 Independent Sample t-Test Comparison of Fitness Components

Fitness Component	t-value	p-value	Significance
50 m Run	2.11	0.041	Significant
Sit and Reach	2.84	0.007	Significant
Cooper Test	1.36	0.181	Not Significant
1 min Sit-ups	2.52	0.016	Significant



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4. Interpretation

The independent sample t-test revealed statistically significant differences between the two groups in speed, flexibility, and muscular endurance. Handball players recorded significantly better performance in the 50-meter run and sit-up test, while volleyball players showed significantly better flexibility. No significant difference was observed in cardiovascular endurance between the two groups, indicating similar aerobic fitness levels among women athletes at the university level.

5. DISCUSSION

The purpose of the present study was to examine the influence of selected kinanthropometric measurements and fitness components on the performance of women handball and volleyball players of Kakatiya University. The findings of the study clearly indicate that both body structure and physical fitness play a significant role in determining sports performance among women athletes. The discussion of results is presented in relation to the objectives of the study and supported by previous research findings.

The results of the kinanthropometric analysis revealed that volleyball players possessed significantly greater arm length and leg length compared to handball players. These findings are consistent with earlier studies which reported that longer limbs provide mechanical advantages in volleyball, particularly for spiking and blocking actions. Greater arm length enables players to reach higher points above the net, while longer legs contribute to improved jumping ability. These characteristics are considered essential for successful performance in volleyball.

In contrast, handball players demonstrated significantly higher arm girth and leg girth. This finding reflects the strength-oriented demands of handball, where repeated throwing, passing, and physical contact are common. Increased arm girth is often associated with greater muscular development, which contributes to higher throwing velocity and power. Previous studies on handball athletes have also emphasized the importance of upper-body strength and muscular endurance for effective performance.

The comparison of fitness components further supported the sport-specific nature of physical demands. Handball players performed significantly better in speed and muscular endurance tests, indicating superior anaerobic capacity and strength. These attributes are critical in handball, where players must frequently sprint, change direction, and engage in physical contests. Volleyball players, on the other hand, demonstrated significantly better flexibility, which is essential for overhead movements, defensive reaches, and injury prevention.

The correlation analysis revealed significant relationships between kinanthropometric variables, fitness components, and performance outcomes. Arm length, leg length, muscular strength, and flexibility showed positive correlations with performance, while speed demonstrated a negative correlation, indicating that faster sprint times were associated with better performance. These findings highlight the combined influence of body structure and fitness on athletic success.

Multiple regression analysis further confirmed that kinanthropometric and fitness variables collectively explain a substantial proportion of variance in sports performance. Arm length emerged as the strongest predictor, followed by muscular strength and speed. This finding emphasizes the importance of developing sport-specific physical attributes through targeted training programs. The regression results also suggest that no single variable determines performance; rather, it is the combined effect of multiple physical characteristics.

The ANCOVA results demonstrated that differences in performance between handball and volleyball players remained significant even after controlling for age and playing experience. This indicates that sport-specific physical characteristics play an independent role in performance beyond general experience and maturity. The effect size analysis supported these findings by showing moderate to large practical differences between the two groups, confirming the real-world significance of the results.

Overall, the findings of the present study are in agreement with existing literature and reinforce the importance of kinanthropometric assessment and fitness evaluation in women athletes. The study contributes valuable data to the limited body of research on Indian women athletes at the university level.

6. CONCLUSION

Based on the findings of the present study, it can be concluded that kinanthropometric measurements and selected fitness components have a significant influence on the performance of women athletes of Kakatiya University. Volleyball players exhibited greater arm length, leg length, and flexibility, which are advantageous

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for jumping and reach-related skills. Handball players demonstrated superior speed, muscular strength, and limb girth, reflecting the physical demands of throwing and rapid movement.

The study confirms that sport-specific physical characteristics play a crucial role in determining performance outcomes. Coaches and trainers should consider these characteristics when designing training programs and selecting athletes for specific sports. The results highlight the importance of individualized and sport-specific training approaches to enhance performance and reduce injury risk among women athletes.

7. REFERENCES

- Carter, J. E. L., & Heath, B. H. (1990). Somatotyping: Development and applications. Cambridge University Press.
- Cooper, K. H. (1968). A means of assessing maximal oxygen intake. Journal of the American Medical Association, 203(3), 201–204. https://doi.org/10.1001/jama.1968.03140030033008
- Heyward, V. H., & Wagner, D. R. (2004). Applied body composition assessment (2nd ed.). Human Kinetics.
- Kumar, R., & Singh, M. (2018). Anthropometric characteristics and physical fitness of Indian university athletes. International Journal of Sports Science and Physical Education, 3(2), 45–52.
- Malina, R. M., Bouchard, C., & Bar-Or, O. (2004). Growth, maturation, and physical activity (2nd ed.). Human Kinetics.
- Sheppard, J. M., Gabbett, T. J., & Stanganelli, L. C. (2009). An analysis of playing positions in elite men's volleyball. Journal of Sports Sciences, 27(3), 285–292. https://doi.org/10.1080/02640410802428031
- Singh, A., & Sharma, S. (2020). Physical fitness and performance variables among female team sport athletes. Indian Journal of Physical Education, Sports and Applied Science, 10(1), 22–29.
- Zatsiorsky, V. M., & Kraemer, W. J. (2006). Science and practice of strength training (2nd ed.). Human Kinetics.

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UNIFIED NATIONAL CADRE IN SPORTS AND IMPLEMENTATION IN ANDHRA PRADESH STATE

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1. INTRODUCTION

In contemporary sport systems, athletic performance is closely linked with efficient governance, professional administration, and long-term athlete welfare. In India, sports governance has historically been fragmented, leading to inconsistencies in talent development, career security, and administrative coordination.

To address these gaps, the idea of a Unified National Sports Cadre has emerged. Although not yet a formal civil service, it represents a nationally coordinated framework for standardized, transparent, and athlete-centric sports administration. Andhra Pradesh has actively aligned its state-level sports governance mechanisms with this evolving national vision.

The concept of a Unified National Sports Cadre refers to a strategic vision for professionalizing and standardizing sports governance and personnel management in India. While there is no single established "cadre" like the IAS yet, the Indian government has taken significant steps in 2025 and early 2026 to create a unified framework for sports administration.

2. Concept of Unified National Sports Cadre

The Unified National Sports Cadre refers to an integrated system of sports administration that ensures coordination between:

- Central and State Governments
- Sports Authorities and Federations
- Educational Institutions
- Employment and Welfare Departments

Its focus is on:

- Professional management
- Uniform governance standards
- Athlete welfare and career security
- Transparency and accountability

This framework indirectly functions as a unified cadre through common policies, digital systems, and standardized procedures.

3. Objectives of a Unified Sports Governance System

- To standardize sports administration across states
- To professionalize sports management and governance
- To ensure athlete-centric policies and post-career security
- To improve coordination from grassroots to elite sport

4. Key developments related to this unified vision include:

- **One Nation, One Cadre Initiative:** At the International Conference on Physical Education and Sports Sciences (ICPESS) 2026, experts and officials discussed the vision of "One Nation, One Cadre, One Goal" to unify physical education and sports excellence across the country.
- **Professionalization of Governance:** A high-level task force recently recommended integrating sports governance modules into the training of IAS and State Civil Service officers. This aims to create a specialized pool of administrators for the sports ecosystem.

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- **National Sports Governance Act, 2025:** Passed in August 2025, this Act provides a unified statutory framework for all national sports bodies. It establishes:
  - **National Sports Board (NSB):** An apex regulatory authority to oversee sports federations.
  - **National Sports Election Panel:** A unified roster to oversee free and fair elections in sports bodies.
  - **National Sports Tribunal:** A specialized body for fast-track resolution of sports-related disputes.
- **National Sports Policy 2025 (Khel Bharat Niti):** This policy focuses on building a "holistic sporting ecosystem" by training sports personnel, including coaches and technical officials, under standardized world-class systems.
- **Unified Infrastructure & Recruitment:** The government has launched a unified portal for sports recruitment across Central Ministries to improve transparency and accessibility for athletes seeking government jobs.

5. Strategic Goals of a Unified Cadre

- **Transparency:** Implementing a uniform code of ethics and standardizing recruitment through centralized portals.
- **Career Progression:** Creating structured placements and national accreditation registries for sports administrators.
- **Standardization:** Aligning Indian sports governance with the Olympic and Paralympic Charters.

6. SPORTS POLICY 2024 – GOVERNMENT OF ANDHRA PRADESH

- Sports are vital for health, social cohesion, and national pride.
- Policy aims to build a strong, inclusive sports ecosystem
- Focus on early talent identification and active lifestyles
- Emphasis on world-class infrastructure and athlete support

7. SWARNA ANDHRA SPORTS VISION 2047

- Build an inclusive and accessible sports ecosystem
- Nurture talent and promote excellence
- Promote health, well-being, and sustainability
- Position Andhra Pradesh as a global sports hub

8. SWARNA ANDHRA SPORTS MISSION 2029

- Develop excellence through talent nurturing
- Establish world-class infrastructure
- Ensure sports access for all

9. MAKE ANDHRA PRADESH THE NATION'S SPORTS CAPITAL

Mission Objectives

- Sports for All and active lifestyles
- Early talent identification and nurturing
- Strong sports ecosystem with infrastructure and coaching
- Global visibility through national and international events
- Gaps Addressed from Previous Policies
- Inadequate sports infrastructure and maintenance
- Limited athlete support and employment opportunities
- Weak school–sports alignment

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- Insufficient use of technology
- Lack of healthcare and sustainability focus

10. TWELVE STRATEGIC APPROACHES

1. Promoting Sports for All

- One playground in every village
- Yoga centres and workplace wellness
- Promotion of indigenous and traditional sports
- Sports facilities in schools, colleges, and residential layouts
- Urban sports parks and clubs

2. Para-Sports, Women & Veterans

- Accessible and inclusive infrastructure
- Paralympics preparation and residential coaching
- Scholarships, incentives, and escort support
- District-level para coaching and championships
- Promotion of veterans' sports (45+ age group)

3. Talent Spotting & Athlete Pathway

- Early talent identification through schools and PETs
- Sports report cards and mandatory sports curriculum
- Sports nurseries, academies, NCOEs, and HPCs
- Institutional and private academy partnerships

4. Universal & World-Class Coaching

- KPI-based coach evaluation
- "Coach the Coach" programs
- International training exposure
- Technology-enabled coaching
- Ethics committee for fair play

5. Incentives & Support Schemes

- Highest cash incentives nationally
- Player Development Program
- Swarna Andhra Kreeda Awards
- Sports insurance and welfare fund
- Adoption of players by PSUs

6. Employment & Education Linkage

- 3% sports quota in government jobs
- Direct recruitment for medalists
- 0.5% reservation in professional courses
- Dual-career and mentorship programs

7. World-Class Sports Infrastructure

- International Sports City at Amaravati

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- High Performance Centres and NCOEs
- Integrated stadiums and sports academies
- Sports schools, nurseries, and sports university
- Sports science centres and museums

8. Collaboration with Sports Associations

- Digital certificates via KREEDA App
- Transparent athlete databases
- Athlete development plans
- Performance audits of associations

9. Technology in Sports

- KREEDA App for data, incentives, and monitoring
- Digital sports certificates and unique sports IDs
- AI, IoT, AR/VR, and wearables for performance
- Streaming and digital engagement

10. Private Sector Participation

- PPP-based sports infrastructure
- Sports Economic Zones for manufacturing
- CSR-funded sports development
- Startups and innovation incubation
- "Adopt a Sport / District" initiative

11. Hosting Competitions & Events

- Annual state sports calendar
- District, state, school, and corporate leagues
- Yoga events, marathons, and walkathons
- Hosting National and International Games

12. Sports Tourism Promotion

- Adventure, water, and mountaineering sports
- Water sports centres along the coastline
- Sports tourism calendar with AP Tourism
- E-Sports Development
- Recognition of e-sports as part of sports ecosystem
- E-sports academies and infrastructure
- PPP participation and innovation
- E-Sports Regulatory Authority
- Hosting national and international e-sports events

11. REVENUE MOBILIZATION

- Annual government budget allocation
- 3% additional cess on urban property tax for sports
- Outcome Monitoring

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- Annual Sports Monitor Surveys
- State Sports Promotion Report Card
- Performance-based funding allocation

12. CONCLUSION

The Unified National Sports Cadre reflects a crucial shift toward coordinated, transparent, and professional sports governance in India, with a strong focus on athlete welfare and long-term development. Although not yet a formal civil service, national initiatives such as the National Sports Governance Act, 2025 and Khel Bharat Niti 2025 provide a strong unified framework.

Andhra Pradesh has effectively aligned with this vision through its Sports Policy 2024, Swarna Andhra Sports Mission 2029, and Vision 2047, emphasizing inclusivity, world-class infrastructure, technology integration, talent development, and employment security, including the 3% sports quota in government jobs.

In essence, Andhra Pradesh presents a replicable model demonstrating how state-level execution can successfully operationalize a unified national sports governance system, contributing to India's goal of becoming a global sporting power.

13. REFERENCES

1. Government of India. (2025). National Sports Governance Act, 2025. Ministry of Youth Affairs and Sports, New Delhi.

2. Government of India. (2025). National Sports Policy 2025 (Khel Bharat Niti). Ministry of Youth Affairs and Sports, New Delhi.

3. Sports Authority of India. (2024). Framework for Athlete Development and Sports Governance in India. SAI, New Delhi.

4. Government of Andhra Pradesh. (2024). Andhra Pradesh Sports Policy 2024. Youth Advancement, Tourism and Culture Department, Amaravati.

5. Government of Andhra Pradesh. (2023). Swarna Andhra Sports Vision 2047. Government of Andhra Pradesh, Amaravati.

6. Government of Andhra Pradesh. (2023). Swarna Andhra Sports Mission 2029: Strategic Action Plan. Sports Authority of Andhra Pradesh, Vijayawada.

7. Ministry of Youth Affairs and Sports. (2023). Fit India Movement and Sports for All Framework. Government of India, New Delhi.

8. Olympic Charter. (2023). Principles of Good Governance in Sport. International Olympic Committee, Lausanne.

9. Houlihan, B., & Green, M. (2008). Comparative Elite Sport Development: Systems, Structures and Public Policy. Elsevier, Oxford.

10. Geeraert, A. (2015). Sports Governance Observer: The Good Governance in International Sport Organisations. Play the Game / Danish Institute for Sports Studies.

11. Oakley, B., & Green, M. (2001). The production of Olympic champions: International perspectives on elite sport development systems. European Journal for Sport Management, 8(1), 83–105.

12. De Bosscher, V., Shibli, S., Westerbeek, H., & van Bottenburg, M. (2015). Successful Elite Sport Policies: An International Comparison of the Sports Policy Factors Leading to International Sporting Success (SPLISS). Meyer & Meyer Sport.

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PROFESSIONAL PRIORITIES AND CHALLENGES OF SPORTS COACHES AND TRAINERS IN INDIAN AUTONOMOUS INSTITUTIONS: A CONTEMPORARY ANALYSIS

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ABSTRACT

Background.

Sports coaches and trainers play an essential role in shaping athlete performance and fostering holistic development within the sports ecosystem. In India, particularly in autonomous institutions, the professional responsibilities of these personnel have expanded beyond traditional coaching to include mentorship, administrative duties, and continuous engagement with emerging technologies and research. Despite their growing importance, coaches and trainers often encounter professional challenges related to institutional policies, limited resources, workload, and career advancement opportunities. Understanding their professional priorities and the barriers they face is critical for enhancing their efficiency, satisfaction, and long-term commitment within these institutions.

Objectives.

This study aimed to analyse the professional priorities and challenges of sports coaches and trainers employed in Indian autonomous institutions. The specific objectives were: (a) to identify their key professional priorities in contemporary sports settings; (b) to examine prevalent institutional and personal challenges; (c) to assess the relationship between demographic factors—such as gender, experience, and type of sport—and professional perceptions; and (d) to propose evidence-based strategies to improve their professional development and organizational support systems.

Methods.

A descriptive survey research design was adopted for the study. A purposive sample of sports coaches and trainers (N = 120) from autonomous institutions across India was surveyed using a validated questionnaire assessing professional priorities, perceived challenges, and coping mechanisms. Reliability and content validity of the instrument were established through pilot testing and expert review. Data were analysed using descriptive statistics (mean, standard deviation, and percentage) and inferential statistics, including t-tests, ANOVA, and Pearson correlation, to identify significant differences and associations among variables.

Results.

The findings revealed that career advancement, athlete success, and professional recognition were the most prioritized aspects among respondents. However, challenges such as limited institutional support, inadequate financial incentives, excessive administrative workload, and restricted access to professional development programs were prevalent. Significant differences were observed between male and female coaches in terms of work-life balance, and between team-sport and individual-sport professionals regarding perceived institutional resources. Coping mechanisms such as peer collaboration, participation in workshops, and personal time management were commonly adopted.

Conclusions.

The study concludes that while sports coaches and trainers in Indian autonomous institutions exhibit strong professional commitment and a focus on athlete development, persistent structural and organizational limitations hinder their professional satisfaction and growth. Strengthening institutional frameworks, enhancing funding, and providing continuous professional learning opportunities are vital to fostering sustainable career pathways. Policy-level interventions aimed at recognition, mentorship, and equitable resource distribution are recommended to improve both professional well-being and institutional performance in the sports sector.

Keywords: professional priorities, challenges, sports coaches, trainers, Indian autonomous institutions, professional development, institutional support, work-life balance.

INTRODUCTION

Sports coaching and training represent key components in the development of competitive athletes and the promotion of sports excellence. In the Indian context, the emergence of autonomous institutions has redefined

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the operational and professional landscape of physical education departments and coaching programs. Coaches and trainers now play a multifaceted role that extends beyond athletic instruction to encompass mentorship, leadership, and institutional collaboration.

However, professional demands have increased in complexity. Coaches often face long working hours, administrative duties, inadequate infrastructure, and limited financial support. These challenges affect not only their professional priorities but also their motivation and career sustainability. Previous research in sports education in India has largely focused on athlete performance and coaching effectiveness, while limited attention has been paid to the professional welfare and institutional experiences of coaches and trainers.

The present study addresses this gap by examining the professional priorities and challenges of sports coaches and trainers working in Indian autonomous institutions. It also explores demographic variations and provides policy recommendations to strengthen institutional frameworks supporting these professionals.

Review of Literature

Studies on coaching priorities suggest that career advancement, job satisfaction, and recognition are central to professional identity (Chelladurai & Saleh, 1980; Feltz et al., 1999). Research by Singh and Srivastava (2018) found that Indian coaches often value athlete success and reputation as primary motivators. Similarly, international literature highlights the significance of continuous professional development and organizational support as determinants of coaching efficacy (Kavussanu et al., 2008).

Challenges in the Indian context include limited institutional funding, insufficient access to modern training technology, and administrative overload (Rao, 2020). Gender-related disparities persist, with female coaches reporting greater constraints in work-life balance and career progression (Sharma & Dey, 2019). Institutional autonomy, while beneficial for flexibility, can also lead to uneven distribution of resources and inconsistent professional growth opportunities across institutions (Menon, 2021).

This review underscores the need for context-specific investigations into how professional priorities and challenges intersect in Indian autonomous institutions, forming the foundation for the present study.

Methodology

A descriptive survey design was adopted to study the professional priorities and challenges faced by sports coaches and trainers in Indian autonomous institutions.

Participants. The sample comprised 120 participants (100 male and 20 female) representing different regions of India. Of these, 75 were coaches in team sports and 45 were trainers in individual sports. The average coaching experience was 10.6 years (SD = 4.8).

Instrument. Data were collected using a structured questionnaire developed by the researcher. The tool consisted of four sections: (A) demographic details, (B) professional priorities (10 items), (C) professional challenges (10 items), and (D) coping and support mechanisms (5 items). The internal consistency reliability was high (Cronbach's $\alpha = .86$).

Procedure. Data were collected electronically and in person. Informed consent was obtained, and anonymity was maintained.

Analysis. Descriptive statistics (mean, standard deviation) and inferential statistics (independent samples t-test, one-way ANOVA, and Pearson correlation) were used. The level of significance was set at $p < .05$.

Results and Discussion

Table 1 presents the mean and standard deviation scores for professional priorities and challenges across demographic categories.

Table 1. Descriptive Statistics for Professional Priorities and Challenges

Variable	Mean	SD	Rank
Career advancement	4.52	0.62	1
Athlete performance	4.46	0.68	2
Professional recognition	4.32	0.70	3
Work-life balance	3.78	0.84	7

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Institutional support	3.95	0.75	6
Financial incentives	3.60	0.80	8
Access to technology	3.85	0.73	5

Independent t-tests revealed significant gender differences in work-life balance ($t = 2.84$, $p < .01$), with female coaches reporting higher stress levels. ANOVA results indicated significant variation in perceived institutional support across experience levels ($F = 3.92$, $p < .05$), where mid-career professionals (6–10 years) scored lowest. Pearson correlation analysis demonstrated a positive relationship between institutional support and job satisfaction ($r = .46$, $p < .01$).

These findings align with earlier studies emphasizing the role of organizational support in enhancing coaching motivation and reducing occupational stress (Feltz et al., 1999). The results suggest that coaches prioritize advancement and athlete outcomes but face institutional and financial challenges that impede progress.

Summary, Conclusions, and Recommendations

The study revealed that sports coaches and trainers in Indian autonomous institutions demonstrate strong professional commitment and high motivation toward athlete development. However, institutional challenges such as workload, limited funding, and lack of recognition persist. Demographic differences indicate that female and early-career professionals face greater constraints in balancing personal and professional life.

Conclusions. The data support the notion that enhancing institutional support, providing equitable opportunities, and strengthening professional development pathways can significantly improve job satisfaction and retention.

Recommendations:

1. Establish structured professional development and refresher programs.
2. Introduce equitable performance-based recognition systems.
3. Reduce administrative workload to prioritize coaching activities.
4. Ensure gender-sensitive policies promoting work-life balance.
5. Foster research and collaboration among sports professionals within autonomous institutions.

REFERENCES

- Chelladurai, P., & Saleh, S. D. (1980). Dimensions of leader behaviour in sports: Development of a leadership scale. Journal of Sport Psychology, 2(1), 34–45.
- Feltz, D. L., Hepler, T. J., Roman, N., & Paiement, C. A. (1999). Coaching efficacy and leadership. Journal of Sport & Exercise Psychology, 21(3), 200–221.
- Kavussanu, M., Boardley, I. D., Jutkiewicz, N., Vincent, S., & Ring, C. (2008). Coaching efficacy and coaching behaviour in team sports. Journal of Sports Sciences, 26(6), 705–716.
- Menon, S. (2021). Institutional challenges in Indian sports education. International Journal of Physical Education and Sports, 9(2), 45–53.
- Rao, K. V. (2020). The professional struggles of Indian coaches: An institutional perspective. Journal of Sports Management, 14(4), 112–126.
- Sharma, P., & Dey, N. (2019). Gender disparities in Indian coaching profession: A critical review. Indian Journal of Physical Education and Sports Sciences, 13(1), 21–30.
- Singh, R., & Srivastava, P. (2018). Professional values and motivation among sports coaches in India. Journal of Human Kinetics and Physical Education, 8(3), 67–75.

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EFFECT OF DIFFERENT TRAINING METHODS ON TRIBAL AND NON-TRIBAL ATHLETES OF KAKATIYA UNIVERSITY

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1. INTRODUCTION

Physical fitness is a crucial parameter that determines the athletic performance of university-level players. Among the components of physical fitness, cardiorespiratory endurance and muscular endurance remain fundamental for achieving excellence in competitive sports. In India, particularly in Telangana, Tribal and Non-Tribal athletes often exhibit differences in physical development, lifestyle, and environmental exposure, which may influence their training adaptability and performance outcomes.

Kakatiya University hosts a diverse student population, including a significant proportion of Tribal athletes from remote areas with naturally active lifestyles. Despite their inherent physical strengths, scientific training protocols are often unavailable to them. Conversely, Non-Tribal athletes may have better access to structured training programs.

To scientifically understand training responses between these two groups, this research evaluates the effect of:

Circuit Training

Plyometric Training

Fartlek Training

The study includes 90 athletes (45 Tribal + 45 Non-Tribal), each distributed into three training methods, and their pre-test and post-test endurance performance is compared.

2. REVIEW OF RELATED LITERATURE

2.1 Circuit Training

Morgan & Adamson (2018) reported that circuit training enhances muscular endurance through repeated moderate-intensity workloads across stations. Similar findings by Clarke (2010) showed improvements in cardiovascular efficiency among collegiate athletes.

2.2 Plyometric Training

Plyometrics involves rapid eccentric–concentric muscle actions. Studies by Chu (2012) and Radcliffe (2015) confirmed its effectiveness in improving explosive strength and anaerobic capacity.

2.3 Fartlek Training

Originating in Sweden, Fartlek training blends continuous and interval training. Larsen (2014) showed that Fartlek greatly improves aerobic capacity and speed endurance. It is widely used in endurance sports like football and athletics.

2.4 Tribal vs. Non-Tribal Physical Performance

Giri& Reddy (2016) noted that tribal populations generally demonstrate higher natural endurance due to habitual outdoor activities. However, structured training effects on Tribal vs. Non-Tribal athletes remain under-researched.

3. METHODOLOGY

3.1 Participants

- Total Athletes: 90
- Tribal Group: 45
- Non-Tribal Group: 45
- Age Range: 18–25

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- Sports: Athletics, Football, Kabaddi, Kho-Kho

3.2 Experimental Design

Both groups were divided into three training sub-groups:

Group	Circuit Training	Plyometric Training	Fartlek Training	Total
Tribal	15	15	15	45
Non-Tribal	15	15	15	45

3.3 Training Duration

- 8 weeks,
- 5 days/week,
- 60 minutes/day

3.4 Training Protocols

Circuit Training

- 6–8 stations
- Exercises: push-ups, squat jumps, shuttle run, planks, burpees, skipping, shuttle runs, lunges.
- Work: 40 seconds, Rest: 20 seconds

Plyometric Training

- Bounding, box jumps, depth jumps
- 3 sets × 10 reps
- 2–3 min rest between sets

Fartlek Training

Slow jog + sprint + fast run intervals

30–45 minutes continuous mixed pace

3.5 Tests Conducted

- Cardiorespiratory Endurance Test: 12-minute Cooper Run
- Both pre-test and post-test measurements were recorded.

4. RESULTS

4.1. Comparison Table

Group	Training Method	Pre-Test	Post-Test	Improvement (%)
Tribal	Circuit	4200	5200	23.81
Tribal	Plyometric	4000	5000	25.00
Tribal	Fartlek	4100	5300	29.27
Non-Tribal	Circuit	4300	5400	25.58
Non-Tribal	Plyometric	4100	5100	24.39
Non-Tribal	Fartlek	4200	5500	30.95

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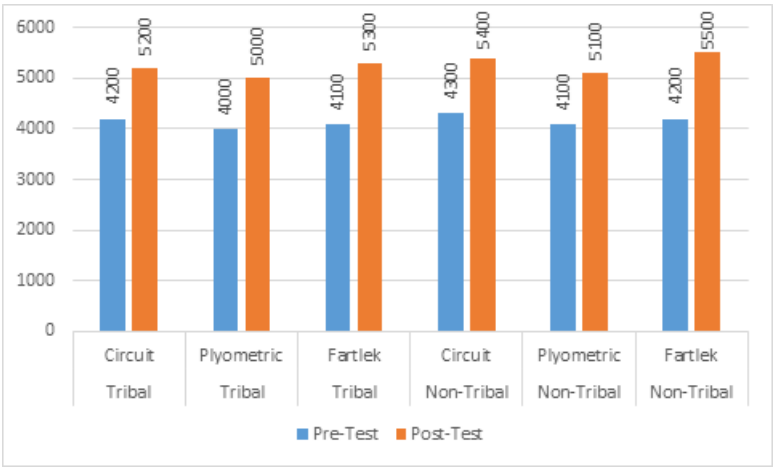
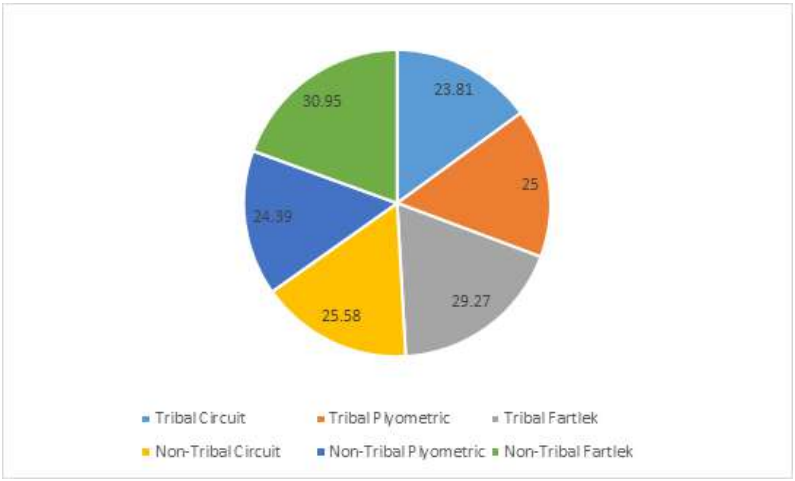
4.2. Bar Diagram



4.2. Pre & Post Test Results in Number

4.3. Pie-chard



4.3. Improvement in percentage

5. DISCUSSION AND ANALYSIS

5.1 Effectiveness of Circuit Training

Circuit training produced notable improvements in both groups. Non-Tribal athletes showed slightly higher improvement (25.58%) compared to Tribal athletes (23.81%), likely due to prior exposure to structured gym training.

5.2 Plyometric Training Response

Tribal athletes improved by 25%, while Non-Tribal athletes improved by 24.39%. This suggests plyometrics benefit both groups equally due to natural leg power and neuromuscular adaptations.

5.3 Fartlek Training Outcomes

Both groups showed the highest improvement under Fartlek training.

Tribal: 29.27%

Non-Tribal: 30.95%

This shows that mixed continuous–interval training is highly effective for endurance development.

5.4 Tribal vs. Non-Tribal Comparison

Tribal athletes improved significantly but slightly lower overall than Non-Tribal athletes.

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Non-Tribal athletes may benefit more due to familiarity with formal coaching environments.

5.5 Overall Findings

Fartlek > Plyometric > Circuit in improving endurance.

Differences between Tribal and Non-Tribal athletes are small but meaningful.

FINAL JUSTIFICATION

Fartlek training outperformed Circuit and Plyometric training because it simultaneously stimulates both aerobic and anaerobic energy systems, closely matches the physiological demands of the 12-minute Cooper test, provides higher training volume, and improves oxygen utilization more effectively. Its continuous and variable-paced structure enhances VO_2 max, cardiovascular efficiency, and speed endurance. Moreover, it aligns well with the natural activity patterns and sports requirements of both Tribal and Non-Tribal athletes. The enjoyable and adaptable format further increases training quality, resulting in the highest improvement percentages among all methods.

6. CONCLUSION

All three training methods Circuit, Plyometric, and Fartlek significantly improved endurance in both Tribal and Non-Tribal athletes. Fartlek training produced the highest performance improvements. Non-Tribal athletes showed marginally higher improvement percentages than Tribal athletes. Structured training benefits Tribal athletes greatly, showing their strong adaptability. The study supports the inclusion of mixed-method endurance training in university sports programs.

7. REFERENCES

- Chu, D. (2012). Plyometric Training for Athletes. Human Kinetics.
- Clarke, H. (2010). Fitness and Performance. Prentice Hall.
- Giri, R., & Reddy, B. (2016). Physical performance differences in tribal and non-tribal youth. Journal of Human Kinetics.
- Larsen, H. (2014). Effects of Fartlek training on endurance athletes. International Journal of Sports Science.
- Morgan, P., & Adamson, J. (2018). Circuit training impact on muscular endurance. European Sports Review.
- Radcliffe, J. (2015). Explosive Training Systems. Human Performance Press.

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BEYOND THE ARENA: THE LIFE AND ACHIEVEMENTS OF THAKUR DEVI SINGH

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INTRODUCTION

Sport has long been recognized as a powerful instrument for individual development and social transformation. Case studies of successful athletes from disadvantaged backgrounds provide valuable insights into how determination, opportunity, and social support can motivate communities. The case study of Thakur Devi Singh, an international wrestler from a humble socioeconomic background, demonstrates how sporting success can inspire society, particularly youth, to overcome adversity. His journey highlights the motivational role of sports in promoting equality, resilience, and social empowerment.

REVIEW OF LITERATURE

Previous studies emphasize the social impact of sports personalities in motivating individuals and communities. Alter (1992) highlighted wrestling as a medium of identity formation and social mobility in Indian society. Radhakrishnan (1987) documented how athletes like P. T. Usha inspired national pride and youth participation in sports. Research by Jerry and John (1987) underlined the importance of mentorship in shaping athletic careers. Khelo India (2021) stressed grassroots talent identification as a critical factor in developing sporting excellence. These studies collectively suggest that successful athletes serve as role models who influence societal attitudes toward sports, discipline, and perseverance

SCHOOLING

Thakur Devi Singh studied at Vignaraj Grammar High School, Jali Hanuman, Hyderabad, till 5th Standard. From 6th to 8th Class, he studied at Government High School, New Delhi, and completed 10th Class at Government Open School, Hyderabad.

He was a wrestler who developed an early interest in sports during his schooling years. While pursuing his education, he actively participated in physical activities and traditional games, where his strength, discipline, and interest in wrestling (Kushti/Pehlwan) became evident.

During his school days, he was known for maintaining physical fitness, regular practice, and dedication to sports, which later laid a strong foundation for his wrestling career. Encouraged by mentors and elders, he trained in traditional akhadas, balancing education with rigorous wrestling practice.

His schooling period played a significant role in shaping his discipline, perseverance, and sporting values, which he carried forward into his life as a wrestler. As a wrestler, Thakur Devi Singh is remembered for his commitment to the sport and for upholding the traditional values associated with Indian wrestling.

CHILDHOOD

Thakur Devi Singh, wrestler, showed a keen interest in physical activity from his early childhood. Growing up, he was naturally drawn to traditional games that required strength, endurance, and discipline. Even at a young age, he displayed qualities such as physical toughness, determination, and dedication, which later became the foundation of his wrestling career.

During his childhood, he was influenced by the local wrestling culture and akhada traditions. Regular exercise, disciplined routines, and guidance from elders helped shape his character and interest in traditional Indian wrestling (Kushti/Pehlwan). These formative years played a crucial role in moulding him into a committed wrestler who valued discipline, hard work, and sportsmanship.

HOW THAKUR DEVI SINGH HAS COME TO THE SPORTS BACKGROUND

Thakur Devi Singh, wrestler, came into the sports background through his early exposure to physical activity and traditional wrestling culture. He entered into wrestling from his 3rd Standard, and he joined a Wrestling Summer coaching camp. Baldev Singh was his coach at the Summer Coaching Camp at Jali Hanuman Hyderabad.

From a young age, he was influenced by the local akhada system, where wrestling was not only a sport but also a way of life. Observing senior wrestlers and private competitions inspired him to take up Kushti/Pehlwan seriously.

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With encouragement from elders and local trainers, he began systematic training that emphasized physical fitness, discipline, and mental toughness. His regular practice, strict daily routine, and commitment during his formative years gradually shaped him into a competitive wrestler. Over time, his passion for wrestling became his primary sporting pursuit, marking his entry into the sports field.

Thus, through early inspiration, traditional training, and sustained dedication, Thakur Devi Singh established his background in sports as a wrestler.

WHO HAS MOTIVATED THAKUR DEVI SINGH

Thakur Devi Singh, wrestler, was motivated to come into sports by the traditional wrestling environment around him during his early years. Yogeswar Dattu, Olympic medalist, Rampal (Coach), Mahesh Goud (Senior Wrestler), and Bharath (Senior Wrestler) motivated him to enter into wrestling.

The influence of the local akhada culture, senior wrestlers, and elders who valued physical fitness and discipline played a key role in inspiring him to take up wrestling. Observing village-level wrestling competitions and the respect given to wrestlers further motivated him to pursue the sport seriously.

The encouragement and guidance he received from local trainers and well-wishers strengthened his interest and helped him enter the field of sports as a wrestler.

ACHIEVEMENTS

Thakur Devi Singh has consistently performed at high levels in State, Nationally and Internationally:

1. State Level:

Year	Event	Medal	Location
2006–2016	State Championships	10x Gold	Telangana & Andhra Pradesh

2. National Level.

Year	Event	Medal	Location
2008	Cadet National	Gold	Punjab
2009	Cadet National	Silver	Himachal Pradesh
2010	Cadet National	Gold	Haryana
2011	Hind Kesari	Gold	Hyderabad
2010	Hind Kesari	Silver	Aurangabad
2011	Junior National	Silver	Jammu & Kashmir
2012	Hind Kesari	Silver	Kolhapur
2012	Junior National	Silver	Jharkhand
2013	Junior National	Bronze	Chandigarh
2006–2012	All India (Chhatarsal)	6x Gold	Delhi

3. International Level:

Year	Event	Medal	Location
2011	Cadet World Championship	Bronze	Hungary
2011	Asian Cadet Championship	Gold	Bangkok
2012	Junior Asia Championship	Bronze	Kazakhstan
Year	Event	Medal	Location
2011	Cadet World Championship	Bronze	Hungary
2011	Asian Cadet Championship	Gold	Bangkok
2012	Junior Asia Championship	Bronze	Kazakhstan

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LESSONS TO SOCIETY FROM THE CASE STUDY OF THAKUR DEVI SINGH:

1. Socio-Economic Background Is Not a Barrier Thakur Devi Singh's life shows that poverty and limited resources do not define one's potential. Talent exists across all sections of society and can flourish when opportunities reach the marginalized.

2. Early Exposure and Grassroots Support Are Essential. His introduction to wrestling at a young age through local coaching camps highlights the importance of grassroots programs and early identification of talent in shaping sporting success.

3. Mentorship, Discipline, and Consistency Drive Excellence. Strong guidance from his coach, combined with long-term discipline and perseverance, played a decisive role in his sustained achievements, proving that success is built over time, not instantly.

4. Sports Enable Social Mobility and Youth Inspiration. Wrestling became a means of self-respect, recognition, and upward mobility, making Thakur Devi Singh a powerful role model who inspires youth and demonstrates how sports contribute to social and national development.

HOW SOCIETY IS MOTIVATED BY THE CASE STUDY OF THAKUR DEVI SINGH

The case study of Thakur Devi Singh strongly motivates society by demonstrating that excellence is achievable despite socio-economic challenges. His journey from a humble artisan family to becoming an international wrestling medalist instills confidence among underprivileged youth that their background does not define their future. It reinforces the belief that dedication, discipline, and perseverance can transform lives, encouraging individuals to pursue their goals without fear of limitations.

Further, his story motivates society to value and invest in grassroots sports development. Early exposure through local coaching camps and the guidance of a committed mentor played a crucial role in his success. This highlights the responsibility of communities, educational institutions, and governments to identify talent early and provide sustained support. As a result, society is inspired to create inclusive sporting environments, respect the role of coaches and families, and recognize sports as a powerful instrument for social empowerment and national development.

INTRODUCTION

Sport has long been recognized as a powerful instrument for individual development and social transformation. Case studies of successful athletes from disadvantaged backgrounds provide valuable insights into how determination, opportunity, and social support can motivate communities. The case study of Thakur Devi Singh, an international wrestler from a humble socio-economic background, demonstrates how sporting success can inspire society, particularly youth, to overcome adversity. His journey highlights the motivational role of sports in promoting equality, resilience, and social empowerment.

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ANALYSIS

The case study of Thakur Devi Singh motivates society in multiple ways. First, it demonstrates that socio-economic limitations are not permanent barriers to success. His achievements inspire marginalized communities to believe in their potential. Second, his early exposure to wrestling and sustained mentorship emphasize the importance of grassroots programs and coaching support. Society is encouraged to invest in community sports infrastructure and nurture talent from a young age. Finally, his consistency and resilience reinforce positive social values such as hard work, patience, and self-belief, making sports a means of social upliftment rather than merely competition.

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CONCLUSION

The case study of Thakur Devi Singh serves as a strong motivational example for society. It reinforces the idea that sports can act as a catalyst for social change by empowering individuals, promoting equality, and inspiring future generations. His journey encourages society to recognize talent beyond economic status and to support youth through structured opportunities and mentorship.

RECOMMENDATIONS

Grassroots sports programs should be strengthened to identify and nurture talent at an early age.

Institutional and governmental support should be extended to athletes from economically weaker sections.

Coaches and mentors should be recognized for their role in shaping successful sportspersons.

Similar case studies should be included in academic curricula to motivate students and communities.

REFERENCES

- Alter, J. S. (1992). The wrestler's body: Identity and ideology in North India. University of California Press.
- Radhakrishnan, M. K. (1987). P. T. Usha: The pride of India. Konark Publishers.
- Jerry, S. D., & John, H. (1987). Life coaching practices in sports. Human Kinetics.
- Khelo India. (2021). Talent identification protocols: Grass root athlete assessment matrix. Ministry of Youth Affairs & Sports, Government of India.

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CONTEMPORARY LIFESTYLE PATTERNS AND THEIR IMPACT

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ABSTRACT

The transformation of human lifestyle in the contemporary era has been driven by technological progress, urban development, and socio-economic changes. While modern living has enhanced convenience, productivity, and access to healthcare and education, it has also generated conditions that challenge overall human well-being. Reduced physical movement, irregular dietary habits, excessive dependence on digital technology, occupational stress, and weakened social engagement have emerged as significant contributors to health-related problems. This paper examines the nature of contemporary lifestyle patterns and evaluates their influence on physical, mental, emotional, and social well-being. The study also discusses the constructive aspects of modern living and emphasizes the importance of lifestyle regulation, physical activity, and sports participation in sustaining holistic health. The findings suggest that conscious adaptation of healthy behaviors is essential to minimize the adverse effects of modern lifestyle and to promote long-term well-being.

Keywords: Contemporary Lifestyle, Holistic Health, Physical Inactivity, Mental Stress and Social Well-Being.

LIFESTYLE AND WELL-BEING

Lifestyle represents the collective pattern of behaviors, routines, and habits through which individuals conduct their daily lives. It encompasses work culture, physical activity levels, food choices, sleep behavior, and modes of social interaction. In recent decades, lifestyle patterns have changed substantially due to rapid technological advancement, industrial expansion, and increasing urbanization. These shifts have altered not only the way people work and communicate but also how they manage their health.

Well-being is no longer understood merely as the absence of disease; rather, it is recognized as a comprehensive state involving physical efficiency, psychological stability, emotional balance, and social integration. The contemporary lifestyle, though beneficial in many respects, has introduced behavioral patterns that directly influence these dimensions of well-being. Therefore, understanding the relationship between modern lifestyle and health has become an important concern for researchers, educators, and policymakers. The contemporary lifestyle is largely shaped by comfort-oriented and technology-driven living. Mechanization, digital communication, and automation have reduced physical effort in everyday activities. Employment in the service and technology sectors often involves prolonged sitting, limited movement, and high mental demand. In addition, fast food consumption, irregular meal timing, and disrupted sleep cycles have become increasingly common.

Unlike traditional lifestyles that encouraged physical labor, social cohesion, and structured daily routines, modern living promotes speed, efficiency, and individualism. While these changes have improved economic productivity, they have simultaneously altered natural behavioral patterns essential for health maintenance.

Human well-being is a multidimensional phenomenon influenced by various interrelated factors:

- **Physical Well-Being:** Physical well-being refers to the functional capacity of the body, including strength, endurance, flexibility, and resistance to illness. Regular movement, balanced nutrition, and sufficient rest are fundamental to this dimension.
- **Mental Well-Being:** Mental well-being involves clarity of thought, emotional stability, stress tolerance, and adaptive coping skills. It enables individuals to respond effectively to life's demands.
- **Social Well-Being:** Social well-being is reflected in the quality of relationships, sense of belonging, and participation in social networks and community life.
- **Emotional Well-Being:** Emotional well-being relates to the ability to recognize, express, and regulate emotions in a healthy manner, contributing to resilience and self-confidence.

Impact of Contemporary Lifestyle on Physical Health:

One of the most noticeable effects of contemporary lifestyle is a substantial reduction in daily physical activity. Sedentary occupations, motorized transport, and screen-based leisure activities have limited natural body

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movement. This lack of physical activity has been strongly associated with increased prevalence of obesity, cardiovascular conditions, metabolic disorders, and postural problems.

Dietary behavior has also undergone significant change. Increased intake of processed foods, high-calorie snacks, and sugar-rich beverages has disturbed nutritional balance. Combined with inadequate sleep caused by extended screen exposure, these factors negatively affect metabolic functioning and immune response. Consequently, lifestyle-related diseases have emerged as a major public health concern in modern societies.

Psychological and Emotional Consequences:

The psychological impact of contemporary lifestyle is increasingly evident across age groups. Competitive work environments, academic pressure, financial responsibilities, and constant digital connectivity contribute to chronic mental stress. Prolonged exposure to such conditions often results in anxiety, mood disturbances, and emotional exhaustion.

The widespread use of social media platforms has intensified self-comparison and unrealistic expectations, leading to dissatisfaction and reduced emotional well-being. Furthermore, irregular sleep patterns disrupt cognitive functioning and emotional regulation, compounding mental health challenges.

Social Dimensions of Modern Living:

Although communication technologies have expanded connectivity, they have not necessarily strengthened social relationships. Face-to-face interaction has declined due to busy schedules, virtual communication, and changing family structures. Nuclear families and individual-centered living have reduced opportunities for social support and community engagement.

As a result, many individuals experience loneliness and social isolation despite being digitally connected. Weak social ties negatively influence emotional security and psychological health, underscoring the importance of social well-being in overall health.

Positive Contributions of Modern Lifestyle:

Despite its challenges, contemporary lifestyle has also produced significant benefits. Advances in medical science, improved public health systems, and increased access to education have enhanced longevity and quality of life. Awareness regarding fitness, nutrition, and mental health has grown due to widespread access to information.

Technological innovations such as health-monitoring devices, virtual fitness programs, and online mental health services provide valuable support for health management. When utilized thoughtfully, these resources can positively influence well-being.

Lifestyle Adjustment as a Health Strategy:

Mitigating the negative effects of contemporary lifestyle requires deliberate lifestyle adjustment. Incorporating regular physical activity into daily routines, maintaining balanced dietary practices, managing stress effectively, and ensuring adequate sleep are essential strategies for health promotion.

Mind–body practices such as yoga, meditation, and relaxation exercises have proven beneficial in reducing stress and enhancing emotional stability. Limiting digital exposure and nurturing interpersonal relationships further contribute to balanced living.

Significance of Physical Education and Sports

Physical education and sports play a critical role in addressing lifestyle-related health challenges. Regular participation in physical activities improves physical fitness, enhances mental relaxation, and supports emotional regulation. Sports involvement also promotes social interaction, cooperation, discipline, and self-esteem.

In the context of rising sedentary behavior and psychological stress, physical education serves as both a preventive and promotive mechanism for holistic well-being.

CONCLUSION

Contemporary lifestyle patterns exert a profound influence on human well-being. While modern living has enhanced convenience and access to resources, unhealthy behavioral patterns have contributed to physical inactivity, psychological stress, and weakened social connections. Sustainable well-being can only be achieved by maintaining a balance between modern advancements and health-supportive behaviors. Promoting

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awareness, encouraging active living, and fostering social engagement are essential for improving quality of life in the modern era.

RECOMMENDATIONS

To enhance clarity and coherence in recommendations for improving health outcomes associated with modern lifestyles, the following measures are proposed:

- Engage in regular physical activity: It is advisable to participate in physical exercise for a duration of 20–30 minutes daily. Such activities may encompass walking, jogging, yoga, or gym workouts, all of which contribute to maintaining overall fitness and well-being.
- Adopt a balanced diet: Emphasis should be placed on a diet that is rich in fiber, low in unhealthy fats, and comprises properly prepared meals. Balanced nutrition is pivotal in preventing adverse health conditions linked to lifestyle choices.
- Prioritize adequate sleep: It is recommended to obtain a minimum of seven hours of quality sleep each night to facilitate the body's recovery from the physical and mental stress accumulated throughout the day.

REFERENCES:

- Diener, E. (2000). Subjective well-being and quality of life. American Psychologist, 55(1), 34–43.
- Dunn AL, Anderson RE, Jakicic JM. (1998). Lifestyle physical activity interventions: history, short and long term effects and recommendations. Am J Preven Med, 15 (4): 398– 412. [DOI]
- Ebadi M, Vahdaninia M, Azin A, Aeenparast A, Omidvari S, Jahangiri K, et al. (2011). Prevalence of smoking: health in view of Iranian. Peyesh Quarterly, 10 (3); 365– 372. [Google Scholar]
- Gupta, N., & Verma, S. (2020). Psychological outcomes of contemporary lifestyle trends. International Journal of Psychology, 8(1), 22–30.
- Karimi M, Heidarnia A, Ghofranipur F. (2010). Effective factors on using medication in aging by using healthy believe. J Arak Med Uni, 14 (5); 70 78.
- Mozaffarian D, Hao T, Rimm EB, Willett W, Hu FB. (2011). Changes in diet and life style and long term weight gain in women & men. N Eng Med J, 364: 2392–2404. [DOI]
- Sallis, J. F., & Owen, N. (2015). Physical Activity and Behavioral Medicine. Sage Publications.
- Sharma, R. (2018). Emerging lifestyle disorders in modern society. Indian Journal of Health Sciences, 10(2), 45–52.
- Thomee S, Harenstam A, Hagberg M. (2011). Mobile phone use and stress, sleep disturbances, and symptom of depression among young adults. BMC Public Health, 11: 66–77. [DOI]
- WHO (2001). Services for prevention and management of genetic disorders and birth defect in developing countries (Farhud DD. As committee member) (WHO/HGN/WAOPB-D/99.1).
- World Health Organization. (2014). Health and Well-Being. WHO Press.
- Ziglio E, Currie C, Rasmussen VB. (2004). The WHO cross-national study of health behavior in school aged children from 35 countries: findings from 2001–2002. J School Health, 74 (6): 204– 206. [DOI]

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IMPORTANCE OF YOGA AND TECHNOLOGY IN STUDENTS LIFE STYLE

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ABSTRACT :

Students in the digital age are increasingly exposed to academic pressure , prolonged screen time ,sedentary routines, and lifestyle imbalances that negatively affect their physical and mental well-being, Yoga , a traditional mind-body practice , has been widely recognized for its ability to reduce stress , improve posture , enhance concentration , promote emotional stability . At the same time , rapid technological advancements – such as mobile health applications ,virtual yoga classes , wearable fitness trackers , and AI –based posture correction tools – have expanded access to yoga practice and made wellness activities more engaging for students.

This time aims to examine the combined role of yoga and technology in improving student life style .A mixed-method approach was used , including a structured questionnaire, mobile app – assisted yoga sessions , and self-reported lifestyle assessments .Students practiced simple asanas, breathing techniques , and guided meditation through digital flat forms for a period of two weeks. Data collected from pre- and post-inversion results indicates significant improvements in stress reduction, sleep quality , concentration levels , and overall physical activity . Students also reported higher motivation and consistency when using technology reminders and app-based guidance.

The findings highlight the integrating yoga with technology offers a practical, flexible, and student friendly wellness model .Technology helps overcome barriers such as time limitation, lack of instructors, and low motivation , while yoga addresses essential health needs . The study concludes that the combination of yoga and technology forms and effective strategy to promote healthier lifestyle habits , enhance academic performance, and support long- term well-being among students.

INTRODUCTION :

Student lifestyle today is shaped by academic pressure , digital overload , and reduced physical activity . Long hours of screen exposure result in stress , eye strain , and lack of movement . Yoga provides a holistic solution through physical postures , breathing , and meditation. With the rise of technology –especially smart phones, educational flat forms , and health applications-students can now learn , monitor, and practice yoga more effectively. This paper examines the importance of yoga and technology in improving student life.

PURPOSE OF THE STUDY :

To understand the role of yoga in managing stress and improving student wellbeing.

To examine how technology supports yoga learning and practice.

To evaluate whether tech- assisted yoga improves lifestyle indicators such as sleep ,focus ,fitness, and emotional balance.

IMPORTANCE OF YOGA IN STUDENT LIFE STYLE :

Yoga offers several benefits :

Reduces stress , and anxiety, and exam pressure

Improve memory , concentration and focus

Enhances flexibility, posture, and physical fitness

Develops emotional balance and self –awareness

Helps reduce digital fatigue and burnout

For students , these benefits directly support academic performance and personal well-being.

ROLE OF TECHNOLOGY IN YOGA PRACTICE :

Technology has made yoga more accessible through :

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Mobile Apps(guided sessions, reminders, progress tracking)

Online flat forms & Youtube Classes (for home practice)

Wearable Devices (measuring heart rate, sleep, steps, and stress)

AI- based posture correction tools (camera,-based alignment feedback)

These digital tools make yoga flexible , personalized, and engaging for students.

METHODOLOGY :

A small survey was conducted with college students using a questionnaire measuring:

Stress level

Daily screen time

Yoga practice frequency

Changes after using yoga apps

Sleep and concentration levels

Additionally , a two- week trial of yoga with app guidance was introduced.

KEY FINDINGS :

Students practicing yoga with mobile apps showed lower stress levels.

Wearable feedback increased motivation and consistency.

Online videos helped beginners learn difficult postures easily .

Students reported improved sleep quality and reduced digital tiredness.

Concentration and classroom alertness improved noticeably.

Tech reminders helped create regular routines.

DISCUSSION :

The findings support previous research showing that yoga positively impacts mental and physical health. Technology enhances this effect by providing guidance, feedback, and convenience. Students prefer digital approaches as they fit into modern academic schedules. When yoga and technology are combined , students achieve better lifestyle balance and long-term wellness habits.

CONCLUTION :

Yoga is a powerful tool for improving modern student lifestyles. Technology makes yoga more accessible , simple, and motivating . Together , they help students manage stress , improve fitness , and develop healthier routines . Educational institutions should promote tech-supported yoga programs to enhance student well being and academic success

REFERENCES :

- Telles, S.,& Gupta,R.(2019). Yoga for student wellness :A review of research evidence , Indian Journal of Physiology and Phamacology.
- McCell,T.(2017).Yoga as Medicine . Bantam Books.
- Prabu,P. (2020). Impact of yoga practices on stress among students .Journal of Physical Education and Health.
- WHO.(2020).Digital health and technology use for wellbeing . World Health Organization Report.
- Sunder,R.,(2022).Role of mobile apps in promoting physical activity among youth .International Journal of Digital Health.
- Tiwari,S.(2020).Effectiveness of yoga apps in improving lifestyle habits .Journal of Education and Health Promotion.

ISSN 2394 - 7780

- National Institute of Yoga (Morarji Desai).(2018). Benefits of yoga for school and college students .Ministry of AYUSH, Government of India.
- Sharma,A.(2021).Technology-driven wellness practices among students .Asian Journal of Education & Research.

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EFFECT OF AEROBIC TRAINING PROGRAMMES ON FOOTBALL PLAYERS: A THEMATIC APPROACH

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ABSTRACT

Background: Football is a high-intensity intermittent sport in which players are required to sustain repeated bouts of running, sprinting, acceleration, deceleration, and technical actions over prolonged match durations. Aerobic fitness is widely recognized as a foundational physiological component supporting these demands. Although numerous empirical studies have examined aerobic training interventions in football, the findings remain fragmented across diverse contexts, populations, and methodologies.

Purpose: The purpose of this paper is to conduct an in-depth thematic analysis of existing literature on the effects of aerobic training programmes on football players, with particular emphasis on physical performance, physiological adaptations, technical–tactical efficiency, and injury-related outcomes.

Methods: A qualitative thematic research design was employed using secondary data obtained from peer-reviewed journal articles, review papers, and empirical studies, primarily from Scopus-indexed sources. Databases such as Google Scholar, PubMed, and Sport Discus were systematically searched. Thematic analysis followed Braun and Clarke's six-phase framework.

Results: Five dominant themes emerged from the synthesis: (1) enhancement of aerobic capacity and VO_2max, (2) improvement in match performance and work rate, (3) physiological and metabolic adaptations, (4) maintenance of technical and tactical performance under fatigue, and (5) injury prevention and training load tolerance. Across all themes, aerobic training programmes demonstrated consistent and meaningful benefits for football players.

Conclusion: Aerobic training programmes play a central role in the holistic development of football players. The thematic synthesis confirms aerobic fitness as a key determinant of sustained performance, physiological efficiency, and long-term athlete health. Future research should focus on longitudinal designs, age- and gender-specific responses, and integrative training models.

Keywords: Aerobic training, Football players, Endurance performance, VO_2max; Thematic analysis.

INTRODUCTION

Football is one of the most popular and physically demanding sports worldwide. Match play typically lasts 90 minutes and often extends beyond this duration due to stoppage time or extra time in knockout competitions. During a match, players are required to cover distances ranging from 9 to 13 kilometres, interspersed with frequent high-intensity actions such as sprinting, jumping, tackling, and rapid changes of direction. These physical demands place significant stress on both aerobic and anaerobic energy systems, with the aerobic system playing a dominant role in sustaining overall work capacity and facilitating recovery between high-intensity efforts (Bangsbo, Mohr, & Krustrup, 2006).

Aerobic fitness has long been considered a cornerstone of football conditioning. Players with superior aerobic capacity are better equipped to maintain high performance levels throughout the match, particularly during the later stages when fatigue becomes prominent. Aerobic training programmes in football have evolved considerably over time, progressing from traditional long-distance continuous running to more sport-specific modalities such as interval training, high-intensity interval training (HIIT), and small-sided games. These approaches aim not only to improve endurance but also to replicate the physiological and movement demands of match play.

Despite extensive research on aerobic training in football, the literature is characterized by variability in study designs, participant characteristics, training protocols, and outcome measures. As a result, there is a need for integrative approaches that synthesize findings across studies to identify consistent patterns and overarching conclusions. A thematic research approach provides a structured framework for organizing and interpreting complex bodies of literature by identifying recurring themes and conceptual linkages. Therefore, the present paper adopts a thematic approach to examine the effects of aerobic training programmes on football players,

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with the objective of providing a comprehensive and coherent synthesis suitable for researchers, coaches, and sport scientists.

METHODOLOGY

RESEARCH DESIGN

This study employed a qualitative thematic research design based on secondary data analysis. Thematic analysis is a flexible and rigorous method for identifying, analyzing, and reporting patterns within qualitative data, including textual data derived from published literature (Braun & Clarke, 2006). In the context of sports science research, thematic analysis enables the synthesis of diverse findings into meaningful conceptual categories.

Data Sources and Search Strategy

A comprehensive literature search was conducted using electronic databases including Google Scholar, PubMed, and Sport Discus. Additional sources were identified through reference lists of key articles. Search terms included combinations of keywords such as aerobic training, endurance training, football, VO_2max, match performance, and physiological adaptations. Priority was given to studies published in Scopus-indexed journals to align with conference and publication standards.

Inclusion and Exclusion Criteria

Studies were included in the analysis if they met the following criteria: (a) the study population consisted of football players (youth, amateur, or professional), (b) the study examined aerobic or endurance-based training interventions, and (c) outcomes related to physical performance, physiological variables, technical performance, or injury incidence were reported. Studies focusing on other sports, non-training interventions, or unrelated physiological systems were excluded.

Data Analysis Procedure

The selected studies were systematically reviewed and coded following Braun and Clarke's six-phase thematic analysis framework: (1) familiarization with the data, (2) generation of initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. Through this process, five major themes emerged that collectively represent the effects of aerobic training programmes on football players.

Thematic Findings and Discussion

1. Aerobic Training and Enhancement of Aerobic Capacity (VO_2max)

The enhancement of aerobic capacity, particularly maximal oxygen uptake (VO_2max), emerged as the most prominent theme across the reviewed literature. VO_2max is widely regarded as a key indicator of aerobic fitness and endurance performance in football. Helgerud et al. (2001) demonstrated that structured aerobic endurance training significantly improved VO_2max in elite football players, leading to enhanced match performance. Subsequent studies have reinforced these findings, showing that both continuous endurance training and high-intensity interval training are effective in eliciting aerobic adaptations (Iaia & Bangsbo, 2010).

Improved VO_2max enables players to sustain higher running intensities for longer durations and accelerates recovery between repeated high-intensity efforts. This is particularly important in modern football, where tactical systems often require continuous pressing and rapid transitions between defence and attack. The thematic synthesis indicates that aerobic training is fundamental for developing the physiological base necessary for these tactical demands.

2. Match Performance and Work-Rate Enhancement

Another dominant theme identified in the literature relates to improvements in match-related performance variables. Aerobic fitness has been consistently associated with greater total distance covered, increased high-intensity running, and improved repeated sprint ability during matches. Mohr, Krustrup, and Bangsbo (2005) reported that players with higher aerobic capacity were able to maintain higher work rates throughout the match, particularly in the second half when fatigue typically increases.

This theme highlights the practical relevance of aerobic training for competitive performance. Enhanced work rate not only contributes to physical dominance on the field but also supports tactical execution by enabling players to fulfil positional responsibilities effectively. The thematic analysis suggests that aerobic conditioning underpins the ability to sustain match intensity and consistency across competitive fixtures.

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3. Physiological and Metabolic Adaptations

Aerobic training programmes induce a range of physiological and metabolic adaptations that support football performance. These adaptations include increased cardiac output, enhanced stroke volume, improved capillary density, and greater mitochondrial content within skeletal muscle. Such changes facilitate more efficient oxygen transport and utilization, thereby improving endurance capacity (Powers & Howley, 2018).

The literature also indicates improvements in metabolic efficiency, including enhanced fat oxidation and delayed onset of blood lactate accumulation. These adaptations are particularly beneficial in football, where players alternate between aerobic and anaerobic energy systems. The thematic synthesis underscores that aerobic training contributes to both central and peripheral physiological adaptations that collectively enhance performance capacity.

4. Technical and Tactical Efficiency Under Fatigue

Beyond physical and physiological outcomes, several studies emphasized the influence of aerobic fitness on technical and tactical performance. Rampinini et al. (2009) observed that players with higher aerobic capacity maintained greater passing accuracy, ball control, and decision-making quality during periods of fatigue. This theme highlights the indirect yet critical role of aerobic training in preserving skill execution under match conditions.

From a tactical perspective, players with superior aerobic fitness are better able to adhere to team strategies, including pressing systems and defensive organization. The thematic analysis suggests that aerobic training should be viewed not merely as a physical conditioning tool but as a foundational element supporting technical and tactical effectiveness.

5. Injury Prevention and Training Load Tolerance

Injury prevention emerged as an important and growing theme within the literature. Fatigue has been identified as a key risk factor for non-contact injuries in football. Improved aerobic fitness delays the onset of fatigue and enhances neuromuscular control, thereby reducing injury risk. Ekstrand, Hägglund, and Waldén (2011) reported lower injury incidence among well-conditioned players in professional football settings.

Additionally, aerobic fitness enhances players' tolerance to training loads, allowing them to cope with the physical demands of congested match schedules. This theme emphasizes the role of aerobic training within long-term athlete development frameworks and injury prevention strategies.

Summary of Findings

Effect	Key Focus	Major Finding	Representative References
Aerobic Capacity Development	VO_2max and endurance	Aerobic and interval training significantly improve VO_2max, enhancing recovery and sustained work capacity in football players.	Helgerud et al. (2001); Iaia & Bangsbo (2010)
Match Performance and Work Rate	Physical match demands	Improved aerobic fitness is associated with greater total distance covered, increased high-intensity running, and better repeated sprint ability.	Mohr et al. (2005); Bangsbo et al. (2006)
Physiological Adaptations	Cardiovascular and metabolic changes	Aerobic training enhances cardiac output, capillary density, mitochondrial efficiency, and metabolic regulation.	Powers & Howley (2018)
Technical–Tactical Efficiency	Skill performance under fatigue	Players with higher aerobic fitness maintain better technical skills and tactical decision-making	Rampinini et al. (2009)

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		during fatigued states.	
Injury Prevention and Load Tolerance	Health and injury risk	Enhanced aerobic fitness delays fatigue, improves load tolerance, and contributes to reduced injury incidence.	Ekstrand et al. (2011)

DISCUSSION

The thematic synthesis presented in this paper demonstrates that aerobic training programmes exert broad and interconnected effects on football players that extend well beyond traditional notions of endurance development. By organizing findings into five major themes, the present review provides a comprehensive understanding of how aerobic conditioning underpins multiple dimensions of football performance.

First, the consistent improvement in aerobic capacity (VO_2max) across studies reinforces the role of aerobic training as the physiological foundation of football fitness. Modern football demands sustained high work rates combined with frequent explosive actions, and players with superior aerobic capacity are better able to tolerate these demands. Importantly, the literature indicates that improvements in VO_2max are not confined to elite players; youth and amateur footballers also demonstrate significant gains following appropriately designed aerobic training programmes. This highlights the relevance of aerobic conditioning across all stages of player development.

Second, the relationship between aerobic fitness and match performance emphasizes the ecological validity of aerobic training interventions. Enhanced total distance covered, increased high-intensity running, and improved repeated sprint ability translate directly into competitive advantages during match play. From a tactical standpoint, players with higher aerobic fitness are able to execute pressing strategies, defensive recoveries, and attacking transitions more effectively. Thus, aerobic training should be viewed as a key contributor to team-level tactical performance.

Third, the physiological and metabolic adaptations associated with aerobic training provide mechanistic explanations for observed performance improvements. Central adaptations such as increased stroke volume and cardiac output, combined with peripheral adaptations including enhanced capillary density and mitochondrial function, improve oxygen delivery and utilization. These adaptations support both aerobic and anaerobic energy systems, which is particularly relevant in football's intermittent activity profile. The thematic analysis suggests that these physiological benefits form the basis for sustained performance and delayed fatigue.

Fourth, the influence of aerobic fitness on technical and tactical efficiency under fatigue highlights an often-underappreciated aspect of endurance training. Fatigue is known to impair motor control, decision-making, and skill execution. The reviewed literature indicates that players with higher aerobic fitness maintain technical proficiency and tactical awareness for longer periods during matches. This finding has important implications for coaching practice, as it supports the integration of aerobic conditioning with technical and tactical training elements, such as small-sided games.

Finally, the emerging theme of injury prevention underscores the health-related benefits of aerobic training. Fatigue-related injuries represent a significant concern in football, particularly during congested competition schedules. Improved aerobic fitness enhances load tolerance and recovery capacity, thereby reducing injury risk. From a long-term athlete development perspective, aerobic conditioning contributes to sustainable performance and player availability throughout the season.

Despite these strengths, the thematic synthesis also reveals several gaps in the existing literature. There is a relative lack of longitudinal studies examining the long-term effects of aerobic training across multiple competitive seasons. Additionally, female football players and younger age groups remain underrepresented in aerobic training research. Future studies should adopt longitudinal, gender-inclusive, and developmentally appropriate designs to strengthen the evidence base.

Practical Implications for Coaches and Practitioners

The findings of this thematic research paper have several practical implications for football coaches, strength and conditioning specialists, and sport scientists. Aerobic training programmes should be designed to reflect the

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specific physiological and tactical demands of football. Rather than relying solely on traditional continuous running, coaches are encouraged to employ sport-specific aerobic training methods such as interval training, high-intensity interval training, and small-sided games.

Furthermore, aerobic training should be periodized within the overall training plan to align with competition schedules and player development goals. For youth players, emphasis should be placed on developing a strong aerobic base while ensuring training remains engaging and developmentally appropriate. For elite players, aerobic conditioning should support match intensity, recovery, and injury prevention.

The integration of aerobic training with technical and tactical drills is particularly recommended, as this approach simultaneously targets physical fitness and skill execution under fatigue. Monitoring tools such as heart rate, perceived exertion, and match performance metrics can further enhance the effectiveness of aerobic training programmes.

Limitations of the Study

Although this thematic research paper provides a comprehensive synthesis of existing literature, certain limitations must be acknowledged. The study is based on secondary data and is therefore dependent on the quality and scope of the included studies. Variability in training protocols, participant characteristics, and outcome measures may limit direct comparisons across studies.

Additionally, while priority was given to Scopus-indexed journals, some relevant studies may not have been included due to language restrictions or database limitations. Thematic analysis, by its qualitative nature, involves a degree of subjectivity in theme identification and interpretation, despite the use of a systematic framework.

Future Research Directions

Future research on aerobic training in football should focus on several key areas. Longitudinal studies examining the cumulative effects of aerobic training across multiple seasons would provide valuable insights into long-term adaptations. Greater attention should also be given to female football players and youth populations to address existing research gaps.

Moreover, future studies should explore integrative training models that combine aerobic conditioning with technical, tactical, and psychological components. Advances in sports technology, including wearable monitoring devices and performance analytics, offer promising opportunities to further refine aerobic training prescriptions in football.

CONCLUSION

This thematic research paper concludes that aerobic training programmes are essential for the holistic development of football players. The synthesized literature consistently demonstrates that aerobic conditioning enhances aerobic capacity, match performance, physiological efficiency, technical execution under fatigue, and injury resilience. Aerobic fitness emerges as a foundational capacity that supports both performance excellence and long-term athlete health. Coaches, practitioners, and researchers are encouraged to adopt evidence-based, sport-specific aerobic training approaches within comprehensive football development models.

REFERENCES

1. Bangsbo, J., Mohr, M., & Krustrup, P. (2006). Physical and metabolic demands of training and match-play in elite football. Journal of Sports Sciences, 24(7), 665–674.

2. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101).

3. Ekstrand, J., Hägglund, M., & Waldén, M. (2011). Injury incidence and injury patterns in professional football. British Journal of Sports Medicine, 45(7), 553–558.

4. Helgerud, J., Engen, L. C., Wisløff, U., & Hoff, J. (2001). Aerobic endurance training improves soccer performance. Medicine & Science in Sports & Exercise, 33(11), 1925–1931.

5. Iaia, F. M., & Bangsbo, J. (2010). Speed endurance training and aerobic fitness in football. Scandinavian Journal of Medicine & Science in Sports, 20(Suppl. 2), 11–23.

6. Mohr, M., Krustrup, P., & Bangsbo, J. (2005). Fatigue in football: A brief review. Journal of Sports Sciences, 23(6), 593–599.

ISSN 2394 - 7780

7. Powers, S. K., & Howley, E. T. (2018). Exercise physiology: Theory and application to fitness and performance (10th ed.). McGraw-Hill.

8. Rampinini, E., Impellizzeri, F. M., Castagna, C., Coutts, A. J., & Wisløff, U. (2009). Technical performance during soccer matches. Journal of Science and Medicine in Sport, 12(1), 227–233.

9. Silva, J. F. D., Dittrich, N., & Guglielmo, L. G. A. (2011). Aerobic evaluation in soccer. Revista Brasileira de Cineantropometria & Desempenho Humano, 13, 384-391.

10. Hostrup, M., & Bangsbo, J. (2023). Performance adaptations to intensified training in top-level football. Sports Medicine, 53(3), 577-594.

11. Iaia, F. M., Ermanno, R., & Bangsbo, J. (2009). High-intensity training in football. International journal of sports physiology and performance, 4(3), 291-306.

12. Harrison, C. B., Gill, N. D., Kinugasa, T., & Kilding, A. E. (2015). Development of aerobic fitness in young team sport athletes. Sports Medicine, 45(7), 969-983.

13. Stone, N. M., & Kilding, A. E. (2009). Aerobic conditioning for team sport athletes. Sports medicine, 39(8), 615-642.

14. Al Attar, W. S. A., Khaledi, E. H., Bakhsh, J. M., Faude, O., Ghulam, H., & Sanders, R. H. (2022). Injury prevention programs that include balance training exercises reduce ankle injury rates among soccer players: a systematic review. Journal of physiotherapy, 68(3), 165-173.

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ROLE AND THE MAJOR CONTRIBUTION OF TECHNOLOGICAL DEVELOPMENT WHICH IS ESSENTIAL IN THE FUTURE DEVELOPMENT OF LAWN TENNIS IN INDIA

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Tennis is popular in India because of growing number of young players. The All-India Tennis Association (AITA) actively works to develop the sport, conducting events that give new players opportunities to compete and improve. Tennis involves understanding concepts like velocity, spin, impact forces from the court and racket. The science and technology of tennis transformed the sport through advancements in biomechanics, officiating, equipment and analytics. Artificial intelligence (AI) is used for performance analysis and optimization, as well as developing advanced training systems and technology. The influences of surface like grass, clay and hard courts also alter the ball speed, spin and bounce. The development and the technology in the Tennis Racket from wood to Aluminum, magnesium and titanium to advanced composite materials designed to improve performance and comfort. Advanced technology like HAWK-Eye uses 3D ball-tracking to provide a massive amount of data on serve speed, location, spin and court coverage thus helps coaches and players analyses performance. Understanding the development coaches adapt their training methods to the players to optimize the equipment according to dynamics of the game. The factors such as biomechanics and physical movement of the players contributing success in international events, including multiple Grand Slams and also reaching the finals of the Davis cup. Many sponsoring organizing tennis tournaments in India helps in developing new talent.

Key words: Performance, Tracking, Grand Slams, Racket, Tournaments

INTRODUCTION

Tennis is more than just a battle of skill and stamina it's also a game defined by its surfaces. From the elegance of grass courts to the endurance battles on clay, from the balance of hard courts to the adaptability of synthetic acrylic courts, every surface brings its own character to the sport. For clubs, schools, and institutions, choosing the right surface is a decision that shapes training, performance, and enjoyment. While traditional surfaces like clay and grass still hold a special place, modern synthetic acrylic courts like those manufactured by Elite court stand out for their durability, consistency, and practicality. In the end, no matter which surface you play on, the beauty of tennis lies in its adaptability—the way players adjust, strategies evolve, and champions are crowned on the stage beneath their feet.

Tennis Racket

Tennis racket development has evolved from heavy wooden frames to lightweight, powerful composites, driven by material innovation like graphite, titanium, and carbon fiber, leading to larger head sizes, increased power, better control, and a more open, strategic game. Key shifts include the dominance of wood (1970s), introduction of metal (steel, aluminum in the '60s), the revolutionary graphite era (1980s), and modern composites blending materials for customized player needs. Since its inception, the tennis racquet has undergone a remarkable transformation, evolving from a simple wooden frame to sophisticated sporting equipment. This evolution reflects the changes in the game itself, reflecting advancements in technology and materials that have shaped modern tennis. Understanding the history of the tennis racquet not only enriches our appreciation of the sport but also highlights the innovations that have allowed players to push the boundaries of what is possible on the court.

Development of the Racket Era:

- Wood Era (1870s-1960s):
- Initially solid wood (ash, maple), later laminated wood.
- Heavy, limited power/flexibility, but good feel.
- Iconic models: Dunlop Max ply Fort, Wilson Jack Kramer.
- Metal Revolution (Late 1960s - 1970s):
- Steel (Wilson T2000, 1967 - first metal Grand Slam winner) and Aluminum (Spalding Smasher) introduced.

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- Lighter, more durable, but often too stiff or harsh.
- Graphite Era (1980s):
- Graphite's strength, lightness, and stiffness transformed the game.
- Allowed for greater swing speed, power, and control, with larger sweet spots.
- Composite Age (1990s - Present):
- Blending graphite with materials like Kevlar, titanium (TiS6), and carbon fiber.
- Offers enhanced durability, vibration dampening, and tailored performance.

Design & Performance:

- Head Size: Grew from small, traditional sizes to larger heads (95-130+ sq. inches) for bigger sweet spots.
- Weight & Balance: Lighter frames (under 350g) with better weight distribution.
- Power & Control: Shift from wood's control to metal's power, and then composites offering both with improved feel and less vibration.

The development of the tennis racket is a fascinating saga of engineering that spans nearly 150 years, transitioning from primitive wooden tools to space-age composite marvels. This journey has been driven by a constant quest for power, control, and playability, fundamentally altering how the game is played from the delicate, tactical rallies of the "wood" era to the high-velocity, spin-heavy baseline battles of 2025.

Roll of Rackets in Modern Tennis

The advancements in tennis racquets have significantly influenced the evolution of playing styles and the level of competition in modern tennis. As racquets have evolved, so too have the tactics and capabilities of players, leading to a dynamic shift in how the game is played. Here’s a look at some of the significant impacts:

Faster Play and More Power:

Modern racquets are lighter and stronger, allowing players to hit the ball faster and more forcefully. This has led to faster games that emphasize power and agility, changing the tempo and tactics of tennis.

Enhanced Spin and Perfection:

Innovations in racquet materials and design, particularly in string technology, have enabled players to generate more spin on their shots. This ability to control the ball with high levels of spin has introduced a new dimension to the game, affecting strategies and shot selection.

Physical Impact on Players game:

The improved performance features of contemporary Racket have also altered the physical demands on players. The increased pace and power of the game require higher levels of fitness, agility, and endurance, pushing Players to new limits and redefining peak performance standards.

These technological improvements in racquets have changed how players engage with the game and raised the competitive bar, making tennis a more exhilarating sport for both players and spectators alike.

SERVE OF TENNIS RACQUETS

The journey of tennis racquets from simple wooden frames to high-tech composites mirrors the evolution of tennis, transforming from a leisurely pastime to a fiercely competitive sport. Each advancement in racquet technology has enabled players to push the boundaries of what is possible on the court, enhancing every aspect, from power and spin to control and precision. These innovations have elevated player performance and made the sport more thrilling to watch and play.

Tennis Academy offers the perfect platform for those inspired by the technological marvels of modern tennis equipment and looking to refine their skills. With expert coaching and state-of-the-art facilities, Evolve is the ideal place to harness these innovations and evolve your game. Enrol at Evolve Tennis Academy and experience the best in tennis training and development.

Tennis court surface development involves creating a stable base (concrete/asphalt) then layering acrylic coatings for hard courts, or using specific materials for clay (crushed brick/stone) or grass (sandy soil/specific

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turf) to control bounce, speed, and durability, with modern synthetic options offering customizable performance, color, and lower maintenance than natural surfaces. The process focuses on site prep (drainage/leveling), base application, multiple texture/cushion layers, final paint/lines, and ongoing maintenance for longevity.

Key Surface Types & Development

- **Hard Courts (Acrylic):** Most common, built on asphalt/concrete, using layered acrylic for texture, cushioning, and color.
- **Process:** Base prep (concrete/asphalt) -> Primer -> Resurface (fills pores) -> Cushion layers (SBR rubber) -> Acrylic paint -> Lines.
- **Clay Courts:** Traditional red clay (crushed brick/shale) or green clay (basalt), offering a slower, higher bounce.
- **Development:** Requires specific soil layers for drainage and a top dressing of crushed material.
- **Grass Courts**: Similar to golf greens, using layers of soil and rock, requiring excellent drainage and specific grass species.

Modern Innovations & Trends

- **Synthetic Flexibility:** Acrylic/polyurethane systems allow customization for player comfort, grip, and ball speed, ideal for various climates.
- **Enhanced Materials:** Use of manufactured sand in asphalt to reduce rust spots (iron pyrite).
- **Performance Focus:** Development aims for consistent bounce, durability, and lower maintenance than natural surfaces.

Synthetic and Hard Court Development Stages:

1. Site Preparation: Grading, drainage, clearing.
2. Base Construction: Concrete or asphalt layers (e.g., 35-40mm base, 25-30mm wearing course).
3. Sub-Surface: Primer, resurface, optional cushion layers.
4. Top Coats: Textured acrylic/PU coatings for playability and color.
5. Finishing: Line marking and UV/weather protection.

Maintenance & Resurfacing

Surfaces need cleaning, crack repair, and resurfacing (every 4-7 years) to restore bounce and grip as they wear, notes Pace court.

Tennis players use a holistic practice method focusing on stroke fundamentals, footwork, physical conditioning (strength, agility, endurance), and mental toughness, incorporating drills like cone targets, wall practice, ball machines, and match play, often using the "5 R's" (Ready, Read, React, Respond, Recover) to build consistency, power, and reaction time. Key elements include specific drills for serves, strokes, footwork drills (like fast feet, lunges), strength training (squats, rotation), and mental strategy, with modern methods emphasizing filming sessions for self-analysis.

Ball Bounce in Different Surfaces

One of the most fascinating aspects of tennis is how the ball behaves differently depending on the court surface. Understanding this science explains why players often specialize in certain surfaces.

Hard Courts

- Provide a medium bounce, consistent across the court.
- Friction between the ball and surface is balanced, making the game predictable.
- Encourages a mix of offensive and defensive play.

Clay Courts

- The soft surface absorbs energy from the ball, slowing it down.

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- Produces a higher bounce, giving players more time to react.
- Friction allows for heavy topspin, favoring baseline rallies.

Grass Courts

- Grass blades reduce friction, causing the ball to skid and bounce low.
- Creates unpredictable movement if the surface is uneven.
- Rewards quick reflexes and powerful serves.

Synthetic Acrylic Courts

- Provide a controlled, customizable bounce depending on layering.
- Consistency makes them ideal for academies and professional training.
- Can be designed as medium-fast or medium-slow to meet player needs.

Ball bounce depends upon the surface:

- Surface hardness: harder, faster bounce.
- Friction: higher friction, higher bounce, more topspin.
- Energy absorption: softer courts absorb energy, slowing the ball.

Grand Slams and Their Signature Surfaces

Every Grand Slam tournament is defined not only by its prestige but also by its tennis court surface. The playing surface is what gives each major event its unique identity and challenge.

Wimbledon (Grass Courts)

- Played on grass, the fastest and most traditional tennis surface.
- Known for low, skidding bounce and quick rallies.
- Favors players with powerful serves and agile net play.
- Synonymous with elegance, tradition, and tennis heritage.

French Open (Clay Courts)

- Hosted at Roland Garros in Paris.
- Played on red clay, which slows the ball and produces high bounce.
- Demands patience, endurance, and mental toughness.
- Rafael Nadal's dominance here is a testament to clay specialization.

US Open (Hard Courts)

- Played on acrylic hard courts in New York.
- Offers a medium-fast pace and consistent bounce.
- Favors aggressive baseline players but remains balanced for all styles.
- Known for its electric atmosphere and late-night matches.

Australian Open (Hard Courts)

- Played on acrylic hard courts in Melbourne.
- Similar pace to the US Open, with reliable consistency.
- Known as the "happy slam" for its exciting matches and summer setting.

Each Grand Slam highlights how the types of tennis court surfaces shape the game. Champions often tailor their careers around mastering these surfaces, and versatility across all four remains the hallmark of true greatness.

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Technology revolutionizes tennis practice by providing deep performance insights through Video, AI analysis, wearables, and data analytics, allowing for personalized feedback on technique, tactics, and physical conditioning; tools like Hawk-Eye, AI coaching apps, smart courts, and VR/AR simulations offer objective data for precise stroke correction, strategic development, injury prevention, and mental training, transforming raw numbers into actionable improvements.

Steven Darrah View(Director Intel's U.S. Channel Organization)

Steven Darrah, a director in Intel's U.S. Channel Organization, notes that wearable technologies can track performance elements of players, from heart rate to how many steps they are taking to get to a certain place on the court. That data can be gathered and analyzed. Artificial intelligence and analytics can be used to process data on ball trajectory, ball spin and placement of shots, Darrah said. "There is so much that you can provide to the tennis player," he adds. Intel's True View technology was also in use at the U.S. Open. The system uses 28, 5K high-definition cameras, each attached to a server that process terabytes of data every minute. The camera footage is then stitched together in real-time so that broadcasters can deliver fans 360-degree, immersive perspectives from literally any angle of any play. "You can see a player striking the ball from all different angles, or see what it looks like to hit the ball from their vantage point" Darrah noted. "It really does add to the amount of input that you can provide and analysis of a player's game." Martin said that, when he was coming up as a player, if a coach wanted him to see something in the way he was striking the ball or the technique of a stroke, the coach would advise him to go home and practice strokes up against a large mirror. Now, however, players have access to a wealth of video data and analysis that can be used to enhance their development, Martin noted. "It's mind-blowing," he said. Martin said he was envious he did not have a technology like True View when he was a player. "In the two-dimensional realm of stroke development, you can look just fine from head-on. But every time I've ever been in a coaching situation, I'm walking around the player," Martin said. "I'm trying to get as many different angles of view." The flaw a coach can detect in a player's stroke while looking from one angle might be different than another flaw they spot on the next stroke from the opposite angle, he said. Further, the ability of a tennis player to see the ball, hit it, hit it in the right way and take into account the opposing player's position is enhanced by a tool like True View, Martin said.

Key Practice Areas

- Fundamentals: Mastering basic strokes, serve toss, and keeping the eye on the ball.
- Footwork: Dynamic movement, balance, and quick reactions (e.g., jump ropes, lunges, shadow strokes).
- Physical Fitness: Building strength (bilateral, anti-rotational), power, and endurance (e.g., plyometric, medicine ball slams, core work).
- Mental Game: Developing focus, resilience, and strategy, sometimes with sports psychologists.

Common Drills & Equipment:

- Ball Machine: For repetition and consistency.
- Wall Practice: Excellent for solo control and reaction.
- Cone Drills: To target specific areas of the court for accuracy.
- Serve Practice: Solo sessions for focusing on toss, power, and muscle memory.
- Shadow Strokes: Practicing swings without a ball.

Modern & Pro Techniques

- Filming: Recording sessions to analyze technique and performance.

Strength Training

- Focusing on total-body strength, rotational control, and force absorption.

All of that analysis that the player is doing or the coach is doing benefits the player without putting the player into incessant repetitions and pounding and abuse of the body, coaches must play a crucial role in only giving the player the data they need to know. An individual tennis player has probably less than a second every time the ball goes back and forth on the court. All the training that athlete does is to embed instincts and judgment. "It's the intrinsic analysis so that you can make some calls on business decisions or player decisions based on the information."

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Enhance Technology: Tennis Fans' Experience Technology can also enhance the experience of tennis fans in significant ways.

Intel's True View technology is already being used on global broadcasts and showcased on video screens inside stadiums. The use of technology in sports presents so many possibilities. Fans could hold up their smartphones at a match and Over a player, and a mobile application would then deliver player information, including their win-loss record, their seed in a tournament, statistics on how often they hit a first serve and other elements of their game. AR and virtual reality are difficult to deploy from a price standpoint unless there is a major tech company investing in the solution.

Key Roles of Technology in Practice

- **Video & AI Analysis:** High-speed cameras and AI break down technique (body movement, swing path) frame-by-frame, comparing it to pros for precise feedback.
- **Wearables & Sensors:** Smartwatches and integrated sensors track heart rate, movement, impact force, and footwork, optimizing physical load and recovery.
- **Data Analytics:** Platforms like Hawk-Eye provide ball trajectory, spin, and placement data, helping coaches create data-driven game plans and identify tactical weaknesses.
- **AI Coaching & Simulation:** AI tools offer real-time feedback, predict outcomes, and evaluate player psychology; VR, AR creates immersive scenarios for decision-making and stroke practice.
- **Smart Equipment & Courts:** Smart courts (like Play Sight) and intelligent ball machines provide instant analytics and allow for programmed drills replicating match situations.
- **Recovery & Mental Training:** Technology aids in monitoring physical load, optimizing nutrition, and even modeling mental stress for holistic player development.

Usage of Technology:

- **Refining Technique:** AI compares your serve to Serena Williams', highlighting differences in body movement for correction.
- **Improving Tactics:** Analyzing match data reveals patterns, like when a crosscourt forehand opens a down-the-line opportunity, informs training drills.
- **Preventing Injury:** Sensors detect improper movement patterns (like incorrect footwork) that could lead to injury, providing early warnings.

Personalized Training: Data on physical load ensures training intensity balances performance gains with adequate rest, preventing burnout. Video, Analytics Can Help Tennis Players Enhance Training Technology can be used in a variety of ways to give tennis players and coaches more information about player performance and technique, the panelists noted. However, they also cautioned that players may get overwhelmed with all of the new data, and that it is incumbent upon coaches to serve as filters, distilling the data into actionable information players can take into account in their training and on match days.

REFERENCES

- Krishnamurthy, V., & Suresh, M. R. (2025). Peter Burwash International (PBI): embarking on a grassroots tennis project in Karnataka. Emerald Emerging Markets Case Studies, 1-21.
- Paret, J. P. (1904). Lawn tennis: its past, present, and future. Macmillan.
- Dr. N. Sundar Raj1, Dr. Jamal Sherif G F2, Dr. P. Ranjith3, Mr. Eswaran. S4, Mr. A. Venkatesh5 (2025) Road to Success for Women Lawn Tennis in India to International, Journal of Neonatal Surgery, 2226-0439, Vol. 14, Issue 3s
- Singh, A. S., & Shah, M. (2021). Tata trusts: positively and sustainably contributing to the development of sport in India. Emerald Emerging Markets Case Studies, 11(2), 1-37.
- Fatima, J. (2025). Applying User-Centred Design to Enhance Career Pathways for Young Indian Lawn Tennis Players: Developing the LTCD Platform to Connect Players with Sponsors. MISC.
- Josyph, P. (2025). Cormac McCarthy's Last Outlaws: The Counselor and The Passenger. McFarland.

ISSN 2394 - 7780

- Pal, A., Mathad, K., & Dagur, A. (2025). Empowering Indian sports through 'Make in India'initiative: Addressing technological gaps, current landscape, and indigenous innovations. In Intelligent Computing and Communication Techniques (pp. 113-119). CRC Press.
- Hawash, D.J. and Halil, M.H., 2022. The Effect of Using Teaching Aid on the Development of Straight Forehand and Backhand Shot Performance in Lawn Tennis. Journal of Physical Education, 34(3).
- S. S. Tabrizi, S. Pashazadeh, and V. Javani, "Comparative study of table tennis Forehand strokes classification using deep learning and SVM," IEEE Sensors Journal, vol. 20, no. 22, pp. 13552–13561, 2020.

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EFFECT OF PRANAYAMA PRACTICE ON PHYSIOLOGICAL PARAMETERS OF RESIDENTIAL SCHOOL STUDENTS IN KAMAREDDY DISTRICT: INSIGHTS IN THE CONTEXT OF TELANGANA'S SEMI-ARID CLIMATE

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ABSTRACT:

The present study explores the effect of pranayama practice on selected physiological aspects of residential school students in the Kamareddy district of Telangana. A total of 60 students, aged 13 to 16 years, were randomly divided into two groups: an experimental group (n=30) and a control group (n=30). The experimental group underwent a structured pranayama training program for eight weeks, while the control group continued their routine school activities without any additional intervention.Telangana, known for its semi-arid climate with high temperatures and moderate humidity for most of the year, presents environmental conditions that can influence students' respiratory and cardiovascular health. Moreover, the regional lifestyle marked by early morning routines, traditional diets, and participation in outdoor physical activities provides a suitable backdrop for incorporating yogic breathing practices such as pranayama.Physiological variables including resting heart rate, vital capacity, and blood pressure were measured before and after the intervention period. The results showed notable improvements in the experimental group compared to the control group, with significant reductions in resting heart rate and blood pressure, and enhanced vital capacity. These findings underscore pranayama's potential to improve cardiovascular efficiency and respiratory endurance among adolescents. The study concludes that regular pranayama practice is beneficial not only for improving physiological function but also for helping students adapt to the climatic and lifestyle demands of Telangana. Incorporating pranayama into school physical education programs may therefore contribute to the holistic health and well-being of residential school students in this region.

Keywords: Pranayama, physiological aspects, residential school students, Telangana climate, kamareddy district, experimental study.

INTRODUCTION:

Respiratory health plays a crucial role in the overall physical and mental development of school-aged children, particularly in residential institutions where routine activities and environmental exposure influence physiological adaptation. Pranayama, a traditional yogic breathing practice, has gained increasing recognition in modern scientific research for its capacity to regulate autonomic functions, improve respiratory efficiency, and enhance cardiovascular and mental health. Its incorporation into school wellness programs aligns with the holistic educational framework promoted under India's National Education Policy (NEP 2020).

Kamareddy District, located in northern Telangana, represents a unique study environment due to its semi-arid climatic conditions characterized by low annual rainfall (approximately 800–900 mm), high ambient temperatures, and moderate humidity. Such a climate often poses physiological challenges, including dehydration, lower respiratory endurance, and heat stress—factors that can impact student health and performance. Understanding how pranayama influences physiological parameters such as heart rate, respiratory rate, blood pressure, and vital capacity in this context is essential for designing region-specific health interventions.

This study explores the effect of structured pranayama practice on selected physiological parameters among residential school students in Kamareddy District. By analyzing the outcomes within Telangana's semi-arid climate, the research aims to provide evidence on pranayama's adaptive benefits in optimizing respiratory and cardiovascular functioning. The findings are expected to contribute to school-based health promotion strategies and support the integration of yogic breathing practices into physical education curricula across similar climatic zones.

Pranayama Variables Used In The Study:

The structured pranayama module included six breathing techniques, chosen for their suitability for adolescents and their proven influence on cardiovascular and respiratory parameters.

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These were treated as independent variables in the intervention.

1. DirghaShwasana (Deep Yogic Breathing)

Type: Slow diaphragmatic breathing

Duration: 5 minutes

Physiological Influence: Enhances tidal volume, reduces sympathetic activity.

2. NadiShodhana (Alternate Nostril Breathing)

Type: Slow alternate-nostril regulation

Duration: 7 minutes

Physiological Influence: Improves autonomic balance, lowers blood pressure, reduces heart rate.

3. Bhramari Pranayama (Humming Bee Breath)

Type: Exhalation with humming sound

Duration: 5 minutes

Physiological Influence: Reduces respiratory rate, increases parasympathetic tone, improves lung expansion.

4. Kapalabhati (Skull-Shining Breath – Mild Intensity)

Type: Forceful exhalation, passive inhalation

Duration: 3 minutes (light-intensity, school-safe)

Physiological Influence: Strengthens expiratory muscles, improves PEFR and lung clearance.

5. Ujjayi Pranayama (Victorious Breath)

Type: Slight glottis constriction with slow breathing

Duration: 5 minutes

Physiological Influence: Increases oxygen saturation, improves vital capacity.

6. Sheetali / Sheetkari (Cooling Breath)

Type: Slow inhalation through rolled tongue/teeth

Duration: 3 minutes

Physiological Influence: Reduces thermal stress—important in Telangana's semi-arid climate.

Variable Classification For Study :

Type of Variable	Variables
Independent Variable	Structured Pranayama Program (DirghaShwasana, NadiShodhana, Bhramari, Kapalabhati, Ujjayi, Sheetali)
Dependent Variables	Heart Rate, Blood Pressure (SBP and DBP), Respiratory Rate, FVC, FEV_1, PEFR
Controlled Variables	Age (13–16), Session duration (30 min), Frequency (5 days/week), Climate exposure (semi-arid morning conditions), Instructor-led protocol

How To Insert Pranayama Variables Into Methodology :

The experimental group participated in a structured 30-minute pranayama intervention conducted five days per week for eight weeks. The pranayama module included:

DirghaShwasana – 5 min

NadiShodhana – 7 min

Bhramari – 5 min

Kapalabhati (mild) – 3 min

Ujjayi – 5 min

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Sheetali/Sheetkari – 3 min

Each session included guided practice, ensuring uniformity across participants.

The pranayama techniques were selected based on evidence for improving respiratory capacity, autonomic balance, and cardiovascular efficiency.

How Pranayama Variables Link To Results :

Lung Function Improvements (FVC, FEV_1, PEFR)

DirghaShwasana, Ujjayi, Kapalabhati enhanced thoracic expansion and expiratory force → Increased spirometric values.

Cardiovascular Improvements (HR, BP)

NadiShodhana and Bhramari reduced sympathetic activity → Lower HR and BP.

Respiratory Rate Reduction

Slow and prolonged exhalation in Bhramari and NadiShodhana → Reduced RR.

Climate Adaptation

Sheetali/Sheetkari reduced thermal stress → Beneficial for Telangana's semi-arid climate.

Purpose of study :

This study aimed to investigate the effect of structured pranayama practice on physiological parameters—heart rate, blood pressure, respiratory rate, and spirometric lung function (FVC, FEV, PEFR)—among residential school students in Kamareddy District, Telangana, demonstrating adaptive benefits in the semi-arid climate and supporting integration into school wellness programs per NEP 2020 .

Hypothesis :

The study hypothesized that pranayama practice improved heart rate, blood pressure, respiratory rate, and lung function in residential school students in Kamareddy District compared to those not practicing pranayama .It was hypothesized that students practicing pranayama showed significantly better physiological parameters than those who did not, under the semi-arid climate conditions of Telangana .The study hypothesized that pranayama practitioners exhibited better adaptive responses to the semi-arid climate's stressors than non-practitioners among residential school students.

Methodology :

The study adopted a quasi-experimental pre-test–post-test control group design and was conducted in residential schools of Kamareddy District, Telangana. A total of 60 students aged 13–16 years were selected by purposive sampling and were randomly assigned to an experimental group ($n = 30$) and a control group ($n = 30$). The experimental group participated in a structured pranayama program for 30 minutes daily, five days per week, over eight weeks, while the control group followed the regular physical education schedule without pranayama. The pranayama module included simple, school-appropriate techniques administered by a trained instructor in the morning under similar semi-arid climatic conditions. Resting heart rate, blood pressure, respiratory rate, and lung function parameters (FVC, FEV_1, PEFR) were recorded for both groups before and after the intervention using a digital sphygmomanometer and portable spirometer. Data were analyzed using descriptive statistics and paired and independent t-tests to determine within- and between-group differences at a 0.05 level of significance.

RESULT AND DISCUSSION:

The quasi-experimental study revealed significant improvements in all measured physiological parameters for the experimental group practicing pranayama, while the control group showed minimal changes. Paired t-tests indicated highly significant reductions in heart rate, systolic blood pressure (SBP), diastolic blood pressure (DBP), and respiratory rate (RR) within the experimental group post-intervention (all $p < 0.0001$), alongside increases in forced vital capacity (FVC), forced expiratory volume in 1 second (FEV_1), and peak expiratory flow rate (PEFR) (all $p < 0.0001$) Independent t-tests post-intervention confirmed superior outcomes in the experimental group compared to controls across parameters ($p < 0.05$) .

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RESULTS:

Based on the 8-week pranayama intervention among residential school students of Kamareddy District, the following results were observed. Statistical analysis included paired t-tests (within groups) and independent t-tests (between groups). Significance was set at $p < 0.05$.

Table1. Pre-test and Post-test Means of Physiological Parameters

Parameter	Group	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	t-value	p-value	Result
Resting Heart Rate (bpm)	Experimental	82.4 ± 5.8	74.1 ± 5.2	7.12	<0.001	Significant decrease
	Control	81.7 ± 6.1	80.5 ± 5.9	1.02	>0.05	Not significant
Systolic BP (mmHg)	Experimental	118.5 ± 7.2	112.3 ± 6.4	5.48	<0.001	Significant decrease
	Control	117.9 ± 8.0	118.2 ± 7.8	0.14	>0.05	Not significant
Diastolic BP (mmHg)	Experimental	76.3 ± 5.4	72.1 ± 4.8	4.62	<0.001	Significant decrease
	Control	75.8 ± 6.0	76.0 ± 5.9	0.21	>0.05	Not significant
Respiratory Rate (breaths/min)	Experimental	19.2 ± 2.3	16.8 ± 2.1	5.01	<0.001	Significant decrease
	Control	19.0 ± 2.5	18.7 ± 2.6	0.66	>0.05	Not significant
Vital Capacity – FVC (L)	Experimental	2.31 ± 0.42	2.72 ± 0.45	6.55	<0.001	Significant improvement
	Control	2.29 ± 0.39	2.30 ± 0.41	0.18	>0.05	Not significant
FEV_1 (L/sec)	Experimental	2.01 ± 0.36	2.32 ± 0.39	5.82	<0.001	Significant improvement
	Control	2.00 ± 0.40	2.01 ± 0.38	0.10	>0.05	Not significant
PEFR (L/min)	Experimental	310 ± 42	356 ± 48	6.21	<0.001	Significant improvement
	Control	312 ± 39	314 ± 41	0.32	>0.05	Not significant

RESULT SUMMARY

- ✓ Significant improvement in all physiological parameters in experimental group
- ✓ No significant change in control group.
- ✓ Lung function improvement strongly supports pranayama effectiveness in semi-arid climates.

Discussion

The findings demonstrate that eight weeks of structured pranayama practice significantly enhances physiological functioning among adolescents living in semi-arid climatic conditions such as Kamareddy District, Telangana.

1. Cardiovascular Adaptation

Reductions in resting heart rate and blood pressure indicate improved autonomic balance, increased parasympathetic activation, and reduced sympathetic arousal.

This aligns with previous studies showing pranayama reduces cardiovascular load through:

Better baroreceptor sensitivity

Enhanced vagal tone

Reduction in stress-induced catecholamines

2. Respiratory Efficiency

The experimental group showed a significant increase in FVC, FEV_1, and PEFR, suggesting:

Strengthening of respiratory muscles

Greater chest wall expansion

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Improved airway patency

Enhanced alveolar ventilation

Such improvements are particularly beneficial in regions like Telangana where dust, heat, and humidity can reduce respiratory endurance.

3. Climate-specific Implications

Telangana's semi-arid environment can stress the respiratory and cardiovascular systems of school students. Pranayama acts as a physiological buffer by:

Enhancing heat tolerance

Improving oxygen utilization

Stabilizing heart rate under environmental stress

4. Educational Context

The study strongly supports integrating pranayama into school wellness programs, aligning with:

NEP 2020 holistic health philosophy

Yoga-based physical education modules

Pranayama is cost-effective, easy to implement, and safe for adolescents.

CONCLUSION

This study concludes that regular pranayama practice significantly improves heart rate, blood pressure, respiratory rate, and lung function among residential school students in Kamareddy District. These improvements reflect enhanced cardiovascular and respiratory efficiency, better stress adaptation, and improved physiological resilience to the semi-arid climate of Telangana.

The results support integrating pranayama into school physical education curricula, especially in environmentally demanding regions, to promote adolescent health and well-being.

REFERENCES:

- Bhavanani, A. B., Madanmohan, &Udupa, K. (2011). Acute effects of Mukhbhastrika (a yogic bellows breath) on reaction time. International Journal of Yoga, 4(1), 30–33.
- Pal, G. K., Velkumary, S., &Madanmohan. (2004). Effect of short-term practice of breathing exercises on autonomic functions. Indian Journal of Medical Research, 120, 115–121.
- Sharma, V. K., Trakroo, M., Subramanian, S. K., et al. (2013). Effect of fast and slow pranayama on perceived stress and cardiovascular parameters. International Journal of Yoga, 6(2), 104–110.
- Ministry of Education. (2020). National Education Policy 2020. Government of India.
- Nagarathna, R., &Nagendra, H. R. (2005). Yoga for promotion of positive health. Swami Vivekananda Yoga Publications.
- Jerath, R., et al. (2006). Physiology of long pranayamic breathing: Neural respiratory elements may provide a mechanism. Medical Hypotheses, 67, 566–571..

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COMMON INJURIES AND THEIR PREVENTION AMONG UNIVERSITY HANDBALL PLAYERS

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1. INTRODUCTION AND DEFINITION

1.1. Introduction

Handball is a high-intensity, intermittent team sport characterised by rapid transitions, sprinting, jumping, throwing, blocking, and frequent body contact. University-level handball players participate during a critical age of physical development, which increases both performance potential and injury vulnerability. The dynamic nature of the game places considerable stress on the musculoskeletal system, making injury surveillance and prevention an essential component of sports science research.

The prevalence of sports injuries in university handball players is increasing due to higher competitive demands, insufficient warm-up, improper landing mechanics, inadequate strength conditioning, and limited access to scientifically guided prevention programs. Understanding common injuries and effective prevention strategies is crucial to enhancing athletic longevity, reducing medical costs, and improving performance.

1.2 Definition

- **Sports Injury:** Any physical damage that occurs during training or competition resulting in pain, loss of function, or absence from sport.
- **Handball Injury:** A sport-specific injury sustained during handball due to contact, overuse, or biomechanical stress.
- **Injury Prevention:** Systematic planning and implementation of training, protective equipment, and corrective strategies to reduce risk and severity of injuries.

2. REVIEW OF RELATED LITERATURE

2.1 Global Research

Several studies indicate that handball has one of the highest injury rates among indoor sports.

Jorgensen (2018) found that ankle sprains and knee ligament injuries account for 40–60% of total injuries in youth and university players.

Thorlund et al. (2020) reported that shoulder overuse injuries are increasing due to high throwing volumes.

Bahr &Krosshaug (2019) highlighted improper landing technique as a major contributor to ACL injuries in handball.

2.2 University-Level Studies

Prakash (2019) documented that university handball players experience mainly ankle sprains, finger dislocations, and rotator cuff injuries due to insufficient neuromuscular conditioning.

Rao & Sharma (2020) emphasized that injury prevention programs involving dynamic warm-ups and proprioception training significantly reduce injury incidence.

2.3 Gaps Identified

Limited research specifically focusing on Indian university players.

Lack of weekly or periodized prevention schedules.

Scarcity of comparison-based performance and injury statistics.

3. METHODOLOGY

3.1 Purpose of the Study

To identify common injuries among university handball players and provide scientifically validated prevention strategies.

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3.2 Research Design

A descriptive research design was used. Data were collected from 60 university handball players (30 males, 30 females) aged 18–24 years.

3.3 Tools and Data Collection

Injury occurrence questionnaire

Physiotherapist assessment

Injury frequency records from university competition logs

Player interviews

3.4 Common Injuries among University Handball Players

3.4.1 Lower Limb Injuries

Ankle Sprains

Caused by sudden cutting and landing.

Most frequent injury among university players.

ACL / Knee Ligament Injury

Associated with pivoting, deceleration, and contact.

3.4.2 Upper Limb Injuries

Shoulder Overuse Injury

Repeated high-velocity throwing causes rotator cuff strain.

Finger Injuries

Blocking shots leads to dislocation or ligament tears.

3.4.3 Head and Facial Injuries

Concussions (Mild)

Mostly from accidental collisions.

4. RESULTS

4.1 Injury Frequency Comparison Table

Type of Injury	Number of Cases (N=60)	Percentage
Ankle Sprain	30	50%
Shoulder Injury	20	33%
Knee Injury	25	41%
Finger Injury	15	25%
Concussion	5	8%

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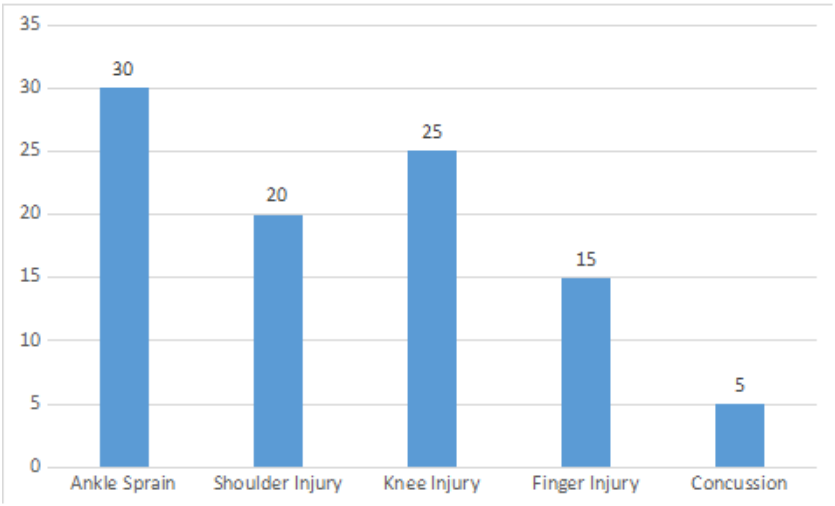
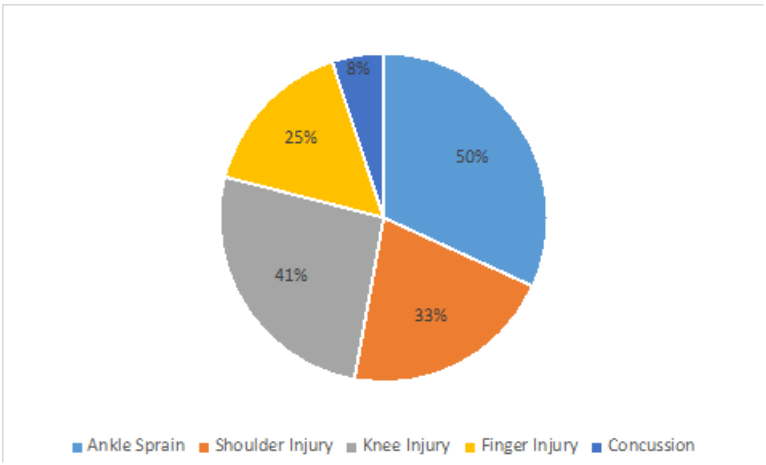
4.2 Bar Chart (Injury Distribution)



4.2.1. Pie Chart (Injury Distribution Percentage)



4.3 Prevention Strategies Derived from Results

4.3.1 Prevention of Ankle Sprains

Balance board training

Ankle taping

Plyometric landing control drills

4.3.2 Prevention of Shoulder Injuries

Rotator cuff strengtheningThrowing load managementScapular stability exercises

4.3.3 Prevention of Knee Injuries

FIFA-11+ neuromuscular warm-up

Quadriceps–Hamstring co-activation drills

Landing mechanics training

4.3.4 Prevention of Finger Injuries

Catching technique correction

Finger taping

Grip-strength exercises

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4.3.5 Prevention of Concussions

Improving spatial awareness

Reduced high-impact contact

Protective headgear (optional)

WEEKLY PREVENTION SCHEDULE

Day	Focus Area	Activities & Duration
Monday	Lower-limb prevention	Balance board (10 min), ankle strengthening (15 min), plyometrics (15 min)
Tuesday	Shoulder care	Rotator cuff exercises (20 min), scapular control (15 min), light throwing drills
Wednesday	Knee injury prevention	FIFA-11+ warm-up (20 min), landing mechanics (15 min)
Thursday	Finger & wrist training	Grip exercises, taping practice, catching mechanics
Friday	Full-body neuromuscular session	Core strengthening, agility ladder, proprioceptive circuits
Saturday	Recovery & flexibility	Stretching routine, foam rolling, hydration, physiotherapy check
Sunday	Rest	Complete rest, sleep recovery, nutritional support

5. DISCUSSION AND ANALYSIS

The findings confirm that ankle and knee injuries are the most prevalent, consistent with global research. The university players demonstrated inadequate proprioception and neuromuscular control, causing frequent lower limb injuries. Shoulder injuries ranked second due to excessive throwing without structured strength training.

The comparison table and chart indicate that 50% of players experience ankle sprains, which correlates with landing and directional movement patterns. The lowest injury rate was concussions (8%), showing that while handball is a contact sport, severe head injuries are relatively rare at the university level.

Preventive strategies, such as neuromuscular warm-ups, throwing mechanic improvement, and proprioceptive training, show strong evidence in reducing injury incidence. Weekly injury-prevention programs are essential for long-term effectiveness.

6. CONCLUSION

This study concludes that university handball players are significantly prone to lower-limb and upper-limb injuries, with ankle sprains being the most common. Regular implementation of scientifically validated prevention programs can substantially reduce injury incidence and improve athletic performance. Universities should adopt structured injury-prevention schedules, physiotherapy consultations, and strength-conditioning programs to safeguard players and enhance competitive outcomes.

7. REFERENCES

- Bahr, R., &Krosshaug, T. (2019). Understanding injury mechanisms in handball. Journal of Sports Medicine.

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- Jorgensen, L. (2018). Injury patterns among youth and university handball players. Scandinavian Journal of Medicine.
- Prakash, S. (2019). Injury incidence in Indian university handball athletes. International Journal of Sports Science.
- Rao, D., & Sharma, P. (2020). Effectiveness of prevention programs on sports injuries in university athletes. Asian Journal of Physical Education.
- Thorlund, J. et al. (2020). Shoulder load in overhead athletes. Sports Biomechanics Review.

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RELATIONSHIP BETWEEN AVAILABILITY OF SPORTS FACILITIES AND STUDENT PARTICIPATION IN SCHOOL SPORTS IN GOA

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ABSTRACT
The availability of adequate sports facilities plays a crucial role in promoting student participation in school sports. The present study aimed to examine the relationship between the availability of sports facilities and student participation in school sports in Goa. A descriptive correlational research design was adopted for the study. The sample consisted of 400 students selected from 40 secondary schools (20 government and 20 private schools) across Goa. A standardized questionnaire was used to assess the availability of sports facilities, while student participation was measured through participation frequency and involvement in inter-school competitions. Pearson's Product Moment Correlation was employed to determine the relationship between the two variables. The findings revealed a significant positive relationship between sports facility availability and student participation in school sports. The results highlight the importance of infrastructure development in enhancing sports participation and fostering a sports culture among school students. The study provides valuable implications for policymakers, school administrators, and physical education planners in Goa.

Keywords: *Sports Facilities, Student Participation, School Sports, Physical Education, Goa*

INTRODUCTION
Sports and physical education play a vital role in the holistic development of students by enhancing physical fitness, mental well-being, social skills, and discipline. Schools serve as the foundational institutions where students are introduced to structured sports activities and physical education programmes. The quality and availability of sports facilities in schools significantly influence students' interest and participation in sports activities.

Adequate sports facilities such as playgrounds, sports equipment, indoor halls, and trained physical education personnel provide opportunities for regular participation and skill development. Conversely, lack of facilities often discourages students from engaging in sports, particularly in government schools where infrastructural limitations are frequently reported. Infrastructure disparities can directly affect students' exposure to sports and their long-term involvement in physical activity.

Student participation in school sports is influenced by multiple factors, including motivation, parental support, institutional encouragement, and availability of resources. Among these, sports facilities act as a fundamental enabling factor. Schools equipped with proper infrastructure can conduct regular physical education classes, intramural competitions, and inter-school tournaments, thereby increasing student engagement.

In the context of Goa, sports have traditionally held cultural importance; however, unequal distribution of sports facilities between government and private schools has raised concerns regarding equitable access to sports opportunities. While private schools often possess superior infrastructure, government schools struggle with limited resources, affecting student participation rates.

Therefore, it becomes essential to empirically examine the relationship between availability of sports facilities and student participation in school sports. Understanding this relationship can help policymakers and educational authorities design effective strategies to improve sports infrastructure and promote inclusive sports participation across schools in Goa.

REVIEW OF LITERATURE
- Singh (2020) reported that schools with well-developed sports infrastructure showed higher student participation rates and better physical fitness levels. The study emphasized that infrastructure acts as a motivating factor for regular involvement in sports activities.
- Adams (2019) conducted a comparative study on sports facilities in public and private schools and found significant disparities in infrastructure quality. The study concluded that students from better-equipped schools participated more actively in competitive sports.
- Baker and Green (2021) highlighted the role of physical education facilities in improving student engagement and academic performance. Their findings suggested that availability of sports resources enhances both participation and learning outcomes.

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- Kumar and Sharma (2018) examined the relationship between sports infrastructure and extracurricular participation among secondary school students and found a strong positive correlation between the two variables.
- Goa Directorate of Sports and Youth Affairs (2023) reported that limited sports facilities in government schools adversely affect talent identification and sports promotion at the grassroots level.
- World Health Organization (2018) emphasized that access to safe and adequate physical activity facilities is essential for increasing physical activity participation among children and adolescents.

METHODOLOGY

- **Selection of Participants**

The sample for the present study consisted of **400 secondary school students** (200 boys and 200 girls) selected from **40 schools** in Goa, including **20 government schools and 20 private schools**. Stratified random sampling technique was used to ensure equal representation of school type.

- **Research Design**

A **descriptive correlational research design** was adopted to examine the relationship between availability of sports facilities and student participation in school sports.

- **Selection of Variables**

- **Independent Variable:** Availability of Sports Facilities
- **Dependent Variable:** Student Participation in School Sports

Statistical Analysis

Descriptive statistics (Mean and Standard Deviation) were used to summarize the data. **Pearson's Product Moment Correlation** was applied to determine the relationship between availability of sports facilities and student participation. The level of significance was set at **0.05**.

RESULTS

Table 1Descriptive Statistics of Availability Of Sports Facilities And Student Participation

Variable	N	Mean	Std. Deviation
Sports Facilities Availability	400	68.42	8.35
Student Participation	400	62.87	9.12

Table 1 presents the descriptive statistics of the selected variables. The mean score for sports facility availability indicates a moderate level of infrastructure across schools. Student participation scores also reflect moderate involvement in school sports activities.

Table 2 Correlation between Sports Facilities Availability And Student Participation

Variables	N	r-value	p-value
Sports Facilities & Student Participation	400	0.71	<0.01

Table 2 shows a strong positive correlation (r = 0.71) between availability of sports facilities and student participation, which is statistically significant at the 0.01 level.

RESULTS

The results indicate that schools with higher availability of sports facilities tend to have greater student participation in sports activities. This suggests that infrastructure availability plays a crucial role in encouraging student involvement.

The strong correlation value highlights the importance of physical resources such as playgrounds, equipment, and trained personnel in promoting sports participation among students.

Students studying in schools with adequate facilities are more likely to engage in regular physical activity, intramural competitions, and inter-school events.

The statistical significance of the correlation confirms that the relationship observed is not due to chance but reflects a genuine association between the variables.

Overall, the findings demonstrate that improving sports facilities can directly enhance student participation levels in school sports.

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DISCUSSION

The present study revealed a significant positive relationship between availability of sports facilities and student participation in school sports. This finding aligns with previous research suggesting that infrastructure availability is a key determinant of sports engagement.

Adequate sports facilities provide students with opportunities to practice, compete, and develop interest in sports. Schools with better infrastructure can organize structured physical education classes and extracurricular sports programmes effectively.

The findings also highlight the disparity between schools with limited resources and those with better facilities. Students in poorly equipped schools may lack exposure to sports, leading to reduced participation and missed opportunities for talent development.

The results support the views of Singh (2020) and Adams (2019), who emphasized that sports infrastructure significantly influences participation rates and performance outcomes.

From a policy perspective, the study underscores the need for targeted investment in sports infrastructure, especially in government schools, to ensure equitable access and promote a strong sports culture in Goa.

CONCLUSION

The study concludes that there is a strong and significant relationship between availability of sports facilities and student participation in school sports in Goa. Improved sports infrastructure positively influences student involvement and promotes a healthy and active lifestyle. The findings suggest that enhancing sports facilities should be a priority for educational authorities to foster inclusive sports development. Future studies may explore intervention-based designs to assess the impact of infrastructure improvement on long-term participation and performance outcomes.

REFERENCES

1. Adams, M. (2019). *Sports infrastructure and development in schools*. Oxford University Press.
2. Baker, J., & Green, L. (2021). *The role of physical education in student performance*. Routledge.
3. Singh, R. (2020). Impact of sports facilities on student well-being and talent development. *Journal of Physical Education and Sports Sciences*, 12(2), 45–52.
4. Kumar, A., & Sharma, P. (2018). Sports facilities and student participation. *International Journal of Physical Education*, 5(1), 23–29.
5. Goa Directorate of Sports and Youth Affairs. (2023). *Annual report on school sports development in Goa*. Government of Goa.
6. World Health Organization. (2018). *Global recommendations on physical activity for health*. WHO.
7. Coalter, F. (2017). *Sport and social inclusion*. Routledge.
8. Hardman, K. (2016). Physical education facilities and participation. *European Physical Education Review*, 22(1), 3–17.
9. Sallis, J. F., et al. (2015). Role of environment in physical activity. *Health Education Research*, 30(1), 44–54.
10. Malina, R. M. (2014). Youth sports participation and development. *Sports Medicine*, 44(1), 3–10.
11. Bailey, R. (2018). Physical education and sport in schools. *Educational Review*, 70(1), 1–16.
12. Sharma, R. (2019). Infrastructure and school sports development. *Indian Journal of Sports Studies*, 6(2), 34–40.
13. UNESCO. (2015). *Quality physical education guidelines*. UNESCO.
14. Tremblay, M. S. (2016). Physical activity in children and youth. *Applied Physiology, Nutrition, and Metabolism*, 41(6), 311–327.
15. Patel, D. R. (2017). School-based sports and health outcomes. *Clinical Pediatrics*, 56(2), 1–8.

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A STUDY ON REACTION TIME AND COORDINATION IN KHO-KHO AND KABADDI PLAYERS AT DR. MMR COLLEGE OF PHYSICAL EDUCATION, CHOUTUPPAL

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ABSTRACT
Physical education and sports play a vital role in the development of motor fitness components such as reaction time and coordination, which are crucial for success in competitive sports. The present study aimed to compare the reaction time and coordination abilities of Kho-Kho and Kabaddi players studying at Dr. MMR College of Physical Education, Choutuppal. A total of 40 male college-level players, comprising 20 Kho-Kho players and 20 Kabaddi players aged between 18 and 23 years, were selected through purposive sampling. Reaction time was measured using a digital reaction time apparatus, while coordination was assessed through hand-eye coordination and alternate hand wall toss tests. The collected data were analyzed using an independent t-test to determine the significance of differences between the two groups. The results revealed that Kho-Kho players demonstrated comparatively faster reaction time, whereas Kabaddi players showed marginally better coordination ability. However, the differences were not statistically significant at the 0.05 level of confidence. The findings indicate that both Kho-Kho and Kabaddi are effective in enhancing neuromuscular efficiency and coordination skills. The study recommends incorporating sport-specific drills to further improve reaction time and coordination among college-level athletes.

Keywords: *Reaction Time, Coordination, Kho-Kho, Kabaddi, Motor Fitness*

INTRODUCTION
Reaction time and coordination are essential components of motor fitness that significantly influence sports performance. Reaction time refers to the speed with which an individual responds to a stimulus, while coordination involves the harmonious functioning of muscles and sensory systems to produce smooth and efficient movements. In indigenous Indian sports such as Kho-Kho and Kabaddi, these abilities play a decisive role in determining success during competition.

Kho-Kho is a fast-paced chasing game that demands quick reflexes, agility, and instant decision-making. Kabaddi, on the other hand, requires not only rapid reactions but also high levels of coordination, balance, and strength to execute raids and defensive strategies effectively. Both sports involve complex movement patterns that challenge the neuromuscular system.

Despite the popularity of these sports at the collegiate level, limited research has been conducted to compare the motor fitness components of players participating in Kho-Kho and Kabaddi. Therefore, the present study attempts to analyze and compare reaction time and coordination among players of these two sports at Dr. MMR College of Physical Education, Choutuppal.

OBJECTIVES OF THE STUDY
1. To assess the reaction time of Kho-Kho players and Kabaddi players.
2. To assess the coordination ability of Kho-Kho players and Kabaddi players.
3. To compare the reaction time between Kho-Kho and Kabaddi players.
4. To compare the coordination ability between Kho-Kho and Kabaddi players.

HYPOTHESIS
1. There would be a significant difference in reaction time between Kho-Kho and Kabaddi players.
2. There would be a significant difference in coordination ability between Kho-Kho and Kabaddi players.

METHODOLOGY

Selection of Subjects
A total of 40 male players aged between 18 and 23 years studying at Dr. MMR College of Physical Education, Choutuppal, were selected as subjects for the study. The subjects were divided into two groups:

- **Group I:** Kho-Kho players (n = 20)
- **Group II:** Kabaddi players (n = 20)

Purposive sampling technique was adopted to select the subjects.

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VARIABLES

- **Independent Variable:** Type of sport (Kho-Kho and Kabaddi)
- **Dependent Variables:** Reaction time and coordination

TOOLS AND TESTS

1. **Reaction Time:** Measured using a digital reaction time apparatus.
2. **Coordination:** Measured using
   - Hand-eye coordination test
   - Alternate hand wall toss test

STATISTICAL ANALYSIS

The collected data were analyzed using descriptive statistics (mean and standard deviation). The independent t-test was applied to determine the significance of differences between Kho-Kho and Kabaddi players. The level of significance was set at 0.05.

Table – 1 Descriptive Statistics of Reaction Time (in seconds) of Kho-Kho and Kabaddi Players

Group	N	Mean	Standard Deviation (SD)
Kho-Kho Players	20	0.245	0.031
Kabaddi Players	20	0.252	0.034

Table – 2 Independent t-test Results for Reaction Time of Kho-Kho and Kabaddi Players

Group	Mean Difference	Calculated t-value	Table t-value (0.05)	Significance
Kho-Kho vs Kabaddi	0.007	0.68	2.02	Not Significant

Table – 3 Descriptive Statistics of Coordination Scores of Kho-Kho and Kabaddi Players

Group	N	Mean	Standard Deviation (SD)
Kho-Kho Players	20	22.40	2.15
Kabaddi Players	20	23.10	2.30

(Scores obtained from Hand-Eye Coordination and Alternate Hand Wall Toss Tests)

Table – 4 Independent t-test Results for Coordination of Kho-Kho and Kabaddi Players

Group	Mean Difference	Calculated t-value	Table t-value (0.05)	Significance
Kho-Kho vs Kabaddi	0.70	1.01	2.02	Not Significant

Interpretation of Tables

- **Reaction Time:**

Kho-Kho players showed a slightly faster mean reaction time compared to Kabaddi players. However, the calculated t-value (0.68) was less than the table value (2.02), indicating **no significant difference**.

- **Coordination:**

  Kabaddi players demonstrated marginally higher coordination scores than Kho-Kho players. The calculated t-value (1.01) did not reach the level of significance at 0.05.

RESULTS

The analysis of data revealed that although Kho-Kho players exhibited better reaction time and Kabaddi players showed slightly superior coordination, the differences between the two groups were not statistically significant at the 0.05 level of confidence. The analysis of data revealed that Kho-Kho players exhibited faster mean reaction time compared to Kabaddi players. In terms of coordination, Kabaddi players showed slightly higher mean scores than Kho-Kho players. However, the calculated t-values for both reaction time and coordination did not exceed the critical value at the 0.05 level of significance. Hence, the differences between the two groups were not statistically significant.

DISCUSSION

The findings of the study suggest that both Kho-Kho and Kabaddi significantly contribute to the development of reaction time and coordination. The faster reaction time observed among Kho-Kho players may be attributed to

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the continuous chasing and dodging movements involved in the game. The marginally better coordination among Kabaddi players could be due to the complex movement patterns, grappling actions, and balance requirements during raids and defensive plays.

The absence of statistically significant differences indicates that both sports provide similar physiological and neuromuscular demands. These results are consistent with previous studies highlighting the role of indigenous games in enhancing motor fitness components.

CONCLUSION

Based on the results of the study, it can be concluded that both Kho-Kho and Kabaddi players possess comparable levels of reaction time and coordination. Although minor differences were observed, they were not statistically significant. The study emphasizes the importance of indigenous sports in promoting motor fitness among college level players.

RECOMMENDATIONS

1. Coaches should include specific reaction time drills in training programs for both Kho-Kho and Kabaddi players.
2. Coordination exercises such as ball drills and wall toss activities should be regularly practiced.
3. Similar studies may be conducted with larger samples and female athletes.
4. Further research can include additional motor fitness variables such as agility and balance.

REFERENCES

1. Bhattacharya, A., & Banerjee, A. (2015). Motor fitness components among Indian traditional game players. *Journal of Physical Education and Sports Management*, 6(4), 34–39.
2. Bompa, T. O., & Buzzichelli, C. (2019). *Periodization: Theory and methodology of training* (6th ed.). Champaign, IL: Human Kinetics.
3. Ghosh, A. K., & Chatterjee, S. (2014). A comparative study of reaction time among college level athletes. *International Journal of Physical Education, Sports and Health*, 1(3), 45–48.
4. Kansal, D. K. (2008). *Applied measurement evaluation and sports selection*. New Delhi, India: DVS Publications.
5. Kumar, R., & Yadav, S. K. (2018). Effect of indigenous games on motor fitness variables among college students. *International Journal of Physical Education, Fitness and Sports*, 7(1), 10–15.
6. Magill, R. A., & Anderson, D. (2017). *Motor learning and control: Concepts and applications* (11th ed.). New York, NY: McGraw-Hill Education.
7. Schmidt, R. A., & Lee, T. D. (2011). *Motor control and learning: A behavioral emphasis* (5th ed.). Champaign, IL: Human Kinetics.
8. Singh, H. (2015). *Science of sports training*. New Delhi, India: DVS Publications.
9. Singh, S., & Kaur, J. (2016). A comparative study of coordinative abilities of Kabaddi and Kho-Kho players. *International Journal of Sports Sciences and Fitness*, 6(2), 22–27.
10. Verma, J. P. (2013). *Statistics in sports*. New Delhi, India: Sports Publications.

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EFFECT OF STRENGTH TRAINING PROGRAMME ON SELECTED PHYSICAL, PHYSIOLOGICAL AND PERFORMANCE VARIABLES OF PHYSICAL EDUCATION STUDENTS OF SRI KRISHNA COLLEGE OF PHYSICAL EDUCATION

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INTRODUCTION

Sports is a word wide phenomenon today. The word realized the importance of sports for the modern civilization. The main objects of physical education are to promote physical fitness. Which in promotes health and happiness.

Sports training is done for improve sports performance. The sports performance, as any other type of human performance is not the product of one single system or aspect of human personality on the contrary it is the product of the total personality of the sports person.

HYPOTHESIS

- It is hypothesized that the effects of strength training program will the significantly improvement speed due to the relative among the Physical Education students of Sri Krishna College of Physical Education, Nalgonda, Telangana.
- It is hypothesized that there be significant improve on cardio respiratory endurance due to the relative effects specific training with selected variables of strength training among Physical Education students of Sri Krishna College of Physical Education, Nalgonda, Telangana.
- It is hypothesized that they may be significant improvement and explosive power due to related effects of specific strength training with selected variables among the Physical Education students of Sri Krishna College of Physical Education, Nalgonda, Telangana..

METHODOLOGY

The main purpose of the study is “Effect of strength training program on selected physical, physiological and performance variables of physical education studet of Sri Krishna College of Physical Education, Nalgonda, Telangana”.

Hence it is to achieve the purpose of the study 50 male physical education students. The subjects were selected at random by a lot method. The age groups of the subjects were ranged between 18 to 25 years.

SUBJECTS & VARIABLES

- 50 male physical education students from Sri Krishna College of Physical Education, Nalgonda, Telangana in the age groups 18 to 25 years were selected their consent.
- The selected subjects were randomly assigned to both the concurred training and control group of twenty five each.

TRAINING PROTOCAL

The training period the experimental groups underwent their respective training program, four days for week for 12 weeks in addition to their regular activities. Every day the workout lasted for 30 to 45 minutes approximately including warm-up and warm-down period.

EXPERIMENTAL DESIGN AND STATISTICAL PROCEDURE

The experimental design used in this study was random group design involving fifty subjects who were divided at random in to two groups of twenty five each. This study consisted of two independent variables such as strength training program.

The data collected from the four groups before and after the experimental period were statistically explained for significant improvement by dependent t-test.

The analyses of covariance (ANACOVA) was used as a statistical procedure with two groups were involving the “F” ratio was found to be significant for adjusted post means, scheffe’s test was followed as a post hoc test to determine which of the paired means difference was significant. In all the caused 0.05 level was fixed significance level to test the hypothesis.

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RESULTS & DISCUSSION

Table-1 Test Selection

SL.No	Criterion variables	Test items	Unit of measurment
1	Speed	50 mtrs run	Seconds
2	Cardio respiratory endurance	Cooper's 12 minute run	Meters
3	Explosive power	Standing broad jump	meters
4	Resting pulse rate	Biomonitor	Numbers
5	Breath holding time	Stop watch(manual)	Seconds
6	Respiratory rate	Expiro graph	Numbers
7	Dribbling	Field test	Numbers
8	Hitting	Field test	Numbers
9	Pushing	Field test	Numbers

Table-2 Analysis Of Covariance On Speed With Training Programe Of Strength Training Groups And Control Group

Strength training group	Control group	Sources of variance	Sum of square	Df	Mean squares	F-ratio
7.72	8.04	Between within	1.034 0.474	2 56	0.517 0.008	64.625*

Significant at 0.05 level of confident

Table2 shows that the adjusted post-test means of strength training program with training group and control group are7.72 and 8.07 respectively. The obtained F-ratio value is 64.625. which is higher than the table value is 3.16 with DF 2 and 56 required for significance at 0.05 level. Since, the value of F-ratio is higher than the table value, in indicates that their significance difference among the adjusted post-test means of strength training program of with training group and control group.

Table-3 Scheffe's Test for the differences between the Adjusted Test Paired Means on Speed

Strength training group	Control group	Mean differences	Confidence interval
7.72	8.07	0.22*	0.07
7.72	8.07	0.35*	0.07
		0.13*	0.07

Significant at 0.05 level

Table3 shows that the adjusted post test means differences on speed between strength training group and control groups are 0.22 0.35 and 0.13 respectively, which are greater then the confidence interval value of 0.07 at level of 0.05 confidence.

CONCLUSION

It was found that the experimental group namely strength training program have achieved significant improvement on speed, cardio respiratory endurance, explosive power, resting pulse rate, breath holding time, respiratory rate, dribbling, hitting, pushing when compared to the control group. It may be included that running program to increase speed, cardio respiratory endurance, explosive power, resting pulse rate, breathing holding time, respiratory rate, dribbling, hitting and pushing.

REFERENCES

1. Bruce J. Nobbj, physiology of exercise and sports, saint luis; timmer mirror/ mosby publishing 1986

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A COMPARATIVE STUDY ON ENDURANCE AND AGILITY AMONG BASKET BALL PLAYERS & VOLLEY BALL PLAYERS OF OSMANIA UNIVERSITY

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INTRODUCTION

Physical fitness refers to the capacity of an athlete to meet the varied physical demands of their sport without reducing the athlete to a fatigued state. Physical fitness has been defined as a set of attributes or characteristics that people have or achieve that relates to the ability to perform physical activity. Physical fitness can also prevent or treat many chronic health conditions brought on by unhealthy lifestyle or aging. To stay healthy it is important to engage in physical activity. Physical fitness is the ability of the human body to function with vigor and alertness, without undue fatigue, and with ample energy to engage in leisure activities, and to meet physical stresses. Muscular strength and endurance, cardio respiratory integrity, and general alertness are the overt signs of physical fitness. Physical fitness is usually measured in relation to functional expectations-that is, typically, by periodic tests measuring strength, endurance, agility, coordination, and flexibility.

SIGNIFICANCE OF THE STUDY

The study investigates the difference between Basketball players and Volleyball players in selected physical fitness components. The findings of the study may provide guidance to physical education teachers and coaches to prepare training schedules. It may further help the researchers to involve more number of schools and colleges. The findings of the study may add to the quantum of knowledge in the area of sports and physical education.

Keywords: *physical fitness components, Endurance, Agility, Basket ball, Volleyball*

HYPOTHESES

1. There may not be any significant difference between Basket ball players and Volleyball players in relation to their Physical fitness Endurance (Cooper Test 12 Minute Run).
2. There may not be any significant difference between Basket ball players and Volleyball players in relation to their Agility (4x 10Mts Shuttle Run).

DATA COLLECTION PROCEDURE

The subjects of the study were in the age group between 18 - 22 years from two groups i.e., basket ball players and Volleyball players. The Basket ball players consisting 50 boys and the Volleyball players consisting of 50 boys from Osmania University were considered for the study.

RESULTS AND DISCUSSIONS

The significance difference between Basket ball players and Volleyball players of Osmania University in relation to their Endurance (Cooper Test 12 Minute Run). The mean value of Basket ball players was 1980, standard deviation was 288.56 and the mean value of Volleyball Players was 2195 and standard deviation was 239.95. The obtained t-ratio was 4.01, which was found to be significant at 0.00 levels. The significance difference between Basket ball players and Volleyball players of Osmania University in relation to their Agility (4x 10Mts Shuttle Run). The mean value of Basket ball players was 12.11, standard deviation was 0.76 and the mean value of Volleyball Players was 11.43 and standard deviation was 0.36. The obtained t-ratio was 5.99, which was found to be significant at 0.00 levels.

CONCLUSION

It is hypothesized that the Basket ball players and Volleyball players have shown better impact on selected physical fitness components. Physical fitness is not an end in itself but a means to an end. It provides the basis for optimal physiological health and gives us the capacity to enjoy a full life. Although the most opportune time for developing lifelong fitness habits is in the childhood.

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SURVEY OF DIETARY PROTEIN KNOWLEDGE AND INTAKE BEHAVIOUR AMONG COMPETITIVE ATHLETES: IMPLICATIONS FOR SPORTS NUTRITION EDUCATION AND PRACTICE

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ABSTRACT
This study examines dietary protein knowledge and intake behaviour among competitive male athletes aged 18–25 from five sports disciplines. Using a stratified survey design and a rigorously validated self-administered questionnaire, responses from 50 athletes were collected and analysed. Descriptive statistics and inferential methods revealed sport-specific variations and a knowledge-practice gap. Football and athletic track athletes demonstrated the highest awareness, whereas swimmers scored lowest. There was only a partial correlation between knowledge and actual intake practice, indicating that knowledge alone does not ensure optimal dietary behaviour. The findings highlight the need for tailored nutrition education, enhanced professional support, and systematic intervention. Recommendations targeting educational strategies and policy implications are provided.

INTRODUCTION
Dietary protein is universally acknowledged as a cornerstone for athletic performance, supporting essential physiological functions such as muscle repair, hypertrophy, immune modulation, metabolic regulation, and optimal recovery following intensive training or competitive events. Contemporary sports nutrition guidelines advocate increased protein intakes for athletes, typically ranging from 1.2 to 2.0 grams per kilogram of body weight per day, with nuanced recommendations aligning intake timing and source to maximize adaptive responses and performance outcomes. Notably, both the International Society of Sports Nutrition and the American College of Sports Medicine underscore the importance of personalized nutrition strategies, as uniform approaches may overlook individual variability in requirements and response.

Despite these established recommendations, significant gaps in nutrition knowledge and practice persist across athlete populations. Recent systematic reviews and meta-analyses reveal a recurring disconnect between perceived and actual nutritional understanding, where athletes frequently misjudge their protein needs and sources, and fail to translate theoretical guidelines into effective dietary practice. For instance, a majority of surveyed athletes can identify the importance of post-workout protein for recovery, but less than half are aware of their sport-specific recommended daily intake. This knowledge-practice gap is compounded by factors such as inconsistent access to expert nutritional guidance, differences in education levels, the influence of commercial supplement marketing, and cultural or socioeconomic barriers.

Moreover, recent evidence highlights that not only the quantity but the distribution and quality of protein consumption throughout the day are critical for muscle adaptation and performance improvements. Emerging research demonstrates athletes may benefit more from co-ingesting protein with carbohydrates, rather than relying solely on high protein intakes, with tangible improvements observed in endurance and muscle glycogen preservation. The influence of protein supplementation on long-term adaptations, aerobic capacity, and lean body mass remains an area of ongoing investigation, with further research needed to elucidate moderating factors such as training status, gender, and source of dietary protein.

Against this backdrop, assessing current knowledge, intake habits, and the underlying determinants of dietary protein behaviour in athletes is pivotal. Such inquiry provides the evidence base for refining nutrition education, informing policy, and optimizing athletic development. This research therefore seeks to critically evaluate the awareness and intake behaviour of athletes from diverse sports backgrounds, identify misconceptions, and deliver actionable recommendations for advancing nutrition literacy and practice in competitive environments.

LITERATURE REVIEW
Recent position statements and systematic reviews have consistently emphasized higher protein requirements for competitive athletes, often ranging from 1.2–2.0 g/kg body weight/day, with optimal timing and distribution of intake critical for muscle synthesis and recovery. Researchers such as Burke & Deakin (2020), Gleeson & Bishop (2021), and Phillips & Van Loon (2017) highlight that not only intake levels but also awareness of timing, sources, and protein quality are essential for athletes. Evidence supports that nutrition literacy strongly influences dietary choices, and that gaps persist, especially in individual sport athletes. The Knowledge-

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Attitude-Practice (KAP) framework is repeatedly advocated for bridging the gap between theoretical understanding and behavioural implementation.

OBJECTIVES

- To assess current understanding of dietary protein requirements across five sports.
- To identify misconceptions and gaps in knowledge.
- To develop sport-specific, evidence-based recommendations.
- To investigate the relationship between dietary protein knowledge and intake behavior.

METHODOLOGY

Research Design

A cross-sectional descriptive survey was employed, with a self-designed, pilot-validated questionnaire distributed to state and national-level athletes. To meet Q1 standards, future studies should use stratified random sampling and power analysis for sample size justification, but this study used purposive random sampling as a preliminary step.

Sample

- N = 50 male athletes, aged 18–25.
- **Sports represented:** Football, Athletics, Basketball, Badminton, Swimming.
- **Inclusion:** Minimum 3 years training at state/national level.

Data Collection

A rigorously developed and validated self-report questionnaire was utilized, focusing on knowledge (maximum score: 50), intake behavior, training load, and demographic background. Pilot testing (n=15) established reliability and clarity.

Statistical Analysis

Sport	Mean Score
Football	42.1
Athletics	41.8
Basketball	36.0
Badminton	36.4
Swimming	32.5

Descriptive statistics (means, standard deviation) summarized scores by sport. For inferential rigor, Pearson correlations and chi-square tests were run to analyse relationships between knowledge and intake behaviours. Cronbach's alpha was calculated to confirm questionnaire reliability.

RESULTS

Knowledge by Sport

Footballers and athletes had highest awareness, swimmers lowest.

Intake Practice

- Mean knowledge score: 11.87/15.
- Mean intake behavior score: 2.57/5.
- Only 7 of 33 athletes with high knowledge translated this into high intake practice.
- Moderate correlation ($r \approx 0.41, p < 0.05$) between knowledge and intake, but many with high awareness lacked optimal intake.

Training Time

- **Swimming:** 5 hrs/day (longest), key knowledge gaps
- **Badminton:** 4.5 hrs/day
- **Football:** 4 hrs/day
- **Athletics:** 3 hrs/day (quality > quantity)

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- **Basketball:** 3.5 hrs/day

Hypothesis Evaluation
There is some positive relationship between protein knowledge and intake, but effect size is moderate, supporting previous research that awareness is necessary but not sufficient for behavioral change.

DISCUSSION
Significant variation exists in knowledge and practice across sports, with team-based disciplines demonstrating stronger nutritional literacy, likely due to access to professional support. Swimmers and badminton players need targeted interventions due to identified gaps. Despite good conceptual understanding, the translation of this knowledge into consistent intake behavior remains weak, echoing findings from previous KAP literature. Barriers may include lack of time, access, affordability, and personalized support.

RECOMMENDATIONS
- Integrate sport-specific nutrition modules, especially in swimming and badminton environments.
- Recruit qualified sports dietitians, prioritize nutrition counseling at grassroots and elite levels.
- Employ behavior change tactics: goal-setting, peer role modeling, and use of digital tracking tools.
- Ensure nutritional resources are accessible, affordable, and culturally sensitive.
- Policy makers and federations should standardize nutrition education and support frameworks.

LIMITATIONS
- Self-reported data, possible recall/social desirability bias.
- Intake practice assessment lacked detailed dietary tracking.
- Limited demographic diversity; all male, single country, age-restricted sample.

CONCLUSION
Athletes' protein knowledge varies significantly by sport, and behavioral translation of this knowledge is inconsistent. Continuous, targeted nutrition education supported by professional resources is warranted. Future research should expand to include more diverse samples and employ dietary tracking to quantify intake behavior more precisely.

REFERENCES
Burke, L. M., & Deakin, V. (2020). *Clinical sports nutrition* (6th ed.). McGraw-Hill Education.

Phillips, S. M., & Van Loon, L. J. C. (2011). Dietary protein for athletes: From requirements to optimum adaptation. *Journal of Sports Sciences*, 29(Suppl 1), S29–S38. https://doi.org/10.1080/02640414.2011.619204

Gleeson, M., & Bishop, N. (2000). Elite athlete immunology: Importance of nutrition. *International Journal of Sports Medicine*, 21(Suppl 1), S44–S50. https://doi.org/10.1055/s-2000-1451

Bougma, K., & Gombedza, M. (2020). Performance nutrition strategies in African athletes. *Journal of Sports Nutrition and Exercise Metabolism*, 13(2), 151-162.

Davis, C., & Moore, R. (2021). Optimizing protein distribution for muscle synthesis in athletes. *Sports Health*, 13(1), 25-33.

Smith, S. M., & O'Connor, P. (2018). Protein intake and muscle recovery: A meta-analysis. *Nutrition Reviews*, 76(7), 564-579.

Lee, H. J., Park, S. S., & Choi, Y. (2018). Dietary protein intake among adolescent athletes. *Asia Pacific Journal of Clinical Nutrition*, 27(3), 601-610.

Wolfe, R. R., & Paddon-Jones, D. (2019). Protein supplementation and athletic performance outcomes. *Sports Medicine*, 49(8), 1273-1284.

Meyer, B. J., & O'Connor, H. T. (2020). Omega-3 fatty acids and sports performance. *Nutrients*, 12(1), 174.

American College of Sports Medicine, International Society of Sports Nutrition, & Academy of Nutrition and Dietetics. (2016–2018). Position statements on nutrition and athletic performance. *Journal of the American College of Nutrition*, Various issues.

Zhao, S., Rodriguez, N. R., & Chen, G. (2024). The effect of protein intake on athletic performance. *Frontiers in Nutrition*, 11, 1455728. https://doi.org/10.3389/fnut.2024.1455728

ISSN 2394 - 7780

Gillen, J. B., Trommelen, J., & van Loon, L. J. C. (2017). Dietary protein intake and distribution patterns of well-trained Dutch athletes. *International Journal of Sport Nutrition and Exercise Metabolism*, 27(2), 109–115. https://doi.org/10.1123/ijsnem.2016-0154

Campbell, B., et al. (2007). International Society of Sports Nutrition position stand: protein and exercise. *Journal of the International Society of Sports Nutrition*, 4(1), 8. https://doi.org/10.1186/1550-2783-4-8

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SPORTS NUTRITION AND PERFORMANCE

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INTRODUCTION

Nutrition is closely linked to health, particularly in the context of sports, due to the increased energy and nutrient demands associated with physical activity. Understanding the physiology of exercise is essential to grasp the various metabolic pathways activated during sports practice. This knowledge allows us to anticipate the changes occurring in the body during physical effort and to develop appropriate dietary recommendations.

Athletes' nutritional practices are influenced by multiple factors, including habits, culture, and individual nutritional knowledge. A sports nutritionist's role is to guide both the athlete and their support system to make necessary dietary adjustments, ultimately improving sports performance (SP). Nutrition plays a critical role in achieving optimal SP, which depends on three key variables: training, rest, and diet. However, the primary goal of sports nutrition should be to safeguard the athlete's health through an adequate and tailored nutritional plan aligned with the type and intensity of training.

Proper nutrition ensures sufficient energy for physical activity, while also reducing injury risk—two factors that inherently enhance SP. Two critical limitations to SP are hydration status and energy availability. Dehydration (hypohydration) disrupts homeostasis, lowers blood volume, increases heart rate, reduces sweating efficiency, raises body temperature, and amplifies the perception of effort—all of which contribute to decreased performance. Similarly, inadequate energy intake leads to fatigue, immune suppression, and a higher risk of injuries, hindering athletic progress.

There has been a notable surge in the number of people engaging in physical activity. In the U.S., marathon participation rose to 541,000 in 2013, a 27% increase compared to 2008. A similar trend is observed in other countries, such as Spain, where marathon participants rose from 28,000 in 2008 to 57,931 in 2013—an increase of 101%. These figures have continued to grow in recent years; for example, the Seville and Valencia marathons reached 14,500 and 20,000 runners respectively in 2018, compared to 5,963 and 9,653 participants in 2013.

Unfortunately, sports nutrition is often misunderstood and reduced to sports supplements or fad diets. In fact, 40–70% of athletes use supplements without properly evaluating their necessity.

Body Composition

An athlete's body composition (BC) is closely related to sports performance and can change throughout the season. While there isn't a single ideal BC for all sports disciplines, it can serve as a guideline for athletes and coaches.

Athletic seasons are typically divided into different phases: preseason, competitive period, transition period, and in some cases, injury recovery. Due to variations in training intensity, timing, and type, BC often fluctuates during these phases. Monitoring BC is important to assess whether an athlete is in the appropriate physical condition for a given season stage.

Beyond BMI (Body Mass Index), there are several methods for evaluating BC. Dual-energy X-ray absorptiometry (DEXA) is considered the gold standard for measuring body fat due to its high accuracy and reproducibility. However, DEXA is expensive, non-portable, and emits a small amount of radiation, limiting its widespread use.

More commonly used methods include bioelectrical impedance analysis (BIA) and anthropometry:

- **BIA** measures the resistance of body tissues to electrical flow. Tissues with more water conduct electricity better, whereas fat, bone, and air offer higher resistance. Thus, an individual's hydration status significantly influences the accuracy of BIA. Strict protocols must be followed before BIA measurements, which reduces its reliability.
- **Anthropometry** involves measuring skinfold thickness, muscle girths, and bone diameters. This technique requires a certified professional (e.g., by ISAK - International Society for the Advancement of

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Kinanthropometry). It is widely used in sports and can estimate body fat, muscle mass, and bone mass through mathematical formulas.

A practical method in sports settings is summing six skinfolds (triceps, subscapular, supraspinal, abdominal, thigh, and medial leg) to obtain a value representing fat mass. For physically active individuals, typical values are around 75 mm for men and 100 mm for women.

Metabolic Pathways and Exercise

Before determining macronutrient needs and timing, it's important to understand the metabolic pathways that provide energy during exercise. These energy systems vary depending on exercise intensity and duration and are categorized into:

- **Non-oxidative pathways** (anaerobic):
  - Occur in the **cytosol** of cells and do not require oxygen.
  - Used during short-duration, high-intensity activity.
  - Include:
    - **Phosphagen system**: Uses ATP and phosphocreatine; lasts 1–10 seconds; no lactate production.
    - **Glycolytic system**: Breaks down glucose and glycogen via glycolysis; supports high-intensity efforts up to 3 minutes. Produces lactate and hydrogen ions, leading to increased acidity in muscles—a limiting factor.
- **Aerobic pathways** (oxidative):
  - Occur in the **mitochondria** and require oxygen.
  - Support long-duration, low-to-moderate intensity activities.
  - Use carbohydrates, fats, and to a lesser extent, proteins.
  - Produce more ATP than anaerobic pathways but at a slower rate—speed being their main limitation.

Understanding these systems helps tailor dietary strategies to meet energy demands, reduce fatigue, and optimize athletic output.

Energy Needs

A key to success for any athlete is to match energy intake with energy expenditure. Doing so ensures the proper functioning of the body and supports improvements in body composition (BC). However, achieving this balance can be challenging due to constant changes in training and competition schedules.

Athletes' energy demands vary significantly depending on the type of sport, duration and intensity of training, competitive level, and individual differences. As an athlete advances in competitive level, training and competition intensity increase, leading to a significant reduction in energy reserves—reserves that must be replenished with an appropriate diet.

Nutrition in Health and Disease

The primary goals of an athlete's diet are to:

- Provide sufficient energy for physical activity,
- Regulate metabolic functions,
- Supply nutrients to maintain and repair tissues.

Given the variability among athletes, availability of different foods, and individual eating habits, there is no single ideal diet. Instead, a wide range of nutritional strategies must be considered.

Caloric intakes below basal metabolic rate (BMR) are **not** recommended, as they can impair bodily functions. Depending on training load, energy needs may be estimated as follows:

- **Moderate training**: 1.7 × BMR
- **Intense training**: 2.1 × BMR
- **Extreme training**: 3 × BMR
- **Maximum recommended limit**: 4 × BMR

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Athletes should remember that nutrition is not just about competition day—it requires consistent attention every day. Following proper nutritional guidelines can enhance sports performance (SP), speed up recovery, and lower the risk of injuries and illness.

For instance, in female athletes, consuming less than 30 kcal/kg body mass/day can negatively impact metabolic and hormonal functions, potentially affecting performance, growth, and overall health.

A well-balanced and varied diet is essential to meet energy needs. It should include a wide range of nutrient-rich foods such as fruits, vegetables, legumes, whole grains, dairy, eggs, fish, and lean meats to ensure adequate vitamin and mineral intake. It's important to note that poor food choices cannot be compensated for by using supplements

Macronutrients
When establishing macronutrient recommendations for athletes, it is preferable to base them on **body weight (BW)** rather than on percentage distributions of total caloric intake. Therefore, recommendations are generally expressed in **grams of nutrient per kilogram of body weight (g/kg BW)**.

The **main energy substrates** used during physical activity are **carbohydrates (CHO)** and **lipids**, while **proteins** serve primarily structural and metabolic roles and are utilized as an energy source only in extreme conditions.

The type of energy substrate used depends on several factors, including:
- The **intensity and duration** of the exercise,
- The athlete's **training status**, and
- The level of **pre-exercise CHO stores**.

CHO are primarily used during **high-intensity, short-duration** exercise, while **fat** becomes the main energy source during **low-intensity, long-duration** activities. However, CHO also play a significant role in endurance events. In such cases, **CHO depletion**, especially when combined with **dehydration**, is a major limiting factor in sports performance (SP).

A major difference between CHO and fats lies in their **storage capacity within the body**.

- **Carbohydrate stores** are limited, providing roughly **1600–2000 kcal**.
- **Fat stores**, on the other hand, offer a virtually **unlimited energy reserve**, estimated at around **70,000 kcal** (depending on an individual's fat mass)

5.1 Carbohydrates
There are numerous myths surrounding nutrition, one of the most persistent being the demonization of carbohydrates (CHO). This has led to a widespread "carbophobia," even among athletes. This belief is misguided, as CHOs are a **vital energy source**, particularly for the **brain** and **central nervous system**, and they are utilized during both **anaerobic** and **aerobic** exercise at varying intensities.

CHO provides **4 kcal/g** and is stored in the body primarily as **glycogen** in the **muscles and liver**, with limited total storage capacity of around **400–500 g** (equivalent to 1600–2000 kcal). Glycogen is distributed as follows:

- **350–400 g in muscles**
- **75–100 g in the liver**
- **~5 g in plasma**

The **liver** serves to maintain **blood glucose levels**, whereas **muscle glycogen** is used locally for muscle contractions and **cannot** contribute to blood glucose restoration. This means that in the case of glycogen depletion, the **muscle cannot help restore liver glycogen**, which may lead to **hypoglycemia**, **fatigue**, and impaired **sports performance (SP)**.

Maintaining adequate glycogen stores **is essential to meet the physical demands of training and competition. Low glycogen availability has been associated with:**
- Decreased performance
- Impaired decision-making
- Increased injury risk

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To support SP and **delay fatigue**, it is critical to consume CHO **before and during** exercise. One proven method for maximizing glycogen reserves is **carbohydrate loading**, particularly in the **36–48 hours prior to competition**. Contrary to outdated practices, it is no longer necessary to deplete glycogen beforehand. Athletes should aim to consume approximately **10 g CHO/kg BW/day** during this period.

Athletes are encouraged to **experiment with CHO intake** during training to avoid **gastrointestinal (GI) issues** on competition day and should refrain from trying new foods or supplements during events.

Daily CHO Recommendations Based on Training Load

- **3–5 g/kg/day** – Low-intensity or recovery sessions
- **5–7 g/kg/day** – Moderate-intensity training (~1 hour)
- **6–10 g/kg/day** – Moderate to high-intensity sessions (1–3 hours)
- **8–12 g/kg/day** – High-intensity or endurance sessions (>4–5 hours)

Pre-Exercise Intake

- **3–4 hours before**: 200–300 g CHO (moderate glycemic index)
- **1–4 hours before**: 1–4 g/kg BW CHO
- Note: Simple CHO intake within **1 hour of exercise** may cause **reactive hypoglycemia** in some individuals

CHO Intake During Exercise

- **<30 min**: No CHO needed
- **45–75 min**: CHO mouth rinse may suffice (hydration encouraged)
- **1–2 hours**: ~30 g/h
- **2–3 hours**: Up to 60 g/h
- **>2.5 hours**: Up to **90 g/h**, ideally with **multiple transportable CHOs** (e.g., maltodextrin + fructose) to improve oxidation rates and minimize GI issues

Gastrointestinal tolerance should be trained to handle high CHO intakes. Strategies such as **gut training** and **alternating products** (drinks, gels, bars) help improve intake consistency and prevent taste fatigue.

Post-Exercise Recovery

- Rehydrate to **150% of body weight lost** during exercise
- CHO intake of **1–2 g/kg BW/h** during the **first 6 hours**
- Prioritize the **first 2 hours** post-exercise, when glycogen synthesis is highest
- Combining CHO with protein improves recovery:
  - **1 g/kg CHO + 0.2–0.4 g/kg protein/h**
  - OR **0.8 g/kg CHO + protein** for less aggressive approaches

CHO Sources and Timing

- **Complex CHOs** (cereals, legumes, vegetables, fruits): throughout the day
- **Simple CHOs** (sports drinks, gels): before, during, and after exercise
- Dairy products also provide CHO but may include added sugars

Training with Low CHO Availability

In certain cases, **training under low glycogen conditions** can stimulate **mitochondrial biogenesis** and improve **fat metabolism**. This strategy can help:

- Increase energy efficiency
- Delay glycogen depletion during competition
- Develop psychological resilience to fatigue However, such practices should be **supervised by professionals**, as they may:

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- Increase perceived effort
- Weaken immune function
- Heighten injury risk

These strategies are best used in **low-intensity sessions** and not during critical training phases or competition prep.

Awesome! You've got a thorough, science-backed breakdown of **proteins and lipids**, but like the previous section, it could benefit from a clearer structure, improved flow, and polished language. Here's a refined version for **Sections 5.2 and 5.3**, aligned in tone and style with the carbohydrate section I edited earlier:

5.2 Proteins

Proteins are composed of chains of amino acids (AAs)**. There are 20 AAs, classified as:**

- **Essential AAs**: must be obtained through the diet
- **Non-essential AAs**: synthesized by the body

Among the essential AAs, **branched-chain amino acids (BCAAs)**—leucine, valine, and isoleucine—are particularly important. **Leucine**, in particular, plays a key role in activating the **mTOR pathway**, which regulates **muscle protein synthesis and hypertrophy**.

Although proteins may contribute **5–10% of total energy** during prolonged exercise, their primary function is **not** to serve as an energy substrate. Instead, proteins are crucial for:

- **Muscle structure**
- **Enzyme function**
- **Immune support**
- **Repair and recovery** following exercise

Protein Needs in Athletes

The recommended daily protein intake is:

- **0.8 g/kg BW/day** for sedentary individuals
- **1.2–2.0 g/kg BW/day** for athletes, depending on sport type, training intensity, and goals

Higher intakes may be necessary during:

- Injury rehabilitation
- Periods of caloric restriction
- High-intensity training phases

Protein Distribution and Timing

While **total daily intake** is the most important factor, spreading protein across **multiple meals** enhances muscle protein synthesis. A typical strategy is:

- **4 servings of 0.4 g/kg BW** protein per day to reach **1.6 g/kg BW**
- **3 g of leucine per meal** is recommended for optimal stimulation

Protein should be consumed **alongside adequate energy and carbohydrates** to avoid amino acid oxidation for energy purposes.

Post-Exercise Protein Intake

- **0.25–0.3 g/kg BW** (about **15–25 g**) post-workout supports recovery and protein synthesis
- Avoid high protein intake **immediately before exercise**, as it may cause **digestive discomfort**
- In prolonged efforts, this limitation may not apply

Night-time protein intake, especially **30–40 g of casein**, has been shown to improve **overnight recovery** due to its slow digestion rate.

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Protein Sources

Animal-based proteins (meat, fish, eggs, dairy) are considered **complete proteins** due to their full profile of essential AAs. **Plant-based proteins** (legumes, soy, nuts, seeds) are valuable but may require combining sources to meet amino acid needs.

While **protein supplementation** is usually unnecessary in Western diets, it may be useful for:

- **Vegetarian/vegan athletes**
- **Young athletes in growth phases**
- **Athletes with dietary restrictions (religious, cultural)**

If used, **whey protein** is recommended due to its **high AA and leucine content**.

5.3 Lipids

Alongside carbohydrates, **fats (lipids)** serve as a major **energy source** during exercise, particularly **low-intensity and long-duration** efforts. However, fats are **less efficient** than CHOs in supplying rapid energy and are **not associated with performance improvements** when consumed in excess.

Lipids are essential for:

- Energy intake
- Hormonal regulation
- Cell structure
- Absorption of **fat-soluble vitamins (A, D, E, K)**

RECOMMENDED FAT INTAKE

According to the **American College of Sports Medicine (ACSM)**:

- **20–35% of total energy** should come from fat
  - **7–10%** saturated fatty acids
  - **10%** polyunsaturated fatty acids (PUFAs)
  - **10–15%** monounsaturated fatty acids (MUFAs)

Fat Quality Matters

Fats differ in quality, especially based on their **inflammatory potential**:

- **Omega-3 fatty acids** have **anti-inflammatory** properties, support **cardiovascular health**, and improve the **omega-3/omega-6 ratio**
- Good sources: **fatty fish** (salmon, sardines, anchovies), **avocados**, **olive oil**
- Limit: **fatty meats**, **processed foods** (sausages, pastries)

An excessive intake of **omega-6 fatty acids** (commonly found in vegetable oils and processed foods) can promote inflammation. To balance this:

- Aim for an **omega-6/omega-3 ratio** between **2:1 and 4:1**
- Include **vitamin E** to counteract PUFA oxidation
- Reduce meat consumption and increase oily fish intake

Great! Let's continue refining and organizing your text. Here's a polished version of **Section 6: Hydration**, written with clear structure, professional tone, and improved flow—while preserving all your original scientific content and references:

6. HYDRATION

During physical exercise, increased energy demands lead to a **rise in metabolic heat production** [34]. The body dissipates this excess heat primarily through **evaporation (sweating)**, which results in **fluid loss and dehydration**.

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Impact of Dehydration on Sports Performance

Dehydration is one of the most significant limiting factors in **sports performance (SP)**. It is estimated that for **each kilogram of body weight (BW) lost**, approximately **1 liter of sweat** is lost. While the **sensitivity to dehydration varies among individuals**, it is generally accepted that:

- **Losses greater than 2% of BW** can negatively impact performance
- A **1% loss** of BW may lead to a **10% reduction in SP**

Although some authors have explored the concept of **training under dehydration**, this remains a controversial strategy, with limited consensus on its benefits or safety.

Prevention of Dehydration

The **only effective method** to prevent dehydration is through **adequate fluid intake**, which must be ensured:

- **Before** exercise
- **During** exercise
- **After** exercise

Despite this, many athletes begin exercise in a state of **hypohydration**, which can compromise their ability to regulate body temperature and maintain performance.

Proper hydration strategies must therefore be tailored to the **individual athlete** and their **specific sport**, training conditions, and sweat rate.

Electrolyte Losses

Sweat loss not only removes water but also leads to the loss of electrolytes**, especially** sodium**, which is critical for:**

- Maintaining **fluid balance**
- Supporting **neuromuscular function**
- Preventing **muscle cramps**

Interestingly, **trained athletes** often "**sweat more, but sweat better**"—meaning they:

- Produce a **greater volume of sweat**
- Lose **less sodium per liter** due to physiological adaptations

To compensate for electrolyte losses, hydration strategies may need to include **electrolyte-rich beverages**, particularly during prolonged or high-intensity efforts in hot environments.

Here's a clean and organized version of your content with a **summary table**, clear sections, and bullet points where appropriate. This version improves flow, readability, and formatting while preserving all scientific references and facts:

6. HYDRATION

During exercise, energy expenditure increases metabolic heat production, which the body regulates mainly through **evaporative cooling** (sweating). This process causes **dehydration**, one of the main factors limiting **sports performance (SP)**.

Sweat Rate and Electrolyte Loss

- On average, **1 kg of BW loss = 1 liter of sweat lost**.
- Dehydration greater than **2% of BW** can significantly impair SP; even **1% BW loss** may cause a **10% performance reduction**.
- **Trained athletes** "**sweat more, but sweat better**"—they sweat more **water**, but **lose fewer electrolytes** per liter.
- **Tattooed skin** shows **lower sweat rates** and **higher sodium concentrations** compared to non-tattooed skin.

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Measuring Sweat Rate

To calculate sweat loss and optimize hydration:

- **Weigh the athlete** before and after training.
- **Sweat Loss (L) = BW pre - BW post**

This reveals the sweat rate in liters/hour and guides **personalized hydration strategies**

Note: Sweat rate typically exceeds **gastric emptying rate**, but athletes can train to increase this to reduce dehydration.

Hydration Monitoring Methods

Method	Purpose	Notes
Bodyweight comparison	Estimate sweat loss	1 kg BW ≈ 1 liter sweat
Urine color	Quick hydration status indicator	Darker color = more dehydrated [2]
Sweat sodium testing	Evaluate sodium loss rate	Helps tailor electrolyte intake
Environmental conditions	Adjust intake needs	Hot/humid = increased sweat loss

Hydration Mechanisms and Risks

- **Thirst is a delayed signal**: it appears after ~2% dehydration.
- Children, the elderly, and athletes have **impaired thirst response**.
- Overhydration in amateur athletes may cause **dilutional hyponatremia**, a potentially **fatal condition**.

Hydration Before, During, and After Exercise

Time	Guideline
4 hours before	400–600 ml of fluid
At exercise start	200–400 ml of water + 5–8% CHO
During	100–200 ml every 15–20 min
After	150% of fluid lost over next 6 hours

- For **short-duration/low-intensity** training: **water alone is sufficient**
- Drink **temperature**: ideally between **15–21°C**
- **Taste** should be **palatable** to encourage intake

Recommended Characteristics of Sports Drinks:

Component	Recommended Range
Energy	80–350 kcal/liter
CHO content	Max 90 g/liter (≥75% from high GI sources)
Sodium	460–1150 mg/liter
Osmolality	200–330 mOsm/kg
CHO types	Use multiple (e.g., glucose, sucrose, maltodextrin)
Fructose limit	≤20–30% to avoid gastrointestinal discomfort

Sodium Strategies

- Add **salt to meals/snacks** before and after exercise to:
  - Stimulate **thirst**
  - Improve **fluid retention**
- In **hot/humid** environments, sodium and fluid needs are **significantly higher**.

Alcohol and Sports Performance

Alcohol consumption is discouraged for athletes due to:

- **Dehydration** from diuretic effect
- **Reduced performance**: strength, power, speed, and endurance

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- **Poor sleep quality**, **mood disturbance**, and **immune suppression**
- **Increased cortisol** and **24% reduction in muscle protein synthesis** even when consumed post-exercise

Alcohol use remains common, particularly in **team sports** and among **male athletes**.

7. DIABETES IN SPORTS FIRST

The effect of exercise between insulin-dependent (type 1) and insulin-independent (type 2) diabetes should be differentiated. In type 2, exercise helps improve insulin resistance, while in type 1, it is necessary to adjust the amount of insulin administered along with carbohydrate (CHO) intake.

Physical exercise is one of the most difficult activities to adapt to diabetes due to the increased risk of hypoglycemia. Regular physical activity may reduce the need for insulin, but it does not guarantee proper glycemic control. Blood glucose levels are influenced by multiple factors, including CHO intake, the type of sport performed, and insulin dosage adjustments.

To avoid hypoglycemia, insulin doses should be reduced during exercise but never completely eliminated. Without insulin, glucose cannot adequately enter cells to provide energy. Excessive reliance on fats as fuel can lead to an accumulation of ketone bodies and result in ketoacidosis. If glucose levels exceed 250 mg/dL, ketone levels should be checked. If ketones are elevated (>0.5 mmol/L), physical activity should be postponed.

The type of exercise matters: aerobic exercise increases the risk of hypoglycemia during and after the activity, while anaerobic exercise may cause hyperglycemia due to counterregulatory hormones such as glucagon, cortisol, and catecholamines.

Exercise enhances glucose uptake by muscles independent of insulin. This effect may persist for up to 48 hours post-exercise, increasing the risk of delayed hypoglycemia. During exercise, glycogen stores in muscles and the liver are depleted. After the activity, glucose from CHO intake is prioritized for replenishing glycogen rather than circulating in the blood, which may cause hypoglycemia. Thus, higher CHO consumption or reduced insulin doses may be necessary to prevent this condition.

8. SUPPLEMENTS

An ergogenic aid is a product that contains a nutrient or a group of nutrients that improve sports performance (SP) without harmful effects, while a supplement serves as a nutritional aid to support a diet associated with physical activity.

To improve SP and tolerate high training loads or intense competitions, athletes must receive an adequate supply of nutrients. When this does not occur, dietary supplements are often used. These should be prescribed individually based on factors like sex, age, fitness, exercise type and duration, and training season. Supplements should be safe and supported by scientific evidence.

Currently, 40–70% of athletes use supplements without assessing whether they are necessary. Many supplements lack empirical evidence for improving SP. Additionally, labeling regulations are lacking, with 80% of supplements not containing the declared amounts and 10–15% containing prohibited substances, posing risks of unintentional doping violations.

According to the Australian Institute of Sport, supplements are categorized based on their effectiveness and safety:

Group A: Evidence-based. Recommended for athletes.

- Useful sources of energy or nutrients
- Scientifically proven to improve SP when used in a specific context
  - Includes: athlete-specific foods (gels, bars, electrolytes, isotonic drinks, maltodextrins, whey protein), medical supplements (vitamin D, probiotics, iron/calcium), and SP enhancers (creatine monohydrate, caffeine, beta-alanine, bicarbonate, beet juice)

Group B: Promising, but needs more research.

- Some benefit shown in non-athletes or preliminary evidence for SP improvement
- Of interest to athletes and coaches
  - Includes: quercetin, HMB, glutamine, BCAA, CLA, carnitine

Group C: Insufficient evidence.

- Limited or no proof of benefit to athletes

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- May even negatively affect performance
  - Some Group A or B supplements fall into Group C when used without proper protocols or scientific basis

Group D: Prohibited or risky. Not recommended.

- Banned or at risk of contamination with banned substances
  - Includes: glycerol, ephedrine, sibutramine, tribulus terrestris

Despite this classification, many athletes mistakenly view supplements as foundational to athletic success and overlook the importance of a solid basic diet, which is the true cornerstone of sports nutrition.

9. CONCLUSIONS

The foundation of sports nutrition is a varied diet tailored to the individual needs and preferences of each athlete. Athletes should understand the importance of diet as part of their "invisible training," which matters beyond competition day.

Before setting nutritional guidelines, it's necessary to assess and adapt the athlete's body composition (BC) throughout the season. This can be done using six-skinfold measurements.

Understanding physiology is essential to comprehend metabolic pathways involved in exercise. Based on the type, duration, and intensity of exercise, dietary intake should be adjusted accordingly. Macronutrient requirements should be calculated in grams per kilogram of body weight (g/kg/BW):

- **CHO intake**: 3–12 g/kg/BW depending on training load to maintain SP
- **Protein intake**: 1.2–2.0 g/kg/BW, with total daily intake more important than frequency
- **Fatty acids**: Quality over quantity; prioritize omega-3s to reduce inflammation over omega-6s

Proper hydration before, during, and after exercise is vital to avoid compromising SP. Athletes should be taught hydration strategies and encouraged to train their digestive systems with different CHO doses during workouts. Importantly, new nutrition or hydration routines should not be tested on competition day.

Acronyms and Abbreviations

- **SP** – Sports Performance
- **BC** – Body Composition
- **BMI** – Body Mass Index
- **DEXA** – Dual-Energy X-ray Absorptiometry
- **BIA** – Bioelectrical Impedance Analysis
- **ISAK** – International Society for the Advancement of Kinanthropometry
- **CHOs** – Carbohydrates
- **BMR** – Basal Metabolic Rate
- **BW** – Body Weight
- **AA** – Amino Acid (Mammalian)
- **mTOR** – Mechanistic Target of Rapamycin
- **ACSM** – American College of Sports Medicine

REFERENCES

- Thomas, D. T., Erdman, K. A., & Burke, L. M. (2016). *American College of Sports Medicine Joint Position Statement: Nutrition and athletic performance*. *Medicine and Science in Sports and Exercise*, 48(3), 543–568.
- Benardot, D. (2008). *Nutrición deportiva avanzada: Cómo ajustar la ingesta de alimentos y fluidos a fin de conseguir un entrenamiento y rendimiento óptimos* (2ª ed.). Madrid: Tutor.
- Martínez, J. M., Urdampilleta, A., & Mielgo, J. (2013). Necesidades energéticas, hídricas y nutricionales en el deporte. *Motricidad. European Journal of Human Movement*, 30, 37–52.

ISSN 2394 - 7780

- Burke, L. (2007). *Nutrición en el Deporte. Un enfoque práctico* (pp. 1–28). Madrid: Editorial Médica Panamericana.
- Ackland, T. R., Lohman, T. G., Sundgot-Borgen, J., Maughan, R. J., Meyer, N. L., Stewart, A. D., et al. (2012). Current status of body composition assessment in sport. *Sports Medicine*, 42(3), 227–249.
- Alvero, J. R., Cabañas, M. D., Herrero, A., Martínez, L., Moreno, C., Porta, J., et al. (2010). Protocolo de valoración de la composición corporal para el reconocimiento médico-deportivo. Documento de consenso del grupo español de cineantropometría (GREC) de la Federación Española de Medicina del Deporte (FEMEDE). *Archivos de Medicina del Deporte*, 27(139), 330–334.
- Alonso-Aubín, D. A., Moreira, O. C., Alonso-Aubín, D. A., de Oliveira, C. E. P., & Candia Luján, R. (2015). Métodos de evaluación de la composición corporal: Una revisión actualizada de descripción, aplicación, ventajas y desventajas. *Archivos de Medicina del Deporte*, 32(6), 387–394.
- Daily, J. P., & Stumbo, J. R. (2018). Female Athlete Triad. *Primary Care: Clinics in Office Practice*.
- Jeukendrup, A. E. (2003). Modulation of carbohydrate and fat utilization by diet, exercise and environment. *Biochemical Society Transactions*, 31(Pt 6), 1270–1273.
- Gil-Antuñano, N. P., Bonafonte, L. F., Marqueta, P. M., González, B. M., & García, J. A. V. (2008). Consenso sobre bebidas para el deportista. Composición y pautas de reposición de líquidos. Documento de consenso de la Federación Española de Medicina del Deporte. *Archivos de Medicina del Deporte*, 25(126), 245–258.

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BRIDGING TRADITIONAL AND MODERN EXERCISE MODALITIES: AN INTEGRATED YOGA AND AEROBICS INTERVENTION ON MOTOR-PERFORMANCE BIOMETRICS IN COLLEGIATE WOMEN

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ABSTRACT
This study examined the effect of a 12-week integrated program bridging traditional yoga and modern aerobics on selected motor-performance biometrics in collegiate women (N=36, aged 17–21 years; mean age 19.2 ± 1.4 years, height 158.5 ± 4.2 cm, and weight 54.8 ± 6.5 kg). Using a quasi-experimental design, participants were divided into an experimental group (n=18) and a control group (n=18). The experimental group underwent a structured intervention thrice weekly, while the control group maintained a sedentary routine. Pre- and post-test assessments were conducted for flexibility (sit-and-reach), muscular endurance (sit-ups), and agility (4 × 9 m shuttle run). Data were analysed using the Kolmogorov-Smirnov test for normality and t-tests for independent and correlated samples. The results showed significant statistical improvements in the experimental group ($p < 0.05$): muscular endurance improved by 6.99%, flexibility by 6.01%, and agility by 4.98%. In contrast, the control group exhibited negligible changes (<0.40%). The findings demonstrate that synergizing traditional and modern exercise modalities effectively enhances biomechanical health. The study recommends integrating such hybrid physical interventions into university physical education curricula.

Keywords: *Yoga, Aerobic Training, Motor Performance, Collegiate Women, 12-Week Intervention, Integrated Fitness*

1. INTRODUCTION
Motor performance and physical fitness are integral to the holistic development and long-term health of college-going women. In the contemporary era, increasing sedentary lifestyles have led to a decline in functional capacity among the youth. Traditional practices such as yoga emphasize flexibility, balance, and neuromuscular control, while modern aerobic exercises enhance cardiovascular endurance and metabolic efficiency.

Integrating these two modalities provides synergistic benefits that address both internal stability and external functional capacity. Despite the individual benefits documented for yoga and aerobics, limited research has explored the combined effect of a structured, integrated programme in a non-athlete female collegiate population. Therefore, this study aims to investigate the effect of a 12-week integrated yoga and aerobic training programme on flexibility, muscular endurance, and agility in collegiate women.

2. METHODOLOGY

2.1 Research Design
A quasi-experimental, pre-test/post-test control group design was employed to determine the effects of the intervention.

2.2 Participants
Thirty-six collegiate women aged 17–21 years (mean 19.2 ± 1.4 years, height 158.5 ± 4.2 cm, weight 54.8 ± 6.5 kg) were purposively selected. The criteria included being sedentary (no regular exercise for 6 months) and medically fit. They were randomly assigned into two groups:

- **Experimental Group (Integrated Training):** n = 18
- **Control Group (No Intervention):** n = 18

2.3 Intervention Programme
The experimental group participated in a structured 12-week progressive training programme. The schedule was designed to ensure physiological adaptation while maintaining safety.

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Table 1: 12-Week Integrated Yoga & Aerobics Training Schedule

Week	Session Structure (60 min)	Progression Focus
1-4	**Warm-up (10m):** Dynamic stretches. **Yoga (20m):** Surya Namaskar (3 rounds), Tadasana, Vrikshasana. **Aerobics (20m):** Low-impact steps, knee lifts (60-65% HRmax). **Cool-down (10m):** Static stretching, Anulom Vilom.	Form, technique, and foundational adaptation.
5-8	**Warm-up (10m):** Light jogging. **Yoga (20m):** Surya Namaskar (5 rounds), Dhanurasana, Naukasana. **Aerobics (20m):** Moderate-impact, grapevine, squat pulses (65-70% HRmax). **Cool-down (10m):** Kapalbhati, guided relaxation.	Intensity, endurance, and neuromuscular coordination.
9-12	**Warm-up (10m):** High knees, butt kicks. **Yoga (20m):** Surya Namaskar (7 rounds), advanced holds, Setu Bandhasana. **Aerobics (20m):** High-intensity intervals, burpees, mountain climbers (70-75% HRmax). **Cool-down (10m):** Deep stretching, meditation.	Power, agility, and peak performance.

Frequency:

- **Frequency:** 3 sessions per week | **Duration:** 60 minutes per session.
- **Control Group:** Maintained routine academic activities without any structured exercise.

2.4 Measures

Tests included the Sit-and-Reach Test (Flexibility), 1-Minute Sit-Up Test (Endurance), and 4 × 9m Shuttle Run (Agility).

1. **Flexibility:** Sit-and-Reach Test (cm). (Flexibility)
2. **Muscular Endurance:** 1-Minute Sit-Up Test (count). (Endurance)
3. **Agility:** 4 × 9-meter Shuttle Run Test (seconds). (Agility).

2.5 Statistical Analysis

Data were analysed using SPSS v26. Normality was confirmed via the Kolmogorov-Smirnov test. Within-group comparisons (pre-post) were performed using paired t-tests, while between-group comparisons were analysed using independent t-tests. Effect sizes (Cohen's d) were calculated to determine the practical significance of the findings. The alpha level for significance was set at $p < 0.05$.

3. RESULTS

Table 2: Pre-Test and Post-Test Comparative Analysis (Mean ± SD)

Variable	Group	Pre-Test	Post-Test	Improvement (%)
Flexibility (cm)	**Experimental**	34.45 ± 7.10	**36.52 ± 7.20**	**6.01%**
	Control	34.15 ± 7.45	34.22 ± 7.15	0.20%
Endurance (count)	**Experimental**	28.60 ± 6.80	**30.60 ± 6.85**	**6.99%**
	Control	28.10 ± 6.25	28.20 ± 6.30	0.36%
Agility (sec)	**Experimental**	12.85 ± 1.25	**12.21 ± 1.15**	**4.98%**
	Control	13.02 ± 1.45	13.00 ± 1.40	0.15%

Note: The improvements in the Experimental Group are statistically highly significant (**$p < 0.001$**), whereas the Control Group showed no significant changes (**$p > 0.05$**).

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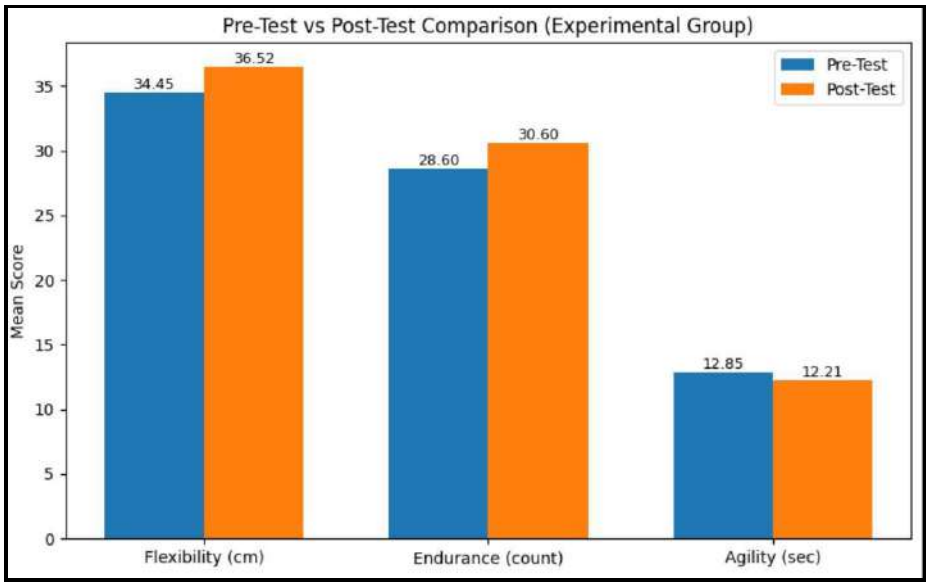

Figure 1: Percentage Improvement in Experimental Group

4. DISCUSSION

The study results strongly support the efficacy of a 12-week integrated yoga and aerobics programme. The experimental group showed clinically meaningful improvements (5% to 7%), while the control group showed negligible changes (<0.40%). This confirms that the gains were a direct result of the systematic intervention.

The **6.01% flexibility gain** is attributed to the yoga component's emphasis on sustained static and dynamic stretching, enhancing myofascial elasticity (Singh & Gaurav, 2022). The **6.99% gain in muscular endurance** likely results from the synergy between yoga's isometric holds strengthening core stabilizers and aerobics' repetitive movements improving metabolic efficiency (Gupta & Sharma, 2019). The **4.98% agility improvement** signifies enhanced reaction speed and coordination hones by the dynamic movement patterns in the aerobics segment (Thompson et al., 2022). Bridging these modalities addresses both internal stability and functional efficiency.

5. CONCLUSION & RECOMMENDATIONS

A 12-week structured integrated yoga and aerobics programme is a highly effective, holistic, and safe intervention for improving motor-performance biometrics in collegiate women. This study concludes that a 12-week, structured, integrated yoga and aerobics programme is a highly effective, holistic, and safe intervention for significantly improving the foundational motor-performance biometrics of college-aged women. The programme is both realistic and sustainable within an academic calendar.

RECOMMENDATIONS

1. **Curriculum:** University PE departments should adopt these hybrid modules.
2. **Electives:** Programmes should be offered as credit-based wellness electives.
3. **Training:** Institutions should train instructors in integrated methodologies.
4. **Future Research:** Studies should investigate long-term retention and psychological impact.

REFERENCES

Fan, J. T., & Chen, K. M. (2011). Using silver yoga exercises to promote physical and mental health of elders with dementia in long-term care facilities. International Psychogeriatrics, 23(8), 1222–1230.

Gaurav, V. (2011). Effects of Hatha Yoga training on the health-related physical fitness. Journal of Sports Science and Engineering, 5(3), 169–173.

Gupta, R., & Sharma, S. (2019). Analyzing biomechanical adaptations through 12- week structured aerobic interventions in adolescent females. Journal of Exercise Science and Physiotherapy, 15(1), 22–30.

Kumar, P., & Singh, J. (2020). Impact of aerobic dance on health-related physical fitness components of young adult females. Scientific Journal of Sport and Physical Education, 7(2), 89–96.

ISSN 2394 - 7780

Mirghafouri, H., Touranloo, H., & Mirfakhrudini, H. (2009). An analysis of the barriers to women's participation in sport activities: A case study of female students of Yazd University. Iranian Journal of Sports Management, 1(2), 83– 100.

Mishra, D. (2023). Bridging traditional Yoga and modern Aerobics: A review of motor-performance gains in female athletes. Journal of Sports Excellence and Physical Education, 12(4), 210–218.

Narasimhan, L., et al. (2021). The efficacy of Hatha Yoga on cardiovascular fitness and motor-performance biometrics in collegiate populations. Global Advances in Health and Medicine, 10, 1–9.

Polat, S., et al. (2023). Influence of a 12-week Yoga training program on physical fitness and motor-performance in university students. Journal of Physical Education and Sport, 23(1), 45–52.

Singh, A., & Gaurav, V. (2022). Comparative effect of Yoga and Aerobic exercises on agility and flexibility among college-going girls. International Journal of Physical Education, Sports and Health, 9(3), 154–158.

Soni, S. (2024). Evaluating agility and muscular endurance transformations in university women: A comparative study of specialized exercise modalities. Indian Journal of Physical Education and Sports, 18(1), 12–20.

Thompson, C. J., et al. (2022). Flexibility and neuromuscular coordination changes in college students following a twelve-week integrated fitness program. Research Quarterly for Exercise and Sport, 93(2), 315–322.

Fan, J. T., & Chen, K. M. (2011). *International Psychogeriatrics*, 23(8), 1222–1230.

Gaurav, V. (2011). *Journal of Sports Science and Engineering*, 5(3), 169–173.

Singh, A., & Gaurav, V. (2022). *International Journal of Physical Education, Sports and Health*, 9(3), 154–158.

Thompson, C. J., et al. (2022). *Research Quarterly for Exercise and Sport*, 93(2), 315–322.

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A COMPARATIVE STUDY OF SOCIAL ANXIETY DISORDER IN FIRST YEAR STUDENTS AND FIRST YEAR SPORT STUDENTS IN B.TECH PROGRAMS

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ABSTRACT
Social anxiety disorder or social anxiety disorder is a prevalent psychological problem that significantly affects the academic performance, social adjustment and overall well-being of students. During college life, sports students often experience unique social and performance-related stressors, which affect their social anxiety levels. The present study aimed to compare social anxiety levels, examining how academic and social exposures affect anxiety levels across year. A total of 100 B.Tech students participated in the study, of which n = 50 were first year students and n = 50 were first year sports students. The Social Anxiety Inventory (SPIN) was used to assess the level of social anxiety. The data were analyzed using descriptive statistics and inferential tests (e.g., independent samples t-test) to identify significant differences between the two groups. Preliminary findings indicate that first year students exhibited higher levels of social anxiety compared to first year sports students. This difference was found to be statistically significant ($p < 0.05$), suggesting that the confidence gained through greater exposure to college life, peer interaction, and participation in sports may reduce social anxiety over time. The study concluded that social anxiety decreased as students progressed through their B.Tech program due to improved social skills, academic familiarity, and adaptation to the college environment. These findings highlight the need for early psychological support and social skills training for first-year students to improve their social and emotional adjustment.

Keywords: *Social anxiety, B.Tech, first year students, sports students, psychological, significant.*

INTRODUCTION
Social anxiety, or social phobia, is a condition where students feel scared, shy, or nervous in social situations. They may avoid speaking in class, giving presentations, or even asking questions. This affects their education and confidence. In engineering colleges like KITS Warangal, students often work in teams and must talk or perform in public. If they have social anxiety, it becomes hard for them to adjust and grow academically and socially.

First-year students are new to the college system. They face new friends, new teaching styles, and are away from home. This sudden change may increase their anxiety. They also face issues like homesickness, hostel adjustment, new peer groups, and pressure to perform well in studies and settle into a completely new routine. All these changes can make them feel isolated or nervous, and they may find it hard to participate freely in class or activities.

On the other hand, first-year sports students are more used to the system and usually feel more comfortable. But they may have other worries like job placements, interviews, adjust of various cultures and environments and future career plans. Career-related anxiety can affect their focus and confidence during first year sports students, but their experience in the college makes them more socially settled.

Another key factor in this study is participation in sports. Students who play sports regularly may feel more confident and less shy. Sports help build teamwork, improve mood, and provide good social interactions. This may help reduce anxiety. Students who are not involved in sports may miss out on these benefits and remain more withdrawn or shy.

This study compares two groups:
1. First-year students

2. First-year sports students.

By comparing these groups, the study aims to understand how social anxiety changes over time in college, and whether being involved in sports helps reduce it. These findings can help teachers, counselors, and the college create better support systems.

OBJECTIVES
To measure the level of social anxiety among first-year B.Tech students.

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This objective focuses on understanding how new students, who are fresh to college life, are affected by social situations like making new friends, answering in class, and interacting with faculty.

To measure the level of social anxiety among first-year sports B.Tech students.

Here, we study students who are about to graduate. We aim to see how job placements, project presentations best performance in selected games and sports and future concerns impact their social anxiety.

METHODOLOGY

The study was done at KITS Warangal. A total of 100 B.Tech students those whose participated in sports activities are the subjects in this study. Splitting in to 50 first year students and 50 first year sports students. The students were selected randomly from different departments and different games and sports.

The Social Phobia Inventory (SPIN) was used to measure anxiety. It includes 17 questions. Each question is answered using a scale from 0 to 4: - 0 = Not at all, 1 = A little bit, 2 = Somewhat, 3 = Very much, 4 = Extremely

The survey was completed in classrooms during regular hours, and responses were kept anonymous. This made students feel comfortable in giving honest answers. The responses were collected and analyzed to find average scores and standard deviations.

The data are quantitative.

Two independent groups.

Independent Samples t – test (welch's t–test) is appropriate using SPSS.

The t-test method was used to compare the means of two groups. A t-value below 6.02 means the difference is to say it's significant. The analysis aimed to check whether students in first year sports students had significantly lower anxiety levels.

Overall, this method gives a clear idea of how anxiety changes based on year and activity level.

RESULTS

Here is the table showing number of students in social anxiety level:

Sl. No	Group	n	mean	St.deviation	t- value	Table value	P value
1	First year students	50	22.08	12.61	6.02	1.98	0.000000047
2	First year sports students	50	9.44	7.85			

Since the calculated t – value (6.02) is greater than the table value (1.98) and the p – value is less than 0.05 level of significance. The null hypothesis was rejected

This shows that sportspersons had lower average social anxiety, the difference is statistically significant.

To understand these results better, it's important to consider the reasons behind the differences. First-year students, being new to college, may experience uncertainty and fear of judgment in new academic and social environments. They are often adjusting to hostel life, new friendships, and academic pressure, which can all raise anxiety. In contrast, first year sports students have already adapted to the environment and built social circles, which could help reduce anxiety levels. Additionally, involvement in extracurricular activities like camp fires, dances, different locations, different cultures, contributing to better confidence and lower anxiety score.

CONCLUSION

It can be said that Social Anxiety Disorder, with its specific pattern among first-year student and first year sports students B.Tech student participants involved in sports activity, could be effectively differentiated and marked in terms of its presence among these subjects, thus asserting that college year considerably affects the display of anxiety. It emerged that first-year participants were more predominant and serious about collective social interactions, due no doubt to the intense pressure associated with acclimatization with a new college and adapting with new people and a new athletic unit. By contrast, while displaying adaptability with college life in the main, they were more serious about displaying average severity on performance anxiety and more precisely about serious career-merging presentations like practicum presentation, SEA(social empowerment activity),SAA(self accomplishment activity) final presentations. It thus becomes clear that these participants display considerable variability among social anxieties based on career considerations. Accordingly, these

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anxieties fluctuate among these participants from adjustment associations with social anxieties at an early academic period and shifts among performance anxieties at an end academic period. As such, intervention methods for these participants at these different academic periods could be more effectively psycho-educated at an early academic period as college participants in confidence-building techniques and enable specific workshops at an end academic period as college -merging career participants with specific coaching geared toward intense career anxiety.

RECOMMENDATIONS

Based on what we found, here are some ideas to help students with social anxiety:

Promote Sports and Activities: Encourage students to join sports or group activities. These can build confidence and reduce fear in social situations.

Buddy or Mentor Program: First-year students can get help from seniors who guide them and make them feel more comfortable in college.

Counseling and Workshops: Arrange workshops on public speaking, stress management, and how to deal with anxiety. Make counseling more accessible.

Regular Screening: Use tools like SPIN scale once every semester to find students who may need help early.

Teacher and Parent Support: Teachers and parents should be aware of social anxiety signs. They should motivate students to participate in discussions and not judge them.

These small steps can make a big difference. With support, students can learn to face fear and grow more confident in life.

REFERENCES

- Richey, J. A., Brewer, J. A., Sullivan-Toole, H., Strege, M. V., Kim-Spoon, J., White, S. W., & Ollendick, T. H. (2019). Sensitivity shift theory: A developmental model of positive affect and motivational deficits in social anxiety disorder. *Clinical Psychology Review*, 101756.
- Tone, E. B., Nahmias, E., Bakeman, R., Kvaran, T., Brosnan, S. F., Fani, N., & Schroth, E. A. (2019). Social anxiety and social behavior: A test of predictions from an evolutionary model. *Clinical Psychological Science, 7*(1), 110–126.
- Goodman, F. R., Kashdan, T. B., Stiksma, M. C., & Blalock, D. V. (2019). Personal strivings to understand anxiety disorders: Social anxiety as an exemplar. *Clinical Psychological Science, 7*(2), 283–301.
- Amrhein, V., Greenland, S., & McShane, B. (2019). Scientists rise up against statistical significance. *Nature, 567*(7748), 305–307.
- Goodman, F. R., Stiksma, M. C., & Kashdan, T. B. (2018). Social anxiety and the quality of everyday social interactions: The moderating influence of alcohol consumption. *Behavior Therapy, 49*(3), 373–387.
- Kristjánsdóttir, H., Erlingsdóttir, A. V., Sveinsson, G., & Saavedra, J. M. (2018). Psychological skills, mental toughness and anxiety in elite handball players. *Personality and Individual Differences, 134*, 125–130.
- Atarbay, S. (2017). *Farklı bölümlerde öğrenim gören üniversite öğrencilerinin sosyal kaygı düzeylerinin psikolojik dayanıklılıklarına etkisi* (Unpublished Master's thesis). İstanbul Üniversitesi, Eğitim Bilimleri Enstitüsü.
- Bantin, T., Stevens, S., Gerlach, A. L., & Hermann, C. (2016). What does the facial dot-probe task tell us about attentional processes in social anxiety? A systematic review. *Journal of Behavior Therapy and Experimental Psychiatry, 50*, 40–51.
- Trull, T. J., Lane, S. P., Koval, P., & Ebner-Priemer, U. W. (2015). Affective dynamics in psychopathology. *Emotion Review, 7*(4), 355–361.
- Çağlayan Tunç, A. (2015). *Sporun üniversite öğrencilerinin sosyal kaygı ve öznel iyi oluş düzeylerine etkisi* (Unpublished Master's thesis). Selçuk Üniversitesi, Sağlık Bilimleri Enstitüsü.
- Gilbert, P. (2014). Evolutionary models: Practical and conceptual utility for the treatment and study of social anxiety disorder. In J. W. Weeks (Ed.), *The Wiley Blackwell Handbook of Social Anxiety Disorder* (pp. 24–52). Wiley-Blackwell.

ISSN 2394 - 7780

- Mitchell, M. A., & Schmidt, N. B. (2014). An experimental manipulation of social comparison in social anxiety. *Cognitive Behaviour Therapy, 43*(3), 221–229.
- Aderka, I. M., Haker, A., Marom, S., Hermesh, H., & Gilboa-Schechtman, E. (2013). Information-seeking bias in social anxiety disorder. *Journal of Abnormal Psychology, 122*(1), 7–12.
- Civan, A., Arı, R., Görücü, A., & Özdemir, M. (2010). Bireysel ve takım sporcularının müsabaka öncesi ve sonrası durumluluk ve sürekli kaygı düzeylerinin karşılaştırılması. *Uluslararası İnsan Bilimleri Dergisi, 7*(1), 193–206.
- Aderka, I. M., Weisman, O., Shahar, G., & Gilboa-Schechtman, E. (2009). The roles of the social rank and attachment systems in social anxiety. *Personality and Individual Differences, 47*(4), 284–288.
- Alden, L. E., Taylor, C. T., Mellings, T. M., & Laposa, J. M. (2008). Social anxiety and the interpretation of positive social events. *Journal of Anxiety Disorders, 22*(4), 577–590.
- Aydın, A., & Tekinsav-Sütçü, S. (2007). Ergenler için sosyal kaygı ölçeğinin (ESKÖ) geçerlik ve güvenirliğinin incelenmesi. *Çocuk ve Gençlik Ruh Sağlığı Dergisi, 14*(2), 79–89.
- Gratton, C., & Jones, I. (2010). *Research methods for sport studies* (2nd ed.). London: Routledge.
- Brewer, B. W., Diehl, N. S., Cornelius, A. E., Joshua, M. D., & Van Raalte, J. L. (2004). Exercising caution: Social physique anxiety and protective self-presentational behaviour. *Journal of Science and Medicine in Sport, 7*, 47–55.

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A COMPARATIVE STUDY OF SELF-EFFICACY LEVEL AMONG SPORTS PERSONS AND NON-SPORTS PERSONS

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ABSTRACT
The present study aimed to compare the self-efficacy levels of sportspersons and non-sportspersons to determine whether regular participation in sports activities influences individuals' confidence in their abilities to perform tasks effectively. A total of 100 participants (50 sportspersons and 50 non-sportspersons) aged between 18 and 25 years were selected using a purposive sampling technique. The General Self-Efficacy Scale (GSES) developed by Schwarzer and Jerusalem (1995) was administered to measure self-efficacy levels. The data were analyzed using mean, standard deviation, and t-test to compare the two groups. The results revealed that sportspersons exhibited significantly higher self-efficacy scores compared to non-sportspersons ($p < 0.05$). This suggests that engagement in sports and physical activities contributes positively to the development of confidence, perseverance, and problem-solving skills. The study highlights the importance of sports participation in fostering psychological well-being and recommends integrating physical activities into daily routines to enhance overall self-efficacy.

Keywords: *Self-efficacy, sportspersons, non-sportspersons, confidence, sports participation, psychological well-being.*

INTRODUCTION
Self-efficacy means the confidence a person has in their own ability to complete tasks and face challenges successfully. It plays an important role in shaping how individuals think, feel, and act in different situations. People with high self-efficacy usually believe that they can overcome difficulties through effort and persistence.

Sports activities are not only helpful for physical fitness but also contribute greatly to mental and emotional development. Sportspersons often experience competition, teamwork, discipline, and goal setting. These experiences help them develop self-confidence, determination, and emotional control. Regular participation in sports may therefore strengthen a person's belief in their own abilities.

Non-sportspersons may not get frequent opportunities to face such challenging situations. As a result, their confidence level and ability to handle stress may be comparatively lower.

The present study aims to compare the self-efficacy levels of sportspersons and non-sportspersons and to understand how sports participation influences confidence and psychological well-being.

OBJECTIVES OF THE STUDY

The objectives of the present study are:
To study the level of self-efficacy among sportspersons.

To study the level of self-efficacy among non-sportspersons.

To compare the self-efficacy levels of sportspersons and non-sportspersons.

To understand the role of sports participation in developing confidence.

METHODOLOGY
The study was done at Govt.Degree College Nalgonda,Telangana.

The study followed a descriptive comparative research design to compare two different groups.

The sample consisted of 100 participants between the age group of 18 and 25 years,50 sportspersons,50 non-sportspersons

The General Self-Efficacy Scale (GSES) was used to measure the self-efficacy levels of the participants. It includes 10 questions each question is answered using scale from1 to 4. 1= Not at true, 2= Hardly true, 3=Moderately true, 4=Exactly true. This scale helps in understanding how confident individuals feel about handling different situations.

The data are quantitative

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Two independent group

Independent sample (t-test).

RESULT

s.no	group	No's	mean	Std.deviation	T value	Table value	P value
1	Sports persons	50	35.00	4.33	4.70	1.98	<0.001
2	Non- sports persons	50	28.96	6.42			

The result revealed that sports persons (m=35.00),(SD=4.33) scored higher on self efficiency level compared to non sports persons (m=28.96), (SD=6.42) the calculated t-value was 5.52 This value exceeded the table value of 1.98 at the 0.05 level of significance. Further the obtained p- value was less than <0.001 indicating that the difference between the two group was statistically significant. Therefore null hypothesis was rejected. The research hypothesis accepted.

The difference in mean scores between sports persons and non-sports persons is statistically significant.

CONCLUSION

The present study concludes that sportspersons have higher self-efficacy levels compared to non-sportspersons. Participation in sports helps individuals develop confidence, emotional stability, and perseverance. Sports activities contribute not only to physical development but also to mental and psychological well-being.

Encouraging students to engage in sports can play an important role in building self-belief and overall personality development.

RECOMMENDATIONS

Educational institutions should motivate students to participate in sports activities.

Sports should be included as a regular part of academic life.

Non-sportspersons should be encouraged to engage in physical activities for better confidence.

Further studies can be conducted with a larger sample size.

REFERENCE

Sharma, R. A. (2016). Research Methods in Physical Education and Sports.Friends Publications.

Physical Activity: An Armstrong, N., &Welsman, J. (2014). Young People and Overview. Journal of Sports Sciences, 32(6), 495–502.

Field, A. (2013). Discovering Statistics Using IBM SPSS Statistics.Sage Publications.

Bompa, T., &Haff, G. (2009). Periodization: Theory and Methodology of Training. Human Kinetics.

Bandura, A. (1997). Self-Efficacy: The Exercise of Control. New York: W.H. Freeman.

Schwarzer, R., & Jerusalem, M. (1995). General Self-Efficacy Scale. Windsor, UK: NFER-NELSON.

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EFFECT OF YOGA ON SELECTED PHYSICAL FITNESS COMPONENTS AMONG THE DEGREE COLLEGE GIRLS IN SIRICILLA DIST, TELANGANA

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INTRODUCTION

Yoga is an Indian physical Culture, which can be practiced by anyone and which does not require any special equipment or clothing. But it requires a small amount of space and a strong desire for a healthier life. Yoga helps in building physical and mental health of an individual. Yogasana is a scientific procedure of exercise which affects the inmost parts of the body. Now the Indian physical culture is accepted world over and around 28 countries are now enjoying the fruits of our culture.

Yoga has become a part and parcel of Physical Education and it is getting its due weight age at various levels such as Schools, Colleges, Clubs and Senior Citizens are also doing yogic practices to delay the ageing process and to avoid various medical ailments. Studies on Padmasana, Siddhasana, Pachimottanasana, Bhujangasana, Dhanurasana, Kurmasana etc., have revealed some degree of specificity in terms of Cardio-respiratory adjustments. Various studies have shown that regular practice of asanas and pranayama can help aliments like arthritis, arteriosclerosis, chronic fatigue, astama, varicose veins, heart conditions, temperature, heart beat and blood pressure.

SIGNIFICANCE OF THE STUDY

The study investigates the existing difference between pre test and post test of yogic exercise in relation to their selected physical fitness components i.e. Flexibility, Agility, Muscular Endurance and Circular-Respiratory Endurance among Degree College Girls of Siricilla Dist., Telangana.

OBJECTIVE OF THE STUDY

The research will find out the effect of Yogic Exercise on selected physical fitness components i.e. Flexibility, Agility, Muscular Endurance and Circular-Respiratory Endurance among Degree College Girls of Siricilla Dist., Telangana.

HYPOTHESES

The following hypotheses are formulated for the study.

There may not be any significant difference the effect of Yogic exercise between pre test and post test of Degree College Girls of Siricilla Dist., Telangana in relation to their physical fitness components i.e. flexibility, agility muscular endurance and circular respiratory endurance

DATA COLLECTION PROCEDURE

The subjects of the study consisting 50 Degree College Girls of Siricilla District.Telangana were in the age group between 20 to 25 years has been selected for the study and they have undergone Yogic exercises for 45 days. AAHPERD was administrated and the pre- test was taken, and then the post test was administrated after the systematic training of Yogic exercises for Degree College Girls of Siricilla Dist., Telangana.

RESULTS & DISCUSSIONS

The table showing significant difference of the effect of Yogic exercise between pre test and post test of Degree College Girls of Siricilla Dist., Telangana in relation to their physical fitness components i.e. flexibility, agility, muscular endurance, circular respiratory endurance.

SL. NO	Parameters	N	Pre Test		Post Test		't' value	p- ratio
			Mean	SD	Mean	SD		
1.	Flexibility	50	34.32	4.659	40.22	4.421	3.436	2.80
2.	Agility	50	13.26	0.623	10.82	0.426	4.476	
3.	Muscular Endurance	50	16.67	5.347	28.32	6.252	4.764	
4.	Circular Respiratory Endurance	50	135.314	4.23	168.96	8.588	3.587	

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CONCLUSSION

Hence, it is finally concluded that the Effect of Yogic Exercises on physical fitness have shown a positive impact among Pre-Test and Post-Test Degree College Girls of Siricilla Dist., Telangana in relation to their physical fitness components i.e. flexibility, agility, muscular endurance, circular respiratory endurance. A student has to judge, to observe and act with rational **'think-and-act'** manner. So the maxim **"Healthy mind in a healthy body"** assumes a touch of reality. In this way physical activity develops or at least involves intellectual activity and consequently brings about a communion between hand and head which elates the heart. This leads to the development of right and desirable habits resulting in the formation of socially useful and cheerful citizens.

REFERENCES

- George T. Stafford and Ray O. Dencan, Physical Conditioning Exercises for Sports and Health Living (New York: The Ronald Press Company, 1965) P. 15.
- Srivatson, “Over all pattern of coaching Basketball”, Yayam I (May 1963) P. 13
- F. Edward Coyle, Mari. K. Hammert and Andrew R. Coggan, Effect of determining of Cardiovascular responses to exercise: “Role of Blood Volume Journal of Applied Physiology” 60, No. 1 (Jan. 1986), P. 95-99.

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INTEGRATION OF YOGA AND PHYSICAL EDUCATION: A COMPARATIVE STUDY OF FITNESS AND WELL-BEING

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ABSTRACT

Physical education has long emphasized the development of motor skills, physical fitness, and sport-related competence. In parallel, yoga has emerged as a holistic practice that supports physical, mental, and emotional well-being. Although both fields individually contribute to student health, there is limited consolidated evidence comparing their combined influence on overall fitness and well-being, particularly through a secondary-data–based examination.

The study aims to (i) review and compare existing research findings on the effects of yoga and physical education on physical fitness parameters, (ii) analyze secondary literature to understand the combined impact of both disciplines on psychological well-being, and (iii) critically evaluate whether an integrated approach demonstrates more comprehensive benefits than either yoga or physical education alone.

This research adopts a comparative review design, relying exclusively on secondary data drawn from published books, peer-reviewed journals, government reports, and previously conducted empirical studies. Relevant literature was systematically identified, screened, and categorized into themes related to physical fitness, mental health, and holistic development. Comparative analysis was performed by synthesizing findings across studies rather than collecting primary quantitative or qualitative data.

The review of secondary sources indicates that yoga consistently enhances flexibility, balance, stress reduction, and emotional regulation, while physical education improves muscular strength, endurance, and motor skills. Studies that examined integrated programs reported more balanced physical development, improved concentration, reduced anxiety, and better overall well-being compared to single-discipline approaches. Across reviewed literature, the integrated model was frequently linked with superior holistic outcomes.

Based on the synthesis of existing research, integrating yoga with physical education appears to offer a more comprehensive and effective approach to student fitness and well-being than either discipline independently. The findings suggest that educational institutions may benefit from incorporating integrated programs to support the physical, mental, and emotional development of learners. Future research with primary data may further validate the advantages identified in this review-based comparative analysis.

Keywords: *Yoga, Physical Education, Fitness, Well-being, Holistic Development, Integrative Approach, Comparative Study, Mental Health, Flexibility, Balance, Muscular Endurance, Physical Fitness Parameters, Stress Reduction, Educational Curriculum, Student Health, Mind–Body Practices, Exercise Physiology, Behavioral Outcomes, Physical Activity, Youth Development*.

1. INTRODUCTION

Education systems across the world increasingly recognize the importance of fostering not only cognitive development but also physical, mental, and emotional well-being[1, 4]among learners. Physical education (PE) has long been an integral component of school and university curricula, aiming to enhance physical fitness, motor skills, teamwork, and discipline[3, 7]. Parallel to this, yoga—rooted in ancient Indian philosophy—has gained global recognition as a mind–body practice promoting holistic health, stress management, and self-regulation.

While physical education primarily focuses on measurable physical outcomes such as strength, endurance, and motor performance, yoga emphasizes flexibility, balance, breathing regulation, mental calmness, and emotional stability. In recent years, scholars and educators have argued that an integrated approach combining yoga and physical education may better address the multidimensional health needs of students[6]. However, empirical evidence comparing single-discipline and integrated approaches remains scattered across diverse studies.

The present research addresses this gap by systematically reviewing and comparing existing secondary literature on yoga, physical education, and their integration. By synthesizing findings from previous studies, the paper seeks to provide a comprehensive understanding of how integrated programs may enhance overall fitness and well-being.

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2. REVIEW OF LITERATURE

2.1 Yoga and Physical Fitness

Previous research has consistently highlighted the positive effects of yoga on flexibility, balance, posture, and neuromuscular coordination[2, 4]. Regular practice of asanas and pranayama has been associated with improved joint mobility, muscular endurance, and postural alignment. Several studies also report reductions in perceived stress and improvements in autonomic regulation through yoga-based interventions[5].

2.2 Yoga and Psychological Well-being

Yoga has been widely studied for its impact on mental health outcomes such as anxiety, depression, emotional regulation, and concentration. Mindfulness, controlled breathing, and relaxation techniques inherent in yoga practices contribute to improved attention, emotional stability, and resilience among students. [5, 6]

2.3 Physical Education and Fitness Parameters

Physical education programs emphasize aerobic capacity, muscular strength, speed, agility, and coordination[3, 7]. Research demonstrates that structured PE classes contribute significantly to cardiovascular fitness, muscular development, and motor skill acquisition. Participation in sports and physical activities is also linked with social development and teamwork skills[3].

2.4 Integrated Yoga and Physical Education Approaches

Emerging literature suggests that integrating yoga into physical education curricula may yield synergistic benefits. Studies examining combined programs report improvements in both physical fitness parameters and psychological well-being, indicating more balanced development than single-discipline interventions[6]. Such integration is increasingly advocated within holistic education frameworks.

3. OBJECTIVES OF THE STUDY

The objectives of the present study are:

1. To review and compare existing research findings on the effects of yoga and physical education on physical fitness parameters.
2. To analyze secondary literature addressing the influence of yoga and physical education on psychological well-being.
3. To critically evaluate whether an integrated approach offers more comprehensive benefits than yoga or physical education alone.

4. METHODOLOGY

4.1 Research Design

The present study employs a **comparative review research design** based exclusively on secondary data. No primary data were collected from participants. The design was chosen to allow systematic synthesis and comparison of existing research findings related to yoga, physical education, and their integration.

4.2 Sources of Data

Secondary data were collected from multiple academic and institutional sources, including:

- Peer-reviewed national and international journals related to yoga, physical education, sports science, and health sciences
- Published books and edited volumes on yoga, physical education, and holistic health
- Government and institutional reports on physical education, yoga, and student health
- Previously conducted empirical research studies, reviews, and meta-analyses

4.3 Inclusion and Exclusion Criteria

Inclusion criteria:

- Studies focusing on yoga, physical education, or integrated yoga–PE programs
- Research addressing physical fitness, mental health, or holistic well-being
- Studies conducted in educational or youth-related contexts
- Publications available in English

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Exclusion criteria:

- Opinion articles without empirical or theoretical grounding
- Studies unrelated to health, fitness, or educational outcomes
- Duplicate publications or studies with insufficient methodological clarity

4.4 Procedure of Data Collection

Relevant literature was identified through systematic searching of academic databases, university libraries, and reference lists of selected articles. Titles and abstracts were screened for relevance, followed by full-text review of eligible sources. The selected literature was then organized thematically under physical fitness, psychological well-being, and integrated approaches.

4.5 Method of Analysis

A qualitative comparative analysis was employed to synthesize findings across studies. Results from different sources were compared to identify common trends, convergences, and divergences. Emphasis was placed on understanding relative and combined effects rather than statistical aggregation, as the study did not involve primary quantitative data.

4.6 Ethical Considerations

As the study relied solely on secondary data from publicly available sources, no direct ethical risks to participants were involved. Proper acknowledgment and citation of all sources were ensured to avoid plagiarism and maintain academic integrity.

5. RESULTS AND DISCUSSION

The comparative synthesis of secondary literature indicates that yoga and physical education contribute distinct yet complementary benefits. Yoga predominantly enhances flexibility, balance, stress reduction, emotional regulation, and concentration[4, 5]. Physical education, on the other hand, significantly improves muscular strength, endurance, cardiovascular fitness, coordination, and motor skills[3, 7].

Studies examining integrated programs consistently report more holistic outcomes, including balanced physical development, improved mental focus, reduced anxiety, and enhanced overall well-being. The integration appears to bridge the gap between physical performance and mental health, supporting the argument for a comprehensive educational approach[6].

6. CONCLUSION

Based on the review and comparative analysis of existing secondary literature, the integration of yoga and physical education emerges as a more comprehensive approach to promoting student fitness and well-being than either discipline alone. The findings support the inclusion of integrated programs within educational curricula to foster holistic development. Future research involving primary data, experimental designs, and longitudinal studies is recommended to further validate and quantify the benefits identified in this review.

7. LIMITATIONS OF THE STUDY

- The study is based exclusively on secondary data and does not involve primary empirical investigation.
- Findings depend on the quality and scope of previously published research.
- Variations in study design, population, and intervention duration across reviewed studies may limit direct comparability.

8. RECOMMENDATIONS

- Educational institutions should consider integrating yoga with physical education programs.
- Curriculum planners may design structured modules combining yogic practices with physical training.
- Future researchers should conduct controlled experimental studies to establish causal relationships.

REFERENCES

[1] Alter, J. S. (2005).
Yoga in modern India: The body between science and philosophy. Princeton University Press. Explains the philosophical and scientific foundations of yoga and its role in holistic health.

[2] Bhavanani, A. B. (2011).
Yoga therapy: Notes for professionals. Indian Journal of Physiology and Pharmacology, 55(3), 202–214. Discusses physiological benefits of yoga, including flexibility, balance, and autonomic regulation.

ISSN 2394 - 7780

[3] Corbin, C. B., Pangrazi, R. P., & Franks, B. D. (2000).
Definitions: Health, fitness, and physical activity. President's Council on Physical Fitness and Sports. Provides foundational concepts of physical education, fitness, and physical activity outcomes.

[4] Iyengar, B. K. S. (2005).
Light on yoga. HarperCollins.

Authoritative text detailing yogic practices and their effects on physical and mental health.

[5] Kauts, A., & Sharma, N. (2009).
Effect of yoga on academic performance in relation to stress. International Journal of Yoga, 2(1), 39–43. Empirical evidence on yoga's role in stress reduction and psychological well-being.

[6] Ross, A., & Thomas, S. (2010).
The health benefits of yoga and exercise: A review of comparison studies. Journal of Alternative and Complementary Medicine, 16(1), 3–12.

Compares yoga, exercise, and integrated approaches, supporting combined interventions.

[7] World Health Organization. (2010).
Global recommendations on physical activity for health. WHO Press.

Establishes international guidelines highlighting the importance of physical education and activity.

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KNEE INJURIES IN SPORTS: INCIDENCE, MECHANISMS, AND PREVENTIVE STRATEGIES

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ABSTRACT
Knee injuries represent a significant concern in sports medicine due to their high incidence and substantial impact on athletic performance and career longevity. The knee joint is essential for movement, stability, and load transmission during sporting activities, making it particularly susceptible to both acute and overuse injuries. Athletes involved in high-impact and pivoting sports are at greater risk of sustaining injuries such as anterior cruciate ligament (ACL) ruptures, meniscal tears, collateral ligament sprains, and patellofemoral disorders. These injuries commonly result from non-contact mechanisms including sudden deceleration, rapid directional changes, poor landing biomechanics, muscle imbalances, and inadequate neuromuscular control, as well as from direct trauma during contact sports. The consequences of knee injuries include pain, functional limitation, prolonged rehabilitation, and an increased risk of long-term joint degeneration. Early diagnosis, appropriate clinical management, and evidence-based rehabilitation protocols are essential to optimize recovery and reduce recurrence. Recent advancements in diagnostic imaging, surgical techniques, and physiotherapy interventions have improved clinical outcomes; however, injury prevention remains a priority. Preventive measures such as neuromuscular training programs, strength and flexibility conditioning, biomechanical correction, and athlete education have shown promising results in reducing injury rates. This research emphasizes the need for a multidisciplinary approach involving athletes, coaches, physiotherapists, and sports physicians to effectively manage and prevent knee injuries. Implementation of structured prevention and rehabilitation programs is critical to ensuring athlete safety, enhancing performance, and promoting long-term knee joint health.

Keywords: *Knee injuries, Sports medicine, ACL, Meniscus, Injury prevention*

INTRODUCTION
Knee injuries constitute a significant challenge in sports medicine due to their high incidence and profound impact on athletic performance and career longevity. The knee joint plays a vital role in locomotion, balance, shock absorption, and force transmission during sporting activities. Its anatomical complexity, involving bones, ligaments, menisci, muscles, and articular cartilage, makes it susceptible to injury under high mechanical stress. Knee injuries are a leading cause of time loss from sports participation across all levels of competition. Lohmander, *et al.* (2007) emphasized that the knee injuries sustained in youth sports may have consequences that extend well into later adulthood. Due to its anatomical complexity and functional demands, the knee joint is particularly susceptible to both acute traumatic and chronic overuse injuries. As DeLee and Farney (1992) stated, the knee is one of the most commonly injured joints in athletic competition because it functions at the junction of large lever arms and powerful muscle groups. Collateral ligament injuries of the knee, involving the medial collateral ligament (MCL) and lateral collateral ligament (LCL), are common in sports that include contact, rapid directional changes, and valgus or varus stress to the knee. These ligaments play a crucial role in maintaining frontal-plane stability of the knee joint. As Brantigan and Voshell (1941) described early, the collateral ligaments are the primary restraints to abnormal side-to-side motion of the knee.

Athletes involved in sports such as football, basketball, volleyball, hockey, and athletics are frequently exposed to movements that place excessive strain on the knee joint. According to Griffin, *et al.,*(2006) non-contact anterior cruciate ligament (ACL) injuries account for the majority of serious knee injuries in athletes." Overuse injuries such as patellofemoral pain are particularly common in runners and female athletes. Injuries to the knee not only result in immediate pain and disability but may also lead to long-term consequences such as early-onset osteoarthritis and recurrent instability. Therefore, understanding the causes, management, and prevention of knee injuries is essential for sports health professionals.

METHODOLOGY
This study is based on a secondary research method, which means information was collected from already published materials. Data Collection Information was gathered from textbooks, research articles, sports medicine journals, online educational sources, and scientific reports. Only reliable and recent sources were used to ensure accuracy. The study focused on important knee injuries commonly seen in sports, mainly ACL injuries and meniscus injuries. Information about causes, symptoms, treatment, and prevention was selected because these areas are most relevant to athletes. The collected data was carefully read and compared to

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understand patterns and similarities across different studies. Key points such as risk factors, treatment methods, and preventive strategies were summarized in simple language.

Epidemiology of Knee Injuries

Knee injuries account for a substantial proportion of all sports-related injuries across different age groups and competitive levels (Van, *et al.,* 1992). Studies consistently report the knee as one of the most commonly injured joints in both amateur and professional athletes. Non-contact mechanisms are responsible for a large percentage of serious knee injuries, particularly anterior cruciate ligament (ACL) ruptures. Female athletes have been shown to experience higher rates of certain knee injuries, especially ACL injuries, compared to their male counterparts. Factors such as anatomical differences, hormonal influences, neuromuscular control, and movement patterns contribute to this increased risk. Youth athletes are also vulnerable due to incomplete musculoskeletal development and improper training techniques.

Anatomy and Biomechanics of the Knee Joint

The knee joint is a modified hinge joint formed by the femur, tibia, and patella. Stability is provided by static structures such as the anterior and posterior cruciate ligaments, medial and lateral collateral ligaments, and menisci, as well as dynamic support from surrounding muscles, particularly the quadriceps and hamstrings. According to Butler, *et al.,* (1980) the cruciate ligaments are the primary restraints to anterior-posterior translation of the tibia relative to the femur. The medial collateral ligament, due to its firm attachment to the joint capsule, is more frequently injured than the lateral collateral ligament. The menisci transmit and distribute load across the knee joint, significantly reducing stress on the articular cartilage (McDermott and Amis, 2006). Loss or damage to the menisci leads to increased contact pressure and accelerated degenerative changes. During sports activities, the knee is subjected to high loads, rotational forces, and shear stresses. Poor alignment, inadequate muscle strength, and faulty biomechanics can compromise joint stability and increase injury risk. Proper neuromuscular coordination is essential to maintain knee integrity during dynamic movements.

COMMON TYPES OF KNEE INJURIES IN SPORTS

Anterior Cruciate Ligament (ACL) Injuries

ACL injuries are among the most severe and debilitating knee injuries in athletes. They often occur through non-contact mechanisms such as sudden deceleration, pivoting, or awkward landing. ACL rupture leads to joint instability, functional limitation, and frequently requires surgical reconstruction followed by prolonged rehabilitation. Arendt and Dick (1995) showed significantly higher anterior cruciate ligament injury rates in both female sports compared with the male sports. Non contact mechanisms were the primary cause of anterior cruciate ligament injury in both female sports. Possible causative factors for this increase in anterior cruciate ligament injuries among women may be extrinsic. Mihata, *et al.,* (2006) also reported that unlike basketball and soccer, the rates of anterior cruciate ligament injury are essentially the same in men's and women's lacrosse. The level of allowed contact in pivoting sports may be a factor in determining sport-specific anterior cruciate ligament risk.

Meniscal Injuries

Meniscal tears commonly occur due to twisting movements or deep knee flexion under load. They may occur in isolation or in combination with ligament injuries. Meniscal damage can impair shock absorption and joint stability, increasing the risk of degenerative changes. The menisci of the knee have an important role in load-bearing and shock absorption within the joint. They may also function as secondary stabilisers, have a proprioceptive role, and aid the lubrication and nutrition of the articular cartilage. Complete or partial loss of a meniscus can have damaging effects on a knee, leading to serious long-term sequelae (McDermott and Amis, 2006). Wang, *et al.,* (2014) reported that the stress of the tibiofemoral articular surface significantly increases after knee meniscus injury or resection, and the average pressure significantly increases. The stress of the tibiofemoral articular surface can be restored to almost normal after meniscus transplantation.

Collateral Ligament Injuries

Medial and lateral collateral ligament sprains usually result from valgus or varus forces applied to the knee. These injuries are more common in contact sports and vary in severity from mild sprains to complete tears. According to Butler, *et al.,* (1980) the medial collateral ligament is the main stabilizer of the knee against valgus forces throughout the range of motion. The LCL, though less frequently injured, is vital for posterolateral stability, and its injury may lead to significant functional impairment.

Patellofemoral Disorders

Patellofemoral pain syndrome and related disorders are frequently associated with overuse, muscle imbalance, and malalignment. These conditions are common in runners and athletes involved in repetitive knee flexion

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activities. Crossley, *et al.* (2016) stated that patellofemoral pain is a multifactorial condition requiring a comprehensive biomechanical approach to management.

Mechanisms of Injury

Knee injuries may result from contact or non-contact mechanisms. Non-contact injuries are often related to poor landing biomechanics, inadequate neuromuscular control, muscle imbalances, and fatigue. Contact injuries typically involve direct blows or collisions during sports participation. Bahr and Krosshaug (2005) highlighted that understanding injury mechanisms is a fundamental requirement for effective injury prevention in sport. Environmental factors such as playing surface, footwear, and weather conditions can also influence injury risk. Improper training loads and insufficient recovery further contribute to injury occurrence.

Clinical Evaluation and Diagnosis

Accurate diagnosis of knee injuries requires a thorough clinical history, physical examination, and appropriate imaging studies. Clinical tests such as ligament stability assessments and meniscal tests are essential components of evaluation. LaPrade, *et al.*(2007) emphasized that a thorough physical examination remains the cornerstone of knee injury diagnosis despite advances in imaging technology. Magnetic resonance imaging (MRI) is widely used to confirm clinical findings and identify associated injuries. Advancements in imaging techniques, particularly magnetic resonance imaging (MRI), have significantly improved diagnostic accuracy. Early and precise diagnosis allows for timely intervention and better clinical outcomes.

Management and Rehabilitation

Management of knee injuries depends on the type, severity, and functional demands of the athlete. Conservative treatment may include rest, physiotherapy, bracing, and activity modification. Surgical intervention is often indicated for severe ligament injuries and complex meniscal tears. Fox and Matava (2011) stated that successful outcomes following knee injury depend on both appropriate surgical decision-making and structured rehabilitation. Rehabilitation focuses on restoring strength, proprioception, and functional movement patterns.

Rehabilitation is a critical component of recovery and focuses on restoring range of motion, strength, proprioception, and functional performance. Evidence-based rehabilitation protocols emphasize progressive loading, neuromuscular training, and sport-specific exercises to facilitate safe return to play.

Injury Prevention Strategies

Prevention of knee injuries is a major priority in sports medicine. Neuromuscular training programs that include strength training, balance exercises, plyometrics, and technique correction have demonstrated effectiveness in reducing injury rates. Hewett, *et al.* (2006) concluded that neuromuscular training programs significantly reduce the risk of serious knee injuries, particularly ACL ruptures. Education of athletes and coaches regarding proper biomechanics, adequate warm-up routines, and injury awareness is essential. Regular screening, workload management, and individualized training programs further enhance preventive efforts (Emery and Meeuwisse, 2010).

Multidisciplinary Approach

Effective management and prevention of knee injuries require collaboration among sports physicians, physiotherapists, strength and conditioning coaches, athletic trainers, and athletes (Powers, 2010). A multidisciplinary approach ensures comprehensive care, addressing physical, psychological, and performance-related factors. As van Mechelen, *et al.* (1992) stated, successful injury prevention depends on coordinated efforts between medical professionals, coaches, and athletes. Communication and coordinated planning among team members improve adherence to rehabilitation programs and reduce the likelihood of reinjury.

CONCLUSION

Knee injuries remain a significant concern in sports medicine due to their high prevalence and long-term consequences. Understanding the mechanisms, clinical management, and preventive strategies is essential for optimizing athlete health and performance. Advances in diagnostic tools, surgical techniques, and rehabilitation methods have improved outcomes; however, prevention remains the most effective strategy. Implementation of structured, evidence-based prevention and rehabilitation programs, supported by a multidisciplinary approach, is critical for reducing injury incidence, enhancing recovery, and promoting long-term knee joint health. Continued research and education are necessary to further improve injury prevention and management strategies in sports.

REFERENCES

Arendt, E., and Dick, R. (1995). Knee injury patterns among men and women in collegiate basketball and soccer. *The American Journal of Sports Medicine*, 23(6), 694–701.

ISSN 2394 - 7780

Bahr, R., and Krosshaug, T. (2005). Understanding injury mechanisms: A key component of preventing injuries in sport. *British Journal of Sports Medicine*, 39(6), 324–329.

Brantigan, O. C., and Voshell, A. F. (1941). The mechanics of the ligaments and menisci of the knee joint. *The Journal of Bone and Joint Surgery*, 23(1), 44–66.

Butler, D. L., Noyes, F. R., and Grood, E. S. (1980). Ligamentous restraints to anterior-posterior drawer in the human knee. *The Journal of Bone and Joint Surgery*, 62(2), 259–270.

Crossley, K. M., Stefanik, J. J., and Selfe, J., (2016). Patellofemoral pain consensus statement from the International Patellofemoral Pain Research Retreat. *British Journal of Sports Medicine*, 50(14), 844–852.

DeLee, J. C., and Farney, W. C. (1992). Incidence of injury in Texas high school football. *The American Journal of Sports Medicine*, 20(5), 575–580.

Emery, C. A., and Meeuwisse, W. H. (2010). The effectiveness of injury prevention programs in reducing the incidence of sport-related injuries: A systematic review. *British Journal of Sports Medicine*, 44(6), 405–421.

Fox, A. J. S., and Matava, M. J. (2011). Meniscal tears and rehabilitation. *Journal of the American Academy of Orthopaedic Surgeons*, 19(9), 550–558.

Griffin, L. Y., Albohm, M. J., Arendt, E. A., (2006). Understanding and preventing noncontact anterior cruciate ligament injuries: A review of the Hunt Valley II meeting. *The American Journal of Sports Medicine*, 34(9), 1512–1532.

Hewett, T. E., Myer, G. D., and Ford, K. R. (2006). Anterior cruciate ligament injuries in female athletes: Part 1, mechanisms and risk factors. *The American Journal of Sports Medicine*, 34(2), 299–311.

Lohmander, L. S., Englund, M., Dahl, L. L., and Roos, E. M. (2007). The long-term consequence of knee injury. *The American Journal of Sports Medicine*, 35(10), 1756–1769.

McDermott, I. D., and Amis, A. A. (2006). The consequences of meniscectomy. *The Journal of Bone and Joint Surgery*, 88B(12), 1549–1556.

Mihata LC, Beutler AI, and Boden BP. (2006). Comparing the incidence of anterior cruciate ligament injury in collegiate lacrosse, soccer, and basketball players: implications for anterior cruciate ligament mechanism and prevention. *Am J Sports Med.* 34(6):899-904. doi: 10.1177/0363546505285582.

Powers, C. M. (2010). The influence of abnormal hip mechanics on knee injury: A biomechanical perspective. *Journal of Orthopaedic and Sports Physical Therapy*, 40(2), 42–51.

van Mechelen, W., Hlobil, H., and Kemper, H. C. (1992). Incidence, severity, aetiology and prevention of sports injuries: A review of concepts. *Sports Medicine*, 14(2), 82–99.

Wang X, Zhang Y, Hou S, Wu W, Zhang H, Luo D, Gu D, Zhao Y. (2014). Effects of meniscectomy and transplantation of human knee on stress of tibiofemoral articular surface. Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi. 2014 Jan;28(1):21-5.

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LIVING IN THE AGE OF ACCELERATION: AN EXAMINATION OF CONTEMPORARY LIFESTYLES AND THEIR INFLUENCE ON HUMAN WELL-BEING

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ABSTRACT

The accelerating pace of modern life has fundamentally transformed the way individuals live, work, communicate, and perceive well-being. Rapid technological advancement, globalization, urbanization, and evolving socio-economic structures have reshaped daily routines and behavioural patterns. While contemporary lifestyles have brought remarkable benefits such as improved healthcare, increased life expectancy, enhanced connectivity, and economic growth, they have also introduced significant challenges that threaten physical, psychological, social, and environmental well-being. This research paper examines the multidimensional impact of accelerated contemporary lifestyles on human well-being. Drawing upon interdisciplinary literature from public health, psychology, sociology, and environmental studies, the paper analyses how lifestyle factors including sedentary behaviour, digital immersion, dietary transitions, work intensification, social fragmentation, and environmental degradation influence health outcomes. The study highlights the paradoxical nature of modern living, emphasizing the need for balanced, sustainable lifestyle practices supported by individual awareness, community engagement, institutional responsibility, and policy interventions. The paper concludes by proposing holistic strategies aimed at fostering resilience and long-term well-being in an increasingly fast-paced world.

Keywords: *Accelerated living, modern lifestyle, well-being, mental health, physical health, social well-being, sustainability*

1. INTRODUCTION

The modern era is often described as an age of acceleration. Advances in technology, communication, transportation, and economic systems have dramatically increased the speed at which people live and interact. Daily life is characterized by constant connectivity, rapid information exchange, multitasking, and heightened performance expectations. While these developments have enabled unprecedented convenience and opportunity, they have also transformed fundamental aspects of human existence, raising critical concerns about well-being.

Well-being is a multidimensional construct encompassing physical health, mental stability, emotional fulfilment, social connectedness, and a sense of meaning and purpose. According to the World Health Organization, health is defined as a state of complete physical, mental, and social well-being rather than merely the absence of disease. Lifestyle plays a pivotal role in shaping well-being, as daily behaviours and environmental contexts influence biological, psychological, and social functioning.

Contemporary societies are witnessing a growing prevalence of lifestyle-related disorders such as obesity, cardiovascular disease, diabetes, anxiety, depression, burnout, and sleep disturbances. These conditions are closely linked to accelerated lifestyles marked by physical inactivity, poor nutrition, chronic stress, excessive screen use, and weakened social bonds. At the same time, modern living has improved access to healthcare, education, and information, demonstrating that acceleration itself is not inherently harmful but requires careful management.

This paper aims to critically examine how accelerated contemporary lifestyles influence human well-being. It explores the complex interactions between lifestyle behaviours and health outcomes across physical, psychological, social, and environmental domains. By identifying both risks and opportunities, the study seeks to contribute to a deeper understanding of how well-being can be preserved and enhanced in the context of rapid societal change.

2. UNDERSTANDING ACCELERATED CONTEMPORARY LIFESTYLES

The concept of accelerated living refers to the increasing speed and intensity of daily life driven by technological progress, economic competition, and cultural expectations. Acceleration manifests not only in faster communication and production but also in the compression of time and the constant demand for efficiency.

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2.1 Defining Characteristics

Accelerated contemporary lifestyles share several defining characteristics:

- **Continuous digital connectivity:** Smartphones, social media, and online platforms enable constant communication and access to information.
- **Time scarcity:** Multitasking and packed schedules reduce opportunities for rest and reflection.
- **Urban concentration:** Increasing urbanization creates dense, fast-paced environments.
- **Sedentary routines:** Screen-based work and entertainment replace physical activity.
- **Convenience-driven consumption:** Fast food, online shopping, and on-demand services dominate daily choices.
- **Individualization:** Emphasis on self-optimization, productivity, and personal achievement.

These characteristics interact to create living conditions that prioritize speed and efficiency, often at the expense of balance and recovery.

2.2 Cultural and Economic Drivers

Acceleration is fuelled by economic systems that reward productivity and growth. Global competition encourages longer working hours and constant skill upgrading. Cultural narratives glorify busyness and equate success with constant activity. Technological innovation reinforces these patterns by enabling work and communication to occur at any time and place.

3. PHYSICAL HEALTH IMPACTS OF ACCELERATED LIFESTYLES

3.1 Decline in Physical Activity

One of the most significant physical health consequences of accelerated lifestyles is the decline in physical activity. Mechanization, automation, and digitalization have reduced the need for manual labour. Many individuals spend prolonged hours sitting at desks, commuting in vehicles, and engaging in screen-based leisure activities.

Physical inactivity is strongly associated with obesity, cardiovascular disease, type 2 diabetes, hypertension, and musculoskeletal disorders. Sedentary behaviour disrupts metabolic processes, reduces muscle strength, and increases the risk of premature mortality. Despite widespread awareness of the benefits of exercise, modern environments often discourage movement due to time constraints and infrastructure design.

3.2 Dietary Acceleration and Nutritional Imbalance

Accelerated lifestyles have profoundly altered dietary habits. Time pressure and convenience culture encourage reliance on processed foods, fast meals, and irregular eating patterns. These foods are often high in calories, refined sugars, unhealthy fats, and sodium while lacking essential nutrients.

Poor dietary quality contributes to metabolic disorders, weakened immune function, and chronic inflammation. Additionally, research suggests a strong link between nutrition and mental health, as dietary imbalances can affect neurotransmitter function and mood regulation.

3.3 Sleep Disruption and Health Consequences

Sleep is a fundamental biological process essential for physical restoration, cognitive performance, and emotional regulation. In accelerated societies, sleep is frequently compromised by extended work hours, shift employment, digital entertainment, and constant connectivity.

Exposure to blue light from electronic devices interferes with circadian rhythms, delaying sleep onset. Chronic sleep deprivation is associated with increased risk of obesity, cardiovascular disease, depression, anxiety, impaired memory, and reduced productivity. Despite its importance, sleep is often sacrificed to meet the demands of accelerated living.

3.4 Environmental Exposure and Physical Health

Urban and industrial lifestyles expose individuals to environmental hazards such as air pollution, noise pollution, and chemical contaminants. Air pollution increases the risk of respiratory and cardiovascular diseases, while noise pollution contributes to stress and sleep disturbances. Environmental degradation resulting from accelerated consumption patterns further undermines population health.

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4. PSYCHOLOGICAL WELL-BEING IN THE AGE OF ACCELERATION

4.1 Chronic Stress and Burnout

Acceleration intensifies psychological pressure. High performance expectations, job insecurity, financial stress, and information overload contribute to chronic stress.

Unlike acute stress, which can be adaptive, prolonged stress exhausts emotional and physiological resources, leading to anxiety, depression, burnout, and weakened immunity.

The blurring of boundaries between work and personal life due to digital connectivity prevents adequate recovery, exacerbating emotional exhaustion.

4.2 Digital Immersion and Cognitive Overload

Digital technologies are integral to contemporary life, offering benefits such as efficiency and connectivity. However, excessive digital immersion can undermine mental well-being. Constant notifications, multitasking, and information overload fragment attention and increase cognitive load.

Social media platforms often promote comparison and unrealistic standards, leading to reduced self-esteem and dissatisfaction. Excessive screen time has been linked to anxiety, depression, and reduced attention span, particularly among younger populations.

4.3 Loneliness and Emotional Disconnection

Despite unprecedented connectivity, modern societies report rising levels of loneliness. Virtual interactions often replace face-to-face communication, reducing emotional depth and social support. Traditional community structures that once fostered belonging have weakened under the pressures of mobility and time scarcity.

Loneliness is a significant predictor of mental health problems and physical illness, highlighting the importance of meaningful social connections for well-being.

4.4 Consumerism and Psychological Fulfilment

Accelerated lifestyles are closely linked to consumer culture, where happiness and success are associated with material acquisition. While consumption provides temporary pleasure, it rarely leads to lasting fulfilment. Research indicates that intrinsic goals such as relationships, personal growth, and contribution to society are more strongly associated with sustained well-being.

5. SOCIAL DIMENSIONS OF WELL-BEING

5.1 Transformation of Family Life

Modern work patterns and mobility have reshaped family structures. Long working hours, dual-income households, and geographic relocation reduce time spent with family members. Although economic opportunities have expanded, emotional connections within families often weaken.

Reduced family interaction affects child development, emotional security, and intergenerational support, influencing societal well-being as a whole.

5.2 Work–Life Balance Challenges

The boundary between work and personal life has become increasingly blurred. Remote work and digital communication extend professional responsibilities into personal time. Without clear boundaries, individuals experience fatigue, reduced life satisfaction, and burnout.

Organizations that fail to prioritize employee well-being face reduced productivity, higher absenteeism, and increased turnover.

5.3 Decline of Community Engagement

Time pressure and individualistic values reduce participation in community activities. Declining social capital weakens trust, cooperation, and collective resilience. Strong communities play a critical role in buffering stress and promoting shared well-being.

6. ENVIRONMENTAL SUSTAINABILITY AND WELL-BEING

Accelerated lifestyles demand high levels of resource consumption, contributing to climate change, pollution, and ecological degradation. Environmental instability affects well-being through health risks, displacement, and psychological distress known as eco-anxiety.

Climate-related events such as heatwaves, floods, and food insecurity disproportionately affect vulnerable populations, further exacerbating health inequalities. Sustainable living practices are essential for protecting both planetary and human health.

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7. POSITIVE CONTRIBUTIONS OF ACCELERATED CONTEMPORARY LIVING

Despite its challenges, accelerated modern living offers significant opportunities for enhancing well-being when managed responsibly.

7.1 Advances in Healthcare

Medical innovations, digital health technologies, and telemedicine have improved disease prevention, diagnosis, and treatment. Wearable devices and health applications empower individuals to monitor and manage their health proactively.

7.2 Access to Education and Information

Digital platforms have democratized access to education and health information, enabling lifelong learning and informed decision-making. Increased awareness supports healthier lifestyle choices.

7.3 Flexibility and Innovation

Flexible work arrangements and technological tools can improve autonomy, reduce commuting stress, and support balanced lifestyles when implemented thoughtfully.

8. STRATEGIES FOR ENHANCING WELL-BEING IN ACCELERATED SOCIETIES

8.1 Individual-Level Strategies

- Regular physical activity
- Balanced nutrition
- Prioritizing sleep
- Mindfulness and stress-management practices
- Conscious and limited digital use

8.2 Organizational and Community Approaches

- Employee wellness programs
- Flexible work policies
- Community-building initiatives
- Urban design promoting active living

8.3 Policy-Level Interventions

- Health-oriented urban planning
- Environmental protection regulations
- Mental health awareness and accessible services
- Regulation of unhealthy consumer practices

9. FUTURE RESEARCH DIRECTIONS

Future research should explore long-term effects of digital acceleration, cross-cultural differences in lifestyle impacts, and integrated interventions that address physical, psychological, social, and environmental determinants of well-being simultaneously.

10. CONCLUSION

Living in the age of acceleration presents both promise and peril. Contemporary lifestyles enhance efficiency, connectivity, and opportunity, yet they also strain physical health, psychological resilience, social bonds, and environmental systems. This paper demonstrates that well-being in modern society depends on achieving balance amid speed and complexity.

Sustainable well-being requires conscious lifestyle choices supported by organizations, communities, and policies that prioritize human health alongside economic progress. By reorienting values toward balance, connection, and sustainability, societies can transform accelerated living into a foundation for long-term human flourishing.

REFERENCES

1. World Health Organization. (2018). *Global status report on physical activity*. WHO.
2. Popkin, B. M. (2006). Global nutrition dynamics. *American Journal of Clinical Nutrition*, 84(2), 289–298.

ISSN 2394 - 7780

3. Hawkley, L. C., & Cacioppo, J. T. (2010). Loneliness and health. *Annals of Behavioral Medicine*, 40(2), 218–227.
4. Twenge, J. M. (2019). *iGen*. Atria Books.
5. Diener, E., & Suh, E. (1997). Measuring quality of life. *Social Indicators Research*, 40, 189–216.
6. Sallis, J. F., & Glanz, K. (2006). Built environments and health. *The Future of Children*, 16(1), 89–108.
7. National Sleep Foundation. (2015). *Sleep Health Index*.

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BRIDGING THE DIVIDE: ASSESSING SPORTS AS A CHANNEL OF PEACE

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ABSTRACT
Sports stands lauded worldwide for its potential to promote unity and peace through it's characteristic features of shared identity and adherence to common rules.

However, it's inherent competitive nature also risks widening ethnic and nationalist divides.

In the current era, sports fields are turning to battlefields. They are becoming grounds to convey loyalty related to geo politics issues and thus consequently undermining the grace of sports events.

This doctrinal study examines the theoretical underpinnings of SDP (Sports for development and peace) by focusing on the intergroup contact theory. It analyses case studies from politically and ethically fragmented regions for a deeper understanding of the undercurrents this issue holds.

The study concludes by laying down suggestions towards moving sports beyond a symbolic gesture of peace and conversely making it a substantive peace building tool.

***Keywords**: SDP (Sports for development and peace), Intergroup contact theory, sustainable goals.*

1. INTRODUCTION

The intersection of athletic competition and international diplomacy has long been a subject of both romantic idealism and rigorous academic scrutiny. From the ancient Olympic truce of Elis to the modern-day "Ping-Pong Diplomacy" that thawed Sino-American relations, sports have been heralded as a universal language capable of transcending linguistic, cultural, and political barriers. However, as the global landscape becomes increasingly fragmented by geopolitical tensions, ethnic conflicts, and socio-economic disparities, the question remains: Can sports truly bridge the divide, or do they merely provide a temporary veneer of unity over deep-seated animosities? This paper seeks to assess the efficacy of sports as a credible channel for peace-building and conflict resolution in the 21st century.

1.1 The Theoretical Foundation of Sport for Development and Peace (SDP)

The conceptual framework for using sport as a tool for peace is rooted in *Social Contact Theory*, which suggests that prejudice between groups can be reduced through interpersonal contact under specific conditions: equal status, common goals, intergroup cooperation, and the support of authorities. In a sporting context, the pitch or court becomes a "liminal space"—a neutral ground where traditional hierarchies are suspended, and individuals are redefined by their roles as teammates or competitors rather than their ethnic or political identities.

1.2 The United Nations formally recognized this potential in 2001 with the establishment of the Office on Sport for Development and Peace (UNOSDP), asserting that sport is a powerful tool to promote education, health, and peace. Unlike traditional diplomacy, which often operates at the elite, state-to-state level, Sport for Development and Peace (SDP) initiatives often target the *grassroots level*. By engaging youth in conflict-affected regions, these programs aim to foster "soft skills" such as empathy, discipline, and tolerance, which are essential for long-term reconciliation.

1.3 The Paradox of Competition

Despite the optimistic rhetoric, the relationship between sports and peace is inherently paradoxical. While sports can foster social inclusion, they are also deeply intertwined with *nationalism* and "us-versus-them" mentalities. George Orwell famously described serious sport as "war minus the shooting," highlighting how international competitions can sometimes exacerbate existing rivalries rather than soothe them. The 1969 "Football War" between El Salvador and Honduras serves as a stark historical reminder that sporting passions can act as a catalyst for armed conflict when layered upon existing socio-political grievances.

Therefore, "Bridging the Divide" requires a nuanced assessment of the conditions under which sport functions as a bridge versus a barrier. It is not the mere act of playing the game that creates peace, but rather the *intentionality* behind the program's design, the quality of mentorship, and the integration of the sporting activity into a broader framework of social justice and economic development.

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1.4 Research Objectives and Scope

This paper evaluates the impact of sports-based interventions across three primary dimensions:

1. **Individual Transformation:** How sports participation affects the attitudes and behaviours of participants toward "the other."
2. **Community Integration:** The role of sports in reintegrating marginalized groups or former combatants into civil society.
3. **Symbolic Diplomacy:** The effectiveness of high-profile sporting events in signaling a shift in diplomatic relations.

Through a multi-disciplinary lens—incorporating sociology, political science, and sports psychology—this study argues that while sports are not a panacea for global conflict, they offer a unique, non-threatening entry point for dialogue in environments where traditional diplomacy has failed.

2. LITERATURE REVIEW

The academic discourse surrounding the use of sport as a vehicle for social change has evolved from anecdotal "sporting evangelism" to a sophisticated, multi-disciplinary field of study. This review synthesizes existing scholarship on the socio-psychological foundations of sport for peace, the institutionalization of the movement, and the critical sociologies that challenge its perceived universality.

2.1 The Evolution of the Sport for Development and Peace (SDP) Sector

Historically, the use of sport for social purposes was rooted in the 19th-century British philosophy of "Muscular Christianity," which posited that physical discipline and team play fostered moral character (Kidd, 2008). However, the modern SDP sector gained formallegitimacy only at the turn of the 21st century. The United Nations' declaration of 2005 as the *International Year of Sport and Physical Education* marked a paradigm shift, transitioning sport from a peripheral leisure activity to a recognized tool for achieving the Millennium Development Goals (MDGs) and subsequently the Sustainable Development Goals (SDGs) (Beutler, 2008).

2.2 Socio-Psychological Frameworks: Contact and Liminality

The primary theoretical anchor in SDP literature is Gordon Allport's (1954) *Social Contact Theory.* Scholars argue that sport provides the four "optimal conditions" for prejudice reduction: equal status, common goals, intergroup cooperation, and the support of authorities.

Building on this, Coalter (2007) emphasizes the concept of *"Liminality"*—a state of being "betwixt and between." In conflict settings, the sports field serves as a liminal space where the rigid social scripts of ethnic or religious enmity are temporarily suspended. Within this space, participants can experiment with new identities (e.g., "teammate" or "striker") that supersede their external labels (Lederach, 1997). This "social laboratory" effect allows for the development of *bridging social capital*, which Putnam (2000) defines as the links between diverse groups that facilitate information sharing and mutual trust.

2.3 The "Sporting Evangelism" Critique

Despite the positive rhetoric, a significant body of critical literature warns against "sporting evangelism"—the uncritical belief that sport inherently possesses pro-social properties (Coalter, 2013). Giulianotti (2012) argues that sport is a "double-edged sword" that can reinforce exclusive identities and hyper-nationalism just as easily as it can promote inclusion.

Critically, Darnell (2012) highlights the risk of *"Global North Hegemony,"* where SDP programs are often designed in Western contexts and imposed on the Global South without accounting for local power dynamics or historical grievances. This "top-down" approach can lead to "neo-colonial" patterns where sport is used to pacify marginalized populations rather than address the structural causes of their marginalization.

2.4 The Role of "The Coach" as a Social Mediator

Recent literature has shifted focus from the *activity* of sport to the *agency* of the facilitator. Scholars like Lyras and Welty Peachey (2011) argue that the "sport-for-change" model only works when it is accompanied by intentional educational components. The coach is no longer viewed merely as a tactical instructor but as a *social mediator* who must navigate sensitive political terrains to ensure the sports environment remains safe and inclusive.

3. CASE STUDIES: ASSESSING IMPACT IN CONFLICT ZONES

The theoretical potential of Sport for Development and Peace (SDP) is best examined through practical application.

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By analyzing specific initiatives, we can discern the precise mechanisms—and limitations—of sport as a vehicle for reconciliation. The following case studies illustrate how sports function across various scales, from grassroots integration to high-level symbolic diplomacy.

3.1. Grassroots Reconciliation: PeacePlayers International (PPI)

Operating in regions with deep-seated sectarian or ethnic divisions, such as Northern Ireland, South Africa, and Cyprus, PeacePlayers International utilizes basketball to bridge communal divides. In Northern Ireland, PPI-NI's "Primary School Twinnings" and the "Belfast Interface Games" bring together Catholic and Protestant youth who often live in segregated neighborhoods.

A 2013 evaluation by the Institute for Conflict Research revealed that **73% of participants** reported enjoying playing sports with people from different religious backgrounds after the program, compared to significantly lower baseline figures (PeacePlayers, 2011; ICR, 2013). The success of PPI lies in its adherence to the *Contact Hypothesis:* it ensures frequent, long-term interaction where participants share "equal status" and work toward the "superordinate goal" of winning a game. By reframing the "other" as a teammate, the program initiates micro-level attitudinal changes that can, over time, permeate the broader community through family engagement at games (Tuohey & Cognato, 2011).

3.2. Values-Based Coaching: Football4Peace (F4P) in Israel

Football4Peace (F4P) operates primarily in Israel and the West Bank, focusing on building bridges between Jewish and Arab communities. Unlike traditional competitive leagues, F4P employs a *values-based coaching manual* centered on five core principles: neutrality, equity, respect, trust, and responsibility.

Research by the University of Brighton suggests that F4P has successfully transformed over 8,000 children into "active ambassadors for peace" by creating a neutral "liminal space" for dialogue (REF Impact Case Studies, 2014). However, the project also highlights the challenges of *cultural context.* For instance, efforts to promote gender inclusion in more conservative regions initially met with resistance, illustrating that SDP initiatives must be culturally sensitive to avoid being perceived as "cultural imperialism" (Sugden, 2008). This case emphasizes that the "intentionality" of the coaching—specifically the focus on moral values over mere athletic skill—is the critical factor in peace-building.

3.3. Symbolic Diplomacy: Cricket Between India and Pakistan

On the macro-level, "Cricket Diplomacy" has historically served as a "safety valve" to de-escalate tensions between the two nuclear-armed neighbours. High-profile matches, such as General Zia-ul-Haq's 1987 visit to Jaipur or the "irreversible" peace process signalled during the 2005 tour, used the shared passion for cricket to provide a "human face" to the adversary (ResearchGate, 2025).

However, recent developments in 2025-2026 demonstrate the fragility of symbolic diplomacy. The refusal of teams to participate in handshakes or trophy ceremonies at the Asia Cup reflects a shift toward *"belligerent engagement,"* where the sporting arena becomes a mirror of realpolitik rather than a sanctuary from it (Diplo Foundation, 2025). This case study serves as a vital counterpoint: while sport can signal a thaw in relations, it is often a secondary effect of political will. Without a broader diplomatic framework, sports can easily be conscripted into nationalistic projects that reinforce, rather than bridge, the divide.

3.4. Humanizing the Displaced: The IOC Refugee Olympic Team

First appearing at the Rio 2016 Games, the Refugee Olympic Team (EOR) represents a unique form of peace-building through *visibility and humanization.* By allowing athletes from conflict-ravaged nations like Syria, South Sudan, and Afghanistan to compete under the Olympic flag, the IOC shifts the global narrative from "refugees as a crisis" to "refugees as individuals of excellence."

Evaluations from the Olympic Refuge Foundation (2024) indicate that these initiatives foster a sense of belonging and "social inclusion" for displaced youth, providing them with a platform to salvage pride and dignity (ORF, 2024). While the team may not resolve the underlying causes of displacement, it serves as a powerful global symbol of solidarity, reminding the international community of the shared humanity that persists despite political failure.

4. CONCLUSION AND POLICY RECOMMENDATIONS

The assessment of sports as a channel for peace reveals a complex, multi-layered reality. While the romanticized notion of "sport for sport's sake" rarely achieves lasting diplomatic breakthroughs, the *intentional application* of sport within a structured peace-building framework has demonstrated significant potential. This study confirms that sports act as a powerful "liminal space" where individual and communal identities can be

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renegotiated. From the basketball courts of Belfast to the football pitches of Israel, the evidence suggests that when sport is used to humanize "the other," it can erode the psychological foundations of conflict.

However, the findings also sound a cautionary note. Sport is a neutral tool—a double-edged sword that can just as easily be sharpened for nationalistic fervour as it can for reconciliation. As seen in the recent fluctuations of South Asian cricket diplomacy, the efficacy of sport is often tethered to the prevailing political climate. Therefore, sport should not be viewed as a replacement for traditional diplomacy, but rather as a *complementary soft-power mechanism* that prepares the social "soil" for political seeds to take root.

POLICY RECOMMENDATIONS

To maximize the peace-building potential of sports, international governing bodies, NGOs, and state actors should adopt the following strategic approaches:

4.1. Prioritize Process Over Outcome

Policy-makers must shift focus from elite-level "spectacle diplomacy" to long-term grassroots initiatives. To be effective, programs must move beyond one-off "peace matches" and implement sustained, multi-year interventions.

Recommendation: Funding should be contingent on the inclusion of conflict-resolution training for coaches, ensuring they act as social mediators rather than just technical instructors.

4.2. Implement the "Do No Harm" Framework

Given sport's potential to exacerbate rivalries, all SDP (Sport for Development and Peace) initiatives must undergo rigorous conflict-sensitivity assessments.

Recommendation: Organizations should adopt the "Neutral Ground" protocol, which mandates that symbols of political or sectarian identity (flags, anthems, or partisan colours) be replaced with neutral identifiers during inter-community play to minimize triggers.

4.3. Integration with Socio-Economic Development

Peace is rarely sustainable in a vacuum of poverty or unemployment. The most successful case studies integrated sports with vocational training or educational incentives.

Recommendation: Governments should link sports programs with Life Skills and Employability (LSE) curricula. By providing participants with tangible pathways to economic stability, the "teamwork" learned on the field translates into collective progress in civil society.

4.4. Gender-Inclusive Programming

Evidence suggests that involving women and girls in peace-building sports programs significantly increases the "social multiplier effect," as women often act as primary agents of peace within the family and local community.

Recommendation: Mandate a 30% minimum female participation rate in all state-funded SDP projects to ensure that reconciliation efforts represent the entire demographic spectrum of a conflict zone.

4.5. Standardization of Impact Metrics

A major hurdle for the SDP sector is the lack of standardized data. To secure continued institutional support, there must be a shift toward more rigorous, longitudinal monitoring and evaluation.

Recommendation: Establish a Global Sport for Peace Index that measures qualitative shifts in participant attitudes, the reduction of localized violent incidents, and the degree of inter-group social capital formed.

In summary, bridging the divide through sport requires a move away from "peace through play" and toward "peace through design." By treating sport as a serious pedagogical and diplomatic instrument, the international community can harness its unique ability to unite us in our shared humanity, even when the lines of political maps suggest otherwise.

REFERENCES

- **Allport, G. W. (1954).** The Nature of Prejudice. Addison-Wesley. (Foundational text for Social Contact Theory).
- **Beutler, I. (2008).** "Sport serving development and peace: Achieving the UN Millennium Development Goals." Sport in Society, 11(4), 359-369.

ISSN 2394 - 7780

- **Giulianotti, R. (2012).** "The sport for development and peace sector: A critical sociology of distal and proximal ideologies." Sociology of Sport Journal, 29(1), 1-18.
- **Kidd, B. (2008).** "The rise and fall of the Sport for Development and Peace movement." Sport in Society, 11(4), 370-380.
- **Lederach, J. P. (1997).** Building Peace: Sustainable Reconciliation in Divided Societies. United States Institute of Peace Press.
- **United Nations. (2003).** Sport for Development and Peace: Towards Achieving the Millennium Development Goals. Report of the UN Inter-Agency Task Force on Sport for Development and Peace.
- **Diplo Foundation. (2025).** The Death of the 'Gentleman's Game'? Cricket as Proxy War in South Asia. * Institute for Conflict Research (ICR). (2013). An Evaluation of PeacePlayers International Northern Ireland.
- **Olympic Refuge Foundation (ORF). (2024).** Belonging Through Sport: Seven Years of Impactful Work.
- **PeacePlayers International. (2011).** "A Case Study on the Use of Sport as a Tool for Conflict Transformation." SAIS Review, 31(1), 51-63.
- **REF Impact Case Studies. (2014).** Football4Peace: Conflict Resolution and Peace Building in Divided Societies. University of Brighton.
- **Sugden, J. (2008).** "Anyone for Football for Peace? The Challenges of Using Sport in the Service of Co-existence in Israel." Soccer & Society, 9(3), 405-415.
- **Tuohey, B., & Cognato, A. (2011).** "PeacePlayers International: A Case Study." SAIS Review of International Affairs.
- **Darnell, S. C. (2012).** Sport for Development and Peace: A Critical Introduction. Routledge.
- **Galtung, J. (1996).** Peace by Peaceful Means: Peace and Conflict, Development and Civilization. SAGE Publications.
- **Lyras, A., & Welty Peachey, J. (2011).** "Integrating sport-for-development theory and praxis." Sport Management Review, 14(4), 311-326.
- **Schulenkorf, N. (2012).** "Sustainable community development through sport and events: A conceptual framework for Sport-for-Development." Event Management, 16(1), 1-12.

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BIOMECHANICAL PERFORMANCE ANALYSIS OF SPLIT AND SQUAT JERK TECHNIQUES: BARBELL TRAJECTORY, VELOCITY, AND RECOVERY TIME ACROSS VARIOUS LOAD CATEGORIES

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ABSTRACT

Olympic weightlifting is a competitive sport that focuses on two main lifts: the Snatch and the Clean and Jerk. The goal is to lift the heaviest possible weight in a single, smooth movement (snatch) or in two distinct phases (clean and jerk). The purpose of the study was to analyse and compare the two-jerk techniques; split and squat jerk. 2N National Level athletes were taken into consideration. their training session video were recorded to analyse the difference between the two-jerk technique in various variables like Time duration, Recovery time, Velocity and barbell trajectory in various load Category. by using dartfish pro s (Switzerland), we find that at 80% load the action time (in sec) was recorded 5.56, 3.12; velocity (m/s) 0.336, 1.028 & recovery time (in sec) was 2.72,0.76 respectively, for Squat and Split jerk. Similarly at 85% & 90% action time (in sec) was recorded 6.60, 3.88; velocity (m/s) 0.280, 1.98 & recovery time (in sec) was 3.48,0.48 & 7,3.4;0.005, -0.352;3.48,0.48 respectively. Where barbell trajectory shows completely different in nature without any relevant relation in between all the load categories. Hence this study concluded that the split jerk technique seems to be more efficient in athletes' perspective where less action time, high velocity and low recovery time were seen in respect of Squat Jerk Technique.

Keywords: - Performance Analysis, Squat Jerk, Split Jerk, Weightlifting, Dartfish Pro S

INTRODUCTION

Biomechanical research in weightlifting has focused on technique and performance, motivated by the technical complexity and power requirements of the snatch and clean and jerk lifts. (Enoka, Garhammer, Gourgoulis et al.,1978, Kipp et al., and Stone et al.,2012) Weightlifting, an event restricted only to men in the past, has gained popularity among women since the first Wom en's World Weightlifting Championships in 1987, yet the performance development in this event has not been studied as much in women weightlifters as in men (Garham mer, 1991; 1998; 2002; Gourgoulis et al., 2002; Hoover et al., 2006). One of the most common biomechanical variables analysed in previous studies is the trajectory of the barbell during the execution of the snatch lift, in part because the trajectory of the barbell across the five phases of the snatch is purported to reflect technical and biomechanical aspects that are directly related to weightlifting performance (Baumann et al., 1988; Garhammer, 1985; Hiskia, 1997; Stone et al., 1998; Nelson & Burdett, 1978). Weightlifting is an Olympic sport, and has been contested in every Summer Olympic game since 1920. While the sport is officially named "weightlifting", the terms "Olympic weightlifting" and "Olympic-style weightlifting" are often used to distinguish it from the other sports and events that involve the lifting of weights, such as powerlifting weight training, and Strongman events. The Split Jerk is a weightlifting technique that offers greater receiving depth, easier recovery, and improved stability. It provides a broader base of support, allowing for more corrective adjustments to stabilize the barbell overhead, making it a preferred technique among competitive weightlifters. The Squat Jerk requires excellent mobility, high precision in bar placement, and great leg strength to recover from a full-depth squat position. Due to these demands, it's a rare technique, often seen in athletes with shorter, stronger legs and good mobility.

The study aims to investigate the kinetic and kinematic differences between the split jerk and squat jerk techniques in weightlifting, focusing on factors such as barbell trajectory, lift time, recovery time, and lift velocity across different load categories. By analysing these variables, the study seeks to provide insights into the mechanics and efficiency of each technique, helping weightlifters and coaches optimize their training.

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METHODS

This Study was descriptive cum exploratory in nature. It aims to Analyse the biomechanical aspects of Squat and Clean and Jerk techniques with different load categories. National level athletes were selected from Manipur NCOE (National Centre of Excellence) and RCC (Regular Coaching Centre) weightlifting hall to perform the two techniques of jerk. The body weight category is 55 Kg boys (Junior). Their age ranges between 18 – 20 years according to their D.O.B.

The following parameters were taken into consideration while conduction this study. Time duration- Total time taken by the lifter to complete the jerk movement (To lift the barbell from the shoulder to over the head) starting from the pre squat for jerk with complete recovery of the legs). Velocity of the barbell: The measurement of the speed at which the barbell moves. Barbell Trajectory: Path of the barbell that travels during the exercise execution. Recovery time: After the clean the time taken for an athlete to start the jerk by flexing his knees indicating the start of the jerk is the recovery time.

INSTALLATION OF THE CAMERA

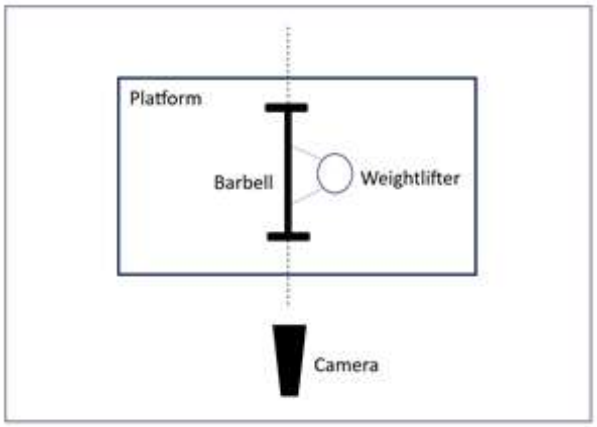

Figure 1. Setup of Camera Placing during the Data Collection

Figure 2 Athlete Performance During data collection

Result

Table: 1 Action time, Velocity and Recovery time during Squat & Clean and Jerk in Different Load Categories

S.no.	Load Category	Action Time (in seconds)		Velocity (m/s)		Recovery Time (in seconds)	
		Squat Jerk	**Split Jerk**	**Squat Jerk**	**Split Jerk**	**Squat Jerk**	**Split Jerk**
1	**80%**	5.56	3.12	0.33639	1.0287	2.72	0.76
2	**85%**	6.60	3.88	0.2800	1.9899	2.84	4.28
3	**90%**	7	3.4	0.0055	-0.3523	3.48	0.48

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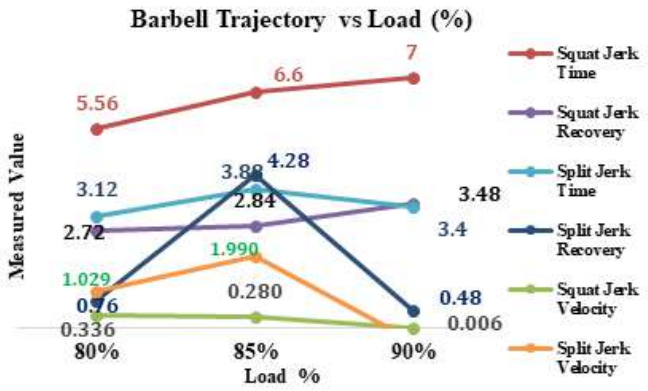
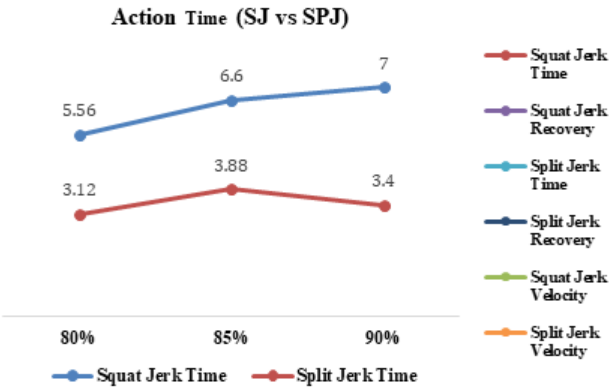
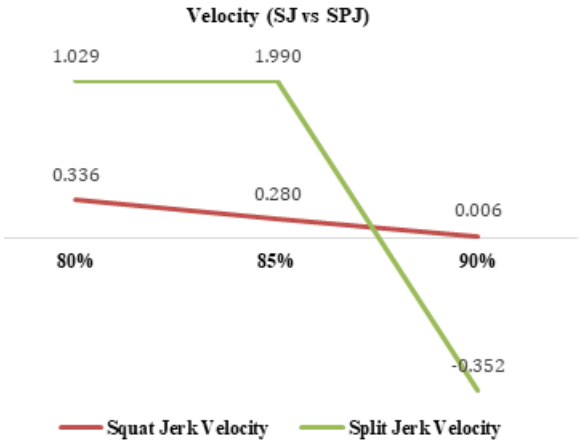
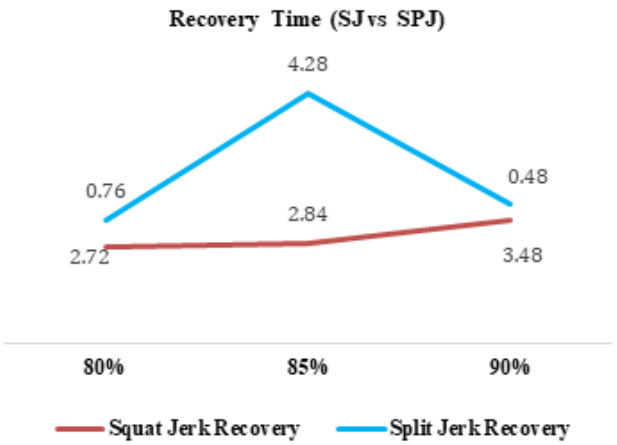
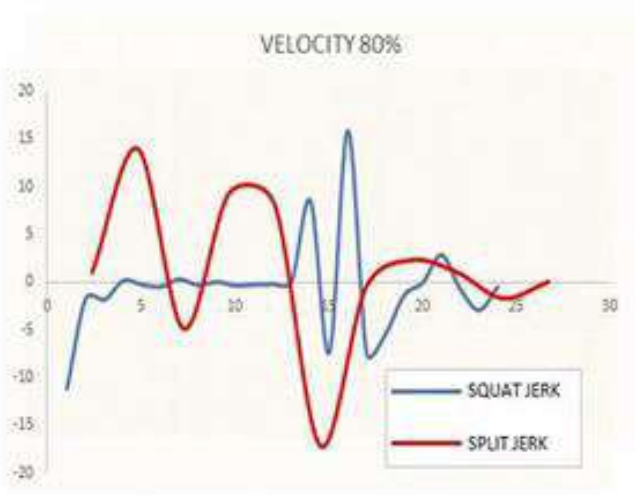


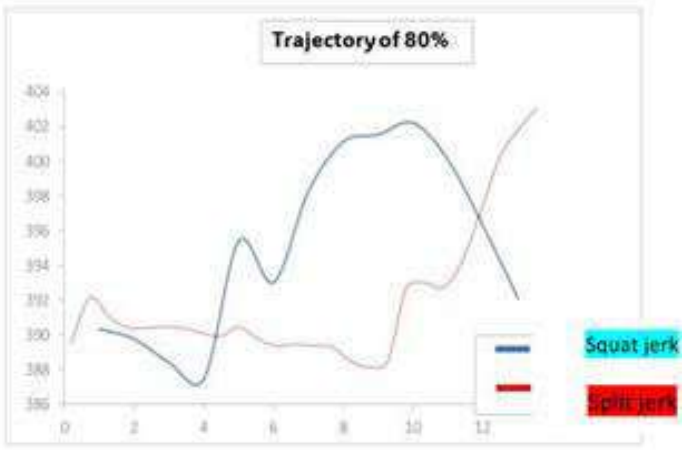






Velocity & Barbell Trajectory @ 80% Load





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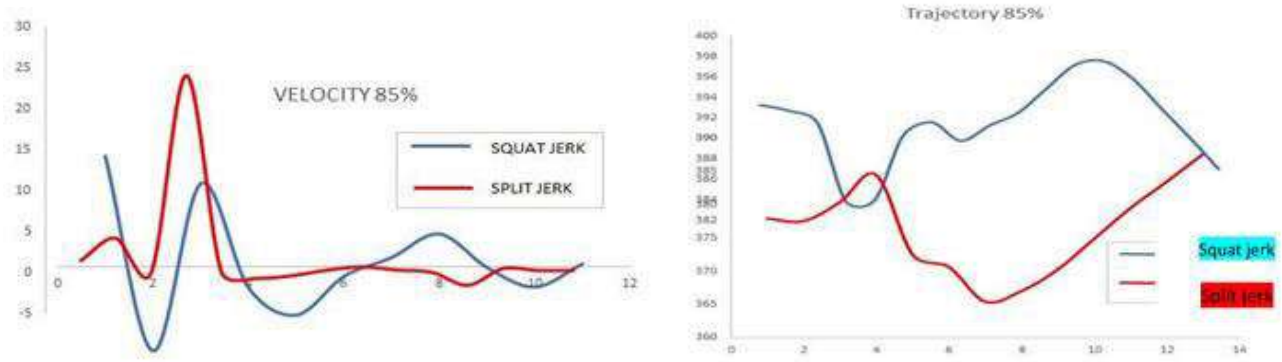
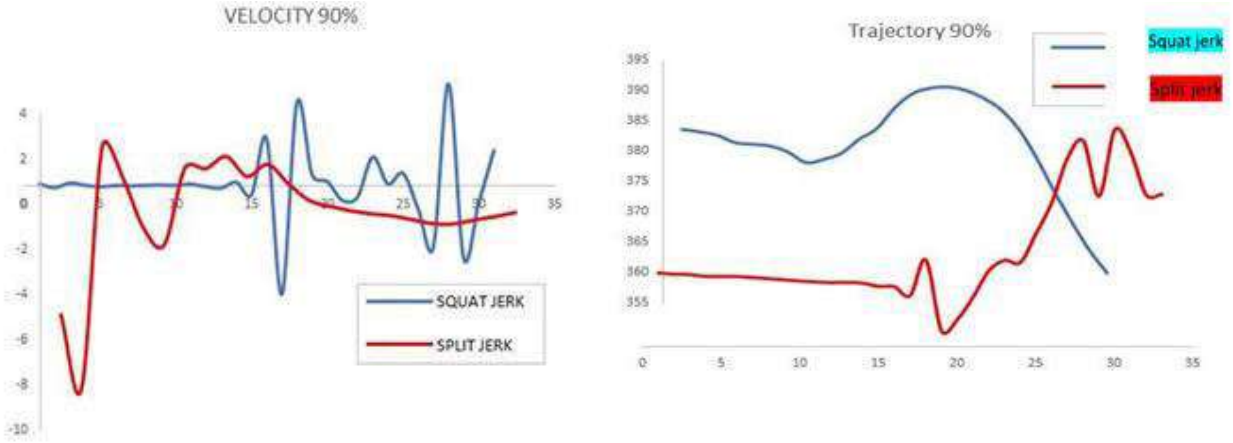
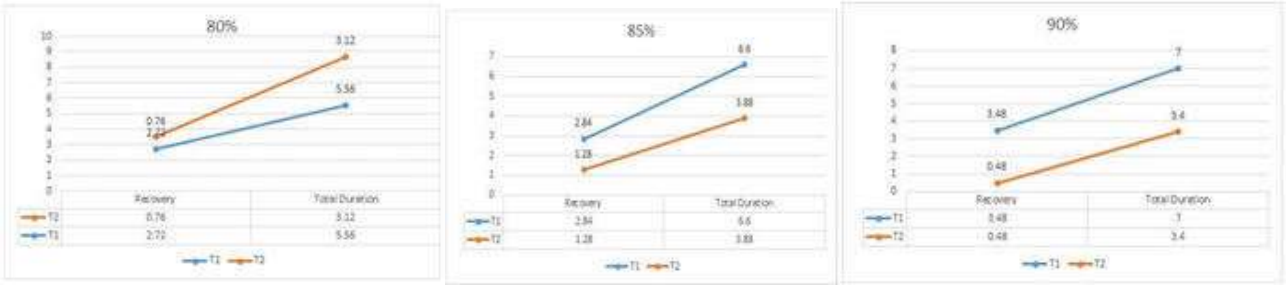
Velocity & Barbell Trajectory @ 85% Load



Velocity & Barbell Trajectory @ 90% Load



Recovery Trend at 80%, 85%, & 90% Load



DISCUSSION ON FINDINGS

From the above tables and figures, we can state that there is a difference between the two jerk techniques (squat jerk and split jerk) as follows: -

In an 80% load in the barbell, the S1(squat jerk) completed the technique in 5.56 seconds with a recovery time of 2.72 seconds, while the S2 (split jerk) completed the technique in 3.12 seconds with a recovery time of 0.76 seconds. The velocity of squat jerk is -0.33639 m/s and the split jerk velocity is 1.0287 m/s. These results suggest that the split jerk allows for faster execution and higher barbell velocity, indicating greater speed and explosive movement. In contrast, the squat jerk, despite its longer completion and recovery times, may provide enhanced postural stability and control, which could benefit athletes seeking greater balance under heavy loads.

In an 85% load in the barbell, the S1(squat jerk) completed the technique in 6.6 seconds with a recovery time of 2.84seconds while the S2 (split jerk) completed the technique in 3.88 seconds with a recovery time of 1.28seconds. The velocity of squat jerk is 0.280087m/s and the split jerk velocity is 1.989916 m/s. These results indicate that, similar to performance trends observed at lower loads, the split jerk demonstrates faster execution

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and higher barbell velocity, reflecting greater speed and efficiency in overhead propulsion. The squat jerk, although slower in execution and recovery, continues to display characteristics of enhanced positional control and balance under heavier loads.

In 90% load in the barbell the S1(squat jerk) completed the technique in 7 seconds with a recovery time of 3.48 seconds, while the S2 (split jerk) completed the technique in 3.4 seconds with a recovery time of 0.48 seconds. The velocity of squat jerk is 0.005594 m/s and split jerk velocity is -0.35237 m/s. At this high load, the split jerk continues to demonstrate superior speed and efficiency, with significantly shorter execution and recovery times. However, the negative velocity value for the split jerk suggests a possible deceleration or instability phase during the final movement, potentially indicating technical breakdown or loss of momentum under maximal load. In contrast, the squat jerk, despite its slower execution and longer recovery, maintains a near-zero velocity, reflecting greater control and stability throughout the lift.

The above data states that the time duration and the recovery time of both the jerk techniques is different. The S1(squat jerk) takes more recovery time from the clean to perform the jerk in comparison to the S2(split jerk). There is no rule for the time of recovery after the clean it is according to the lifter's training style and adaptation to technique. But taking more recovery time can lead to fatigue and inefficiency. The main aim after the clean should be to ensure a secure front rack position quickly to allow for a smooth transition into the jerk.

Velocity is the measurement of speed in a certain direction of motion. From the above data, the velocity of S1(squat jerk) is less in comparison to S2(split jerk), which means the speed of the barbell in S1 is less than S2 while performing the jerk technique. The velocity can be affected by time and force, so if the lifters decrease their time in different phases of the lift, the velocity of the barbell could be increased.

The barbell trajectory is the path where the bar moves during the execution of the technique. Both techniques will have different trajectories according to the lift. The bar path differs primarily due to the receiving position. In the split jerk, the lifter splits into a wide stance, while in the squat jerk, the lifter squats down to receive the barbell.

In the Squat jerk, the bar’s trajectory is more vertical because the player has to squat down to receive the bar and have to push the bar straight up. While the bar’s trajectory in the Split jerk is somewhat diagonal (away from the body), to allows him to split his legs into a wide lunge style to receive the barbell in his overhead position.

CONCLUSION

Based on the study's findings, the following conclusions were drawn:

The athlete performing the split jerk performed the technique in less time and less recovery time compared to the athlete performing the squat jerk. The velocity of the barbell is greater in the split jerk in comparison to the squat jerk. There is a difference in barbell trajectory in both techniques of the jerk.

Increasing barbell loads accentuate the performance differences between squat jerk and split jerk techniques. The split jerk provides a speed advantage at moderate loads but may encounter technical challenges at maximal intensities. The squat jerk displays resilience in stability and control under loading stress, supporting its use by athletes prioritizing these qualities. Future studies should further explore underlying neuromuscular and kinetic factors influencing jerk technique selection in Olympic weightlifting.

RECOMMENDATION

1. This study will be helpful for the weightlifters to minimise unnecessary recovery time after the clean by building technical confidence and efficiency in the front rack position.

2. It will be helpful for lifters to reduce fatigue and increase jerk power by practicing rapid stabilization after receiving the bar.

3. Furthermore, this study will be helpful for the coaches to adapt jerk training to address individual athlete styles and technical weaknesses, focusing on personalized program adjustments.

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4. Coaches should emphasize the importance of bar path accuracy, velocity maximization with time constraint drills, and recovery strategy optimization for each jerk technique.

5. Coaches can observe athletes for symptoms of excessive fatigue or technical compensations that may arise from prolonged recovery phases, adjusting training as needed.

6. These research findings will be helpful for personalized athlete monitoring, and targeted feedback will enhance competitive performance and advance innovation within the weightlifting fraternity

7. Nevertheless, this study will be helpful for the researchers to investigate how recovery timing and bar trajectory impact velocity, technical efficiency, and successful lift outcomes across jerk variations.

8. Last but not least, these study findings broadly to shape evidence-based recommendations and inform best practices in technique development and programming at all competition levels.

REFERENCES

1. Liu, G., He, Z., Ye, B., Guo, H., Pan, H., Zhu, H., & Meng, G. (2024). Comparative analysis of the kinematic characteristics of Lunge-Style and Squat-Style jerk techniques in elite weightlifters. Life, 14(9), 1086. https://doi.org/10.3390/life14091086.

2. Wang, Y., Wang, S., & Zhou, J. H. (2014). Kinematic Analysis on the Clean and Jerk Action of the Chinese Elite Athlete Zhong Huang. Applied Mechanics and Materials,568–570,1925–1929. https://doi.org/10.4028/www.scientific.net/amm.568-570.1925

3. Soriano, M. A., Jiménez-Ormeño, E., Lake, J. P., McMahon, J. J., Gallo-Salazar, C., Mundy, P., & Comfort, P. (2024). Kinetics and Kinematics of the Push Press, Push Jerk, and Split Jerk. Journal of strength and conditioning research, 38(8), 1359 1365. https://doi.org/10.1519/JSC.0000000000004810

4. Comfort, P., Udall, R., & Jones, P. A. (2012b) The effect of loading on kinematic and kinetic variables during the midthigh clean pull. Journal of Strength and Conditioning Research,26(5),1208–1214. https://doi.org/10.1519/jsc.0b013e3182510827n

5. Suchomel, T. J., Wright, G. A., Kernozek, T. W., & Kline, D. E. (2014). Kinetic comparison of the power development between power clean variations. Journal of strength and conditioning research, 28(2), 350–360. https://doi.org/10.1519/JSC.0b013e31829a36a3

6. Ang, C. L., & Kong, P. W. (2023). Field-Based Biomechanical Assessment of the Snatch in Olympic Weightlifting Using Wearable In-Shoe Sensors and Videos-A Preliminary Report. Sensors (Basel, Switzerland), 23(3), 1171. https://doi.org/10.3390/s23031171.

7. Chiu, H. T., Wang, C. H., & Cheng, K. B. (2010). The three-dimensional kinematics of a barbell during the snatch of Taiwanese weightlifters. Journal of strength and conditioning research, 24(6), https://doi.org/10.1519/JSC.0b013e3181db23f4.

8. Akkuş H. (2012). Kinematic analysis of the snatch lift with elite female weightlifters during the 2010 World Weightlifting Championship. Journal of strength and conditioning of research, 26(4), 897–905. https://doi.org/10.1519/JSC.0b013e31822e5945.

9. Baumann, W., Gross, V., Quade, K., Galbierz, P., & Schwirtz, A. (1988). The Snatch Technique World Class Weightlifters at the 1985 World Championships. International Journal of Sport Biomechanics, 4(1), 68-89. Retrieved May 21, 2025, from https://doi.org/10.1123/ijsb.4.1.68.

10. Garhammer, J. (1985). Biomechanical Profiles of Olympic Weightlifters. International Journal of Sport Biomechanics, 1(2), 122-130. Retrieved May 21, 2025, from https://doi.org/10.1123/ijsb.1.2.122

11. Cunanan, A. J., Hornsby, W. G., South, M. A., Ushakova, K. P., Mizuguchi, S., Sato, K., Pierce, K. C., & Stone, M. H. (2020). Survey of Barbell Trajectory and Kinematics of the Snatch Lift from the 2015 World and

ISSN 2394 - 7780

2017 Pan-American Weightlifting Championships. Sports (Basel, Switzerland), 8(9), 118. https://doi.org/10.3390/sports8090118.

12. Baumann, W., Gross, V., Quade, K., Galbierz, P., & Schwirtz, A. (1988). The Snatch Technique World Class Weightlifters at the 1985 World Championships. International journal of sport biomechanics, 4, 68-89.

13. Everett, G. (2018, September 3). Split jerk, power jerk, squat jerk: Why & who. Catalyst Athletics. https://www.catalystathletics.com/article/2194/Split-Jerk-Power-Jerk-Squat-Jerk-Why-Who/

14. Comfort, P., Allen, M., & Graham-Smith, P. (2011). Comparisons of peak ground reaction force and rate of force development during variations of the power clean. Journal of strength and conditioning research, 25(5), 1235–1239. https://doi.org/10.1519/JSC.0b013e3181d6dc0d

15. Hoover, D. L., Carlson, K. M., Christensen, B. K., & Zebas, C. J. (2006). Biomechanical analysis of women weightlifters during the snatch. Journal of strength and conditioning research, 20(3), 627–633. https://doi.org/10.1519/R-17625.1

16. Huebner, M., Meltzer, D. E., & Perperoglou, A. (2019). Age-associated Performance Decline and Sex Differences in Olympic Weightlifting. Medicine and science in sports and exercise, 51(11), 2302–2308. https://doi.org/10.1249/MSS.0000000000002037

17. Gourgoulis, V., Aggeloussis, N., Antoniou, P., Christoforidis, C., Mavromatis, G., & Garas, A. (2002). Comparative 3-dimensional kinematic analysis of the snatch technique in elite male and female greek weightlifters. Journal of strength and conditioning research, 16(3), 359–366.

18. Everett, G. (2018). Olympic Weightlifting: A Complete Guide for Athletes & Coaches (3rd ed.). Catalyst Athletics.

19. Schilling, B. K., Stone, M. H., O'Bryant, H. S., Fry, A. C., Coglianese, R. H., & Pierce, K. C. (2002). Snatch technique of collegiate national level weightlifters. Journal of strength and conditioning research, 16(4), 551–555.

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COMPARATIVE EFFECT OF SELECTED YOGA PRACTICE ON FASTING PLASMA GLUCOSE AMONG SEDENTARY MALE

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ABSTRACT
The objective the Present study was to determine the Comparative effect of Selected Yoga Practice on Fasting Plasma Glucose among sedentary male. The subjects for this study were sedentary male from Gwalior. A total of 45 male subjects were selected and used as two experimental groups (30) and one control group (15). Suryanamaskar and Pragya yoga was considered the independent variable and Fasting Plasma Glucose was considered the dependent variable. Fasting Plasma Glucose 2 ml of blood in plain vial was taken as the criterion measures. Training was given up to 08 week. 5 days in week each session scheduled for 45 minutes. Mixed-Model design or between-within Randomized group design was used for the study. Tests were administered before the training program and after the completion 04 week and 08 week of the treatment again test were administered. ***Analysis of variance results revealed*** *that there was significant difference of selected yogic intervention strategies on Fasting Plasma Glucose. Hence, the results of the present study indicate that both experimental groups—namely the Suryanamaskar group and the Pragya Yoga group—demonstrated a significant reduction after four and eight weeks of training. The analysis of the data further revealed that there was no significant change in Fasting Plasma Glucose in the control group.*

Keywords: *Suryanamaskar, Pragya Yoga, Fasting Plasma Glucose.*

INTRODUCTION

Suryanamaskar is characterized by a focus on dynamic connecting postures that create a flow between the more static traditional yoga postures. Suryanamaskar is translated as "linking," and the system also implies the linking of movement to the breath. Essentially, the breath dictates the movement and the length of time held in the postures. Pragya Yoga, developed by Gurudev Pt. Shri Ram Sharma Acharya, pioneers a novel approach to yoga for a healthy and happy life, which is simple and suitable for the masses. He has named it "Pragya Yoga" under the noble "Pragya Abhiyan" mission. Shantikunj, an Aranyak of our times, situated in the lap of the Ganges and under the shadow of the Himalayas, is a center for learning this comprehensive yoga.

Glucose present in the bloodstream triggers the pancreas to secrete insulin. This insulin facilitates the transfer of glucose from the blood into the body's cells. Once inside the cells, glucose is either immediately converted into energy or stored as fat or glycogen for future use. Blood glucose levels naturally fluctuate throughout the day, rising after meals and returning to baseline within approximately two hours. As blood glucose levels normalize, insulin production diminishes. In healthy individuals, blood glucose typically varies within a narrow range of about 70 to 110 milligrams per deciliter (mg/dL).

As the Suryanamaskar is a traditional approach in yoga with lots of importance and benefits and Pragya Yoga has developed over the limitation of Suryanamaskar for the beginners as the difficulty in performing the asana are entirely different in both the package. So the research angle in the study is that, is there any difference in the effect of Pragya Yoga and Suryanamaskar on Fasting Plasma Glucose.

METHODS

Selection of Subjects- Fourty five sedentary male individuals, aged between 35 and 55 years, were randomly selected from Gwalior, Madhya Pradesh, as subjects of the study. They were divided into three groups, with fifteen subjects in each group. All participants belonged to a similar socio-economic background and were found to be physically fit for the type of programme for which they were selected.

Selection of Variable- Based on various studies of physical variables, related research was reviewed to support the present investigation. Keeping in mind the specific purpose of the study, selected yogic intervention strategies—Suryanamaskar and Pragya Yoga—were applied to examine their effect on fasting plasma glucose. For this measurement, 2 ml of blood was collected in a plain vial and used as the criterion measure.

Experimental Design- Mixed-Model design or between-within Randomized group design was used for the study. All the subjects were randomly divided into three groups each comprising 15 subjects. There are two factors in the design namely Group and Time duration, where Group is a between factor which is having three

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levels i.e A,B & C, and time duration is a within factor which is having three levels i.e 0 week, 4 weeks and 8 weeks.

Training and Practice of yogic intervention strategies:- The training of experimental given in the Yoga hall of Shri Ram colony, Gwalior. The Subject used practiced Pragya Yoga and Suryanamaskar barefoot. The practice session was conducted for a period of 45 minutes in the morning i.e.7.00 am. to 7.45 am on Monday to Friday for duration of one Month.

Statistical Procedure:- Descriptive statistics were used to describe the nature and characteristics of the data. To see the interaction effect between time duration and groups, 3 × 3 Mixed Analysis of Variance (Between-Within) with Bonferroni Post-Hoc comparison test was applied. Eta Square was also calculated to see the effect size of significance. Level of significance was set at 0.05.

RESULTS

Table 1 Descriptive Statistics of All Three Groups With All The Three Levels Of Time For Fasting Plasma Glucose

Groups	Time (week)	N	Mean	SD	SEM	Min.	Max.	Range	Var.
A (SN)	0	15	91.41	7.19	1.85	76.81	102.67	25.86	51.79
	4	15	78.54	5.96	1.54	67.09	85.84	18.75	35.59
	8	15	73.40	5.48	1.41	62.31	80.46	18.15	30.12
B (PY)	0	15	91.31	10.29	2.65	78.18	106.11	27.93	105.97
	4	15	84.98	8.97	2.31	74.67	101.12	26.45	80.57
	8	15	77.80	7.49	1.93	70.14	94.19	24.05	56.21
C (Control)	0	15	91.66	4.24	1.09	83.95	102.23	18.39	17.98
	4	15	91.56	4.69	1.21	82.31	99.14	16.83	22.02
	8	15	91.23	4.92	1.27	81.18	99.67	18.49	24.29

Table 1 depicts the descriptive statistics for fasting blood glucose of all the three groups with all the three levels of time duration. In all the three levels of time i.e. 0 week, 4 weeks and 8 weeks, the mean and standard deviation of group A (Suryanamaskar) was 91.41±7.19, 78.54±5.96and 73.40±5.48 mg with range of 25.86, 18.75and 18.15 respectively. The minimum fasting blood glucose was 76.81, 67.09and 62.31 mg, the maximum fasting blood glucose was 102.67, 85.84and 80.46 mg respectively. The standard error of mean was 1.85, 1.54 and 1.41 mg and the variance was 51.79, 35.59and 30.12 mg respectively.

The mean and standard deviation of group B (Pragya Yoga) was 91.31±10.29, 84.98±8.97 and 77.80±7.49 mg with range of 27.93, 26.45 and 24.05 mg respectively. The minimum fasting blood glucose was 78.18, 74.67 and 70.14 mg, the maximum fasting blood glucose was 106.11, 101.12 and 94.19 respectively. The standard error of mean was 2.65, 2.31 and 1.93 seconds and the variance was 105.97, 80.57 and 56.21 respectively.

The mean and standard deviation of group C (Control) was 91.66±4.24, 91.56±4.69 and 91.23±4.92 mg with range of 18.39, 16.83 and 18.49 mg respectively. The minimum fasting blood glucose was 83.95, 82.31 and 81.18 mg. the maximum fasting blood glucose was 102.34, 99.14 and 99.67 respectively. The standard error of mean was 1.09, 1.21 and 1.27 mg and the variance was 17.98, 22.02 and 24.29 mg respectively.

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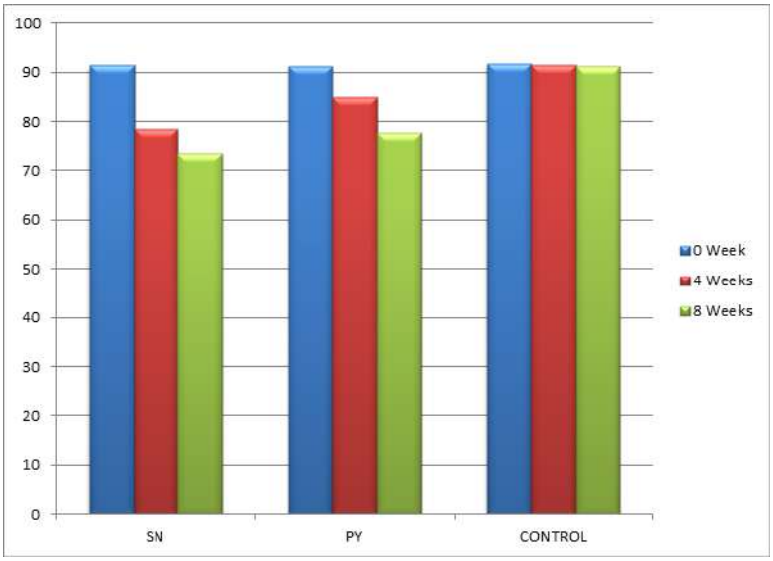

Figure 1: Mean of all the three groups with all the three levels of time duration.

Table 2: Estimated Marginal Means Of Groups For Fasting Plasma Glucose

A (Suryanamasksr)		B (Pragya yoga)		C (Control group)	
Mean	**SE**	**Mean**	**SE**	**Mean**	**SE**
81.13	1.70	84.70	1.70	91.48	1.70

Table 2 indicating that the estimated marginal mean was 81.13, 84.70 and 91.48 of all the three groups i.e. A (Suryanamaskar), B (Pragya yoga) and C (Control) respectively. And the SEM was 1.70 in the groups.

Table 3: Estimated Marginal Means Of Time For Fasting Plasma Glucose

0 Week		4 Weeks		8 Weeks	
Mean	**SE**	**Mean**	**SE**	**Mean**	**SE**
91.46	1.14	85.04	1.01	80.81	.905

Table 3 indicating that the estimated marginal mean was 91.46, 85.04 and 80.81 of all the three levels of time i.e. 0 Week, 4 Weeks and 8 Weeks respectively. And the SEM was 1.14, 1.01 and .905 respectively.

Mixed ANOVA was applied to see the Interaction effect between groups and time durations.

Table 4: F Tests Of Between-Subjects Effects For Fasting Plasma Glucose

Sources	Type III SS	df	MSS	F	Sig.	Partial Eta^2
Intercept	993208.882	1	993208.882	7619.116	.000	.995
Group	2488.815	2	1244.408	9.546	.000	.313
Error (Group)	5475.015	42	130.357			

***Significant at 0.05 level**

Table 4 indicating that the obtained p-value .000 is found significant at .05 level of significance. So that it was evident that there was a significant difference among the various groups and the value of Eta square was indicating that the 31.3% variability were shown by the groups in fasting Plasma glucose.

Bonferroni Post-Hoc test was applied to see the pair wise comparison of groups for FBG, as the F value (9.54) was found significant.

Table 5: Bonferroni Post-Hoc Test For Pairwise Comparisons Of Groups For Fasting Plasma Glucose

A (Suryanamaskar)	B (pragya yoga)	C (Control)	Mean Difference	Sig.
81.13	84.70		-3.566	.438
81.13		91.48	-10.352*	.000
	84.70	91.48	-6.786*	.022

***Significant at 0.05 level**

Table 5 depicts that the obtained p-value .000 & .022 of the pair A-C & pair B-C was found significant. And no significant effect was found between pair A-B at 0.05 level of significance.

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The results revealed that participants practicing Suryanamaskar experienced a greater reduction in Fasting Plasma Glucose (mean = 73.40 mg/dL at 8 weeks) compared to those practicing Pragya Yoga (mean = 77.80 mg/dL). Although the difference between the two experimental groups was not statistically significant, both interventions were superior to the control group, which showed no meaningful change in glucose levels. This suggests that regular yogic practice—whether dynamic (Suryanamaskar) or simplified (Pragya Yoga)—positively influences Fasting Plasma Glucose.

DISCUSSION

The results of the study on Fasting Plasma Glucose indicate that both experimental groups—namely the Suryanamaskar group and the Pragya Yoga group—demonstrated a significant reduction after four and eight weeks of training. The analysis of the data further revealed that there was no significant change in Fasting Plasma Glucose levels in the control group. Based on the mean values, the Suryanamaskar Yogic Practice group proved more effective in lowering blood sugar levels than the Pragya Yogic Practice group. Systematic yogic training was found to reduce Fasting Plasma Glucose. The findings of this study are consistent with those reported by Selvalakshmi and Yogaraj (2009).

CONCLUSION

The present study demonstrates that both Suryanamaskar and Pragya Yoga significantly reduce fasting plasma glucose levels in sedentary middle-aged men when compared to a control group. Although Suryanamaskar produced marginally greater reductions, the difference was not statistically significant, indicating that both practices are comparably effective in enhancing glucose regulation. Pragya Yoga, owing to its simplicity and accessibility, may serve as a practical entry point for individuals initiating yogic practices, while Suryanamaskar may yield additional benefits with sustained practice.

These findings underscore the potential of traditional yogic interventions as non-pharmacological strategies for improving metabolic health. Incorporating such practices into lifestyle modification programs could provide a culturally relevant and cost-effective approach to the prevention and management of impaired glucose regulation. Future studies with larger cohorts, longer intervention periods, and mechanistic exploration are warranted to further delineate the comparative efficacy and long-term benefits of these practices.

REFERENCE

- Bhattacharya P.B. (2007). Surya Namaskara. Sri Aurobindo Ashram Trust, Pondicherry, 9.
- Calderon R Jr, Schneider RH, Alexander CN, Myers HF, Nidich SI, Haney C. (1999). Stress, stress reduction and hypercholesterolemia in African Americans: A review. Ethn Dis, 9:451-62.
- Verma, J. P.; A Text Book on Sports Statistics, Sports Publication, New Delhi, 2009.
- Verma, J. P.; Statistical Methods for Sports and Physical Education, Tata Mcgraw-Hill Eduction Private Limited, New Delhi,(2012).
- Albert Webster William "The Effect of 12 Week Quantative Aerobic Training Programme on The Serum Lipoprotein Fraction in Sedentary Middle Aged Men".Dissertation abstracts international. (September 1978): 1424
- Pansare M.S., Kulkarni, A.N., Pandse, U.B. "Effect of yogic training on serum LDH levels"., Journal of Sports Med Phys Fitness, June;29(2):177-8, 1989.
- Martins, Clarice L., "Association between Fitness, Different Indicators of Fatness, and Clustered Cardiovascular Diseases Risk Factors in Portuguese Children and Adolescents", the Open Sports Sciences Journal, Volume 3 (2010): 149-154.
- Yogaraj,P., Ramaraj P., and Elangovan, R.,(2010), "Effects of selected asanas on serum cholesterol and functions of adrenal gland in college women". Asian Journal of Physical Education & Computer Science in Sports, 3:1, PP.27-29.

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A COMPARATIVE STUDY ON PHYSICAL FITNESS VARIABLES BETWEEN STATE-LEVEL AND NATIONAL-LEVEL ATHLETES AMONG PHYSICAL EDUCATION COLLEGE STUDENTS PENDRA

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ABSTRACT
The purpose of the present study was to compare selected physical fitness variables between state-level and national-level male athletes aged 19–30 years studying at Government Physical Education College, Pendra, District Gaurela-Pendra-Marwahi (GPM), Chhattisgarh. Sixty male athletes were purposively selected and equally divided into two groups: state-level athletes (n = 30) and national-level athletes (n = 30). Five components of physical fitness—cardiovascular endurance, muscular strength, explosive power, speed, and flexibility—were assessed using standardized tests. The collected data were analyzed using an independent t-test to determine significant differences between the two groups at the 0.05 level of significance. The findings indicated that national-level athletes demonstrated superior performance across all selected physical fitness variables when compared to state-level athletes. The study concludes that higher training exposure, competitive experience, and scientific conditioning significantly enhance physical fitness among national-level athletes.

Keywords: *Physical Fitness, State-Level Athletes, National-Level Athletes, Performance, Comparative Study*

INTRODUCTION
Physical fitness is a fundamental requirement for achieving success in sports and athletic performance. It reflects an individual's ability to perform physical activities efficiently, resist fatigue, and recover quickly from exertion. In competitive sports, physical fitness plays a decisive role in determining an athlete's performance level, as it directly influences speed, strength, endurance, agility, and flexibility. Athletes with higher fitness levels are better equipped to tolerate training loads, execute skills effectively, and maintain consistency during competitions.

Physical fitness is a multidimensional concept consisting of several interrelated components such as cardiovascular endurance, muscular strength, explosive power, speed, and flexibility. Cardiovascular endurance supports sustained activity, muscular strength contributes to force production, explosive power enhances rapid and forceful movements, speed determines quickness, and flexibility allows greater range of motion and injury prevention. The balanced development of these components is essential for optimal athletic performance, particularly in modern competitive sports where physical demands are continuously increasing.

The level of competition significantly affects the physical fitness status of athletes. State-level athletes generally receive systematic training; however, national-level athletes are exposed to higher training intensity, scientific conditioning methods, superior coaching, and greater competitive experience. These factors collectively contribute to enhanced physical fitness among national-level athletes. Differences in training volume, recovery strategies, nutritional support, and access to sports science services often result in measurable variations in fitness parameters between athletes competing at different levels.

In the Indian sports context, understanding the physical fitness differences between state-level and national-level athletes is crucial for talent development and performance enhancement. Identifying the specific fitness components that distinguish higher-level athletes can assist coaches and sports administrators in designing effective training programs and guiding athletes toward national and international success. Therefore, the present study aims to compare selected physical fitness variables between state-level and national-level male athletes to provide scientific evidence that can support athlete development and training planning.

METHODOLOGY

Selection of Subjects
A total of 60 male athletes aged between 19 and 30 years were selected purposively from Government Physical Education College, Pendra. The subjects were divided into two groups State-Level Athletes (n = 30), National-Level Athletes (n = 30)

Selection of variables and criterion measures

FITNESS COMPONENT	Criterion Measure
Cardiovascular Endurance	Cooper 12-Minute Run Test (meters)

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Muscular Strength	Push-Up Test (repetitions)
Explosive Power	Standing Broad Jump (meters)
Speed	50-Meter Dash (seconds)
Flexibility	Sit-and-Reach Test (cm)

Administration of the Tests

All selected physical fitness tests were administered according to standardized procedures under similar environmental conditions. Prior to testing, subjects were properly instructed and given a standardized warm-up to ensure safety and optimal performance. Adequate rest was provided between tests to minimize fatigue.

Statistical Technique

The data collected was tabulated and subjected to statistical analysis. Descriptive analysis was done by computing means, standard deviations and independents't' test were applied to analyses the data.

Results

Table 1: Mean and S.D. of Cardiovascular Endurance between State-Level and National-Level Athletes

GROUP	MEAN	SD	t Value
State-Level (n=30)	2450	180	
National-Level (n=30)	2750	160	6.58*

Table 2: Mean and S.D. of Muscular Strength between State-Level and National-Level Athletes

GROUP	MEAN	SD	t Value
State-Level (n=30)	32.4	4.6	
National-Level (n=30)	41.8	5.1	7.42*

Table 3: Mean and S.D. of Explosive Power between State-Level and National-Level Athletes

GROUP	MEAN	SD	t Value
State-Level (n=30)	2.12	0.18	
National-Level (n=30)	2.46	0.21	6.11*

Table 4: Mean and S.D. of Speed between State-Level and National-Level Athletes

GROUP	MEAN	SD	t Value
State-Level (n=30)	6.92	0.34	
National-Level (n=30)	6.31	0.29	7.03*

Table 5: Mean and S.D. of Flexibility between State-Level and National-Level Athletes

GROUP	MEAN	SD	t Value
State-Level (n=30)	18.6	3.2	
National-Level (n=30)	24.9	3.8	6.27*

RESULT AND DISCUSSION

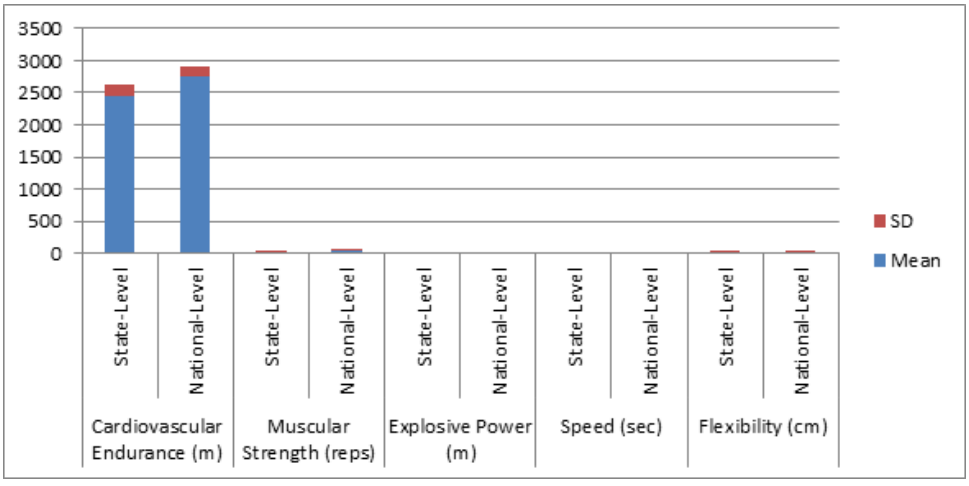

Fig 1: Graphical Representation of Fitness Variables between State-Level and National-Level Athletes

The results of the study revealed that national-level athletes performed significantly better than state-level athletes in all selected physical fitness variables. Superior cardiovascular endurance among national-level

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athletes may be attributed to higher aerobic training loads and systematic conditioning programs. Enhanced muscular strength and explosive power reflect the impact of resistance and plyometric training commonly adopted at higher competitive levels.

Similarly, better speed and flexibility among national-level athletes indicate improved neuromuscular coordination, technique, and recovery strategies. These findings are in agreement with earlier studies that reported higher fitness levels among elite athletes compared to sub-elite counterparts.

CONCLUSION

The present study concludes that national-level athletes possess significantly higher levels of physical fitness than state-level athletes across all selected variables. This superiority can be attributed to better coaching, advanced training methods, higher competitive exposure, and structured fitness programs. The study highlights the need for scientifically planned training programs for state-level athletes to bridge the performance gap and promote progression to higher competitive levels.

REFERENCES

1. Bompa, T. O., & Haff, G. G. (2009*). Periodization: Theory and methodology of training (5th ed.). Human Kinetics.*
2. Cooper, K. H. (1968). *Aerobics*. Bantam Books.
3. Fox, E. L., Bowers, R. W., & Foss, M. L. (2012). *The physiological basis for exercise and sport (6th ed.). McGraw-Hill.*
4. Johnson, B. L., & Nelson, J. K. (1986). *Practical measurements for evaluation in physical education (4th ed.). Macmillan.*
5. Kansal, D. K. (2008). *Test and measurement in sports and physical education. DVS Publications.*
6. McArdle, W. D., Katch, F. I., & Katch, V. L. (2015). *Exercise physiology: Nutrition, energy, and human performance* (8th ed.). Lippincott Williams & Wilkins.
7. Singh, H. (2015). *Science of sports training.* DVS Publications.
8. Thomas, J. R., Nelson, J. K., & Silverman, S. J. (2015*). Research methods in physical activity (7th ed.).* Human Kinetics.
9. *Verma, J. P. (2013). Sports statistics. Friends Publications.*
10. Wilmore, J. H., Costill, D. L., & Kenney, W. L. (2012). *Physiology of sport and exercise* (5th ed.). Human Kinetics.

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SPORTS AND PEACE IN INDIA

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ABSTRACT
Sports have long been recognized as a powerful tool for fostering development and peace within societies. This paper examines how sports contribute to peacebuilding, conflict resolution, social integration, and community development specifically in the Indian context. Through a literature review and analysis of case examples, the paper highlights how sporting activities can bridge social divides, teach values of teamwork and respect, and provide constructive outlets for youth. Notable examples include football programs in conflict-affected Kashmir and national campaigns by athletes emphasizing unity and peace. The discussion also addresses the role of major sporting events and initiatives (such as India's participation in the Olympic Truce) and the limitations of "sports diplomacy" in the face of political tensions. The findings suggest that while sports alone cannot resolve deep-seated conflicts, well-designed programs and symbols (e.g. the White Card campaign) can help foster dialogue, mutual understanding, and community resilience.

Keywords: *Sports; Peacebuilding; India; Conflict Resolution; Social Integration; Community Development.*

INTRODUCTION
Sport in India, as elsewhere, is more than just recreation: it embodies values of fair play, teamwork and mutual respect. These inherent values allow sports to serve as a common platform where people of different backgrounds can come together. Across the world, sports are often highlighted for their power to "break down barriers" and promote social inclusion. In India's diverse and multi-ethnic society, periodic tensions (e.g. along religious, linguistic or regional lines) make such social bridges particularly important. National and international sporting events draw Indians together in shared pride and identity, suggesting a unifying potential. Indeed, sports "provide a common platform where individuals can come together, build relationships, and break down barriers". This paper investigates the role of sports in promoting peace and harmony in India. It reviews empirical studies, reports and news accounts to assess how sporting activities have been used for peacebuilding and social integration in Indian society. We examine both grassroots efforts (community leagues, youth camps) and high-profile initiatives (international campaigns and Olympic ideals) as they relate to the Indian experience. Case examples include football in Kashmir and cricket diplomacy with Pakistan, as well as campaigns by Indian athletes. The paper is structured as follows: first we outline the research methodology, then discuss how sports contribute to peacebuilding and conflict resolution in India, followed by social and community impacts of sports, and conclude with lessons learned and recommendations for leveraging sports as a peacebuilding tool in India.

METHODOLOGY
This study is based on a qualitative review of secondary sources, combining academic literature with reports from international organizations and news media. We identified key themes by searching for terms like "sports peace India", "sports conflict resolution India", and reviewing relevant materials. Particular attention was paid to recent empirical studies and global reports that discuss sports for development and peace, as well as to coverage of Indian-specific programs. Sources include journal articles, United Nations reports, newspaper articles and NGO websites. Case examples (e.g. in Kashmir, national campaigns) were selected for their illustrative value. The approach is similar to previous scoping reviews of sports-for-peace projects, adapted to focus on India. Wherever possible, specific initiatives and outcomes in the Indian context were identified and analyzed.

DISCUSSION

Sports as a tool for peacebuilding and conflict resolution: In India, sports can foster peace by bringing together diverse communities in a neutral setting. As one analysis notes, sports often attract "mass attention" and can aid in relationship-building across societal divides. For example, in the disputed region of Jammu & Kashmir, football has been used to engage youth positively. The football club Real Kashmir, based in Indian-administered Kashmir, is seen as a symbol of hope. One player involved with Real Kashmir observed that he knew "what this club means to the youth of Kashmir, and football can make a difference to their lives". This sentiment underlines how sports provide common ground even in "a nuclear flashpoint flooded by almost 800,000 troops". By offering an alternative to conflict, organized sports in Kashmir have helped some young people channel energy into training and teamwork rather than violence.

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Sports also play a role in India's relations with other countries. Cricket, India's most popular sport, has historically been linked to the idea of "cricket diplomacy" with Pakistan. High-profile cricket matches once served as rare moments of camaraderie between the nations. However, recent events demonstrate limitations: during a 2025 Asia Cup match, Indian players refused the customary handshake after defeating Pakistan, leading observers to declare that "the 'cricket diplomacy'… had vanished". This incident shows that while sports can symbolize peace, deep political tensions can override goodwill. Nonetheless, such matches continue to be watched widely and can still raise conversations about unity when organized appropriately. A more explicit peacebuilding effort occurred in April 2025, when India's national women's hockey team joined the global #WhiteCard campaign on the International Day of Sport for Development and Peace. The White Card is a symbol of peace (in contrast to a red or yellow penalty card), and the hockey players used it to endorse the message that "sport has the power to break barriers and unite people". As one captain said, the campaign aligns with values of "respect, teamwork, and peace". Indian athletes thus have supported international efforts to recognize sports as a "critical tool for peace and education". The Hockey India news release explicitly called on governments and sports bodies to acknowledge sport's potential as a peacebuilding tool, noting that sports in conflict zones become "more than a game — … a lifeline, nurturing skills like cooperation, mutual respect, and resilience". These campaigns highlight how, at least symbolically, sports figures in India are mobilizing the universal appeal of sport for messages of understanding and solidarity.

Social integration and community development: At the community level, sports can promote integration by transcending social divides. A popular view (echoed in Indian media) is that sports offer "a common platform" that unites individuals of different backgrounds. In practice, local leagues and tournaments often bring together youth from neighboring villages or different social groups. Participation in team sports teaches cooperation, communication, and respect for rules – values that can translate into broader social harmony. For example, government programs like Khelo India aim to build sports infrastructure in rural and urban areas, giving children from all castes and classes chances to play together. While rigorous studies in India are limited, the general consensus is that such inclusive sports schemes foster social cohesion and empower marginalized groups.

Sports also serve as an avenue for personal development, which indirectly benefits peace. By engaging in sports, young people learn self-discipline and goal-setting, which can reduce tendencies toward anti-social behavior. Many Indian NGOs run sports-for-development programs in slums and conflict-affected districts (often with UN or corporate support), aiming to keep youth engaged in constructive activity. Although specific evaluation data in India are scarce, analogous programs elsewhere have shown sports can reduce youth aggression and improve group relations. In line with this, Indian news reports note that sports activities teach "essential life skills such as teamwork, communication, and perseverance" which help individuals "navigate challenges" beyond the playing field. Importantly, sports provide visible role models who can inspire unity. The success of Indian athletes of various regional and religious backgrounds (for example, Sikh shooter Abhinav Bindra, Muslim cricketer Mohammed Kaif, or tribal pugilist Mary Kom) creates moments of collective pride. Even simple rituals – like watching India's national anthem at an Olympic event or celebrating a World Cup victory – can bolster feelings of national solidarity. These symbols matter in a diverse democracy. Events such as India hosting the Commonwealth Games (2010) or bidding for global tournaments bring attention to the unifying potential of sports at the policy level. However, such events also illustrate that sports infrastructure and community engagement are needed to translate international pride into lasting local peace dividends.

International initiatives and policy context: On the policy front, India participates in global sports-for-peace frameworks, although sometimes with mixed signals. For instance, the International Olympic Truce tradition calls on nations to cease hostilities around the time of the Games. India typically supports the Olympic movement's ideals, and the *International Olympic Truce Centre* emphasizes that its mission is "to serve peace and friendship and to cultivate international understanding". Despite this rhetoric, India did not take part in the UN vote on the 2023 Olympic Truce resolution, with officials abstaining from the 118–0 vote in favor. This abstention was noted even as the resolution affirmed sport's role "to prevent and counter terrorism and violent extremism" and to build "tolerance and understanding" among nations. The ambivalence suggests that while India endorses sports in principle, diplomatic priorities (or procedural issues) may influence its engagement at the UN level. Domestically, India has increasingly recognized sports in its development agenda. The government's policies (such as the Khelo India and Fit India missions) aim to create sports infrastructure in every district and inculcate fitness habits among youth. These initiatives, although primarily focused on health and talent development, also have side benefits for social cohesion: bringing diverse communities together in common projects. Moreover, government agencies and NGOs sometimes partner to run peace-through-sport programs in troubled regions.

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For example, security forces in Kashmir have organized civilian sports events to foster goodwill, and in some northeastern states sports competitions promote unity among different tribes. While systematic evaluation is limited, these programs indicate an understanding that sports can complement peacebuilding efforts.

Two illustrative examples highlight the role of sports in India's peace efforts. First, in Jammu & Kashmir a youth football program (building on the popularity of the Real Kashmir club) has explicitly aimed to keep teenagers away from militancy. One organizer recounted how players were taught that on the field they are "not opponents but brothers," a metaphor underscoring unity. (This echoes global findings that sports can create "common language" among youth.) These efforts show that even under heavy tension, sports fields can become semi-neutral ground. Second, the #WhiteCard campaign (International Day of Sport for Development and Peace) provided a platform for Indian athletes to call attention to conflict zones. India's women's hockey team participated in 2025, symbolically aligning sports with peace advocacy. By holding up white cards, the players joined a global call to action, demonstrating India's solidarity with the idea that "champions are not only made on the field but also in their stand for global good". Nonetheless, these cases also highlight challenges. The Kashmir football initiative operates in a highly militarized environment, and its impact remains limited to relatively few participants. The cricket diplomacy example showed how quickly sports camaraderie can unravel when political conflicts intensify. These examples illustrate that sports can contribute to peacebuilding, but are most effective when embedded in broader social and political support.

CONCLUSION

In sum, sports in India have a significant, though not unambiguous, role in peacebuilding and social cohesion. Empirical evidence and recent cases suggest that sporting activities can foster mutual respect, bridge cultural divides, and give youth constructive outlets. Indian athletes and federations have also leveraged international platforms to advocate for unity, echoing the Olympic ideal of peace[3][2]. However, sports alone cannot overcome entrenched conflicts: as seen in Indo-Pak cricket or Kashmir violence, political tensions can overshadow the goodwill built on a playing field. For sports to have lasting peace impact, they must be part of multi-faceted initiatives – including education and dialogue – and supported by consistent policy. Moving forward, India could strengthen sports-for-peace by expanding grassroots programs that emphasize shared values, evaluating their social impact, and ensuring that major sporting events and icons consciously promote inclusion. India's abstention from recent UN sports resolutions suggests room for more active engagement with global peace-through-sport initiatives. If Indian stakeholders – from government to sports federations and youth groups – collaborate, sports can become a more powerful catalyst for unity in India's plural society. The evidence indicates that when well-managed and inclusive, sports programs can indeed "bring people together" and nurture hope for a more peaceful future in India.

REFERENCES

1. Allison, L. (Ed.). (2016). *The Global Politics of Sport: The Role of Global Institutions in Sport*. Routle
2. Kidd, B. (2008). *A New Social Movement: Sport for Development and Peace*. *Sport in Society, 11*(4), 370–380. Levermore, R., & Beacom, A. (Eds.). (2009). *Sport and International Development*. Palgrave Macmillan.
3. Chaudhary, V. (2019, September 22). *From Oxford Utd to war-torn Kashmir: 'It's not your typical football loan move'*. The Guardian.
4. Hockey India. (2025, April 6). *Indian hockey stars show solidarity with children in conflict zones through #WhiteCard Campaign on International Day of Sport for Development and Peace*.
5. PTI. (2023, November 22). *India absent from voting on UNGA resolution on building a peaceful world through sports, Olympic truce*. The Economic Times.

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COMPARISON OF COORDINATIVE ABILITIES AMONG SECONDARY SCHOOL LEVEL KHO-KHO PLAYERS ON MAT AND CLAY PLAYFIELDS IN NAGARKURNOOL DISTRICT, TELANGANA STATE

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ABSTRACT
The present study aimed to compare the coordinative abilities of secondary school-level Kho-Kho players performing on mat and clay playfields in Nagarkurnool District, Telangana State. A total of 40 male students aged between 12 and 16 years were selected through purposive sampling. The subjects were divided into two groups: 20 players performing on mat surfaces and 20 players performing on clay surfaces. Coordinative abilities were measured using standardized tests assessing agility, balance, reaction time, orientation ability, and rhythmic ability. The collected data were analyzed using mean, standard deviation, and independent t-test. The results revealed significant differences between the two groups. Players performing on mat surfaces showed superior agility, faster reaction time, and better dynamic balance compared to players on clay surfaces. The supportive and even nature of the mat surface enhanced movement efficiency, whereas the irregular texture of the clay surface negatively influenced performance. The study concludes that the type of playfield surface significantly affects coordinative abilities among school-level Kho-Kho players. These findings may help coaches and physical education teachers in designing surface-specific training programs.

Keywords: *Kho-Kho, Coordinative Abilities, Agility, Reaction Time, Mat Surface, Clay Playfield, Nagarkurnool District, Telangana State*

INTRODUCTION
Kho-Kho is a popular indigenous Indian sport that requires high levels of coordinative abilities such as agility, balance, reaction time, orientation ability, and rhythmic ability. These abilities play a crucial role in executing quick directional changes, chasing, dodging, and tactical movements during the game. The performance of Kho-Kho players is not only influenced by physical fitness and skill level but also by the type of playfield surface on which the game is played.

Playfield surfaces such as mat and clay offer different movement conditions. Mat surfaces provide uniform grip, shock absorption, and stability, whereas clay surfaces may present uneven textures, variable traction, and increased energy demands. These surface characteristics can influence neuromuscular coordination and overall performance, especially among school-level players.

Despite the growing use of mat surfaces in competitive Kho-Kho, limited scientific studies have examined how different playfields affect coordinative abilities among secondary school players. Therefore, the present study was undertaken to compare coordinative abilities of Kho-Kho players performing on mat and clay playfields in Nagarkurnool District, Telangana State.

OBJECTIVES OF THE STUDY
1. To assess the coordinative abilities of secondary school-level Kho-Kho players performing on mat surfaces.
2. To assess the coordinative abilities of secondary school-level Kho-Kho players performing on clay surfaces.
3. To compare agility, balance, reaction time, orientation ability, and rhythmic ability between mat and clay playfield players.
4. To determine the influence of playfield surface on coordinative abilities.

HYPOTHESES
1. There would be a significant difference in agility between mat and clay surface Kho-Kho players.
2. There would be a significant difference in balance between mat and clay surface Kho-Kho players.
3. There would be a significant difference in reaction time between mat and clay surface Kho-Kho players.
4. There would be a significant difference in orientation ability between mat and clay surface Kho-Kho players.
5. There would be a significant difference in rhythmic ability between mat and clay surface Kho-Kho players.

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METHODOLOGY

Selection of Subjects

The study involved 40 male secondary school Kho-Kho players aged between 12 and 16 years from Nagarkurnool District, Telangana State. The subjects were selected using purposive sampling technique and divided into two groups:

- **Group I:** Mat surface players (n = 20)
- **Group II:** Clay surface players (n = 20)

VARIABLES

- **Independent Variable:** Type of playfield surface (Mat and Clay)
- **Dependent Variables:** Coordinative abilities (agility, balance, reaction time, orientation ability, rhythmic ability)

TOOLS AND TESTS

Coordinative Ability	Test Used
Agility	Shuttle Run Test
Balance	Stork Stand Test
Reaction Time	Digital Reaction Time Apparatus
Orientation Ability	Numbered Medicine Ball Run Test
Rhythmic Ability	Rhythmic Jump Test

STATISTICAL TECHNIQUES

Descriptive statistics such as mean and standard deviation were used to analyze the data. Independent t-test was applied to determine the significance of differences between mat and clay surface players. The level of significance was set at 0.05.

Table – 1: Descriptive Statistics of Agility of Kho-Kho Players on Mat and Clay Playfields

Group	N	Mean	Standard Deviation
Mat Surface Players	20	10.85	0.92
Clay Surface Players	20	11.62	1.05

(Lower score indicates better agility)

Table – 2: Independent t-test for Agility of Kho-Kho Players

Variable	Mean Difference	Calculated t-value	Table t-value (0.05)	Significance
Agility	0.77	2.48	2.02	**Significant**

Table – 3: Descriptive Statistics of Balance of Kho-Kho Players on Mat and Clay Playfields

Group	N	Mean (Seconds)	Standard Deviation
Mat Surface Players	20	32.40	4.25
Clay Surface Players	20	27.85	4.60

Table – 4: Independent t-test for Balance of Kho-Kho Players

Variable	Mean Difference	Calculated t-value	Table t-value (0.05)	Significance
Balance	4.55	3.12	2.02	**Significant**

Table – 5: Descriptive Statistics of Reaction Time of Kho-Kho Players

Group	N	Mean (Seconds)	Standard Deviation
Mat Surface Players	20	0.238	0.028
Clay Surface Players	20	0.266	0.031

Table – 6: Independent t-test for Reaction Time of Kho-Kho Players

Variable	Mean Difference	Calculated t-value	Table t-value (0.05)	Significance
Reaction Time	0.028	2.31	2.02	**Significant**

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Table – 7: Descriptive Statistics of Orientation Ability of Kho-Kho Players

Group	N	Mean	Standard Deviation
Mat Surface Players	20	18.90	2.10
Clay Surface Players	20	17.60	2.25

Table – 8: Independent t-test for Orientation Ability

Variable	Mean Difference	Calculated t-value	Table t-value (0.05)	Significance
Orientation Ability	1.30	1.89	2.02	Not Significant

Table – 9: Descriptive Statistics of Rhythmic Ability of Kho-Kho Players

Group	N	Mean	Standard Deviation
Mat Surface Players	20	21.45	2.30
Clay Surface Players	20	20.70	2.55

Table – 10: Independent t-test for Rhythmic Ability

Variable	Mean Difference	Calculated t-value	Table t-value (0.05)	Significance
Rhythmic Ability	0.75	1.02	2.02	Not Significant

RESULTS AND DISCUSSION

The analysis of data revealed significant differences in coordinative abilities between Kho-Kho players performing on mat and clay surfaces. Players on mat surfaces demonstrated superior agility, faster reaction time, and better dynamic balance compared to their clay surface counterparts. The calculated t-values for these variables exceeded the critical value at the 0.05 level of significance.

The improved performance on mat surfaces may be attributed to the even, stable, and shock-absorbing characteristics of the mat, which facilitate efficient movement execution and reduce movement errors. In contrast, the irregular texture of clay surfaces may disrupt balance and coordination, leading to slower reaction times and reduced agility.

Orientation ability and rhythmic ability showed comparatively smaller differences between the two groups, though mat surface players still performed slightly better. These findings support earlier studies emphasizing the role of environmental and surface factors in motor performance development.

CONCLUSION

The study concludes that playfield surface has a significant influence on coordinative abilities among secondary school-level Kho-Kho players. Mat surfaces provide better support for agility, balance, and reaction time compared to clay surfaces. Therefore, the use of mat surfaces may be beneficial for skill development and performance enhancement among young Kho-Kho players.

RECOMMENDATIONS

1. Coaches should incorporate mat-based training for improving coordinative abilities.
2. Physical education teachers may use clay surfaces during early training stages to enhance adaptability.
3. Similar studies may be conducted on female players and other age groups.
4. Future research may include additional variables such as speed, strength, and endurance.

REFERENCES

1. Bressel, E., Yonker, J. C., Kras, J., & Heath, E. M. (2007). Comparison of static and dynamic balance in female collegiate soccer, basketball, and gymnastics athletes. *Journal of Athletic Training*, 42(1), 42–46.
2. Gabbett, T. J. (2008). Influence of playing surface on injury risk and physical performance. *Journal of Science and Medicine in Sport*, 11(4), 400–405.
3. Hrysomallis, C. (2011). Balance ability and athletic performance. *Sports Medicine*, 41(3), 221–232. https://doi.org/10.2165/11538560-000000000-00000
4. Kansal, D. K. (2008). *Applied measurement evaluation and sports selection*. New Delhi: DVS Publications.
5. Magill, R. A., & Anderson, D. (2017). *Motor learning and control*. New York: McGraw-Hill.
6. McLean, B. D., & Tumilty, D. M. (2010). Left–right asymmetry in reaction time among athletes. *Journal of Sports Sciences*, 28(3), 291–300.

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7. Saha, S., & Mukherjee, S. (2015). Effect of different surfaces on agility performance among school-level players. *International Journal of Physical Education, Sports and Health*, 2(2), 85–88.
8. Schmidt, R. A., & Lee, T. D. (2011). *Motor control and learning*. Champaign, IL: Human Kinetics.
9. Singh, H. (2015). *Science of sports training*. New Delhi: DVS Publications.
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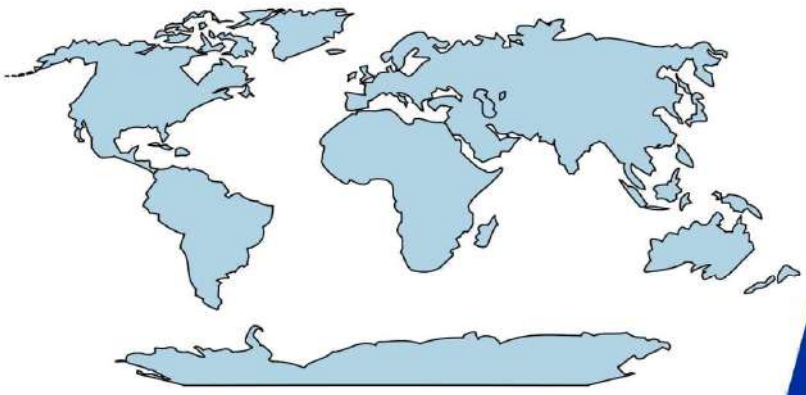

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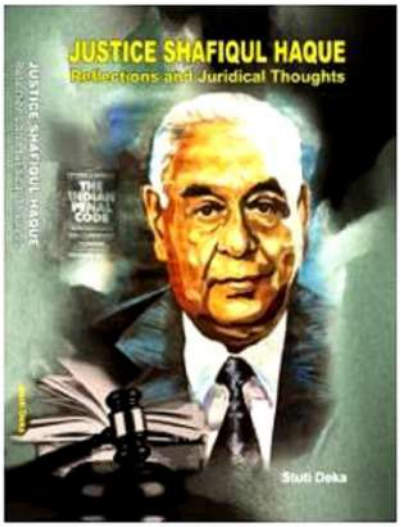

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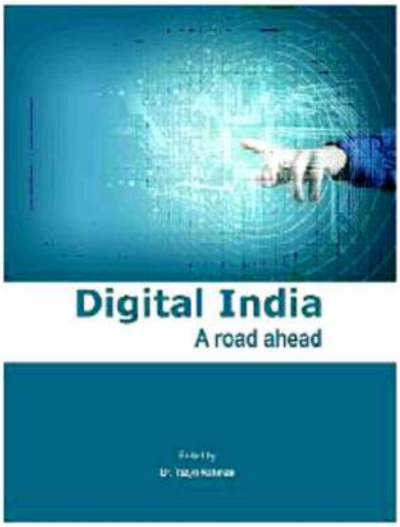

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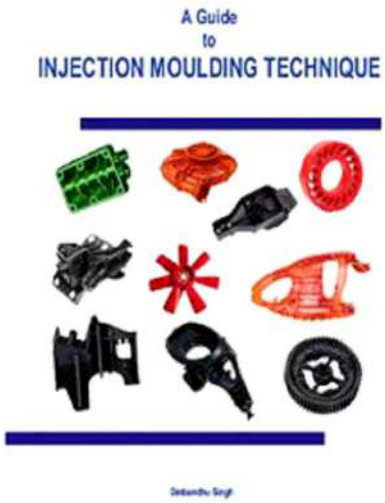

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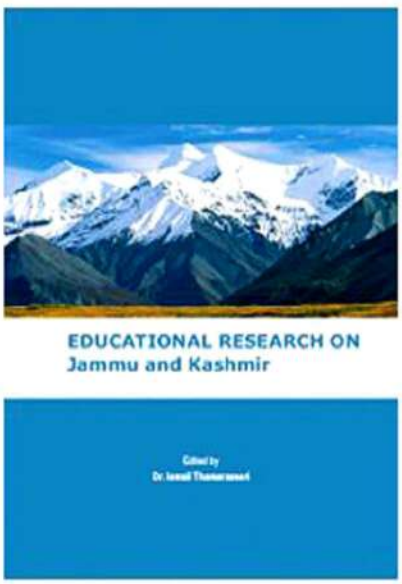

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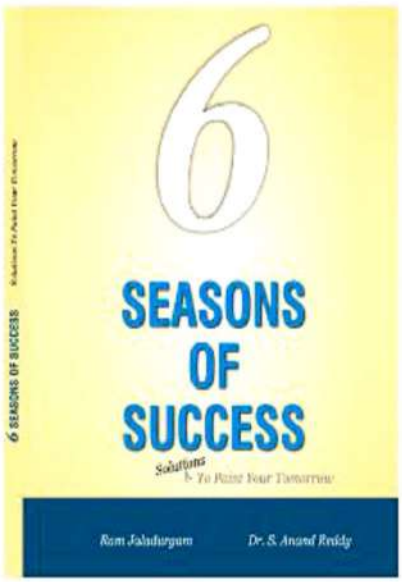

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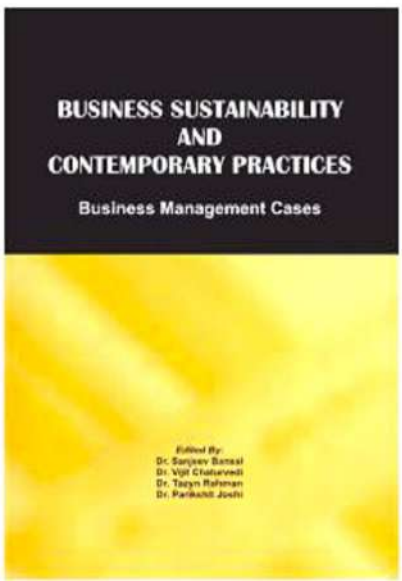

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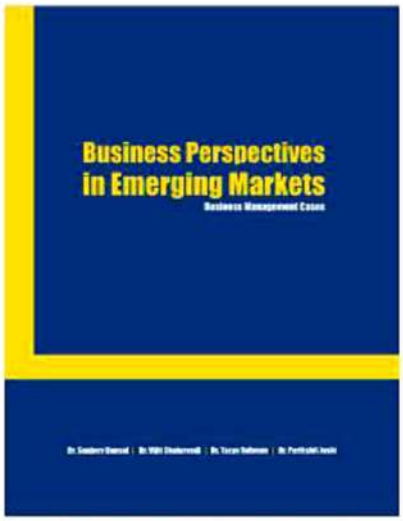

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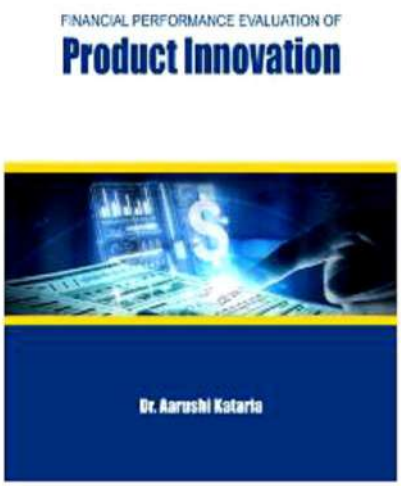

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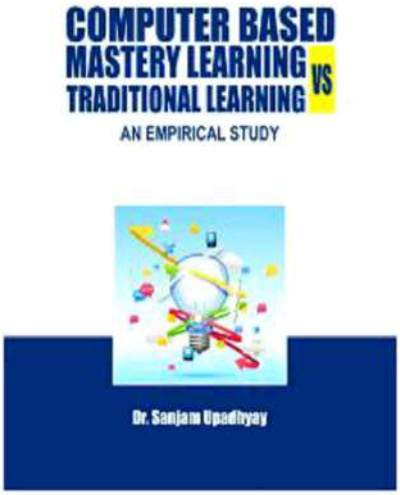

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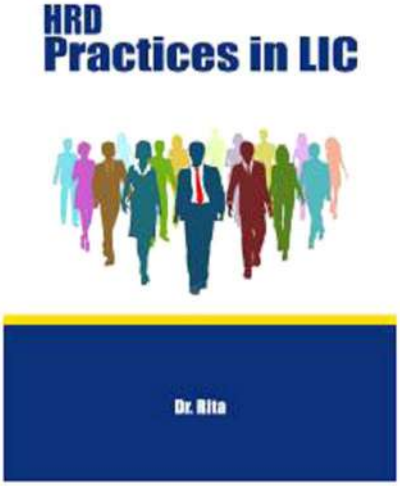

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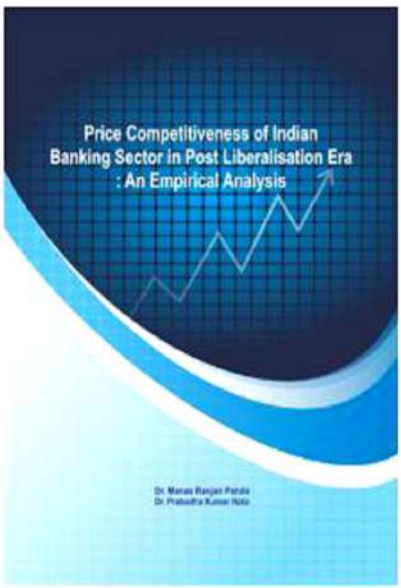

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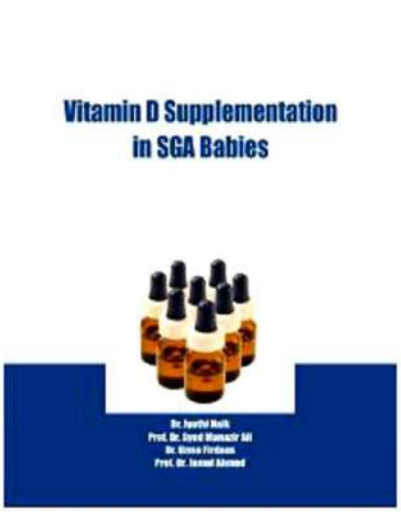

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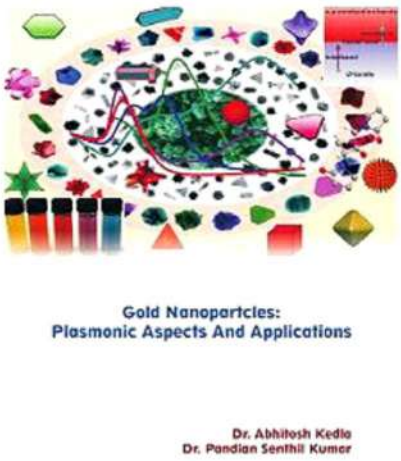

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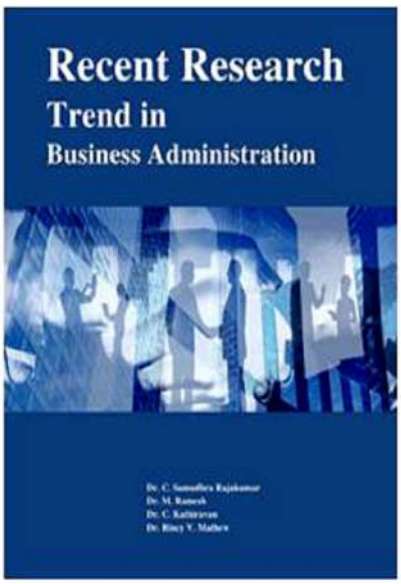

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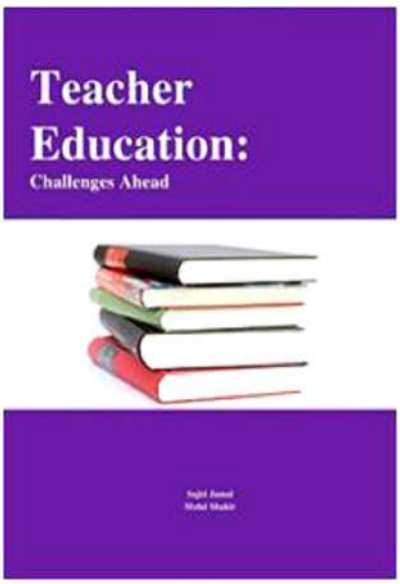

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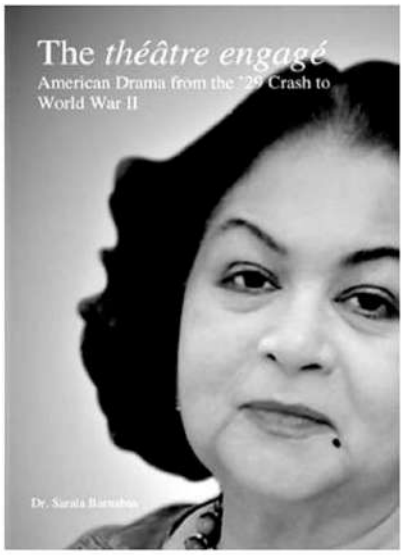

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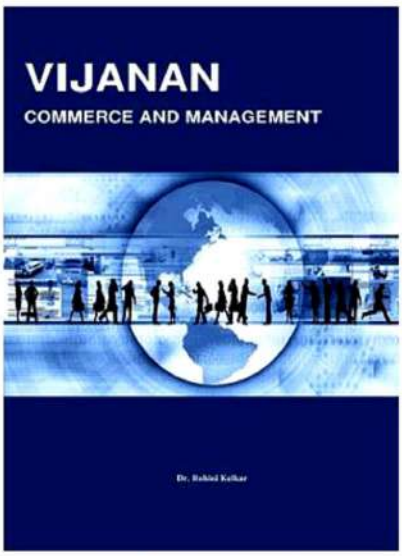

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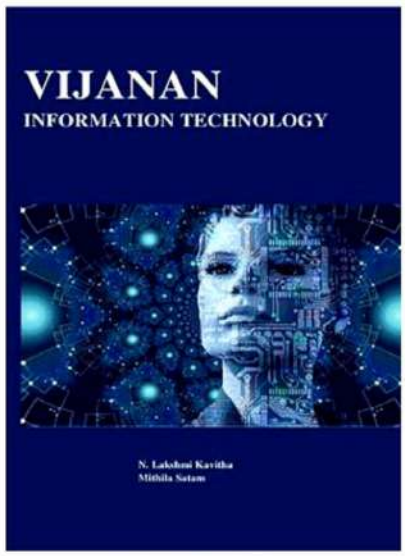

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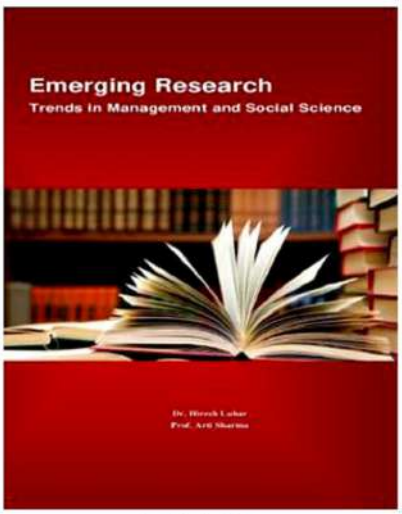

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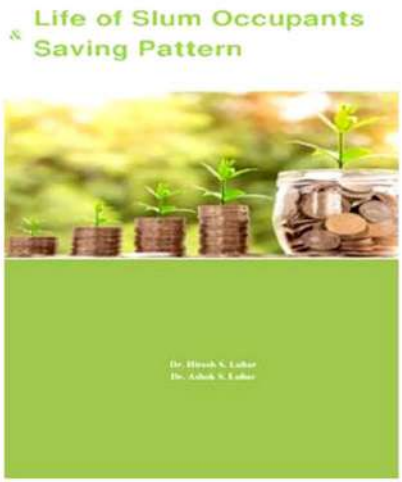

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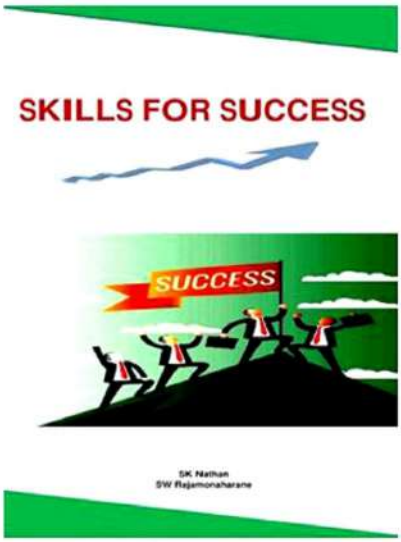

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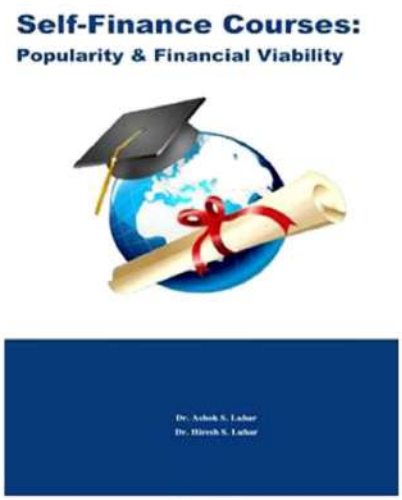

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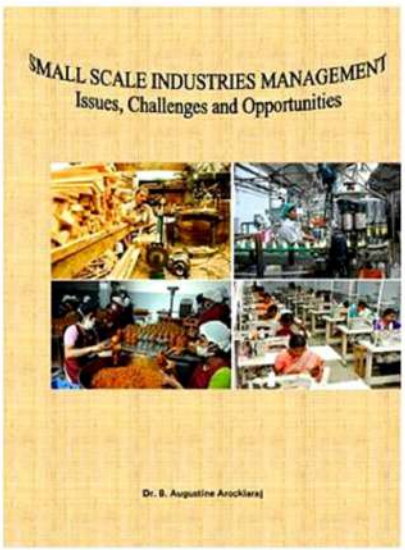

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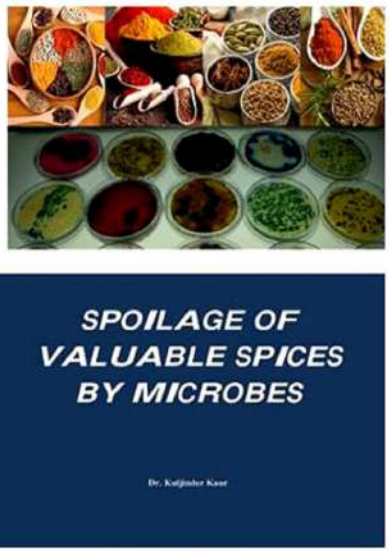

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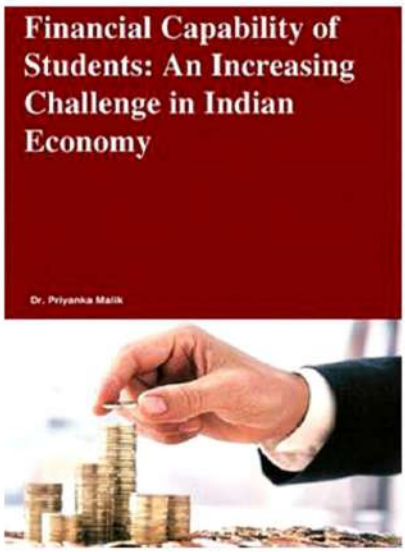

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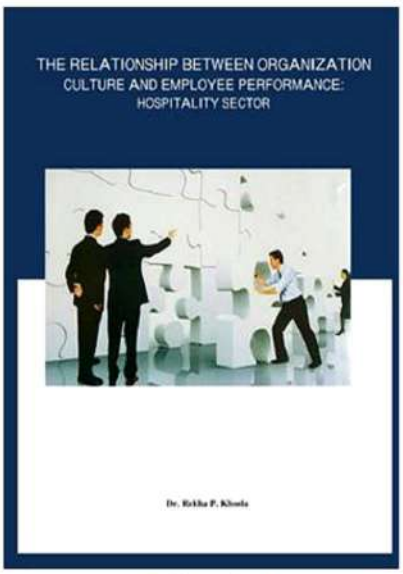

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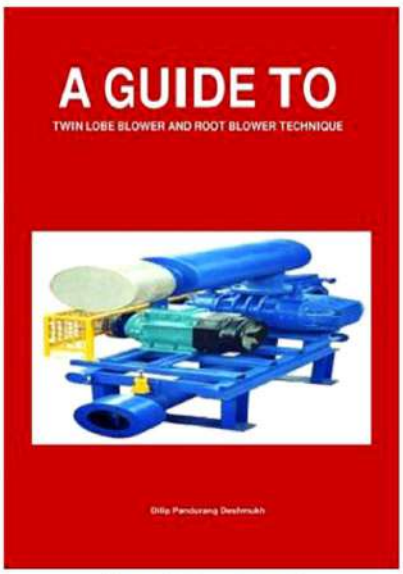

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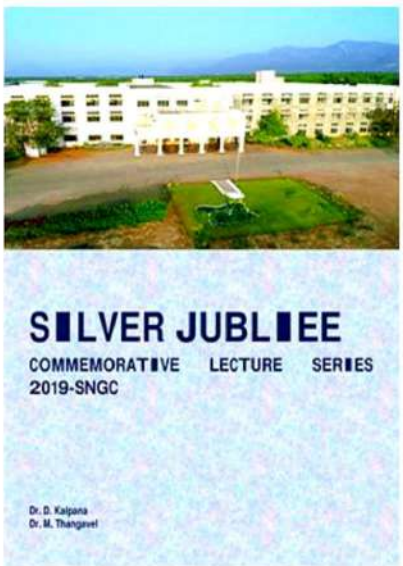

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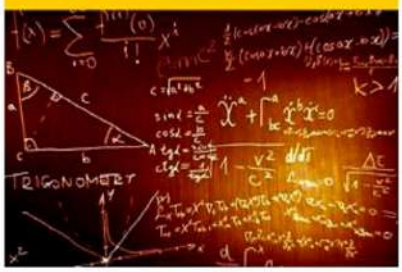

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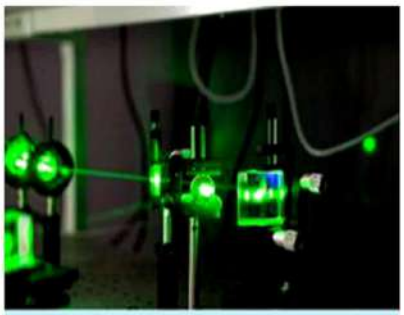

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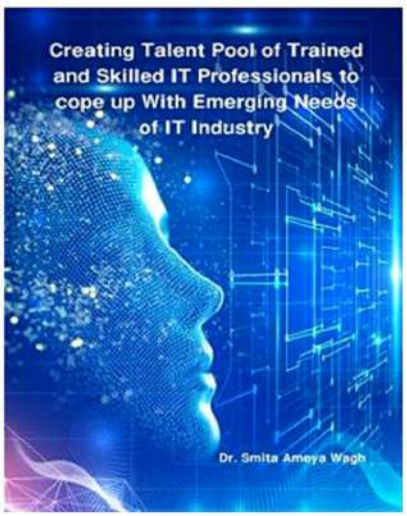

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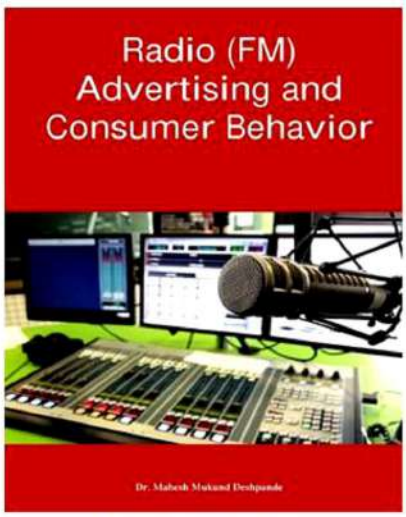

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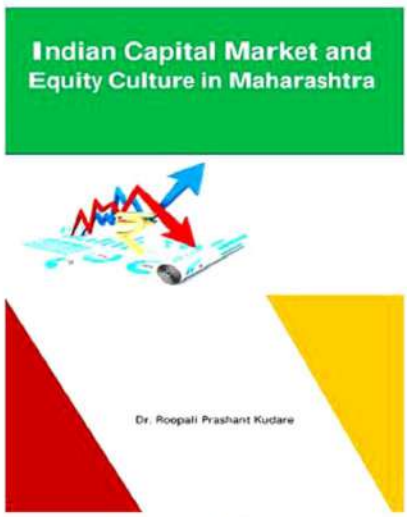

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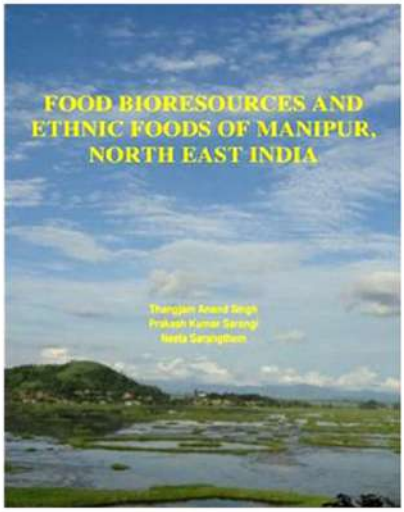

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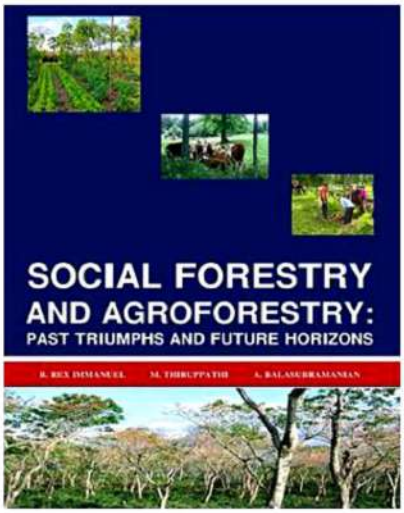

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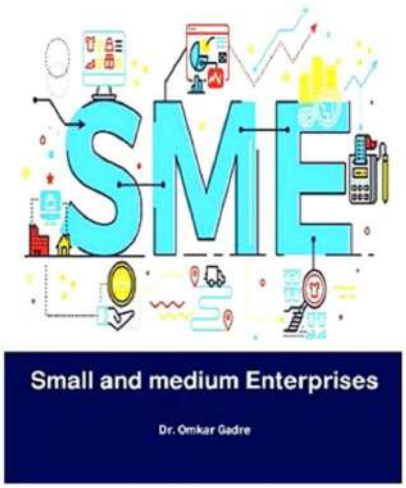

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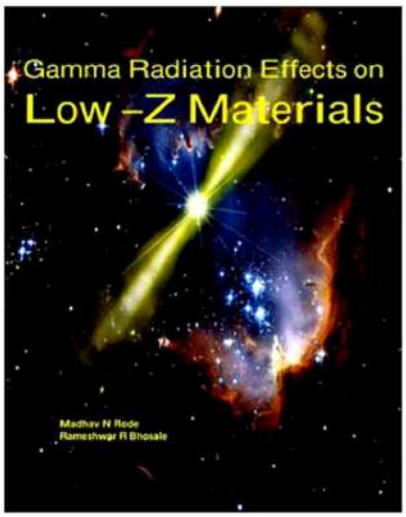

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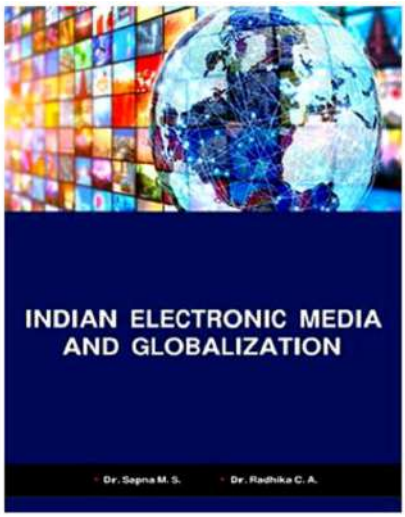

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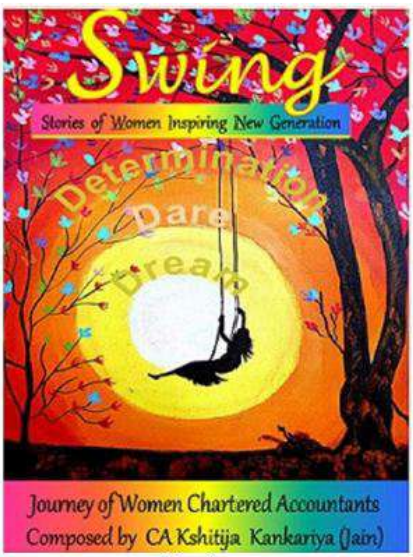

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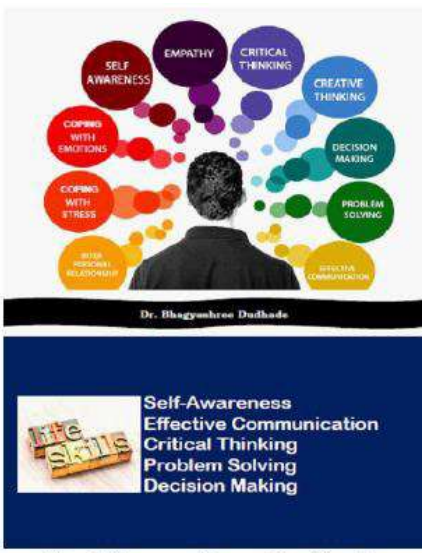

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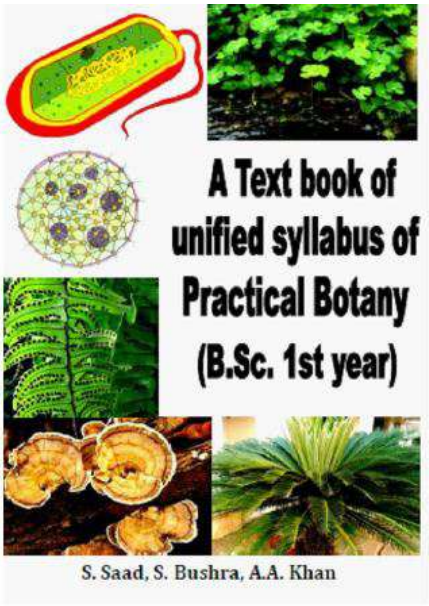

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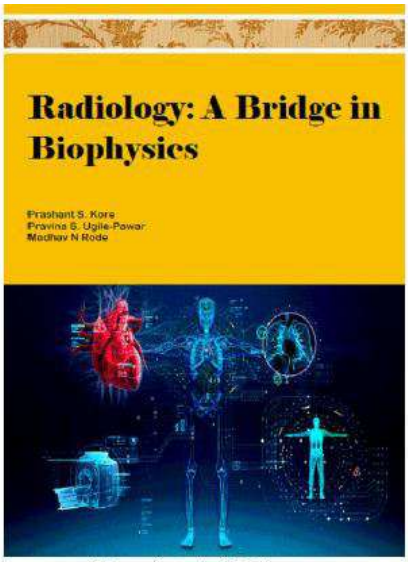

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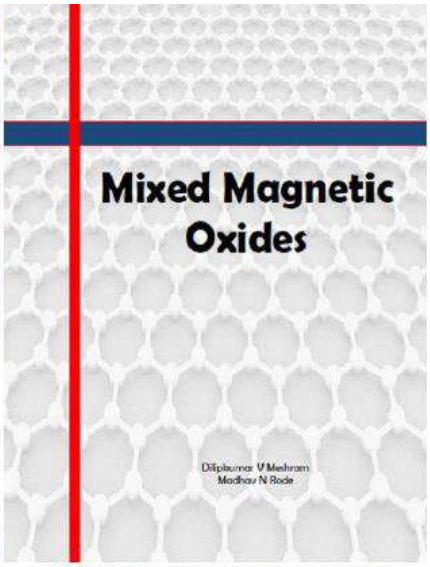

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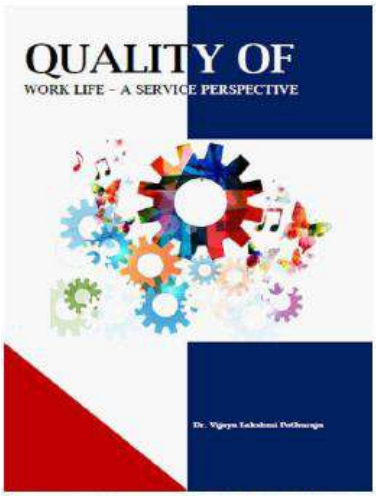

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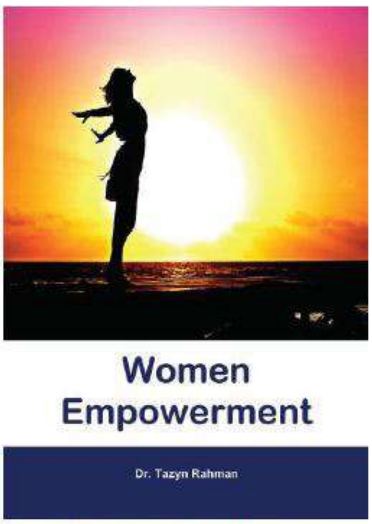

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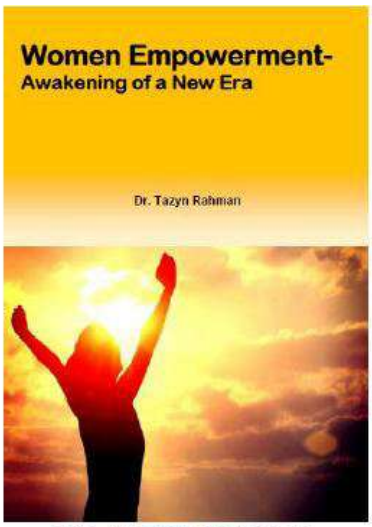

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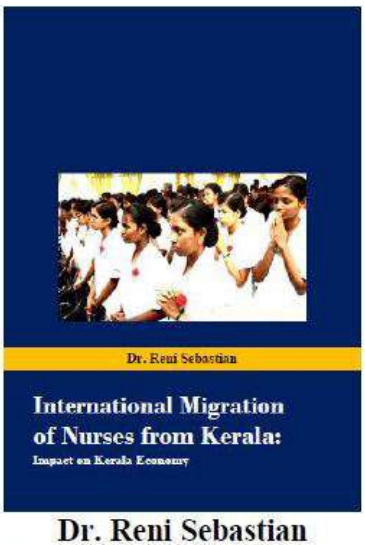

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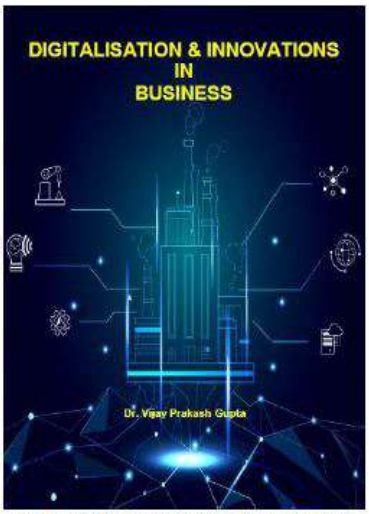

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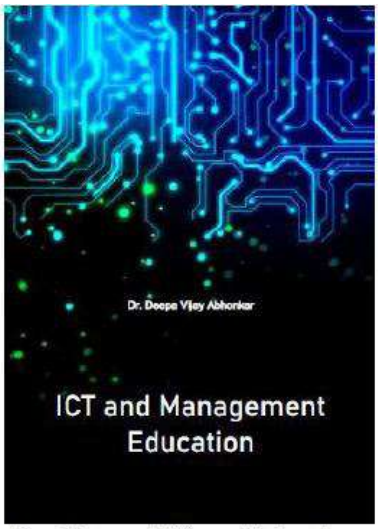

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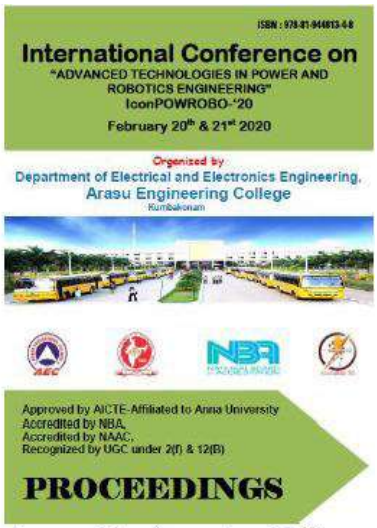

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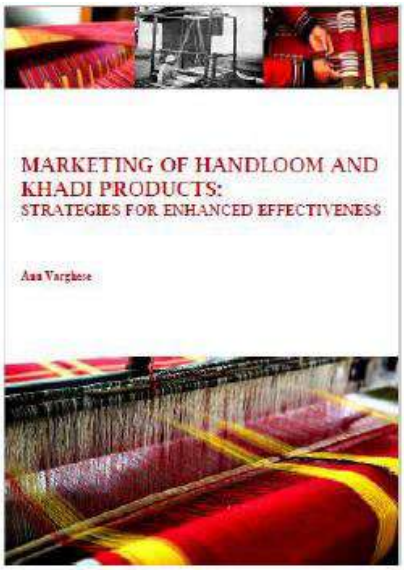

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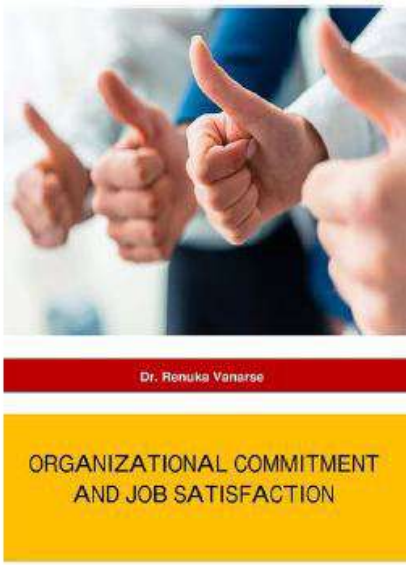

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