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Address for Correspondence : Dr. Mahesh Deshpande (Executive Editor),  
M.M.'s Chandrashekhar Agashe College of Physical Education,  
Veer Sawarkar Nagar, Gultekadi, Pune 411037

Contact No. : 020-24261872

E-mail : [joshpe@agashecollege.org](mailto:joshpe@agashecollege.org)

Website : <https://www.agashecollege.org/>

# INDEX

A Comparative Analysis of Performance Indicators between Winning and Losing Teams in Women's Football	Dr. Manisha Manoj Kondhare	3
Understanding and Supporting Coach Development in Private Cricket Academies in Pune, India	Dr. Atul Gaikwad	12
The Correlation Between Mobile Screen Time and Physical Fitness Levels: A Cross-Sectional Study of Mahavir Mahavidyalaya Students in Kolhapur	Sanket Sunil Savekar Sayali Babi Mandrekar	35
Sustainable Endurance Sport Events in Coastal Regions : Assessment of Goa's Suitability for Ironman 70.3	Siddhesh Subhash Kesarkar Pandurang Kisan Lohote	44
Off-Ball Movements of Junior Football Players from Pune City During Corner Kicks: An Observational Study	Subham Kumar Singh Prof. Mahesh Deshpande	59
Development and Validation of Changeover Recovery Strategy Assessment Tools in Competitive Tennis Players (16-25 Years)	Mr. Tanmay Shirish Nandurdikar Dr. Sopan Kangane	66
१४ वर्ष वयोगटातील तायक्रांदो खेळाडूंच्या किर्किंग वेगाचा स्फोटक शक्ती व लवचिकतेशी असलेझ सहसंबंध	Mr. Omkar Bhopale Prof. Dr. Yogesh Bodke	71
जागतिक आरोग्य संघटनेच्या धोरणावर आधारित शाळांमधील शारीरिक क्रियाशीलतेचा अभ्यास	डॉ. शरद आहेर	78
व्हॉलीबॉल अंडरहँड पास कौशल्याच्या मुल्यमापनासाठी प्रमाणित रेटिंग स्केलची निर्मिती	हृषिकेश मराठे प्रो. डॉ. योगेश बोडके	91

प्राथमिक शालेय मुलांमध्ये कारक कौशल्य क्षमता वाढवण्यासाठी संरचित अॅनिमल वॉक कार्यक्रमाचा विकास	सुजित कुरकुटे डॉ. योगेश बोडके	98
पुणे शहरातील व्यायामशाळांमधील सोयी-सुविधा व सदस्यांच्या समाधानाचा विश्लेषणात्मक अभ्यास	प्रा. सतीश वाघमारे डॉ. दादासाहेब बबन ढेंगळे	106
Physical Performance Profiling of Elite National-Level Kho Kho Players	Dr. Shirish More Mr. Atharva Tapadia	116

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# A Comparative Analysis of Performance Indicators between Winning and Losing Teams in Women's Football

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**Dr. Manisha Manoj Kondhare**

All India Shri Shivaji Memorial Society College of Engineering, Pune 411002.

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## ABSTRACT

*Women's football has grown rapidly in participation, competitiveness, and visibility across the world. As the level of play continues to improve, understanding the performance indicators that differentiate winning and losing teams has become an important area of research for coaches, analysts, and sports scientists. The purpose of this study is to examine key technical, tactical, and physical performance indicators that contribute to match outcomes in women's football. The paper synthesizes available literature, analyzes commonly observed patterns in competitive matches, and interprets how specific variables such as ball possession, passing accuracy, shots on target, defensive actions, and transition efficiency correlate with success. Results from existing research and comparative insights suggest that successful teams often demonstrate higher efficiency in ball circulation, create more goal-scoring opportunities, win more duels, and minimize defensive errors. The study concludes by highlighting practical implications for training and future research directions..*

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**Keywords :**

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## Introduction

Women's football has witnessed tremendous growth in the last two decades, both at the professional and collegiate levels. Increased investment, improved coaching quality, sports science integration, and global exposure through tournaments such as the FIFA Women's World Cup have significantly improved the standard of play. Along with this growth, the need for objective performance analysis has become greater. Modern football relies heavily on data-driven decision-making, with match statistics playing a crucial role in evaluating team performance.

Performance indicators are measurable variables that provide insights into a team's technical ability, tactical behavior, physical output, and psychological readiness during competition. These indicators help coaches understand why teams win or lose, identify strengths and weaknesses, and design more effective training programs. In women's football, although research is increasing, there remains a gap in understanding which specific indicators most strongly influence match outcomes.

This research paper aims to comparatively analyse performance indicators between winning and losing teams in women's football. By reviewing literature and integrating practical insights from match analysis, the study identifies key factors associated with successful performance and provides recommendations for coaches and sports scientists.

## **Review of Literature**

Multiple researchers have examined performance determinants in football, though studies focusing exclusively on women's football remain fewer compared to men's.

Archer et al. (2019) found that winning women's teams generally exhibit higher ball possession and passing accuracy. Gréhaigne (2015) highlighted the importance of transition play, where quick movement from defence to attack often leads to successful scoring opportunities. Furthermore, Lago Ballesteros & Lago Peñas (2010) emphasized the importance of shots on target as a strong predictor of match outcomes.

Research on women's football specifically shows unique tactical patterns. González Rodenas et al. (2021) observed that winning teams create a greater number of attacks through wide areas, taking advantage of speed and crossing ability. Another study by Bradley et al. (2014) noted that physical intensity in high-speed running contributes significantly to offensive actions in elite women's matches.

Kumar and Mishra (2018) examined how different physical fitness variables influence football performance among college-level women players. Their study highlighted that aerobic endurance, agility, lower body strength, and speed are the most significant predictors of effective match performance. They found that players with higher fitness levels demonstrated better ball control, faster movement during transitions, and improved ability to maintain intensity throughout the game. The authors concluded that targeted fitness training plays a crucial role in enhancing the overall performance of women football players.

Defensive indicators have also been studied. Winning teams frequently demonstrate better defensive compactness, fewer fouls, and higher recovery rates in midfield zones

(Yi et al., 2020). Match analyses from international tournaments consistently reveal that winning teams commit fewer turnovers in dangerous defensive zones.

Overall, literature supports that technical precision, tactical organization, and physical intensity are major determinants of success, but more comparative data specific to women's football is needed. This study contributes to this growing body of work.

## Objectives of the Study

The major objectives of this research are:

- To identify key technical performance indicators that differentiates winning and losing women's football teams.
- To compare tactical indicators such as possession, defensive organization, and transition play.
- To interpret how physical performance indicators contribute to match outcomes.
- To provide practical implications for coaches, players, and analysts to enhance competitive performance.

## Methodology

This study uses a qualitative and comparative research approach. A narrative review of previous studies, match reports, and performance statistics from major women's football tournaments including collegiate leagues, national championships, and FIFA competitions was conducted.

Key performance indicators analyzed include:

1. Possession (%)
2. Passing accuracy (%)
3. Shots & shots on target
4. Expected Goals (xG)
5. Crosses completed
6. Successful tackles & interceptions
7. High-intensity runs
8. Ball recoveries in midfield & defensive third

9. Transition efficiency (counterattack success rate)
10. Goalkeeping performance indicators

Data was compared to identify consistent patterns distinguishing winning and losing teams. The discussion integrates literature findings and practical match analysis to present a comprehensive understanding.

## **Results and Discussion**

### **1. Technical Performance Indicators**

#### **1.1. Passing Accuracy and Ball Circulation**

Winning teams typically maintain higher passing accuracy, especially in the middle and attacking third. Studies show that passing accuracy above 75% is common among winning sides, while losing teams often fall below 68–70%.

Better passing accuracy allows winning teams to:

- Control tempo
- Progress the ball more effectively
- Reduce turnovers

Women's teams that struggle with passing precision often find themselves defending more, which contributes to match losses.

#### **1.2 Shots and Shots on Target**

One of the strongest predictors of winning is the number of shots on target. While losing teams may take similar numbers of shots, the difference lies in quality of shooting opportunities.

Winning teams:

- Create more high-percentage chances
- Shoot more often from inside the penalty area
- Have higher expected goals (xG) ( team created better, higher-quality scoring chances)

Losing teams often rely on long-range attempts, which rarely produce goals.

### **1.3 Dribbling and 1v1 Success**

Women's football has seen increasing emphasis on individual attacking skills. Winning teams often have wingers or forwards with high dribble success rates, contributing to:

- Chance creation
- Overloads on the wings
- Defensive disorganization of opponents

Losing teams show reduced effectiveness in 1v1 situations, limiting their ability to break defensive lines.

## **2. Tactical Performance Indicators**

### **2.1. Possession Percentage**

Possession is not always a guarantee of victory, but trends show that winning teams generally maintain 55–60% possession in women's matches. Possession allows for sustained attacks and reduces defensive fatigue. However, counterattacking teams with low possession can also win, provided their transitions are efficient.

### **2.2. Transition Play**

Transition moments moving from defence to attack or attack to defence are critical in women's football.

Winning teams exhibit:

- quicker transitions
- shorter time from ball recovery to shot attempt
- higher counterattack success rates

Losing teams often fail to reorganize quickly, leading to goals conceded during defensive transitions.

### **2.3 Defensive Organization**

Winning teams maintain better defensive compactness, demonstrated by:

- fewer defensive errors
- better backline coordination
- lower xG conceded (team created poor-quality or fewer scoring chances)

- more interceptions in midfield

Losing teams generally allow more gaps between midfield and defence, making them vulnerable to through balls and wing attacks.

### **3. Physical Performance Indicators**

Women's football has seen significant increases in physical demands.

#### **3.1. High-Intensity Running**

Studies show that winning teams tend to perform more high-speed runs, particularly in the final third. This contributes to:

- quicker attacks
- more pressing actions
- better defensive recovery
- Physical conditioning therefore directly influences match outcomes.

#### **3.2. Sprinting Ability**

Sprints during counterattacks, wing runs, and defensive recovery are strongly correlated with success. Winning teams perform more sprints in critical phases of the match.

#### **3.3. Aerobic Capacity**

Higher aerobic fitness allows winning teams to maintain intensity throughout the match. Losing teams often show decreased endurance in the final 20 minutes, leading to late goals conceded.

### **4. Psychological and Game-Management Indicators**

Though more difficult to measure, psychological factors also affect match outcomes.

Winning teams often demonstrate:

- better decision-making under pressure
- higher confidence in possession
- effective communication
- composure in critical moments (finishing, defending set pieces)

Losing teams may show signs of anxiety, hesitation, and tactical confusion, especially after conceding goals.

### Comparative Summary of Winning vs. Losing Teams

Performance Indicator	Winning Teams	Losing Teams
Passing Accuracy	High (above 75%)	Lower (below 70%)
Shots on Target	More and higher-quality	Fewer, long-range
Possession	Moderate to high	Often lower
Transition Efficiency	Very effective	Slow and inconsistent
Defensive Errors	Minimal	More frequent
High-Intensity Runs	Higher volume	Lower and inconsistent
Counterattacks	Quick and purposeful	Ineffective or rare
1v1 Success	High	Low
Set-Piece Execution	More effective	Poor finishing & marking

## Practical Implications

The findings of this study offer several actionable suggestions for coaches and teams:

### a. **Emphasize Passing and Build-Up Play**

Training drills should target passing precision under pressure, positional play, and movement to create passing lanes.

### b. **Improve Finishing Ability**

Teams should focus on:

- shooting from inside the box
- high-quality goal-scoring opportunities
- composure in front of goal

### c. **Strengthen Transition Drills**

Fast-attacking transition drills and defensive recovery runs must be incorporated regularly.

### d. **Enhance Physical Conditioning**

Women's teams should implement programs focusing on:

- sprint training

- aerobic conditioning
- strength and agility development

**e. Tactical Discipline**

Coaches must prioritize:

- defensive compactness
- communication between lines
- pressing strategy

**f. Psychological Training**

Confidence-building, decision-making drills and pressure-simulation activities can improve mental resilience.

## Conclusion

This study highlights that performance indicators play a critical role in determining match outcomes in women's football. Winning teams consistently demonstrate higher levels of technical proficiency, tactical organization, and physical intensity. Key differentiators include passing accuracy, shot quality, possession strategies, efficient transitions, and defensive stability. The comparative analysis shows that success in women's football is multi-dimensional. Technical skill alone is insufficient; tactical awareness, fitness levels, and psychological factors collectively shape team performance. Coaches and analysts can use these indicators to refine training methods and match strategies.

As women's football continues to grow, more research is required to deepen the understanding of performance metrics, especially using modern tools such as GPS data, analytics software, and biomechanical analysis. This research contributes to bridging that gap and provides a foundation for future work.

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# Understanding and Supporting Coach Development in Private Cricket Academies in Pune, India

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**Dr. Atul Gaikwad**

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## **ABSTRACT**

*Private cricket academies are an important part of youth cricket development in India. yet little empirical research has studied how coaches within these environments learn and develop. This study explored coach learning in private cricket academies in Pune, India, with a focus on learning opportunities accessed by coaches across formal, non-formal, and informal modes, the perceived strengths and limitations of these learning experiences, and coaches' views on effective growth. A qualitative, exploratory design was adopted. Data were generated through 20 semi-structured interviews, one focus group with eight coaches, and an online survey completed by 38 coaches. Data were analysed using reflexive thematic analysis, supported by triangulation across data sources and ongoing reflexivity given the researcher's insider position as a coach developer. Findings indicated that coach learning was mostly experiential, informal, and socially situated within everyday coaching practice.*

*Formal coach education was valued but often view as out of reach or misaligned with day-to-day coaching realities, while organised non-formal learning opportunities were limited. Reflection emerged as unfamiliar rather than resisted, with engagement shaped by confidence, identity, and organisational culture. Based on these insights, the paper proposes a simple Coach Development Framework designed to support mentoring, peer learning, and reflective practice within resource-constrained private academy environments. This study offers practical ideas based on the local context to help coach developers and organisations support coach learning in ways that go beyond formal courses..*

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**Keywords :** Coach learning; informal learning; cricket coaching; private academies; India; coach development

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## Introduction

Cricket is a very important sport in India and is closely connected to everyday life and culture. People play cricket in many forms, from street gully cricket and school matches to club cricket and, increasingly, private cricket academies. It is estimated that more than 25 million young people between the ages of 8 and 18 play cricket in India (Ormax BCCI, 2024). In cities such as Pune, private cricket academies have grown rapidly over the last two decades, creating a large and competitive coaching environment. These academies range from elite, performance-focused programmes to small, resource-limited setups serving local communities. For many young players, private academies provide their first experience of regular and organised coaching, shaping early learning, skill development, and long-term involvement in the sport.

Within these environments, coaches play a central role. Coaches, behaviours, and professional judgement directly influence not only technical skill development, but also players' confidence, motivation, and continued participation. Despite this importance, there is limited understanding of how coaches working in Indian private cricket academies learn and develop. Much of the existing research on coach learning has been conducted in Western, club-based, or professionally regulated systems, where formal education pathways, organisational support, and stable working conditions are often assumed (Cushion et al., 2003; Nelson et al., 2006; Trudel et al., 2013). These assumptions do not always apply to Indian private academies, where coaching roles are often informal and shaped by commercial pressures rather than structured development systems.

Research also shows that many coaches do not enter coaching as a planned career. Instead, they often begin coaching by chance, due to financial need, informal recruitment, or after finishing their playing careers (Cushion et al., 2003; Nelson et al., 2006; Trudel & Gilbert, 2006). In cricket, playing experience is frequently seen as sufficient preparation for coaching. Within private academies in India, paid coaching roles often do not require formal certification, and appointments are commonly based on reputation, playing background, or availability rather than recognised qualifications.

Although formal coach education pathways exist, access is often limited by cost, time demands, language barriers, and institutional requirements. Many coaches also feel that formal courses do not reflect the realities of private academy coaching, where large groups, limited facilities, and pressure to deliver quick results are common. As a result, coaches rely heavily on learning through experience, observation of other coaches, informal mentoring, and everyday interaction. While these learning

processes are recognised as important, they are often unstructured and unsupported (Werthner & Trudel, 2006; Stodter & Cushion, 2017).

This reliance on informal learning places responsibility on individual coaches to manage their own development while dealing with heavy workloads and performance pressure. At the academy level, the lack of structured coach development can lead to uneven coaching practices, limited sharing of knowledge, and little collective learning. For coach developers and academy leaders, this creates a challenge: how to support coach learning in environments with limited formal systems and constrained resources.

Although research helps explain how coaches learn in general, there is still limited knowledge about how these processes operate within Indian private cricket academies. The scale, diversity, and commercial nature of these academies create conditions that shape how coaches learn and engage with development. Without research in the local context, development approaches borrowed from other countries may not fit well and may be less effective over time.

The purpose of this study was therefore to explore how coaches learn and develop within private cricket academies in Pune, India, and to generate applied insights to support context relevant coach development. The study observed coaches engagement with formal, non formal, and informal learning, identified strengths and constraints within these experiences, and explored coaches' views on effective professional growth. Based on these insights, the study aimed to inform the development of a practical Coach Development Framework suited to resource-constrained and practice-intensive environments.

***The study was guided by the following research questions:***

1. What learning opportunities (formal, non-formal, and informal) are accessed by cricket coaches in private academies in Pune?
2. What strengths and limitations do coaches perceive in these learning experiences?
3. Which forms of learning do coaches consider most valuable, and why?

By addressing these questions, this study contributes to coach development research that views learning as experiential, social, and shaped by local context. It responds to the need for practitioner-informed research that moves beyond prescriptive education models and supports practical approaches aligned with how coaches learn in private academy settings.

## Literature Review

### 1 *Coach Learning Beyond Formal Education*

Research shows that coaches do not learn only through formal courses. Early work in coaching scholarship highlighted that coaches often learn predominantly through experience, informal interaction, and ongoing problem-solving within practice, rather than through formal courses alone (Cushion et al., 2003). Later research has supported this view and shown that learning to coach is not a straight or simple process. Instead, it is influenced by a coach's personal background, the environment they work in, and their interactions with others (Werthner & Trudel, 2006).

Formal coach education programmes are usually designed to provide standard knowledge, technical frameworks, and recognised certification. While these programmes can offer structure and a shared language for coaching, research has often questioned how much they actually influence everyday coaching practice (Cushion et al., 2003; Trudel et al., 2013; Stodter & Cushion, 2017). Coaches often report difficulty transferring formal knowledge into practice, particularly when course content is abstracted from the realities of everyday coaching environments (Nelson et al., 2006). Because of this, formal education is increasingly understood as one part of a broader coach learning system, not the only way coaches develop.

This view is especially important in coaching environments where access to formal education is limited. When coaching courses are difficult to access because of cost, time, language, or institutional rules, many coaches miss out on formal learning even though they are actively coaching. In such situations, coaches continue to learn in other ways, which makes it important to understand how coaches develop outside formal systems.

### 2 *Formal, Non-Formal, and Informal Learning in Coaching*

A widely used conceptual distinction within coach learning literature differentiates between formal, non-formal, and informal learning (Nelson et al., 2006). Formal learning refers to institutionally recognised programmes leading to certification or accreditation. Informal learning describes unstructured and often implicit learning embedded within everyday coaching practice, such as learning through experience, observation, experimentation, and problem-solving. Non-formal learning occupies a middle ground, referring to organised

and intentional development activities that are not formally accredited, including mentoring, peer learning groups, workshops, and facilitated reflection.

Research consistently indicates that informal learning is the dominant mode of coach development across sports and contexts (Werthner & Trudel, 2006; Trudel et al., 2013). Coaches frequently report learning “on the job,” adapting their practice through trial and error and drawing on insights gained from peers. Informal learning is often perceived as highly relevant because it is closely connected to practice. However, its unstructured nature can also limit its developmental impact. Without opportunities for guided reflection or dialogue, informal learning may reinforce existing habits and assumptions rather than promote critical development.

Non-formal learning has been identified as a particularly valuable mechanism for supporting coach development because it offers structure while remaining flexible and context-sensitive (Nelson et al., 2006). Activities such as mentoring and peer discussion can support reflection, confidence, and shared sense-making. Despite this potential, non-formal learning opportunities are frequently underdeveloped or inconsistently supported within many coaching environments. Where such opportunities do exist, access may depend on informal networks rather than deliberate organisational design.

### **3 *Experiential Learning and Learning Through Practice***

Experiential learning theories provide a useful lens for understanding how coaches develop through practice. Kolb’s (1984) Experiential Learning Theory conceptualises learning as a cyclical process involving experience, reflection, conceptualisation, and experimentation. In coaching, this learning cycle usually happens as part of daily work, when coaches plan sessions, respond to players’ needs, and change their approach based on what happens in practice.

However, research suggests that coaches rarely move through this cycle in a formal or deliberate way. Instead, learning is often fragmented and reactive, shaped by immediate challenges and performance demands (Cushion et al., 2003). This kind of “just-in-time” learning helps coaches deal with immediate problems, but it can limit chances for long-term planning and deeper professional development. This shows why coach development should help coaches understand and reflect on their experiences, not just gain more experience.

Experiential learning theory shows that reflection is important for turning experience into learning (Kolb, 1984; Schon, 1983). However, the way reflection is understood and used in coaching can differ a lot. While formal

coach education often encourages structured reflection tools, these do not always match how reflection actually happens in everyday coaching practice (Knowles et al., 2014).

#### **4 Reflection and Psychological Safety**

Reflection is often described as an important part of professional learning in coaching and other practical professions (Schon, 1983). Schon explains that professionals usually reflect both during and after their work in natural and informal ways, changing their actions based on what the situation demands. In coaching, reflection can include thinking back on training sessions, discussing problems with other coaches, or making changes to future sessions based on how players respond.

However, even though reflection is strongly supported in theory, coaches do not always find it easy or comfortable to practise. Research shows that reflection can sometimes be linked to judgement, evaluation, or monitoring, especially in performance-focused environments where results are closely watched (Cushion & Nelson, 2013). In such settings, coaches may avoid reflective activities that could expose mistakes, uncertainty, or challenge their professional identity.

Power relationships and organisational culture strongly influence how coaches engage with reflection. Coaches who feel confident, trusted, and respected are more willing to share ideas, discuss challenges, and reflect openly. In contrast, coaches who feel insecure or worried about being judged are more likely to limit reflection (Knowles et al., 2014). This shows that reflection is not just an individual skill, but a social practice shaped by psychological safety and the surrounding culture.

From this view, limited engagement with reflection may be due to unfamiliarity or the coaching environment rather than resistance. Understanding this difference is important for coach developers, as it highlights the need to support reflection in simple, supportive ways rather than through formal or evaluative systems.

- 5 Social Learning, Communities of Practice, and Mentoring Social learning theories further emphasise learning as embedded within relationships and shared practice. Situated learning theory conceptualises learning as participation within social contexts, where individuals develop competence through interaction with more experienced members (Lave & Wenger, 1991). Wenger's (1998) communities of practice framework highlights learning as a collective process involving shared meaning-making, identity development, and mutual engagement.

Within coaching, social learning processes such as observation, informal mentoring, and peer discussion have been identified as central to development (Werthner & Trudel, 2006). Coaches often value opportunities to learn from others facing similar challenges, particularly when these interactions are grounded in shared practice. However, access to social learning opportunities is not guaranteed. Without organisational support, mentoring and peer learning may depend on informal relationships, potentially excluding less confident or less connected coaches.

Mentoring has been identified as a particularly effective non-formal learning mechanism when it is collaborative and context-sensitive rather than hierarchical (Trudel et al., 2013). Such relationships can support reflection, confidence, and professional identity development, but they require time, trust, and recognition to be sustainable.

## **6 Context, Culture, and WEIRD Assumptions in Coach Development**

Much of the existing coach learning and coach development literature has been generated within Western, Educated, Industrialised, Rich, and Democratic (WEIRD) sport systems (Henrich et al., 2010). These contexts often assume stable organisational structures, formalised coach education pathways, and consistent access to development resources. As a result, many coach development models are implicitly designed for environments where coaching roles are regulated, professionally recognised, and supported by governing bodies.

In contrast, private cricket academies in India operate under markedly different cultural, organisational, and economic conditions. Coaching roles are frequently informal, commercially driven, and shaped by local constraints such as financial pressure, limited institutional support, and high participant demand. These conditions influence how coaches learn, reflect, and engage with professional development. The transferability of coach development models derived from WEIRD contexts to such environments therefore warrants careful consideration.

There is increasing recognition of the need for context-sensitive and practitioner-informed research that reflects the diversity of coaching environments (Trudel et al., 2013). Understanding coach learning within private academy systems requires attention to culture, organisation, and lived experience rather than reliance on prescriptive development pathways.

## Methodology

### 1 Research Design

This study used a qualitative and exploratory research design to develop a detailed understanding of how coaches learn in private cricket academies in Pune, India. A qualitative approach was chosen because the project focused on coaches' real-life experiences, how they make sense of learning, and the complex nature of learning within everyday coaching practice (Cushion et al., 2003; Lyle & Cushion, 2017). Qualitative research is especially useful for understanding how people interpret their experiences within specific social and organisational settings, rather than testing fixed ideas or measuring outcomes (Tracy, 2010).

An exploratory design was used because there is very limited research on coach learning in Indian private academy systems. Instead of trying to produce findings that apply everywhere, the study aimed to generate context-based insights that could help understand coach development in similar environments. This approach aligns with calls in coaching research for studies that are closely connected to practice and sensitive to local context (Muir & North, 2017).

### 2 Participants and Context

The participants in this study were coaches working in private cricket academies in Pune, a large city with many private coaching setups. Most of these academies work independently and are not closely linked to formal clubs or associations. They differ in size, available resources, and how they are organised. Coaches in these settings often work with players of different age groups and skill levels and usually face commercial pressures and expectations around performance.

Data were collected from a total of 66 coaches using three methods:

- 20 semi-structured interviews with private academy coaches
- One focus group discussion with 8 coaches
- An online survey completed by 38 coaches

The coaches came from different playing and coaching backgrounds, had varying levels of experience, and differed in their access to formal coach education. Interviews and the focus group were conducted in English, Hindi, or Marathi, depending on what the participants were most comfortable with. This helped coaches express their views more freely and supported a deeper understanding of their experiences within the local context.

### **3 Data Collection Methods**

#### **Semi-Structured Interviews**

Semi-structured interviews were used to explore coaches' learning histories, beliefs, and experiences in depth. This method allowed flexibility to follow participants' narratives while ensuring alignment with the study's research objectives (Kvale & Brinkmann, 2009). Interview questions focused on how coaches learned to coach, the sources of knowledge they valued, perceived barriers to development, and their experiences with formal and informal learning opportunities.

Interviews enabled participants to reflect on their coaching journeys and to raise issues that they considered personally meaningful. This approach was particularly valuable given the informal and varied pathways through which many coaches entered the profession.

#### **Focus Group Discussion**

A focus group discussion was conducted to explore shared experiences and collective sense making among coaches. Focus groups are well suited to examining social learning processes, as they allow participants to build on each other's perspectives and highlight areas of agreement and difference (Morgan, 1997). The group setting encouraged reflection, dialogue, and the articulation of tacit assumptions that may not emerge in individual interviews.

The focus group also provided insight into how coaches discuss learning within peer contexts, reflecting the social nature of learning highlighted in coaching literature.

#### **Online Survey**

An online survey was used to provide broader contextual insight and to explore whether patterns identified in interviews and the focus group resonated across a wider group of coaches. The survey included a combination of closed and open-ended questions related to learning sources, perceived challenges, and development needs.

The survey was not intended to generate statistically generalisable findings. Instead, it supported triangulation by identifying recurring themes and enhancing confidence in the qualitative patterns identified across data sources (Tracy, 2010).

#### **4. Data Analysis**

Data were analysed using reflexive thematic analysis, following the approach outlined by Braun and Clarke (2006, 2021). Reflexive thematic analysis is well suited to qualitative research that seeks to identify patterned meaning across datasets while acknowledging the active role of the researcher in interpretation. The analysis involved an iterative process of familiarisation with the data, reflexive coding, theme development, and ongoing refinement.

Initial coding focused on coaches' descriptions of learning experiences, sources of knowledge, and perceived challenges. Codes were then grouped into broader themes that captured recurring patterns across individual, collective, and contextual perspectives. Throughout the analysis, attention was paid to both convergence and divergence within the data, allowing complexity and nuance to be retained.

Reflexivity was a central component of the analytical process. As the researcher was also a coach developer within the cricket system, reflective notes were maintained to examine how prior experience, assumptions, and positionality influenced interpretation. This reflexive engagement enhanced transparency and supported analytical rigour (Finlay, 2002).

#### **5 Rigour and Trustworthiness**

Rigour was supported through several strategies commonly used in qualitative research. Methodological triangulation was achieved by combining interviews, a focus group, and survey data, allowing patterns to be examined across multiple sources rather than relying on isolated accounts. This strengthened confidence in the credibility of the findings (Tracy, 2010).

Transparency was enhanced through clear documentation of methodological decisions, reflexive note-taking, and alignment between research aims, data collection, analysis, and product design. Rather than seeking objectivity, the study embraced the interpretive nature of qualitative research while striving for coherence and plausibility in interpretation (Braun & Clarke, 2021).

#### **6 Ethical Considerations**

Ethical considerations included obtaining informed consent from all participants, ensuring anonymity and confidentiality, and clearly communicating the voluntary nature of participation. Particular attention was given to the researcher's insider position as a coach developer. While this position facilitated access and trust,

it also required sensitivity to power dynamics and the potential influence on participants' responses.

Ethical practice was supported through transparency, reflexivity, and an emphasis on creating a respectful and psychologically safe research environment. These considerations were consistent with ethical guidance for practitioner-researchers working within their own professional contexts (Finlay, 2002).

## **7 Methodological Alignment with the Professional Project**

The research approach used in this study fits well with the aims of the Professional Project module, as it supported an applied enquiry into an issue that is important for organisations. Using different qualitative methods helped develop a deep understanding of how coaches learn in private academy settings, while the reflective and exploratory design ensured that the findings stayed closely connected to real coaching practice.

Importantly, the research process did not only help generate knowledge, but also guided the development of the professional product. Insights from interviews, group discussions, and survey responses directly informed the design of the Coach Development Framework, ensuring a clear link between the data, the interpretation, and practical application.

## **Findings**

The findings are organised into four related themes that explain how coaches in private cricket academies in Pune learn, the challenges that affect their development, and the social and emotional factors that influence their learning. Together, these themes show that coach learning mainly happens through experience, interaction with others, and everyday coaching practice, while also highlighting the lack of structured support.

### **1 Coach Learning as Experiential, Informal, and Embedded in Practice**

Across interviews, the focus group, and survey responses, coaches consistently described learning as something that mainly happened through daily coaching work rather than through planned or structured development activities. Coaches explained that they learned by doing the job, dealing with coaching challenges as they came up, and changing their sessions based on how players responded and what results they saw.

Coaches reported learning through repeated coaching experiences, trial-and-error, and by watching more experienced coaches at work. Informal mentoring relationships developed naturally, often because coaches worked close to each other or had good personal relationships, rather than through any formal mentoring system. Discussions with other coaches about session planning, managing players, and preparing for matches were described as important sources of support and practical learning.

This type of learning was mostly reactive and based on immediate situations, which has been described in research as experiential or “just-in-time” learning (Cushion et al., 2003;

Werthner & Trudel, 2006). While this helped coaches solve short-term problems, it was rarely part of a planned or long-term development approach. As a result, learning depended heavily on individual motivation, access to informal networks, and available opportunities.

Survey findings supported these patterns, with most coaches identifying experience, observation, and interaction with other coaches as their main sources of learning. Together, these findings show that informal learning is not a small part of coach development, but the main way coaches learn within private cricket academy environments.

## **2 Absence of Structured Non-Formal Learning Opportunities**

Even though informal learning was common, opportunities for non-formal learning were described as limited, inconsistent, or missing in most private cricket academies. Coaches spoke about the absence of organised mentoring systems, peer learning groups, or planned development activities that could support shared learning among coaches.

Where non-formal learning did take place, it was usually started by individual coaches rather than being part of the academy’s normal working practices. Participation often depended on personal relationships or on whether a more experienced coach was willing to provide guidance. Because of this, access to learning support was uneven, and less experienced or less confident coaches were more likely to miss out.

The lack of structured non-formal learning meant that learning was often personalised but fragmented. Coaches appreciated the freedom and flexibility of informal learning, but many were unsure whether they were actually improving as coaches or simply repeating the same practices. This reflects

previous research showing that while informal learning is highly relevant, it can also reinforce existing habits and assumptions if it is not supported through discussion and reflection (Nelson et al., 2006).

Overall, these findings suggest that non-formal learning could play an important role in connecting formal coach education with everyday coaching practice. However, within private cricket academies, such opportunities remain underdeveloped and largely unsupported.

### **3 Perceptions of Formal Coach Education: Value, Access, and Legitimacy**

Coaches had mixed views about formal coach education. On the positive side, formal certification was valued because it provided structure, professional recognition, and legitimacy. Having recognised qualifications was seen as important when dealing with parents, academy owners, and other stakeholders.

However, many coaches found it difficult to access formal coach education. Common barriers included high course fees, long time commitments, language challenges, and institutional requirements. Several coaches said it was hard to attend courses alongside heavy coaching workloads, while others felt that private or commercial courses had limited value because they were not recognised by governing bodies such as the BCCI.

Coaches also felt that formal education did not always reflect the realities of private academy coaching. Course content was often described as disconnected from everyday challenges such as large group sizes, limited facilities, and pressure to deliver quick results. As a result, formal learning was sometimes seen as less useful for daily coaching practice, a concern also raised in previous research on coach education and learning transfer (Cushion et al., 2003; Nelson et al., 2006).

These experiences influenced coaches' confidence and professional identity. Some coaches felt insecure due to the absence of recognised qualifications, while others placed greater value on practical experience and coaching results. This often led coaches to rely more on informal, experience-based learning rather than formal education pathways.

### **4 Coaching Identity, Confidence, and Emotional Dimensions of Learning**

A strong theme in the findings related to the emotional side of coaching and how coaches saw themselves in their role. Many coaches explained that they entered coaching unexpectedly, often after their playing careers ended, rather

than as a planned profession. This unplanned transition shaped their confidence and sense of professional identity.

Coaches who felt confident, trusted, and respected were more willing to seek learning opportunities, discuss challenges openly, and try new ideas in their coaching. In contrast, coaches who felt insecure described their learning as private and cautious. Fear of being judged or seen as incompetent made some coaches hesitant to ask questions or share difficulties.

Confidence played an important role in how coaches learned. Less confident coaches tended to copy others and rely on familiar routines, while more confident coaches spoke about experimenting, adapting sessions, and reflecting on their practice. These findings align with previous research showing that coaching biography, professional identity, and confidence strongly influence learning engagement (Cushion et al., 2003; Knowles et al., 2014; Trudel & Gilbert, 2006).

Organisational culture also shaped these experiences. In academies where performance and results were prioritised over learning, opportunities for open discussion and shared reflection were limited. As a result, learning often took a back seat to daily delivery demands, leading to development that was individual, reactive, and short-term.

## **5 Reflection as Unfamiliar Rather Than Resisted**

Reflection emerged as a particularly significant theme. Coaches frequently described thinking about sessions, mentally revisiting coaching decisions, and discussing challenges with peers. However, these activities were rarely identified as “reflection” in a formal sense. Instead, reflection was embedded informally within practice and conversation.

Many coaches reported limited exposure to structured reflective practices and expressed uncertainty about how to reflect in a “correct” or formal way. Reflection was sometimes associated with evaluation, judgement, or criticism, particularly within performance-oriented environments. This association reduced willingness to engage openly, especially among less confident coaches.

Importantly, the data indicated that coaches were not resistant to reflection, but rather unfamiliar with it as an explicit learning process. When reflective activity was framed as supportive dialogue rather than assessment, coaches reported greater comfort and engagement. This finding supports existing research suggesting that reflective learning in coaching often occurs informally

and may be constrained by power relations and performance pressures rather than active resistance (Schon, 1983; Cushion & Nelson, 2013; Trudel et al., 2013).

At a broader cultural level, hierarchical relationships and time pressures limited opportunities for reflective dialogue. Coaches described few spaces within academy environments to pause, discuss experiences, and collectively make sense of practice.

## **6 Summary**

Overall, the findings show that coaches in private cricket academies in Pune mainly learn through experience, informal interaction, and social relationships. While coaches are motivated to improve, their learning is shaped by confidence, professional identity, academy culture, and limited access to organised development support. Informal learning is widespread but largely unsupported, non-formal opportunities are scarce, and formal education is valued but often hard to access or not closely linked to daily coaching practice.

Reflection was commonly part of coaching, but it was rarely recognised as “reflection” by coaches. Engagement with reflective learning was influenced by confidence, power relationships, and performance pressure. These findings highlight the need for coach development approaches that support how coaches already learn, while providing light structure to build confidence, legitimacy, and sustainable learning.

## **Discussion**

The aim of this discussion is to make sense of the findings by linking them to existing research on coach learning and to consider what they mean for coach development in private cricket academies. The findings show that coach learning in this setting is mainly based on experience, informal interaction, and social relationships. Learning is strongly influenced by organisational constraints, professional identity, and confidence. These insights support existing research but also highlight the importance of understanding learning within specific local contexts.

### **1 Coach Learning as Context-Based Practice**

The findings confirm that coaches in private cricket academies mainly learn through their everyday coaching work, rather than through planned or structured development systems. Coaches described learning by trying things out, making mistakes, observing other coaches, and having informal discussions. This

matches earlier research showing that experiential and informal learning are central to how coaches develop (Cushion et al., 2003; Werthner & Trudel, 2006).

However, this study adds to existing research by showing how these learning processes operate within private, commercially run academies. In these environments, coaches face strong performance pressure and limited resources. Unlike club-based or association-led systems often studied in Western contexts, private academies in India work with little formal oversight and very limited development support. As a result, learning is driven by immediate needs and day-to-day challenges rather than long-term planning.

While learning through experience helps coaches respond quickly to situations, the findings suggest that this learning is often reactive. Coaches adjust to problems as they arise but rarely have opportunities to step back, reflect deeply, or build learning over time. This supports the idea that experience alone does not automatically lead to development and needs to be supported through reflection and social learning to encourage professional growth (Kolb, 1984; Cushion et al., 2003).

## **2 The Missing Middle: Non-Formal Learning as a Gap**

One of the key contributions of this study is identifying the lack of structured non-formal learning in private cricket academies. While informal learning was widespread and formal education was valued but difficult to access, opportunities such as organised mentoring, peer learning groups, or guided reflection were mostly missing.

This supports earlier work by Nelson et al. (2006), who describe non-formal learning as an important link between formal education and informal practice. Without these opportunities, learning remained individual and uneven. Coaches' development depended heavily on personal confidence, experience, and informal networks rather than on organisational support.

The absence of non-formal learning also helps explain why many coaches felt unsure about their professional progress, even after years of experience. Without shared spaces to discuss, reflect, and make sense of practice together, learning risks becoming repetitive rather than developmental. These findings suggest that coach development in private academies may be most effective when it focuses on strengthening simple, flexible non-formal learning structures that fit naturally within everyday coaching work.

### **3 Formal Education, Legitimacy, and Transferability**

The findings show a mixed relationship between coaches and formal coach education. Coaches valued formal certification because it gave them recognition and legitimacy, especially when dealing with parents, academy owners, and other stakeholders. Having a certificate helped coaches feel more professional and credible. However, many coaches felt that formal education did not always help them improve their day-to-day coaching.

Access to formal coach education was limited due to cost, time, language, and course availability. Even when courses were completed, coaches felt that the content often did not match the realities of private academy coaching. Large group sizes, limited facilities, and pressure to deliver quick results made it difficult to apply what was taught. This reflects earlier research showing that formal coach education does not always transfer well into different coaching contexts (Cushion et al., 2003; Nelson et al., 2006).

The findings also show that legitimacy and confidence are closely linked. Coaches without recognised certification often felt insecure and less confident, which influenced how openly they engaged in learning and reflection. At the same time, many coaches relied on experience rather than qualifications to build credibility. These findings highlight the need for coach development approaches that support confidence and legitimacy without relying only on formal courses, especially in settings where access to accredited education is limited.

### **4 Identity, Confidence, and Psychological Safety in Coach Learning**

An important contribution of this study is its focus on the emotional and identity-related side of coach learning. Many coaches shared that they did not plan to become coaches and entered the role unexpectedly, often after finishing their playing careers. This influenced how they saw themselves as coaches and affected their confidence. This supports earlier research showing that coaching is closely linked to personal background and professional identity (Cushion et al., 2003; Trudel & Gilbert, 2006).

Confidence played a major role in how coaches engaged with learning. Coaches who felt confident, trusted, and respected were more open to asking questions, discussing problems, and trying new ideas in their coaching. In contrast, coaches who felt unsure or insecure tended to rely on fixed routines and copying others, rather than experimenting or reflecting. This reflects research showing that

people learn more effectively when they feel psychologically safe (Knowles et al., 2014; Edmondson, 1999).

The culture of the organisation also strongly influenced these patterns. In environments where performance and results were prioritised over learning, coaches felt less comfortable sharing doubts or reflecting openly. As a result, learning often became private and cautious. These findings show that coach development is closely connected to organisational leadership and culture. Supporting coach learning requires attention to trust, relationships, and power dynamics, not just providing courses or resources.

## **5 Reflection as Practice**

The findings challenge the idea that coaches resist reflection. Coaches often described reflective actions, such as thinking back on training sessions or talking with other coaches about problems, even though they did not label these activities as “reflection.” This supports the view that reflection usually happens as part of action and experience, rather than as a formal step or process (Schon, 1983).

Reflection became difficult when it was linked to judgement or evaluation, especially in performance-focused environments. In such settings, coaches were less comfortable reflecting openly because they feared being assessed or criticised. This supports earlier research showing that reflection can lose its value when it is treated as a formal requirement rather than a learning tool (Cushion & Nelson, 2013). The findings suggest that coaches’ engagement with reflection depends less on personal motivation and more on how reflection is introduced and supported.

Overall, these findings highlight the need for reflective approaches that are simple, supportive, and based on dialogue rather than formal assessment. Reflection that happens through everyday conversations, mentoring, and shared problem-solving is likely to be more meaningful and practical for coaches working in resource-limited and performance-driven environments.

## **6 Implications for Coach Development and the Framework**

Taken together, the findings support the need for a context-specific Coach Development Framework that focuses on mentoring, learning from peers, and simple ways to reflect on practice. The framework developed through this project is intentionally simple and closely linked to everyday coaching work. It is based on a learning cycle where coaches learn through their own experience,

talk with other coaches or mentors, reflect on what happens in practice, and then try new ideas in their next sessions. This cycle reflects how coaches already learn in private academies and avoids forcing a fixed curriculum or formal assessment system.

The framework is strongly connected to the organisational context of the academy. While the learning cycle shows what coaches do, how effective it depends on the environment created by the academy. Factors such as leadership support, time availability, expectations, and psychological safety all influence whether coaches feel able to learn. In private academies, management plays an important role by valuing learning alongside performance, encouraging discussion and mentoring, and allowing space for reflection during daily coaching work. Without this support, learning remains individual and reactive; with it, learning becomes more shared, purposeful, and sustainable.

Rather than introducing new systems or programmes, the framework recognises and supports how coaches already learn in practice. It adds only light structure to help improve confidence, professional legitimacy, and long-term development, without placing extra pressure on limited resources.

The framework also recognises the influence of organisational leadership in shaping learning environments. Decisions made by academy leaders about time, priorities, and expectations directly affect whether coach learning is supported or pushed aside. By fitting development activities into everyday coaching routines, the framework offers a practical approach that matches the realities of private academies.

This approach responds to calls for research that is closely connected to practice and sensitive to local context, especially in non-WEIRD coaching environments. Instead of copying fixed models from elsewhere, the framework offers a flexible and locally grounded way to support coach development.

## **7 Summary**

This discussion shows that coach learning in private cricket academies is shaped by experience, relationships, professional identity, and organisational culture. Informal learning is widespread but not well supported, non-formal learning opportunities are limited, and formal education is valued but difficult to access or apply in practice. Reflection happens regularly in coaching work, but it is not always recognised as a formal learning process and is influenced by confidence and psychological safety.

These findings highlight the need for coach development approaches that are flexible, sensitive to local context, and closely linked to everyday coaching practice. The Coach Development Framework developed through this project directly responds to these needs by offering practical support for coach developers and academy leaders working in private academy settings.

## Conclusion

This professional project aimed to understand how coaches working in private cricket academies in Pune, India learn and develop, and to generate knowledge that is useful for coach developers and organisations. Using interviews, a focus group, and a survey, the study explored coaches' learning experiences, the challenges they face, and how they engage with formal, non-formal, and informal development opportunities.

The findings show that coach learning in private cricket academies is largely experiencebased, informal, and social. Coaches learn mainly through daily coaching work, observing other coaches, informal mentoring, and discussions around practical problems. While these learning processes are central to development, they are often unplanned and unsupported, meaning much of the responsibility for learning rests with individual coaches. Formal coach education remains the most visible and recognised pathway, but barriers such as cost, time, language, and limited relevance to practice reduce its impact in private academy settings.

A key contribution of this project is identifying the gap between formal education and informal learning. Opportunities for non-formal learning, such as organised mentoring, peer learning groups, and supported reflection, were largely absent or inconsistent. As a result, learning often occurred in response to immediate challenges rather than through planned or sustained support. Professional growth depended heavily on confidence, personal networks, and opportunity, rather than structured organisational systems.

The project also highlights the emotional and identity-related aspects of coach learning. Many coaches entered coaching unexpectedly, often after the end of their playing careers, which influenced their confidence and professional identity. Coaches who felt trusted, respected, and confident were more willing to learn, discuss challenges, and reflect on their practice. In contrast, coaches who felt insecure or worried about judgement tended to be more cautious. Reflection was commonly part of coaching practice, but it was not always recognised as "reflection" by coaches themselves. Limited engagement with reflection was shaped more by performance pressure, power relationships, and fear of judgement than by resistance.

In response to these findings, the project developed a context-specific Coach Development Framework that supports how coaches already learn in practice. The framework is intentionally simple and flexible. It is not designed as a fixed curriculum, formal qualification pathway, or assessment system. Instead, it offers light structure through mentoring, peer learning, and simple reflective tools that can be integrated into everyday coaching work. By connecting informal learning with organised support, the framework supports confidence, clarity, and longer-term development without adding pressure to limited resources. Importantly, the framework recognises that coach learning does not happen in isolation. Learning is shaped by organisational and leadership conditions within private academies, including how time, priorities, and learning are valued. Decisions made by academy owners and leaders strongly influence whether coaches are able to talk, reflect, and learn together. Where learning is supported, even informally, coaches are more likely to engage in shared problem-solving. Where performance pressures dominate, learning is often left to individual effort. While formal coach education in India is largely governed by state associations and the BCCI, private academies operate with considerable independence, placing greater responsibility on local leadership to create learning-supportive environments.

From a methodological perspective, this project demonstrates the value of applied qualitative research for understanding coach development in complex and under-researched contexts. Although the findings are not intended to be statistically generalised, they offer insights that may be useful in similar private and resource-constrained environments. The researcher's insider position supported access and trust, while reflexive practice and transparency helped manage potential bias.

Overall, this professional project shows how research and development can work together. By grounding the Coach Development Framework in coaches lived experiences and organisational realities, the project produces applied knowledge with clear practical value for coach developers and academy leaders. The findings reinforce the need for flexible, contextsensitive approaches to coach development that move beyond formal education alone and focus on recognising, supporting, and strengthening how coaches learn in practice.

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# The Correlation Between Mobile Screen Time and Physical Fitness Levels: A Cross-Sectional Study of Mahavir Mahavidyalaya Students in Kolhapur

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**Sanket Sunil Savekar**

Assistant Professor Mahavir Mahavidyalaya, Kolhapur

**Sayali Babi Mandrekar**

Physical Education Teacher Lexicon International school, Pune

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## ABSTRACT

*Smartphones are now a central part of a college student's world, used for everything from chatting with friends to studying. But what happens when "screen time" takes over? This study looked at whether all that time spent on phones is affecting students' physical fitness. We worked with 50 students, aged 19 to 23, and split them into three groups based on how many hours a day they used their phones for non-school activities: low use (under 3 hours), medium use (3-5 hours), and high use (over 5 hours). We then measured their fitness by checking their body weight, how fast they could run a certain distance, how many push-ups they could do, and how flexible they were. The results were clear: the more time a student spent on their phone, the worse their fitness was. Students who used their phones for less than 3 hours a day were, on average, in better shape they were faster, stronger, and more flexible. On the other hand, students who used their phones for more than 5 hours a day had the lowest fitness levels. The medium-use group fell somewhere in the middle, suggesting that other habits, like what they eat and how much they sleep, also play a role.*

*This research shows that while phones are incredibly useful, too much screen time can quietly harm our health by making us sit still for too long. The beneficial news is that the solution isn't to throw away our phones but to find a better balance. We suggest that colleges should help by raising awareness, creating more fun opportunities for exercise, and teaching students how to build healthy digital habits..*

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**Keywords** : Mobile screen time, physical fitness, cross-sectional study, sedentary behavior, digital habits, health awareness.

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## Introduction

Our phones are glued to our hands. For college students, they are our social lifeline, our entertainment center, and even our mobile library. But as we dive deeper into the digital world, a big question pops up: what is all this screen time doing to our bodies? It's a real concern. Every hour we spend scrolling, watching, or gaming is usually an hour we spend sitting still. This "couch potato" lifestyle has been linked to lower activity levels and can lead to health problems down the road. College is a time of major change. We're figuring out who we are, managing classes, friends, and freedom all at once. The habits we build now will likely stick with us for life. But our phones, as helpful as they are, can work against our health. They're designed to keep us hooked, making it all too easy to choose another episode over a workout or a walk. Late-night browsing can ruin our sleep, leaving us tired and with zero motivation to hit the gym or the field the next day. On the flip side, being physically fit is about so much more than just weight. It's about having the stamina to get through a hectic day, the strength to feel capable, and the flexibility to move without pain. It boosts our mood, sharpens our focus for exams, and just makes us feel better overall. Yet, studies show that students everywhere are becoming less active, and our screens are a huge reason why. The World Health Organization recommends 150 minutes of exercise per week, but many of us aren't even coming close, thanks to our screen-filled routines. That's why we launched this study here at Mahavir Mahavidyalaya in Kolhapur. We wanted to see if there's a real connection between our phone habits and our fitness. We looked at 50 students, tracking their daily screen time and testing key health indicators like their BMI, how long they could run, their strength, and their flexibility. In a city like ours, where tradition and technology mix in unique ways, understanding this link is especially important. So why does this matter? If we can prove that too much phone time is hurting our fitness, we can actually do something about it! Our college could start awareness campaigns, create more fun fitness programs, and teach us how to have a healthier relationship with our devices. Ultimately, this isn't about giving up our phones. It's about finding a balance. This research is a step toward making sure we can enjoy technology without sacrificing our health, ensuring we grow into well-rounded, healthy adults.

## Review of Literature

### *Why Fitness Tends to Drop in College*

You've probably felt it yourself. Staying in shape in college can be tough. Fitness isn't just about weight; it's about your stamina, your strength, and how flexible you are. Researchers point out that between classes, exams, and a new social life, exercise

often gets pushed aside (Buckworth & Nigg, 2004). And what fills that gap? Usually, our screens. We end up swapping a game of football for a gaming session, or a walk with friends for a scroll through social media. This swap is a major reason why fitness levels often drop during these years.

### ***The Situation Here in India***

In India, smartphones have exploded in popularity. While early research focused on big cities like Mumbai and Delhi, the same thing is now happening in smaller cities and towns (Verma & Singh, 2020). Students everywhere are spending more and more time on their phones, which means less time playing sports or being active outdoors. This is an even bigger problem in places where colleges might not have great gyms or sports facilities, making it harder for students to choose an active lifestyle.

### ***Your Phone: Friend or Foe?***

Here's the interesting part: your phone can actually be a great workout buddy! It can be a fitness tracker, a personal trainer with workout videos, and a health coach all in one (Middleton, 2021). But there's a catch.

These healthy features have to compete with the endless fun of TikTok, Instagram, and YouTube. And let's be honest, the fun stuff usually wins. Without making a conscious effort, it's easy to get sucked into passive scrolling, and the fitness apps just sit unused.

## **Methodology**

### **1. Study Design**

This study employed a cross-sectional, observational design to investigate the relationship between non-academic mobile screen time and physical fitness levels among undergraduate students at Mahavir Mahavidyalaya, Kolhapur. Data were collected at a single point in time to assess patterns and correlations without intervention.

### **2. Participants**

- *Sample Size* : 50 students (male) aged 19–23 years.
- *Sampling Method* : Convenience sampling was used, with participants voluntarily recruited from various undergraduate programs.
- *Inclusion Criteria* : Currently enrolled as a full-time student, owns a personal smartphone, willing to participate in physical fitness tests.

- *Exclusion Criteria* : Students with physical disabilities or medical conditions limiting physical activity, those using smartphones primarily for academic purposes (e.g., e-learning, research).
- *Groups* :
  - <3 hrs/day (15 students)
  - 3–5 hrs/day (20 students)
  - 5 hrs/day (15 students)
- *Fitness Indicators* :
  - BMI
  - Endurance (1.6 km run time in minutes)/ 1-mile run test
  - Strength (push-ups)
  - Flexibility (sit-and-reach cm)
- *Analysis* : Group averages compared using bar charts.

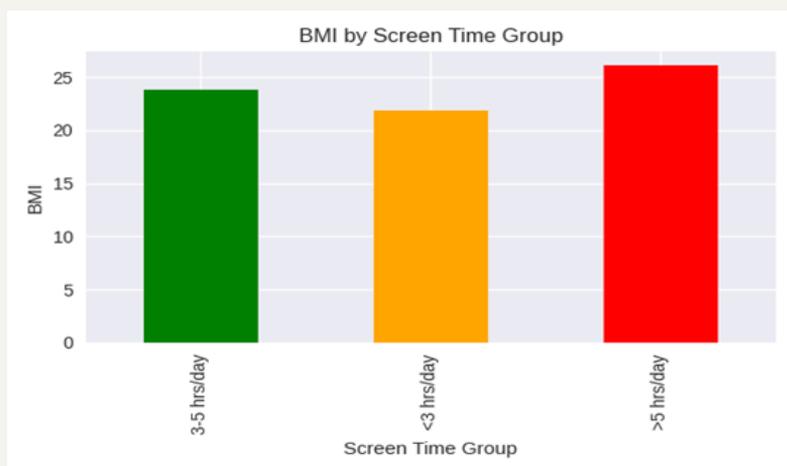
## Results

**Table 1 : Average Fitness Indicators by Screen Time Group**

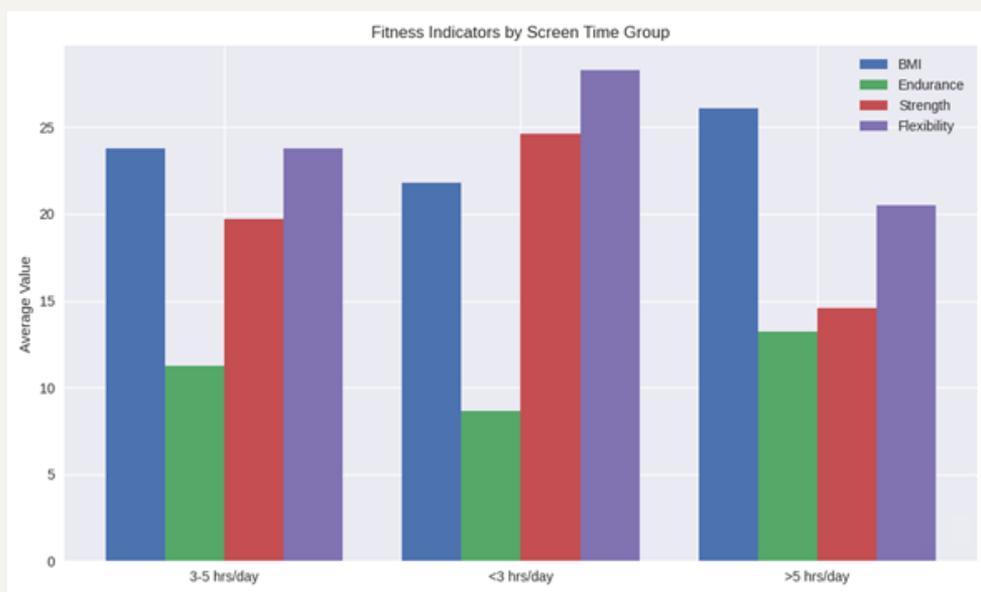
<b>Screen Time Group</b>	<b>BMI</b>	<b>Endurance (min)</b>	<b>Strength (Push-ups)</b>	<b>Flexibility (cm)</b>
<3 hrs/day	22	9	25	28
3–5 hrs/day	24	11	20	24
>5 hrs/day	26	13	15	20

## Charts

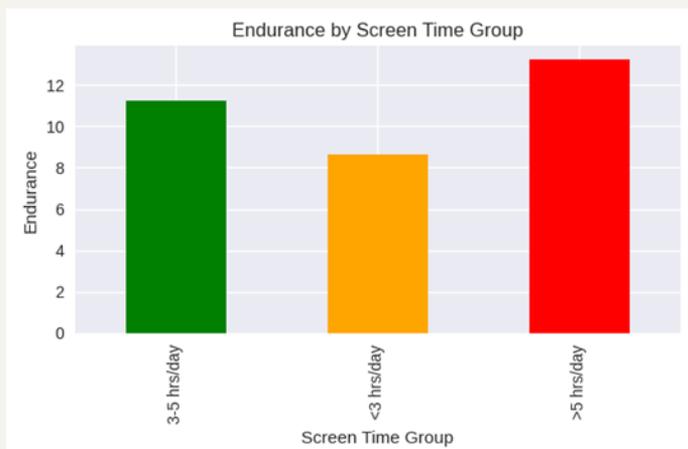
- **Figure 1:** BMI vs Screen Time



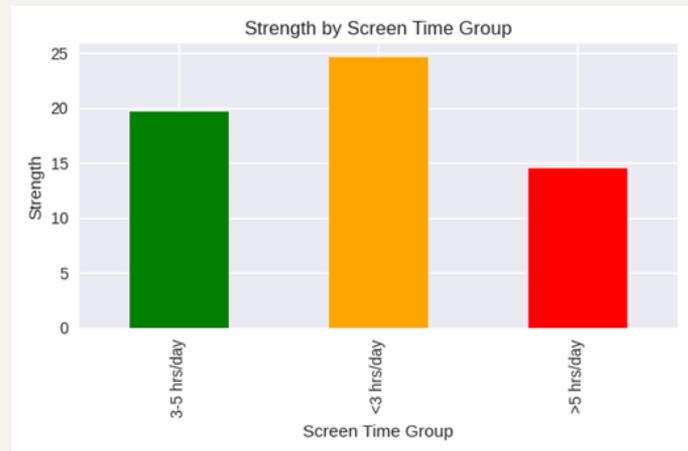
- **Figure 2 :** Endurance vs Screen Time



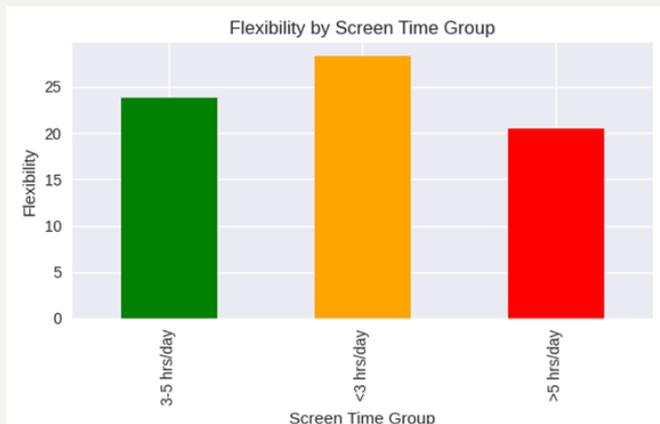
- **Figure 3 : Strength vs Screen Time**



- **Figure 4 : Flexibility vs Screen Time**



- **Figure 5 : Grouped Bar Chart comparing all indicators**



## Discussion

Our study shows a clear trade-off: more screen time = lower fitness.

- **High Users (>5 hrs/day)** : Had the highest weight, slowest run times, and lowest strength. Phones are directly replacing active time.
- **Moderate Users (3-5 hrs/day)** : Fell in the middle. This suggests that good habits like diet, sleep, or occasional exercise can help, but can't fully cancel out the screen time effect.

**The Solution?** Balance. We don't need to quit our phones, but we do need to be more mindful. Colleges can help by creating fun, easy ways for students to get moving and learn about digital wellness.

## Summary

This study explored the relationship between non-academic mobile screen time and physical fitness among college students at Mahavir Mahavidyalaya in Kolhapur. Fifty students between the ages of 19 and 23 were grouped based on their daily phone usage: low (under 3 hours), medium (3–5 hours), and high (over 5 hours). Their fitness was assessed through measures such as BMI, endurance via a 1.6 km run, strength through push-ups, and flexibility using a sit-and-reach test. The results revealed a clear pattern: as screen time increased, fitness levels declined. Students with low screen time displayed better overall fitness, while those in the high-use category showed poorer performance across all metrics. These findings highlight how excessive phone use can displace physical activity and negatively impact health. Rather than suggesting the removal of smartphones, the study advocates for a more balanced approach, recommending that colleges promote awareness, integrate accessible physical activities, and encourage healthier digital habits to support student well-being.

## Conclusion

In simple terms, our study shows that the more time we spend on our phones for fun, the less fit we tend to be. It's a trade-off many of us feel but don't always measure: scrolling often means sitting, and sitting often means not moving. For students at our college, those who used their phones for more than five hours a day were, on average, heavier, slower, weaker, and less flexible than those who used them less. It's a clear reminder that our digital habits have a real impact on our physical health. But this isn't just a problem it's an opportunity. Recognizing this link is the first step toward making positive changes. We don't have to give up our phones to be healthy.

Instead, we can learn to use them more intentionally, making room in our day for movement, whether it's a walk between classes, a short workout, or just stretching while we watch a video. Colleges like ours can help, too not by scolding students for screen time, but by creating easier, more inviting ways to be active. Imagine more sports events, outdoor yoga sessions, walking groups, or even reminders to stand up and move during long study hours. Small changes in our environment can lead to big changes in our habits. This isn't just about physical health. When we move more, we often sleep better, feel less stressed, and think more clearly all things that help us do better in class and enjoy life more. In a world where phones are part of everything we do, finding balance is key. We can be connected and active; we can enjoy technology without letting it take over our health. So, let's start the conversation in our classrooms, hostels, and friend groups. Let's share what works, challenge each other to put the phone down and get outside, and remember that health isn't about perfection, but about small, daily choices. Together, we can build a campus culture that values both digital connection and real-world movement, helping each other grow into healthy, happy, and whole human beings.

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## Sustainable Endurance Sport Events in Coastal Regions : Assessment of Goa's Suitability for Ironman 70.3

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**Siddhesh Subhash Kesarkar**

Research Scholar at Chandrashekhar Agashe College of Physical Education, Pune, Maharashtra, India.  
College Director of Physical Education at Goa College of Music, Panaji, Goa, India..

**Pandurang Kisan Lohote**

College Director of Physical Education at Rayat Shikshan Sanstha's Mahatma Phule Mahavidyalaya,  
Pimpri-Chinchwad, Maharashtra, India

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### ABSTRACT

*Purpose: The objective of this case study is to assess the appropriateness of Goa as a destination for conducting Ironman 70.3 events based on the sustainability approach.*

*Methodology: The assessment model incorporates the use of secondary data regarding the four different arenas of sustainability: the environmental arena, the economic arena, the arena of infrastructure and the arena of policy and governance and the findings are supplemented*

*Key Results: The robust tourist infrastructure and government support in Goa indicate high potential for economic benefits, brand positioning and international exposure. The major risks include: Environment-related constraints, including the preservation of the coastal ecosystem, waste management and the carbon footprint of tourism activities, particularly in peak tourist seasons.*

*Conclusion: Goa has great potential in sustainably hosting Ironman 70.3 events, but this requires various policy alignments and great sustainability planning and execution efforts.*

*Recommendations: Event-specific environmental management (waste, emissions, coastal protection) should be improved and the connection between the event and development should be emphasized. Continuous monitoring and reporting frameworks should be set up to conform to international sustainability standards.*

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**Keywords** : sport tourism, sustainability, triathlon, Goa, Ironman 70.3

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## Introduction

Sport tourism is thus recognized as a vibrant field where the boundaries between sport and tourism are increasingly blurred, including travel for participation or spectating sporting events (Vrondou, 2017). Emerging within this field are events based on endurance sports, such as long-distance triathlons, increasing in popularity across locations and identified as a means of tourism development through events (Wood, 2005). Coastal locations are generally identified as attractive locations, integrating natural icons with developed tourism infrastructure, but simultaneously requiring attention to ecosystem sustainability (Carneiro et al., 2016). The case of Goa brings out a coastal setting where tourism is economically imperative and sustainability issues are relevant; thus, this case study is applicable for evaluating the suitability of endurance events based on the sustainability factor (Government of Goa, 2021).

There now appears to be an appreciation for the fact that sport event tourism needs to occur in a sustainable way in order to protect the environments that support the quality of the destination from degradation in the future (International Olympic Committee, 2017). High visitor numbers and the operational logistics of sport events can have negative effects on the marine ecosystems, especially in areas that have high capacity constraints and regulation impediments (Central Water Commission, 2024). Nevertheless, there appears to have been a prevailing concern with the previous scholars regarding the sport events in general, particularly in the context of mega events, while there appear to have been relatively reduced findings for the application of sport events in a sustainable way for the support of sport-tourism in lesser developed regions, especially in the context of the marine sport environment of the sport event destination (Gibson, 1998). Evidence acquired in the marine sport tourism context for the sport event destination appears to indicate that while there might have been an awareness of sustainability, there appears not to have been the same consistency in the conduct in a sustainable way, particularly for less complex environments, especially regarding organizers within the sport event context (Carneiro et al., 2016).

In this regard, this study focuses on evaluating the applicability of hosting an Ironman 70.3 triathlon event sustainably in the context of Goa's suitability. Generally, the Ironman 70.3 event symbolizes the type of standardized endurance sports activities that have the potential for regional, or even global appeal and simultaneous focused pressures on the transportation, resources and infrastructure (Ironman Group, 2016).

The underlying premise or argument and rationale for this research study is based upon evaluating whether and in which manner an activity involving an endurance sports event might and ought to or can and should be harmonized with or integrated

into the broader sustainability paradigm within a regulated coastal area, which is simultaneously subject to the pressures of tourism (Government of Goa, 2021).

Specifically, this study offers secondary research findings and rationale into the relevant sustainability context and issues and applications facing destination managers and policymakers regarding the optimization and maximization of tourism versus the sustainability and collective stewardship, preservation and conservation interests, needs and requirements and applications. This advances the generally accepted body of regional, theoretical, or empirically based knowledge and research.

Thus, the aim of the study is to analyze the importance of the environmental, economic, infrastructure and policy/governance dimensions in relation to hosting an Ironman 70.3 event in Goa. This would help in bringing forth the challenges and opportunities arising from these dimensions with an ultimate goal of making recommendations on how to improve the sustainability of sports events like the Ironman 70.3.

## **Methodology**

The research is based on a detailed analysis of secondary data sources through an interpretative qualitative methodological approach. The literature that is relevant to this research is based on publications concerned with the topic of sport tourism and sustainability, along with case studies based on endurance events. The literature will form a multi-dimensional framework for analysis of sustainability in sport events for coastal areas.

For the purpose of analysis, a conceptual framework has been modified and adapted to suit the research. This framework has its roots in theoretical and contemporary visions associated with sustainability and applied to the context of sport tourist destinations. The framework comprises of four main pillars. These include environmental, economic, infrastructure and policy/governance issues. The framework above captures the full spectrum of a holistic approach to sustainability that brings together matters concerning environmental integrity, the balancing and distribution of socio-economic benefits and issues pertaining to institutional capabilities and capacities necessary and integral to effective and continuous improvements. Within the context of the framework described above, the infrastructure pillar takes into account physical and social infrastructure considerations necessary within the broader context of endurance events and associated legacy development.

The methodology adopted a qualitative content analysis technique. Sources were analyzed to harvest data relevant to either the state of Goa or similar endurance event and coastline tourism-related issues within the four areas. In the area of environment

sustainability, sources like event sustainability reports and carbon footprint studies were analyzed to determine general event effects and solutions that can mitigate these when conducting triathlon events (One Carbon World, 2024 & 2025). Economic concerns were taken from economic research studies related to sport events tourism-related spending and local economic integration (Wood, 2005). Event infrastructure readiness was studied from documents related to tourism planning and development in Goa, as well as best practices from building coastal sport tourism infrastructure systems that make destinations more competitive (Government of Goa, 2021). Lastly, policy-related concerns were analyzed from sources that specialize in regulation related to the coastal environment and sport event management to determine sustainability approaches and general perceptions regarding coastal management (Central Water Commission, 2024).

In the course of the analysis, triangulation methods ensured the reliability of interpretation of the data. This entailed comparing official records with scholarly literature. For instance, sustainability risks identified from the perspective of destinations related to the tourism industry were analyzed in light of stakeholder perceptions. As the research did not involve human participants, the need for expert ethical clearance did not arise.

## **Results**

### ***Environmental Dimension***

One of the primary concerns for organizing an endurance sport like Ironman 70.3 in a coastal area, including Goa, is the sustainability of the environment. The coastal environment, consisting of beaches, sea and related flora and fauna, is fragile and should be regulated. In India, the notification related to the Coastal Regulation Zone (CRZ) regulates activities around the shoreline and governs the sustainability of the environment. Any beach activities, like the organization of large events, involving the setting up of stages, stands and transition points for the triathlon in Ironman 70.3 Goa, have to be done in accordance with the CRZ notification, clearly keeping away from the shoreline, particularly the area within the high tide level and obtaining environmental clearance for the temporary activities (Mascarenhas, 1999). Therefore, organizing Ironman 70.3 Goa requires addressing the environmental authorities at the initial stages to see if the proposed layout, transition points and other activities remain environmentally safe.

Aside from regulatory requirements, there is a need for strategies to address direct environment effects. The event-related activity that raises the most concern is waste generation associated with events. Sustainability reports for triathlon events emphasize

strategies for waste diversion techniques like recycling, composting and selective waste collection for those that are difficult to recycle, which should be facilitated by adequate event plans and vendor coordination (Ironman Group, 2016). As for Goa's tourism environment, waste management and stress to the environment are common sustainability issues, which emphasize the need for a detailed plan for waste and environment restoration after the events (Government of Goa, 2021). The Ironman 70.3 would thus be suitable when proper strategies for waste segregation, speed clean-up strategies and vendor plans are in place to avoid dissemination of trash into nearby bodies (Central Water Commission, 2024).

The quality of water and the state of the ecosystem are also of considerable importance in the context of the coastal triathlon because the swimming component relies on appropriate conditions in the waters adjacent to the coastline. Although the current study does not identify any new parameters of water quality, the management of the coastline considers that the pressures of tourism, on one hand and sewage and shoreline pollution, on the other hand, may compound each other in complex ways that threaten the suitability of the environment, starting from the appropriate management of materials that could find their way into the sea, such as minimizing the use of plastics (International Olympic Committee, 2021).

Carbon footprint, or the effect of carbon on the environment, is another aspect of environment sustainability. All endurance events produce carbon emissions stemming from the transportation of athletes and employees, energy utilization, as well as logistics. These aspects of sustainability in the reporting of triathlons illustrate the importance of measuring the associated operational carbon emissions in the endurance event industry to mitigate such emissions through the implementation of associated strategies within the overall sustainability strategy for the event (Ironman Group, 2016). Carbon footprint measurement strategies employed within the governance structure of triathlons, such as carbon-neutral reporting, provide pertinent methodology for measuring carbon emissions within endurance events (One Carbon World, 2025).

It is evident from the results of the environment assessment that a sustainable event is possible within the confines of the coastal regulation management rules that are applicable in Goa, if effective management is done (Mascarenhas, 1999). To this effect, there must therefore be effective environment management planning regarding waste diversion, water protection and pollution control that is geared towards the sustainability plans applicable to global sports events (International Olympic Committee, 2024).

## **Economic Dimension**

Organizing the Ironman 70.3 triathlon in Goa involves significant economic aspects that could be positive if these are properly managed to generate maximum advantages to Goa. Hosting sports activities has been linked to increased tourist expenses related to accommodations, food, transport and additional services and the sustainability reports of endurance sports offer evidence for such economic activities (Wood, 2005). Goa as a destination could experience the influx of foreign athletes and fans attending the branded sports event and could potentially experience additional tourist activities beyond the organized event, as long as the destination management capacity can manage this pressure without affecting the social well-being of Goa (Peric et al., 2019).

Job and business opportunities in the area are another possible advantage. Major events create short-term employment (event management, medical services, logistics, food and beverage services), while they also create a short-term demand for services if the area is given priority in procurement practices (Wood, 2005). Evidence from a seafront sports tourism context has shown that sustainable enterprises maintain a greater level of economic advantage locally when they forge supplier-community linkages and align their activities with the characteristics of the destinations (Carneiro et al., 2016). For the Ironman 70.3 Goa event, this would involve vendor or expo participation and service procurement arrangements that maximize linkages with the area.

Regarding the literature on destination planning, the role of events in tourism can be seen as promoting destination branding and product diversification when combined in a tourism context (Wood, 2005). For the case of Goa, the inclusion of endurance events within the tourism product offering would help in dealing with seasonality and quality tourism; this should be done while ensuring sustainability to avoid the cost being imposed on local communities. As such, economic plans for Ironman 70.3 should include strategies for equitable sharing of benefits and local business involvement (Miragaia et al., 2025).

The second significant economic factor is that of benefit distribution. Event tourism is likely to invite negative feedback if more benefits are distributed to non-local stakeholders instead of the local community. Meeting this challenge is ensured by negotiating local purchasing targets, employment guarantees and downstream investments that retain economic value within the local economy (Peric et al., 2019). Harmonizing the event with local development plans can further enhance economic benefits since sports events can become policy tools when aligned with local development plans for the destination (Miragaia et al., 2025). With respect

to the case of the state of Goa, this would mean harnessing the event platform to promote local cultural industries and to cultivate visits to destinations away from the coastal zone, rather than being confined to the immediate coastline.

Research into tourist perceptions conducted in Goa shows sustainability and benefit sharing factors contribute to tourism development and employment generation perceptions (Venugopalan, 2021). A sporting endurance event may enhance positive perceptions by providing direct support and benefit to local sources of livelihood, skills and resource exploitation (Peric et al., 2019). In due course, sustainability and successful delivery may develop a positive reputation in relation to the sport tourism market, with incentives to develop capacity if sustainability metrics follow growth patterns (International Olympic Committee, 2024). Consequently, the economic evaluation tends to indicate the potential benefits of the Ironman 70.3 Goa as a methodology for tourist diversification and branding, with long-run advantages accrued by ensuring social linkages and addressing potential negative externalities (Miragaia et al., 2025).

### ***Infrastructure Dimension***

The infrastructure aspect involves the physical and organizational necessities of hosting events and then the readiness of the related socio-cultural factors to facilitate such events. Goa has a tourism industry and this means such infrastructural necessities exist and details of tourism planning include factors such as infrastructure and service levels identified as factors of tourism development (Government of Goa, 2021).

Conducting an endurance triathlon, infrastructure readiness consideration factors include adequate facilitation of routes, their accessibility and then municipal services' readiness to take care of possible demands (Moradi, 2025).

However, this event also poses infrastructure-related issues. Roads that are generally congested could become bottlenecks during race closures; thus, effective traffic rerouting systems are required. Medical preparedness is also essential; while Goan cities have good hospitals and emergency care facilities, these must be integrated into race-day activities.

Infrastructural requirements for a triathlon event are usually temporary and modular and designed for each sport, but coastal considerations set certain boundaries. The suitability of the location and infrastructure, therefore, has to be determined within set boundaries of coastal regulations and doesn't require sensitive dune or intertidal areas that could be affected (Mascarenhas, 1999). Carrying capacity is a factor that needs to be considered, especially with the increase in the number of people participating or viewing the events (Zhao, 2023).

Human resources and capacity also play important roles. Capacity-building among local volunteers and staff members (lifeguards, marshals and medical teams) can improve the level of safety and the quality of services and can be helpful for the event's legacy by ensuring the expertise is shared locally by repeating the delivery cycles. (Miragaia et al., 2025)

Community support is an important component of readiness and sustainability. The literature on destination highlights the significance of community relations and factors of social capital in determining the acceptability of tourism development and determining the sustainability of events, especially where disruption factors (traffic, noise and overcrowding) impact particular localities (Van Ninh & Van Tam, 2026). Anticipatory engagement through communication, volunteering and engagement with lasting legacies can help enhance community support and minimize the source of tension related to recurring events (Ma et al., 2023).

### ***Policy and Governance Dimension***

The dimension related to policy and governance plays a vital part in ensuring that the development of endurance sports events relate to sustainable development. For the state of Goa, a positive policy environment related to effective governance would play a crucial part in improving the viability of holding Ironman 70.3.

At the state level, the role of policy and institutional strength is paramount to ensuring that a sports endurance event can be conceptualized and implemented for sustainable destination development, following a standard of quality and diversification of tourist products and services form a functional platform for implementing event tourism initiatives in Goa (Mascarenhas, 1999). An important question, therefore, related to the sustainability of these events is how well can the institutions handle coordination of permits, environment, safety and services while ensuring levels of transparency and accountability (International Olympic Committee, 2024).

One of the most important governance factors in a coastal environment is environmental regulation and coastal zone management. The Coastal Regulation Zone Notification regulates and limits activities near shorelines to ensure environmental sustainability, which means that even sporting events must be organized so as not to infringe these regulations and identified areas of sensitivity (Mascarenhas, 1999). A more general view of coastal zone governance focuses on remediation, surveillance and risk management of tourism-related impacts, which apply specifically to the delivery of sporting events (Central Water Commission, 2024). Consequently, governance adequacy must be predictable, monitorable (including managing waste and water

issues) and punitive with regard to restoration and compliance (International Olympic Committee, 2021, 2024).

The other level of governance is linked to the compliance level for sport organisations and events; this includes safety, environment and reporting (Ironman Group, 2016). Carbon footprints and neutrality strategies in the evaluation for the sport's level of governance are some strategies that can be applied for the event's level of sustainability (One Carbon World, 2024, 2025). The applicable level of sustainability for Goa would require collaboration between government bodies such as transport, police, health department and other municipal bodies for a safe environment along the route, which is framed by the coastline boundaries of Goa (Mascarenhas, 1999).

Public policy can also capitalize on the potential of endurance sports for other public goals, like development or health, provided these goals do not undermine the importance given to environmental and benefit-share considerations. Literature on events and policy suggests sports events can provide elements of development policy provided these events become an integrated policy component with a clear local benefit valued by stakeholders alike (Miragaia et al., 2025). This means specific "goals" of sports events, like skill development or contributions to infrastructure, should overlap with "commitments" to minimize risks (International Olympic Committee, 2017).

Another governance issue for the sustainable hosting of events is stakeholder engagement. Cooperation and collective action involving various stakeholders are commonly linked with more sustainable forms of innovation in the area of tourism, especially when there are trade-offs between the interests of the environment and society (Van Ninh and Van Tam, 2026). Institutionalizing stakeholders' feedback, whether before or after the event and establishing grievance procedures may help with legitimacy and adaptive governance over several editions (International Olympic Committee, 2021).

In conclusion, the policy and governance review reveals that the key to sustainability lies not within the policy or policy statements but within the ability of operations, including integrated plans, an environmental policy framework, public reporting systems and engagement processes (Miragaia et al., 2025).

## Discussion

Among the outcomes of this multi-dimensional analysis of the sustainability of Goa as a destination for the Ironman 70.3 competition, it is evident that the interaction between the benefits and the requirements is complex on multiple fronts. On the

environment-friendly aspect, for instance, it confirms the importance of respecting the limitations and capacities set by nature, particularly for coast areas (Zhao, 2023). When events such as endurance races are organized on a regular basis, it is necessary to track the sustainability thresholds for the environment, including the water quality, the condition of beaches and the amounts of waste and wastewater generated (Central Water Commission, 2024; International Olympic Committee, 2024), so far as the negative impacts are kept, as far as possible, within the sustainability bounds by ensuring, through organized capacity control or the adoption of careful schedules, limited disturbances to the ecology (Chen, 2025).

From an economic standpoint, the Goa case shows how endurance events, when integrated with policy and readiness, could act as catalysts for development themselves. Correspondingly, from one angle, criticisms of early sporting tourism ventures have argued that there may be a lack of concern for what might be considered benefit vs. cost, or, put differently, what groups might be better served vs. what groups might be bearing the burden of such tourism ventures. Nevertheless, in terms of countering this, our discussion of this issue always centers on including the local population in a fashion which seeks to ensure that economic benefits (such as travel spending, job creation, worldwide press exposure and so forth) benefit the population being serviced and staying in this one location and not merely being 'spent and gone' unknown and uninterrupted within their home country, beyond simply being noticed in terms of traveler-dollars.

On the infrastructure and community aspect, our results map the significance that while Goa offers a solid foundation to stage an event, it is necessary to exercise prudent management. On one level, the success of staging of the Ironman 70.3 event in Goa, India on earlier occasion indicates that the management of logistics (road closures, health support, management of volunteers) has been satisfactory. Still, if a focus on stage endurance sporting activities is to be continued as regular events in this location, there has to be further improvement and tuning of the infrastructure. One critical aspect here is transportation management: this will require planning related to road closure timings and possible systems to control traffic flow management and alternate routes; further, while hosting sporting activities attached to stage endurance events here will require infrastructure planning to address possible health issues due to high humidity and high temperatures that may require health stations to be augmented. Comparing this situation with the event organised by the Ironman series held at Langkawi, Malaysia, another tropical location similar to Goa, indicates that as a special measure to mitigate health issues to athletes the provision of extra water and ice stations as well as cooling tents has been introduced; this will require innovation from the management of this location as well to better assist athletes who may suffer

from high levels of heat. Another factor to address here is to take care to leave the location after events without causing further harm to the local environment and this will fall under the management of infrastructure and policy compliance. One more aspect that our view here highlights is that while more attention has to focus on building infrastructure here to sustain sporting activities of this type, equal focus has to be placed on an aspect that is often overlooked: this is the aspect that this is not merely an event that has to undertake all activities alone but rather must mobilize local resources as well to address increased health-related issues as suggested here: this will mean that to develop a resource-rich team of event management staff here will become one critical model that can transform current management strategies here to stage sporting activities as regular events without harm to local infrastructure as these local resource persons will revise and implement from event to event here.

One thing that appears evident when comparing the results above with other research is the sustainability trade-offs. It is obvious that Ironman races provide positive trade-offs economically and socially through the influx of tourist dollars, the potential for improvement in physical infrastructure and the promotion of physical wellness among attendees. On the negative side, there are trade-offs related to the sustainability of the environment and society, including emissions, trash and disruption. It may be hypothesized, for the state of Goa, a trade-off could be the burden of tourist traffic on the physical infrastructure for the potential benefits and branding associated with hosting the Ironman competition. It is a matter of striking a balance so that the negative trade-offs remain within acceptable parameters. Necessary steps may include limiting the number attending wherever possible, through tickets, tourism authorities regulating numbers in restricted viewing areas and expanding the races geographically. Also, the matter of adapting for the end effects associated with global warming is becoming paramount. Events associated with coastal regions now include the matter of adapting for the results of global warming, including potential damage from a rise in sea levels, flooding, heatwaves and other related environmental hazards. It does not appear within the research a set amount is dedicated within the planning process for adapting for the effects associated with global warming. It may be hypothesized, through the IOC's planning process for sustainability, they advocate within their planning for adapting for the effects associated with global warming.

Insights gained from comparative analyses of coastal sport tourism confirm that the move to sustainable practice involves pragmatic applications of practice, greater localized engagement and better monitoring and reporting. Evidence for coastal Portugal reflects sustained, although perhaps uneven, adoption of sustainable practices to limit leakages and build greater supplier engagement in coastal areas (Carneiro et al., 2016). The Goa site analysis reveals similar promising developments, which

are likely to require formalizing environmental metrics (waste and emissions) and stakeholder engagement, in addition to weaving cooperation among stakeholders as a sustained governance practice (Venugopalan, 2021). International best practice from island backgrounds can further shape practical design considerations for coastal arenas (Cabildo of Lanzarote, 2025).

One key issue that has emerged again and again is that of sustainability as a continuous process of adaptation and improvement. To achieve sustainability in each edition, there needs to be a continuous process of monitoring, transparency and the ability to adapt to change every year, in line with global sport sustainability best practice (Ironman Group, 2016). Methodologies for the measurement of carbon footprint, applied in the context of triathlon sport governance, can offer key pointers for establishing an adaptive process of continuous monitoring and reporting aiming for improvement (One Carbon World, 2025). With each edition being an opportunity for continuous learning, documenting data for waste amounts, diversion, stakeholder reaction and mitigation performance can contribute to an adaptive management process with better legitimacy in the long term (Melenez-Roman & Font, 2026).

In summary, the case of Goa, it is possible to see both the opportunities and challenges involved in combining endurance sports and sustainability principles in a coastal area. The findings are consistent with those of the literature review: collaboration, limits, empowerment and learning are all crucial. As coastal areas begin to consider the hosting of events of this kind, the example of Goa, where a balance of all these aspects is reached, could provide a significant case study, showing that it is possible, with dedication and imagination, to couple the passion of endurance sports with the principles of sustainable development.

## Conclusion

The Goa experience of organizing Ironman 70.3 triathlon races is one such example of the challenges and opportunities of conducting sustainable sports events in coastal destinations. Taking all of these factors together, this study concludes that Goa is suitable for such activities, given that these activities are designed and conducted in such a manner that their focus is on sustainability. Goa is endowed with quite attractive tourist destinations and the government is quite supportive of organizing such activities in the state. The experience in conducting sports activities is gradually being gained in Goa as well.

Based on the above-discussed findings and analysis, certain recommendations are made to improve the focus on sustainable practices in sports activities, such as:

- Integrate a sustainable events plan: It should include the development and implementation of a comprehensive sustainability plan for managing events and should comprise the following:
- It should lay down the goals and objectives related to the targeted waste diversion rate, emission standards and adherence by the suppliers (International Olympic Committee, 2024).
- The benefits related to sustainability reporting and mainstreaming the data and analysis on a yearly basis to measure improvement and enhance the sustainability performance and standards (One Carbon World, 2024, 2025).
- Maximize Local Economic and Social Benefits: For the event to positively benefit the local community, the developers and the government need to focus on local sourcing, enterprise linkages (food, transport, logistics, accommodation and event services) and retain the benefits locally by reinvesting in the community to create long-lasting effects (Peric et al., 2019). This allows the money to circulate within the local economy and also aids in increasing community acceptance (Ma et al., 2023).
- Enhance collaboration and governance among stakeholders: The creation of a multi-stakeholder collaborative mechanism, whether it involves the sports sector, tourist boards, environmental departments, local administrations, sports organizations, or a representation of the local community, can help in goal integration and the enforcement of coastal regulations to promote risk management and transparency (International Olympic Committee, 2021). This can also enhance understanding, legitimacy and collaboration with a view to cooperative innovation in sustainable tourism practices (Van Ninh & Van Tam, 2026).
- Seize the opportunity for long-term sustainability projects: Instead of treating the Ironman 70.3 as a standalone event, Goa can find ways to link the event for long-term sustainability initiatives. For instance, the Ironman 70.3 can be used as the launching pad for beach cleaning initiatives and/or develop cycling facilities for the residents when the cycling routes used for the Ironman 70.3 competition can be utilized. Tie-in initiatives for the “Swachh Bharat” movement and the “Fit India” campaign, among other initiatives, can be achieved through the Ironman 70.3 competition.

To summarise, a cautious and optimistic conclusion comes from analyzing the viability of hosting an Ironman 70.3 event in a sustainable way in Goa. A state that has all the right elements in its favor and has been proactive about sports tourism and sustainability in all its activities in Goa. At the end of this journey and analysis, the importance of indigenous adaptations in non-traditional environments and

qualitatively balancing developmental needs and natural resource conservation has been established as a set of guidelines that apply to all areas in a coastal environment looking towards leveraging adventure sports in a way that benefits their environment and population without breaking them.

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# Off-Ball Movements of Junior Football Players from Pune City During Corner Kicks: An Observational Study

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**Subham Kumar Singh**

MPEd Student CACPE, Pune.

**Prof. Mahesh Deshpande**

Professor, CACPE, Pune

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## ABSTRACT

*Off-ball movement is a key tactical component in football that significantly influences goal-scoring opportunities and team performance. This study aimed to analyse the off-ball movements of under-19 (U19) football players during corner kicks using a structured observation tool. A sample of 80 under-19 players from ZP school football matches in Pune City was observed. The observation tool categorized offensive runs into near post, far post, and penalty spot movements, while recording outcomes such as goals, shots on target, shots off target, ball loss, fouls, and no involvement. Data were collected through real-time match observations. The results revealed patterns in player positioning, frequency of different types of runs, and their effectiveness in creating scoring opportunities. Findings from this study provide insights into tactical behaviour during set-pieces at the youth level and highlight the importance of systematic off-ball movement analysis for coaching and player development. The observation tool proved to be a reliable and objective method for capturing and evaluating these movements in U19 football matches.*

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**Keywords :** Off-ball movement, Corner kicks, U19 football players, Observation tool, Set-piece analysis, Youth football, Tactical behaviour, Player positioning.

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## Introduction

Football is a dynamic team sport that requires not only technical skills but also tactical awareness and intelligent movement off the ball. Off-ball movement refers to the strategic positioning and movement of players without possession of the ball, aimed at creating space, supporting teammates, and generating goal-scoring opportunities.

In modern football, effective off-ball movements are crucial during set-pieces, particularly corner kicks, where precise positioning and timing can determine the success of an attack.

Set-pieces, including corner kicks, are recognized as critical moments in a match because they often lead to scoring opportunities. The efficiency of these moments depends heavily on players' understanding of space, anticipation of ball trajectory, and ability to execute planned movements. Observing and analysing these movements provides valuable insights into the tactical behaviour of players, especially at the developmental level, such as under-19 (U19) football players.

Despite the importance of off-ball movements, limited research has focused on systematically analysing these actions in youth football. Understanding how U19 players position themselves, execute runs, and respond during corner kicks can help coaches optimize training, improve set-piece strategies, and enhance overall team performance.

For this study, a structured observation tool was developed to systematically record and evaluate offensive players off-ball movements during corner kicks. The tool captures different types of runs, player positioning, and outcomes, providing an objective framework for analysing performance. By applying this tool, the study aims to identify movement patterns, assess effectiveness, and provide actionable insights for coaching and player development in youth football.

## **Methodology**

The present study employed a descriptive observational research design aimed at developing and validating an observation tool to analyse offensive players off-ball movement during corner kick situations in football. The study focused on systematic, non-participant observation of match play without manipulating any variables.

The present study adopted a descriptive and analytical research design. The study aimed to systematically observe, analyse, and compare the off-ball movements of offensive football players during corner kick situations. No experimental manipulation was involved, and data were collected through structured observation. The population of the present study consisted of football players of Pune City who actively participated in organized football competitions at various levels, including 19 above school-level tournaments. The sample for the study comprised 80 Under-19 school football players selected from Zilla Parishad (ZP) inter-school football matches conducted in Pune City. The players were selected using a random sampling technique, and only

those players who were involved in offensive situations during corner kicks were included in the sample.

## **Data Collection Tool**

The data for the present study were collected using a self-designed Off-Ball Movement Observation Tool developed specifically to analyse offensive players off-ball movements during corner kick situations in football matches. The tool was prepared after an extensive review of relevant literature related to football performance analysis and set-piece tactics, along with consultation from subject experts and experienced football coaches. The observation schedule included variables such as type of off-ball run, direction of movement, timing of the run, utilization of space, player positioning, and the outcome of the corner kick. Data were recorded through systematic observation of inter-school football matches, using both real-time match observation and recorded video footage to ensure accuracy and consistency in data collection.

## **Validity**

Content validity of the observation tool was established to ensure that the items included accurately represent the construct of offensive off-ball movement during corner kick situations in football. The development of the tool was grounded in an extensive review of literature related to football tactics, set-piece analysis, performance analysis, and off-ball movement behaviour.

To establish content validity, the preliminary version of the tool was submitted to a panel of subject experts consisting of experienced football coaches, university-level physical education professors, and scholars specializing in football performance analysis and research methodology. The experts were requested to evaluate each item of the tool based on relevance, clarity, comprehensiveness, and appropriateness for analysing offensive off-ball movement during corner kicks.

Suggestions provided by the experts regarding modification, deletion, or inclusion of items were carefully reviewed. Necessary corrections were made to improve clarity, eliminate ambiguity, and enhance the tactical relevance of movement categories and outcome measures. After incorporating expert feedback, the final version of the observation tool was deemed content valid and appropriate for systematic data collection in football research.

## **Reliability**

Reliability of the Off-Ball Movement Observation Tool was established through repeated self-verification by the researcher. The researcher is an experienced football player and

a certified football coach, which contributed to accurate identification and consistent interpretation of offensive off-ball movements during corner-kick situations. The tool was applied multiple times by the same researcher using standardized observation procedures during both real-time match observation and recorded video analysis of international football matches. Repeated observations of identical situations at different time intervals ensured consistency in recording movement categories and outcomes. Clearly defined operational definitions, uniform coding criteria, and the researcher's domain expertise minimized observer bias and confirmed intra-observer reliability of the observation tool.

### **Pilot Testing**

A pilot study was conducted to test the feasibility and effectiveness of the self-designed off-ball movement observation tool. The pilot observations were carried out on Under-19 Bishop's School zone football matches, where teams from different zones competed against each other. In addition, selected international football matches were analysed using recorded video footage obtained from YouTube. Both live match situations and recorded videos were used to observe offensive off-ball movements during corner kick situations. The pilot study helped in refining the observation variables, improving clarity in recording off-ball movement patterns, and ensuring the practical applicability of the tool before its final use in the main study.

### **Procedure of Research Study**

The data collection procedure was carried out systematically during Under-19 Zilla Parishad (ZP) inter-school football matches conducted in Pune City. Prior permission was obtained from the concerned tournament organizers before data collection. Selected matches were observed live at the venue. During each match, only corner kick situations taken by the attacking team were considered for analysis. The offensive players off-ball movements were carefully observed and recorded using the self-designed off-ball movement observation tool. Multiple observations of the same corner kick situations were conducted to ensure accuracy and consistency of data. The collected data were then organized, tabulated, and prepared for further statistical analysis.

## Data Analysis

**Table 1.1** : *Off-ball Movement and Outcome Observed Data*

S. N.	Off-ball Movement	Goal Scored	Shot on Target (no goal)	Shot off target	Ball Lost	Foul	No Involvement	Total
1	<b>Near post run</b>	2	2	8	4	0	8	24
2	<b>Far post run</b>	0	0	5	2	0	6	13
3	<b>Penalty spot run</b>	1	1	2	0	1	8	13
4	<b>Edge of the box</b>	0	0	3	1	0	5	9
5	<b>Circling</b>	0	0	1	1	2	3	7
6	<b>Dummy run</b>	0	0	0	0	0	3	3
7	<b>Blocking</b>	0	0	0	0	0	3	3
8	<b>Crowding the goalkeeper</b>	0	0	0	1	0	3	4
9	<b>Decoy position</b>	0	0	1	0	0	1	2
10	<b>Rebound</b>	0	1	1	0	0	0	2
	<b>Total</b>	<b>3</b>	<b>4</b>	<b>21</b>	<b>9</b>	<b>3</b>	<b>40</b>	<b>80</b>

The analysis of off-ball movements during corner kicks reveals distinct patterns and outcomes across different types of runs. The near post run was the most frequently attempted movement, accounting for 30% of all observations, and resulted in 2 goals, 2 shots short on target, 8 off-target attempts, and 4 instances of losing the ball, with 8 instances of no involvement, indicating moderate effectiveness in creating scoring opportunities. Far post runs and penalty spot runs were attempted less frequently; while penalty spot runs produced one goal, far post runs did not result in any goals, highlighting the importance of precise timing and positioning for these movements. Edge-of-box runs, circling, and crowding the goalkeeper showed low scoring effectiveness and often resulted in no involvement, suggesting these movements function more to create space or disrupt defenders than to directly score. Movements such as dummy runs, blocking, and decoy positions had minimal direct involvement and no goals, emphasizing their tactical role in facilitating teammates rather than generating scoring chances. Overall, only 3 out of 80 movements (3.75%) resulted

in goals, while half of all movements (50%) led to no involvement, underscoring the challenge of converting off-ball movements into direct scoring. These findings indicate that while movements like near post and penalty spot runs have some scoring potential, the majority of off-ball movements serve strategic purposes, such as creating space, distracting defenders, or supporting teammates. Therefore, training should focus on improving timing, positioning, and coordinated team movements to enhance the effectiveness of these off-ball strategies during corner kicks. Descriptive statistics such as frequency and percentage were used for data analysis

## Conclusion And Recommendations

The study of off-ball movements during corner kicks in U19 football players from Pune City reveals that different types of movements serve distinct tactical purposes. Near post runs were the most frequent and moderately effective in creating scoring opportunities, while far post and penalty spot runs showed limited goal-scoring outcomes, emphasizing the importance of timing and positioning. Movements such as edge-of-box runs, circling, dummy runs, blocking, and decoy positions had minimal direct involvement in scoring, indicating their primary role is to support teammates, create space, or disrupt defenders. Overall, only a small fraction of movements (3.75%) directly resulted in goals, while half of all movements (50%) led to no involvement, highlighting that off-ball movements are largely strategic rather than directly goal-oriented. Based on these findings, it is recommended that coaches focus on improving the timing and positioning of key runs, utilize supporting movements strategically to create space, implement coordinated team drills simulating corner-kick scenarios, and employ video analysis for feedback to enhance player awareness and tactical decision-making. Additionally, continuous performance monitoring of off-ball movement efficiency can help identify strengths and areas for improvement, ultimately enhancing the effectiveness of set-piece strategies in youth football.

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# Development and Validation of Changeover Recovery Strategy Assessment Tools in Competitive Tennis Players (16–25 Years)

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**Mr. Tanmay Shirish Nandurdikar**

M.P.Ed. Students, MMCACPE

**Dr. Sopan Kangane**

Principal, MMCACPE

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## ABSTRACT

*Changeover recovery plays a subtle yet decisive role in performance regulation in competitive tennis. Although players routinely engage in physical, mental, and tactical recovery behaviours during these brief intervals, systematic tools to assess such practices remain limited. The present study aimed to develop and validate context-specific research instruments in the form of a structured questionnaire and an observational schedule to assess changeover recovery strategies among competitive tennis players aged 16–25 years.*

*Tool development followed a structured multi-phase methodology involving literature review, preliminary observation of elite match play, expert consultation, and pilot testing. Recovery domains such as hydration behaviour, breathing regulation, posture and movement, emotional control, self-talk, tactical planning, and environmental interaction were identified and operationalised into measurable indicators. Content and face validity were established through evaluation by eight subject experts from sports coaching, sports science, and physical education. Expert feedback resulted in refinement of language, clarity, domain balance, and age appropriateness.*

*The final questionnaire consisted of 32 items distributed across physical, mental, tactical, and open-ended sections, while the observation schedule enabled systematic recording of visible recovery behaviours during changeovers. Pilot testing confirmed feasibility and clarity of both tools. The developed instruments provide researchers, coaches, and sports scientists with standardised means to assess changeover recovery behaviours and support evidence-based performance enhancement strategies in tennis.*

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**Keywords** : Changeover recovery, Tennis, Tool development, Questionnaire validation, Observation schedule

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## Introduction

Tennis is an intermittent, high-intensity sport characterised by repeated explosive movements interspersed with brief recovery periods. Players must simultaneously manage physical fatigue, emotional fluctuations, and tactical decision-making across extended match durations. Unlike team sports, tennis offers limited opportunities for structured recovery, making the changeover period a critical phase for short-term restoration and performance recalibration.

During changeovers, players may engage in hydration, controlled breathing, stretching, equipment adjustment, emotional regulation, visualisation, and tactical planning. While such practices are widely acknowledged within coaching and performance settings, their assessment remains largely informal, subjective, and inconsistent. Existing research in tennis has primarily focused on physiological demands, match load, and injury profiles, with comparatively limited emphasis on systematic evaluation of recovery behaviours during changeovers.

The absence of validated assessment tools restricts both scientific investigation and applied coaching practice. This limitation is particularly evident among players aged 16–25 years, a transitional developmental phase during which athletes move from supervised junior participation to independent competitive performance and recovery management. Therefore, there is a need for structured, validated tools that can capture both self-reported and observable recovery strategies during changeovers in competitive tennis.

## Methodology

The study adopted a tool development and validation research design, focusing on the systematic construction, expert validation, and pilot testing of instruments designed to assess changeover recovery strategies in tennis.

### Development of the Questionnaire

An extensive review of literature related to tennis physiology, recovery strategies, sport psychology, and match behaviour was conducted to identify key recovery domains relevant to changeovers. Based on this review and preliminary observations, recovery strategies were categorised into physical, mental, and tactical domains.

An initial pool of questionnaire items was developed using simple and player-friendly language suitable for the 16–25 years age group. The draft questionnaire was evaluated by eight subject experts from the fields of sports coaching, sports science, and physical education. Experts assessed the items for relevance, clarity, redundancy, and practical applicability. Based on expert feedback, items were revised, reworded, or eliminated to ensure clarity, balance across domains, and age appropriateness.

The final questionnaire comprised 32 items distributed across four sections: physical recovery (12 items), mental recovery (7 items), tactical recovery (8 items), and open-ended responses (5 items). Pilot testing was conducted on competitive tennis players to assess clarity, comprehension, and feasibility in competitive settings.

### **Development of the Observation Schedule**

An observation schedule was developed to systematically record visible recovery behaviours during changeovers. Preliminary observation of an elite-level tennis match (Isner vs. Mahut, Wimbledon 2010) was conducted to identify observable recovery behaviours. These behaviours were grouped into domains such as hydration and nutrition, posture and movement, breathing and stretching, equipment handling, emotional expression, and interaction with the competitive environment.

Each domain was operationalised into specific, observable indicators suitable for live match observation. The observation schedule was reviewed by subject experts for objectivity, clarity, and feasibility. Field application during local competitive matches confirmed its usability without disrupting match flow.

### **Population and Sample**

The population comprised competitive tennis players aged 16–25 years and subject experts from sports coaching, sports science, and physical education. Purposive sampling was used to select eight experts for content and face validation. Competitive tennis players within the specified age range were selected through convenience sampling for pilot testing of the questionnaire.

### **Results**

Expert evaluation confirmed strong content relevance across all identified recovery domains. Suggested modifications primarily related to item clarity, simplification of language, and elimination of redundancy. Pilot testing revealed high levels of comprehension and ease of administration among players. The observation schedule enabled systematic and objective recording of recovery behaviours during changeovers without interfering with match dynamics.

## Discussion

The findings of the study indicate that structured assessment of changeover recovery strategies is both feasible and meaningful in competitive tennis contexts. The combination of self-reported questionnaire data and direct observational assessment provides a comprehensive understanding of recovery behaviours. The tools developed in this study address a significant gap in tennis performance research by offering validated instruments specifically designed for changeover recovery assessment.

Focusing on players aged 16–25 years enhances the applicability of the tools to athlete development, as this stage represents a critical transition towards performance autonomy and self-regulated recovery practices. The tools may assist coaches and sport scientists in identifying effective recovery behaviours and areas requiring intervention.

## Conclusion

The present study successfully developed and validated a structured questionnaire and an observation schedule to assess changeover recovery strategies in competitive tennis players aged 16–25 years. The tools demonstrated strong content relevance, clarity, and practical feasibility. Their application can facilitate systematic analysis of recovery behaviours and contribute to evidence-based performance enhancement strategies in tennis.

## Recommendations

Based on the findings of the study, the following recommendations are made:

1. Coaches and sport scientists may use the developed tools to monitor and improve players' recovery behaviours during competition.
2. Tennis academies may incorporate changeover recovery education into athlete development programmes.
3. Future studies should examine the reliability and construct validity of the tools on larger and more diverse samples.
4. Researchers may explore relationships between changeover recovery strategies, fatigue indicators, and match performance outcomes.

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## १४ वर्ष वयोगटातील तायक्वांदो खेळाडूंच्या किकिंग वेगाचा स्फोटक शक्ती व लवचिकतेशी असलेझ सहसंबंध

**Mr. Omkar Bhopale**

Researcher

**Prof. Dr. Yogesh Bodke**

CACPE, Pune

### ABSTRACT

Taekwondo is a sport based on speed, power, and precision of movement. Among various performance components, kicking speed is considered one of the most important factors influencing competitive success. During adolescence, rapid development of physical abilities occurs; therefore, it becomes essential to study the factors associated with kicking speed in this age group.

The purpose of the present study was to determine the relationship of kicking speed with explosive strength and flexibility among 14-year-old taekwondo players. For this study, thirty taekwondo players were selected using the purposive sampling method. Kicking speed was measured using an appropriate kicking speed criterion. Explosive strength was assessed through the Standing Broad Jump, while flexibility was measured using the Sit and Reach Test.

The obtained scores were converted into ranks, and the Spearman Rank Order Correlation method was applied for statistical analysis. The results revealed a significant positive correlation between kicking speed and explosive strength. A positive but comparatively moderate correlation was also found between kicking speed and flexibility.

The findings of the study indicate that the development of kicking speed in taekwondo players requires a balanced contribution of both explosive strength and flexibility. Therefore, training programs for adolescent taekwondo players should emphasize systematic development of these physical components to enhance overall performance.

**Keywords :** Taekwondo, Kicking Speed, Explosive Strength, Flexibility, Spearman Rank Order Correlation

## सारांश

तायक्रांदो हा वेग, शक्ती व हालचालींच्या अचूकतेवर आधारित खेळ आहे. या खेळामध्ये किर्किंग वेग हा खेळाडूच्या कामगिरीचा अत्यंत महत्वाचा घटक मानला जातो. किशोरावस्थेतील खेळाडूंमध्ये शारीरिक क्षमतांचा वेगाने विकास होत असल्यामुळे या वयोगटात किर्किंग वेगाशी संबंधित घटकांचा अभ्यास करणे आवश्यक ठरते.

सदर अभ्यासाचा उद्देश १४ वर्ष वयोगटातील तायक्रांदो खेळाडूंच्या किर्किंग वेगाचा स्फोटक शक्ती व लवचिकतेशी असलेला सहसंबंध निश्चित करणे हा होता. या संशोधनासाठी ३० तायक्रांदो खेळाडूंची हेतुपूर्वक नमुना पद्धतीने निवड करण्यात आली. किर्किंग वेग मोजण्यासाठी योग्य कसोटीचा वापर करण्यात आला. स्फोटक शक्तीसाठी स्टँडिंग ब्रॉड जंप व लवचिकतेसाठी सिट अँड रीच या कसोट्यांचा वापर करण्यात आला. प्राप्त गुणांना क्रमांक देऊन स्पिअरमन रँक ऑर्डर सहसंबंध पद्धतीचा वापर करण्यात आला. विश्लेषणातून किर्किंग वेग व स्फोटक शक्ती यांच्यात लक्षणीय सकारात्मक सहसंबंध आढळून आला. तसेच किर्किंग वेग व लवचिकता यांच्यातही सकारात्मक सहसंबंध आढळून आला, परंतु तो तुलनेने मध्यम स्वरूपाचा होता. या निष्कर्षांवरून असे स्पष्ट होते की तायक्रांदो खेळाडूंच्या किर्किंग वेगाच्या विकासासाठी स्फोटक शक्ती व लवचिकता या दोन्ही घटकांचा समन्वय आवश्यक आहे.

**महत्वाच्या सज्ञा :** तायक्रांदो, किर्किंग वेग, स्फोटक शक्ती, लवचिकता, स्पिअरमन रँक ऑर्डर सहसंबंध.

## प्रस्तावना

तायक्रांदो हा आधुनिक काळातील वेग, शक्ती, संतुलन आणि हालचालींच्या अचूकतेवर आधारित एक लोकप्रिय मार्शल आर्ट खेळ आहे. कोरियामधून उदयास आलेला हा खेळ आज ऑलिम्पिक स्तरावर मान्यता प्राप्त करून आंतरराष्ट्रीय क्रीडा क्षेत्रात विशेष महत्व प्राप्त करत आहे. तायक्रांदो खेळामध्ये प्रामुख्याने पायांच्या तंत्रांचा वापर केला जातो आणि त्यामुळे किर्किंग कौशल्य हे खेळाडूच्या एकूण कामगिरीचे मुख्य आधारस्तंभ मानले जाते (Bridge et al., 2014).

स्पर्धात्मक तायक्रांदोमध्ये किर्किंग वेग हा निर्णायक घटक ठरतो. वेगवान किकमुळे प्रतिस्पर्ध्याला प्रतिक्रिया देण्यासाठी कमी वेळ उपलब्ध होतो, परिणामी गुण मिळवण्याची शक्यता वाढते. अनेक संशोधनांमध्ये असे आढळून आले आहे की किर्किंग वेग जितका अधिक प्रभावी असेल, तितकी खेळाडूची स्पर्धात्मक कामगिरी अधिक उत्कृष्ट ठरते (Falco et al., 2009). म्हणूनच किर्किंग वेग हा केवळ तांत्रिक घटक नसून तो शारीरिक क्षमतांशी थेट संबंधित असलेला कार्यात्मक घटक आहे.

किर्किंग वेगाच्या निर्मितीसाठी विविध शारीरिक घटकांचा समन्वय आवश्यक असतो. यामध्ये स्नायूंची स्फोटक शक्ती, सांध्यांची हालचालक्षमता, लवचिकता, समन्वय व न्यूरोमस्क्युलर नियंत्रण यांचा समावेश होतो. स्फोटक शक्ती म्हणजे अल्प कालावधीत जास्तीत जास्त शक्ती निर्माण करण्याची क्षमता असून ती तायक्रांदोमधील किर्किंग हालचालीसाठी अत्यंत आवश्यक असते (Bompa, 1999). पायांचे स्नायू, विशेषतः कूल्हा व मांडी भागातील स्नायू, किकच्या गतीत महत्त्वपूर्ण भूमिका बजावतात.

त्याचप्रमाणे लवचिकता ही किर्किंग हालचालीची श्रेणी वाढविण्यास मदत करते. योग्य लवचिकतेअभावी किकची उंची, वेग व अचूकता मर्यादित राहू शकते. तसेच अपुरी लवचिकता दुखापतींचा धोका वाढवते (Alter, 2004). त्यामुळे तायक्रांदो खेळाडूसाठी लवचिकता हा सहाय्यक परंतु अत्यंत आवश्यक घटक मानला जातो. किशोरावस्था ही शारीरिक व मानसिक विकासाच्या दृष्टीने अत्यंत संवेदनशील अवस्था आहे. १४ वर्ष वयोगटामध्ये स्नायूंची ताकद, समन्वय क्षमता आणि हालचालींचे नियंत्रण वेगाने विकसित होत असते. या टप्प्यावर वैज्ञानिक पद्धतीने प्रशिक्षण दिल्यास खेळाडूंच्या क्रीडा क्षमतांचा पाया अधिक भक्कम होऊ शकतो (Malina et al., 2004). म्हणूनच या वयोगटातील खेळाडूंमध्ये किर्किंग वेगाशी संबंधित शारीरिक घटकांचा अभ्यास करणे महत्वाचे ठरते.

आजच्या प्रशिक्षण पद्धतींमध्ये अनेकदा वेग, शक्ती व लवचिकता स्वतंत्रपणे विकसित केली जाते. मात्र या घटकांमधील परस्परसंबंधाचा अभ्यास केल्यास प्रशिक्षण अधिक परिणामकारक, उद्दिष्टाधारित आणि वैज्ञानिक स्वरूपाचे बनू शकते. सहसंबंधात्मक अभ्यासांमुळे कोणते घटक कामगिरीवर अधिक प्रभाव टाकतात हे स्पष्टपणे समजते (Verma, 2016).

याच पार्श्वभूमीवर सदर संशोधनामध्ये १४ वर्ष वयोगटातील तायक्रांदो खेळाडूंच्या किर्किंग वेगाचा स्फोटक शक्ती व लवचिकतेशी असलेला सहसंबंध स्पिरामन रँक ऑर्डर सहसंबंध पद्धतीच्या सहाय्याने अभ्यासण्याचा प्रयत्न करण्यात आला आहे. हा अभ्यास प्रशिक्षक, शारीरिक शिक्षण तज्ज्ञ आणि क्रीडा वैज्ञानिकांना किशोर वयोगटासाठी अधिक प्रभावी प्रशिक्षण नियोजन करण्यास मार्गदर्शक ठरेल.

या संशोधनाचे उद्दिष्ट १४ वर्ष वयोगटातील तायक्रांदो खेळाडूंच्या किर्किंग वेगाचा स्फोटक शक्ती व लवचिकतेशी असलेला सहसंबंध स्पिरामन रँक ऑर्डर सहसंबंध पद्धतीच्या सहाय्याने अभ्यास करणे होते.

## संशोधन पद्धत

सदर अभ्यास सहसंबंधात्मक संशोधन पद्धतीवर आधारित होता. या संशोधनामध्ये चलांमधील परस्परसंबंध निश्चित करण्यावर भर देण्यात आला.

या संशोधनासाठी १४ वर्ष वयोगटातील ३० तायक्रांदो खेळाडूंची हेतुपूर्वक नमुना पद्धतीने निवड करण्यात आली. सर्व निवडलेल्या खेळाडूंना किमान दोन वर्षांचा तायक्रांदो प्रशिक्षणाचा अनुभव होता. नमुन्यातील सर्व खेळाडू नियमित प्रशिक्षणात सहभागी होते.

वापरलेल्या कसोट्या

घटक	वापरलेली कसोटी
किर्किंग वेग	किर्किंग वेग कसोटी
स्फोटक शक्ती	स्टॅडिंग ब्रॉड जंप कसोटी
लवचिकता	सिट अँड रीच कसोटी

प्राप्त माहितीचे विश्लेषण करण्यासाठी स्पिअरमन रँक ऑर्डर सहसंबंध पद्धतीचा वापर करण्यात आला. सर्व गुणांना क्रमांक (Rank) देऊन सहसंबंध निश्चित करण्यात आला. महत्वाची पातळी 0.05 निश्चित करण्यात आली.

### सदर संशोधन पुढील टप्प्यांमध्ये पूर्ण करण्यात आले :

- प्रथम तायक्रांदो खेळाशी संबंधित संशोधन साहित्य, ग्रंथ, जर्नल्स व पूर्वीचे अभ्यास यांचा सखोल आढावा घेण्यात आला. त्यानंतर संशोधनाचा विषय निश्चित करून उद्दिष्टे ठरविण्यात आली.
- यानंतर १४ वर्ष वयोगटातील तायक्रांदो खेळाडूंची हेतुपूर्वक नमुना पद्धतीने निवड करण्यात आली. निवडलेल्या खेळाडूंना संशोधनाच्या स्वरूपाची माहिती देण्यात आली व त्यांची संमती घेण्यात आली. माहिती संकलनासाठी सर्व कसोट्या एकाच मैदानावर व समान परिस्थितीत राबविण्यात आल्या. प्रथम खेळाडूंना आवश्यक वॉर्म-अप करून घेण्यात आला. त्यानंतर किर्किंग वेग कसोटी घेण्यात आली. प्रत्येक खेळाडूला निश्चित वेळ व संधी देण्यात आली आणि सर्वोत्तम प्रयत्नाची नोंद करण्यात आली.
- यानंतर स्फोटक शक्ती मोजण्यासाठी स्टॅडिंग ब्रॉड जंप कसोटी घेण्यात आली. खेळाडूंना दोन प्रयत्न देण्यात आले व त्यामधील सर्वोत्तम कामगिरी नोंदविण्यात आली. पुढील टप्प्यात लवचिकतेसाठी सिट अँड रीच कसोटी घेण्यात आली.

- सर्व कसोट्यांमधून प्राप्त झालेल्या गुणांची स्वतंत्र नोंद घेण्यात आली. नंतर या गुणांना क्रमांक देऊन स्पिरमन रँक ऑर्डर सहसंबंध पद्धतीने सांख्यिकीय विश्लेषण करण्यात आले.
- विश्लेषणानंतर निष्कर्ष मांडण्यात आले व त्यावर आधारित चर्चा सादर करण्यात आली.

**तक्ता १ :** किर्किंग वेग व स्फोटक शक्ती यांतील स्पिरमन सहसंबंध

चल	नमुना (N)	$\rho$ मूल्य	निष्कर्ष
किर्किंग वेग $\times$ स्फोटक शक्ती	30	0.88	लक्षणीय

तक्ता क्रमांक 1 मधील माहितीवरून असे दिसून येते की 14 वर्ष वयोगटातील तायक्रांदो खेळाडूंच्या किर्किंग वेग व स्फोटक शक्ती यांच्यात  $\rho = 0.68$  असा सकारात्मक व लक्षणीय सहसंबंध आढळून आला. हा सहसंबंध 0.05 पातळीवर महत्त्वपूर्ण असल्यामुळे असे निष्कर्ष काढण्यात आले की स्फोटक शक्तीमध्ये वाढ झाल्यास किर्किंग वेगामध्येही लक्षणीय सुधारणा होते. यावरून स्फोटक शक्ती हा किर्किंग वेगाचा प्रमुख घटक असल्याचे स्पष्ट झाले.

**तक्ता २ :** किर्किंग वेग व लवचिकता यांतील स्पिरमन सहसंबंध

चल	नमुना (N)	$\rho$ मूल्य	निष्कर्ष
किर्किंग वेग $\times$ स्फोटक शक्ती	30	0.68	मध्यम

तक्ता क्रमांक 2 मधील माहितीवरून असे आढळून आले की किर्किंग वेग व लवचिकता यांच्यात  $\rho = 0.42$  असा सकारात्मक सहसंबंध आढळून आला. हा सहसंबंध 0.05 पातळीवर महत्त्वपूर्ण असला तरी तो स्फोटक शक्तीच्या तुलनेत मध्यम स्वरूपाचा होता.

यावरून असे स्पष्ट झाले की लवचिकता ही किर्किंग वेगासाठी थेट निर्णायक घटक नसून ती सहाय्यक घटक म्हणून कार्य करते.

**निष्कर्ष :** सदर संशोधनामध्ये १४ वर्ष वयोगटातील तायक्रांदो खेळाडूंच्या किर्किंग वेगाचा स्फोटक शक्ती व लवचिकतेशी असलेला सहसंबंध अभ्यासण्यात आला. स्पिरमन रँक ऑर्डर सहसंबंध पद्धतीद्वारे प्राप्त निष्कर्षांच्या आधारे पुढील निष्कर्ष काढण्यात आले.

१. १४ वर्ष वयोगटातील तायक्रांदो खेळाडूंच्या किर्किंग वेग व स्फोटक शक्ती यांच्यात लक्षणीय सकारात्मक सहसंबंध आढळून आला. यावरून असे स्पष्ट झाले की स्फोटक शक्तीमध्ये वाढ झाल्यास किर्किंग वेगामध्येही सुधारणा होण्याची शक्यता अधिक असते.

२. किर्किंग वेग व लवचिकता यांच्यातही सकारात्मक सहसंबंध आढळून आला; तथापि हा सहसंबंध स्फोटक शक्तीच्या तुलनेत मध्यम स्वरूपाचा होता. यावरून लवचिकता ही किर्किंग वेगासाठी सहाय्यक घटक म्हणून कार्य करते हे स्पष्ट झाले.
३. अभ्यासातून असे दिसून आले की प्रभावी किर्किंग वेगासाठी केवळ तांत्रिक कौशल्य पुरेसे नसून संबंधित शारीरिक क्षमतांचा समन्वय आवश्यक आहे.
४. किशोर वयोगटातील खेळाडूंमध्ये स्फोटक शक्ती व लवचिकतेचा वैज्ञानिक पद्धतीने विकास केल्यास किर्किंग कार्यक्षमतेत लक्षणीय सुधारणा साधता येऊ शकते.
५. सदर संशोधनाने तायक्रांदो प्रशिक्षण प्रक्रियेमध्ये शारीरिक घटकांचे महत्त्व अधोरेखित केले असून प्रशिक्षकांनी प्रशिक्षण नियोजन करताना या घटकांचा समतोल राखणे आवश्यक असल्याचे स्पष्ट झाले. एकूणच, १४ वर्ष वयोगटातील तायक्रांदो खेळाडूंच्या किर्किंग वेगाच्या विकासासाठी स्फोटक शक्ती व लवचिकता हे दोन महत्वाचे शारीरिक घटक असल्याचे सदर अभ्यासातून निष्पन्न झाले.

## चर्चा

अभ्यासातून किर्किंग वेग व स्फोटक शक्ती यांच्यात लक्षणीय सकारात्मक सहसंबंध आढळून आला किक करताना मांडी व पायांच्या स्नायूंमधून निर्माण होणारी स्फोटक शक्ती थेट किकच्या गतीवर परिणाम करते. स्नायूंनी अल्प वेळेत अधिक शक्ती निर्माण केल्यास किकचा वेग वाढतो, हे तत्वा प्रशिक्षणशास्त्रात मान्य करण्यात आले आहे (, १९९९). त्यामुळे स्फोटक शक्ती व किर्किंग वेग यांच्यात दृढ सहसंबंध आढळणे अपेक्षितच होते.

या निष्कर्षावरून असे स्पष्ट झाले की ज्या खेळाडूंमध्ये पायांच्या स्नायूंची स्फोटक शक्ती अधिक प्रभावी होती, त्यांचा किर्किंग वेग तुलनेने जास्त आढळून आला. यावरून प्लायोमेट्रिक व्यायाम, जम्प ट्रेनिंग व वेगाधारित सराव यांचे महत्त्व अधोरेखित होते.

तसेच अभ्यासातून किर्किंग वेग व लवचिकता यांच्यात सकारात्मक परंतु मध्यम स्वरूपाचा सहसंबंध आढळून आला. लवचिकता ही हालचालींच्या श्रेणी वाढवून किक अधिक सहज, प्रवाही व अडथळारहित पार पाडण्यास मदत करते. योग्य लवचिकतेमुळे स्नायूंमध्ये अनावश्यक ताण कमी होतो आणि हालचालींची गती सुधारते (, २००४). तथापि, लवचिकता ही थेट वेग निर्माण करणारी क्षमता नसून ती सहाय्यक घटक म्हणून कार्य करते. त्यामुळे तिचा सहसंबंध स्फोटक शक्तीपेक्षा तुलनेने कमी आढळणे शास्त्रीयदृष्ट्या योग्य ठरते.

किशोरावस्थेतील खेळाडूंमध्ये न्यूरो-मस्क्युलर प्रणालीचा विकास चालू असतो. या टप्प्यावर स्नायू शक्ती व लवचिकता यांचा योग्य समतोल साधल्यास किर्किंग हालचाली अधिक प्रभावी बनतात. सदर संशोधनाचे

निष्कर्ष इत्यादी (२००४) यांच्या मताशी सुसंगत असून त्यांनी किशोर वयोगटातील शारीरिक क्षमतांचा कौशल्यविकासावर होणारा परिणाम अधोरेखित केला आहे.

एकूणच, सदर संशोधनातील निष्कर्ष तायक्रांदो प्रशिक्षण प्रक्रियेला वैज्ञानिक आधार देणारे ठरले. स्फोटक शक्ती ही किर्किंग वेगाचा प्रमुख निर्धारक घटक असल्याचे स्पष्ट झाले, तर लवचिकता ही सहाय्यक व पूरक भूमिका बजावत असल्याचे आढळले. त्यामुळे किशोर तायक्रांदो खेळाडूंसोठी संतुलित व नियोजित प्रशिक्षण कार्यक्रम राबविण्याची गरज या अभ्यासातून अधोरेखित झाली.

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# जागतिक आरोग्य संघटनेच्या धोरणावर आधारित शाळांमधील शारीरिक क्रियाशीलतेचा अभ्यास

डॉ. शरद आहेर

प्राध्यापक, महाराष्ट्रीय मंडळाच्या चंद्रशेखर आगाशे शारीरिक शिक्षण महाविद्यालय पुणे

## गोषवारा

आजच्या काळात विद्यार्थ्यांमध्ये शारीरिक निष्क्रियता (Physical Inactivity) ही संपूर्ण जगातील एक गंभीर सार्वजनिक आरोग्य समस्या बनली आहे. जागतिक आरोग्य संघटनेच्या (WHO) अहवालानुसार जगभरातील ८०% पेक्षा जास्त विद्यार्थी दररोज आवश्यक असलेल्या ६० मिनिटांच्या शारीरिक क्रियाशीलतेच्या शिफारसी पूर्ण करत नाहीत. या गंभीर पार्श्वभूमीवर, WHO ने "Promoting Physical Activity Through Schools" हे धोरणात्मक डॉक्युमेंट तयार केले आहे, कारण शाळा हे विद्यार्थ्यांना नियमित शारीरिक क्रियाशील राहण्यासाठी सर्वात योग्य व्यासपीठ आहे. या धोरणानुसार शाळांनी "Whole-of-School Approach" स्वीकारणे आवश्यक आहे, ज्यामध्ये संपूर्ण दिवसभर मुलांना सक्रिय ठेवले जाते. प्रस्तुत संशोधन पेपरचे प्रमुख उद्दिष्ट महाराष्ट्रातील शाळांमध्ये या जागतिक आरोग्य संघटनेच्या मार्गदर्शक तत्वांची प्रत्यक्ष अंमलबजावणी कशी होते आणि विद्यार्थ्यांना शारीरिक क्रियाशीलतेच्या कोणत्या संधी दिल्या जातात, या प्रश्नांची उत्तरे शोधणे हे आहे. या अभ्यासासाठी वर्णनात्मक सर्वेक्षण संशोधन पद्धतीचा अवलंब करण्यात आला. महाराष्ट्रातील विविध भागांमध्ये इंटरनेटशिपसाठी गेलेल्या महाराष्ट्रीय मंडळाच्या चंद्रशेखर महाविद्यालयातील बीपीएड द्वितीय वर्षातील ९६ विद्यार्थी शिक्षकांमार्फत WHO च्या धोरणातील प्रमुख घटकांवर आधारित संरचित प्रश्नावलीचा (गुगल फॉर्मद्वारे) वापर करून माहिती संकलित करण्यात आली.

संशोधनाचे प्रमुख निष्कर्ष असे दर्शवतात की, महाराष्ट्रातील शाळांमध्ये WHO च्या धोरणांची अंमलबजावणी मध्यम स्तरावर आहे. शाळांमध्ये क्रीडा साहित्य आणि पायाभूत सुविधांचा अभाव, शारीरिक शिक्षणाला दुय्यम स्थान आणि अभ्यासक्रमकेंद्री दबाव हे शारीरिक क्रियाशीलतेतील मोठे अडथळे आहेत. त्यामुळे विद्यार्थ्यांना सक्रिय, निरोगी आणि सक्षम बनवण्यासाठी शाळा, शिक्षक, पालक आणि समाज या सर्वांनी एकत्र येऊन "Whole-of-School" दृष्टिकोन अधिक प्रभावीपणे स्वीकारणे आवश्यक आहे.

**महत्वाच्या सज्ञा :** शारीरिक क्रियाशीलता, शारीरिक निष्क्रियता, सक्रिय प्रवास, मधली सुट्टी कार्यक्रम

## प्रस्तावना

आजच्या काळात विद्यार्थ्यांमध्ये शारीरिक निष्क्रियता (Physical Inactivity) ही संपूर्ण जगातील एक गंभीर सार्वजनिक आरोग्य समस्या बनली आहे. जागतिक आरोग्य संघटनेच्या (WHO) अहवालानुसार जगभरातील ८०% पेक्षा जास्त विद्यार्थी दररोज आवश्यक असलेल्या ६० मिनिटांच्या शारीरिक क्रियाशीलतेच्या शिफारसी पूर्ण करत नाहीत. आधुनिक जीवनशैली, स्क्रीन-टाइम मध्ये झालेली वाढ, शहरीकरण आणि सुरक्षित खेळण्याच्या मैदानांचा अभाव यामुळे ही समस्या अधिक गंभीर होत आहे. या पार्श्वभूमीवर जागतिक आरोग्य संघटनेने "Promoting Physical Activity Through Schools" हे महत्त्वपूर्ण धोरणात्मक डॉक्युमेंट तयार केले आहे. हे डॉक्युमेंट शाळांमधून नियमित शारीरिक क्रियाशीलतेला प्रोत्साहन देण्यासाठी शाळेमध्ये काय उपाय योजना करता येतील याचे मार्गदर्शन करते.

## शाळा : शारीरिक क्रियाशीलतेसाठी सर्वात प्रभावी स्थान

UNICEF च्या आकडेवारीनुसार जगभरातील जवळपास १ अब्ज मुले रोज शाळेत जातात. घराबाहेर मुलं जास्त वेळ ज्या ठिकाणी घालवतात ती म्हणजे शाळा, त्यामुळे शाळा हे विद्यार्थ्यांना नियमित शारीरिक क्रियाशील राहण्यासाठी सर्वात योग्य व्यासपीठ आहे. जागतिक आरोग्य संघटनेच्या धोरणानुसार शाळांनी "Whole-of-School Approach" स्वीकारणे आवश्यक आहे. म्हणजेच शाळेतील वेळापत्रक, सुविधा, शिक्षक प्रशिक्षण, कुटुंब आणि समाज यांच्या सहभागातून संपूर्ण दिवसभर मुलांना क्रियाशील/सक्रिय ठेवणे. काही अभ्यासानुसार शैक्षणिक कार्यमान मिळविण्यासाठी विद्यार्थ्यांचे आरोग्य चांगले असणे आवश्यक आहे. तसेच शारीरिक हालचालींचा आणि बौद्धिक कार्यमान, एकाग्रता यांचा जवळचा संबंध आहे जे शिकण्याची क्षमता आणि शैक्षणिक यश सुधारण्यास योगदान देतात. खेळात सहभाग घेतल्याने केवळ शारीरिकच नव्हे तर मानसिक, भावनिक आणि सामाजिक फायदे देखील मिळू शकतात.

## शारीरिक क्रियाशीलता वाढवण्यासाठी शाळांमध्ये प्रभावी ठरणारे सहा घटक

जागतिक आरोग्य संघटनेने खालील सहा प्रमुख उपाय सुचविले आहेत:

१. **गुणवत्तापूर्ण शारीरिक शिक्षण :** गुणवत्तापूर्ण शारीरिक शिक्षण (QPE) यामध्ये मुख्यत्वे मूलभूत क्रीडा कौशल्ये खेळ, तसेच आजीवन शारीरिक क्रियाशीलता आणि आरोग्य टिकवण्यासाठी आवश्यक आरोग्यविषयक वर्तनांची माहिती यांचे शिक्षण समाविष्ट असावे. शारीरिक शिक्षण (PE) या विषयाच्या माध्यमातून शाळेत दिवसभरामध्ये शारीरिक क्रियाशीलता वाढवण्याची एक महत्त्वाची संधी मिळते.

शारीरिक शिक्षणामुळे बहुसंख्य विद्यार्थ्यांपर्यंत पोहोचणे शक्य होते, तसेच आरोग्यदायी शारीरिक उपक्रमांचे महत्त्व विद्यार्थ्यांपर्यंत पोहोचवता येते.

याद्वारे विद्यार्थ्यांना विविध आणि संतुलित प्रकारच्या शारीरिक उपक्रमांमध्ये प्रावीण्य मिळवण्यासाठी संधी मिळते, ज्यामुळे ते सक्रिय राहण्यात आनंद मानू शकतात. विद्यार्थ्यांमध्ये शारीरिक क्रियाशीलतेबाबतचा आत्मविश्वास आणि कौशल्य विकसित केल्याने ते स्वतःहून आणि त्यांच्या मोकळ्या वेळेतही सक्रिय राहण्याची शक्यता अधिक वाढते. त्यामुळे गुणवत्तापूर्ण शारीरिक शिक्षणाबरोबरच शारीरिक शिक्षण तासांची आठवड्यातील संख्याही वाढविणे गरजेचे आहे. सध्या शालेय अभ्यासक्रमात विविध विषयांचा होणारा अंतर्भाव यामुळे शारीरिक शिक्षणासाठी एका वर्गाला दोन ते तीन तासांचा आठवड्यामध्ये मिळतात. ही संख्या खूप कमी आहे. कारण जागतिक आरोग्य संघटनेच्या मानकानुसार प्रत्येक शालेय विद्यार्थ्यांने दररोज किमान ६० मिनिट शारीरिक हालचाली करणे आवश्यक आहे. विद्यार्थ्यांवरील अतिरिक्त अभ्यासाचा ताण कमी करण्यासाठी शारीरिक शिक्षण या विषयाला वेळापत्रक चांगले स्थान मिळणे अनिवार्य आहे.

२. **सक्रिय प्रवास (Active Travel) :** सक्रिय प्रवास म्हणजे दैनंदिन प्रवासासाठी कार, मोटारसायकल, यांसारख्या वाहनांच्या ऐवजी पायी चालणे, सायकल चालवणे किंवा इतर कोणतेही शारीरिक श्रमावर आधारित प्रवासाचे साधन वापरणे होय. यामध्ये सार्वजनिक वाहतूक देखील समाविष्ट असू शकते, कारण या प्रवासामध्ये बस, ट्रेन किंवा इतर प्रकारच्या वाहतुकीत जाण्यासाठी अनेकदा शारीरिक हालचालींची आवश्यकता असते. बहुतेक विद्यार्थ्यांसाठी, जिथे शाळेत जाण्यासाठी आणि शाळेतून घरी जाण्यासाठी सक्रिय प्रवास सुरक्षित असतो, याद्वारे दैनंदिन शारीरिक हालचाल वाढवण्याची सवय लागण्याची शक्यता वाढते. सर्व शाळांनी विद्यार्थी, पालक आणि कर्मचाऱ्यांसाठी शाळेत येण्या जाण्यासाठीचा प्रवास सक्रिय, अधिक सुरक्षित आणि शाश्वत करण्यासाठी उपाययोजना कराव्यात. या दिशेने एक महत्त्वाचे पाऊल म्हणजे सक्रिय प्रवास योजना राबवणे. उदा. शाळा/महाविद्यालयांनी आठवड्यातून एक दिवस असा ठरवावा ज्या दिवशी विद्यार्थी आणि शिक्षक चालत, सायकलने व सार्वजनिक वाहतुकीने शाळेत येतील.

३. **शाळेपूर्वी व शाळेनंतर सक्रिय कार्यक्रम (Before After School Programmes) :** शालेय अभ्यासक्रमाच्या व्यतिरिक्त विद्यार्थ्यांना शारीरिक क्रियेशीलतेच्या संधी या कार्यक्रमाच्या माध्यमातून देता येऊ शकतात. शाळेच्या वेळमध्ये विविध विषयांचा अंतर्भाव असल्यामुळे शारीरिक शिक्षणासाठी आठवड्यातून दोन ते तीन दिवसच येतात त्यामुळे शाळेमध्ये विद्यार्थ्यांच्या हालचालींना बऱ्याच मर्यादा येतात परंतु शाळा पूर्व व नंतर सक्रिय कार्यक्रमाद्वारे ही समस्या दूर केले जाऊ शकते. भारतातील बऱ्याच शाळांमध्ये अशा प्रकारचे उपक्रम घेतले जातात. ज्यामुळे विद्यार्थ्यांना पुरेसा वेळ शारीरिक हालचालीसाठी अथवा खेळण्यासाठी मिळतो. काही शाळांमध्ये हा कार्यक्रम

मोफत आहे तर काही शाळा यासाठी वेगळी फी आकारतात. हे उपक्रम सर्व विद्यार्थ्यांना उपलब्ध असावेत मोफत किंवा अत्यल्प खर्चात जेणेकरून प्रत्येक मुलाला त्याचा लाभ मिळू शकेल.

४. **मधली सुट्टी कार्यक्रम (Recess Physical Activity) :** शालेय वेळापत्रकामध्ये मधली सुट्टी वेगवेगळ्या कालावधीची असते. ती १० ते २० मिनिटे पर्यंत असते. निरीक्षण केले असता असे दिसते की मधल्या सुट्टी मध्ये विद्यार्थी आपल्या सहकाऱ्यांबरोबर मनसोक्तपणे खेळत असतात. मधल्या सुट्टी मध्ये विद्यार्थी किती सक्रिय असतात किंवा कोणकोणते उपक्रम करतात यावर काही संशोधनेही झालेली आहेत. त्यामुळे विद्यार्थ्यांच्या दिवसभरातील शारीरिक क्रियाशीलतेची पातळी वाढविण्यासाठी मधली सुट्टी कार्यक्रम हा परिणामकारक ठरू शकतो. मधली सुट्टी कार्यक्रमांमध्ये शारीरिक शिक्षण शिक्षकाने कुठल्याही प्रकारचे औपचारिक शारीरिक शिक्षण न राबविता विद्यार्थ्यांच्या अनौपचारिक हालचाली कशा होतील, विद्यार्थी विविध उपक्रम करण्यासाठी प्रेरित कसे होतील यासाठी उपाय योजना कराव्या. त्यासाठी विद्यार्थ्यांना दोरीवरच्या उड्या, वेगवेगळ्या खेळाचे चेंडू, लगोरी ई साहित्य उपलब्ध करून दिल्यास विद्यार्थी निश्चितच त्यांना जो वेळ मिळतो त्यामध्ये सक्रिय राहण्याची शक्यता वाढते. त्याचबरोबर सगळेच विद्यार्थी जर विविध उपक्रम करू लागले तर मैदानावर गर्दी होऊन दुखापती होण्याची शक्यता वाढते म्हणून वेगवेगळ्या खेळासाठी किंवा उपक्रमांसाठी वेगवेगळ्या जागा उपलब्ध असतील तर त्या शिक्षकांनी निश्चित करून द्याव्या. जेणेकरून सगळ्यांना विविध उपक्रमांचा आनंद घेता येईल. मधली सुट्टी कार्यक्रमांमध्ये विद्यार्थ्यांना विविध उपक्रम निवडण्याची मुभा असावी. मधली सुट्टी कार्यक्रम सुरू असताना शारीरिक शिक्षकांनी पर्यवेक्षण, निरीक्षण करावे. मधली सुट्टी कार्यक्रम सुरू करताना शालेय व्यवस्थापनाला कळवावे तसेच त्याची पूर्वतयारी केल्यास त्याचे चांगले परिणाम मिळतील.

५. **सक्रिय वर्गखोल्या (Active Classrooms) :** शाळेच्या वेळेत वर्गामध्ये शारीरिक क्रियाशीलता विविध पद्धतीने वाढविता येऊ शकते. उदाहरणार्थ-

- शाळेच्या वेळापत्रकातील प्रत्येक तासानंतर ३-५ मिनिटांचे लहान शारीरिक क्रियाशीलतेचे ब्रेक देणे. फिनलँड या देशात अशा प्रकारचा उपक्रम राबवला जातो. त्या ठिकाणी प्रत्येक तासानंतर विद्यार्थ्यांना १० ते १५ मिनिटांचा ब्रेक असतो ज्यामध्ये विद्यार्थी मैदानावर जाऊन विविध शारीरिक हालचाली करतात. दोन तासांच्या मध्ये अशा प्रकारचा ब्रेक असल्यामुळे विद्यार्थी पुढच्या तासाला अधिक चांगला प्रतिसाद देतात आणि त्यांचे अध्ययन चांगले होते असेही अभ्यासांती निदर्शनास आले आहे.
- शैक्षणिक विषयांच्या अध्यापनात शारीरिक क्रियाशीलता समाविष्ट करणे, जसे की, गणित शिकताना उड्या मोजणे किंवा खोलीभर चाललेले पावले मोजून अंतराचा अंदाज लावणे. नवीन

शैक्षणिक धोरणामध्ये सक्रिय अध्ययन (Active Learning), कृतीयुक्त अध्ययन यासारख्या अध्यापन पद्धतींचा आग्रह धरला आहे. त्यामुळे विद्यार्थ्यांचे अध्ययन हे अधिक परिणामकारक होते असे संशोधनाद्वारे सिद्ध झालेले आहे. त्यामुळे मराठी, हिंदी, इंग्रजी, इतिहास, भूगोल, विज्ञान अशा विविध विषयांचे अध्यापन करताना शारीरिक क्रियाशीलतेची जोड दिल्यास विद्यार्थ्यांचे शिकणं अधिक चांगले होईल व विद्यार्थ्यांची क्रियाशीलता पातळीही वाढेल.

- वर्गखोल्यांची रचना बदलणे, ज्यामुळे शारीरिक क्रियाशीलता वाढेल किंवा बसून राहण्याचा वेळ कमी होईल उदा. स्टँडिंग डेस्क, हलके व्यायाम करता येणारी साधने, किंवा बाहेरील जागांचा वापर करणे.

**हे उपक्रम मुख्यत :** वर्गशिक्षकांच्या मार्गदर्शनाखाली राबवले जातात. विद्यार्थी दिवसातून बराच वेळ बसून राहतात, त्यामुळे अशा सक्रिय वर्गखोल्या बसून राहण्याचा वेळ कमी करतील आणि त्यांच्या शारीरिक क्रियाशीलतेवर तसेच शैक्षणिक परिणामांवर सकारात्मक प्रभाव पडेल.

६. **सर्वसमावेशकता (Inclusive Physical Activity) :** UNESCO च्या International Charter of Physical Education, Physical Activity and Sport या मध्ये असा स्पष्ट उल्लेख आहे की "शारीरिक शिक्षण, शारीरिक क्रियाशीलता आणि क्रीडा यांचा सराव हा प्रत्येकाचा मूलभूत हक्क आहे." शाळांची जबाबदारी आहे की त्यांनी प्रत्येक विद्यार्थ्यांच्या शारीरिकदृष्ट्या दुर्बल असो किंवा अत्यंत कुशल असो त्यांच्या विशिष्ट गरजांना अनुरूप असा अभ्यासक्रम उपलब्ध करून द्यावा. जगभरात १४ वर्षांखालील ९३ ते १५० लक्ष इतकी मुलं दिव्यांग आहेत. अनेक देशांनी दिव्यांग मुलांचा शैक्षणिक वातावरणातील सहभाग सुलभ करण्यासाठी वैयक्तिक शिक्षण योजना (Individual Education Plans - IEPs) हा उपाय स्वीकारलेला आहे. उदाहरणार्थ, अमेरिकेत राष्ट्रीय स्तरावर असे धोरण आहे की, प्रत्येक शाळेने दिव्यांग विद्यार्थ्यांच्या शारीरिक शिक्षणाच्या गरजा पूर्ण करणे अनिवार्य आहे.

शारीरिक क्रियाशीलता ही केवळ आरोग्यासाठीच नव्हे तर विद्यार्थ्यांच्या सर्वांगीण विकासासाठी आवश्यक आहे. जागतिक आरोग्य संघटनेच्या मार्गदर्शक तत्वांनुसार शाळांनी "Whole-of-School" दृष्टिकोन स्वीकारल्यास विद्यार्थ्यांमध्ये वाढणाऱ्या स्थूलतेवर नियंत्रण येऊ शकेल, मानसिक स्वास्थ्य सुधारेल आणि शैक्षणिक कामगिरी यांवर लक्षणीय सकारात्मक परिणाम होऊ शकतो. शाळा, शिक्षक, पालक आणि समाज या सर्वांनी एकत्र येऊन विद्यार्थ्यांना सक्रिय, निरोगी आणि सक्षम बनवणे ही आजची गरज आहे. परंतु सध्या शाळांमध्ये यापैकी कोणत्या उपाययोजना केल्या जातात? विद्यार्थ्यांना शारीरिक क्रियाशीलतेच्या कोणकोणत्या संधी दिल्या जातात? शारीरिक शिक्षणासाठी आठवड्यातून किती तास दिले जातात? शाळेपूर्वी व शाळेनंतर

सक्रिय कार्यक्रम होतात का? अशा विविध प्रश्नांची उत्तरे शोधणे हे प्रस्तुत संशोधन पेपरचे प्रमुख उद्दिष्ट आहे.

## संशोधन पद्धती

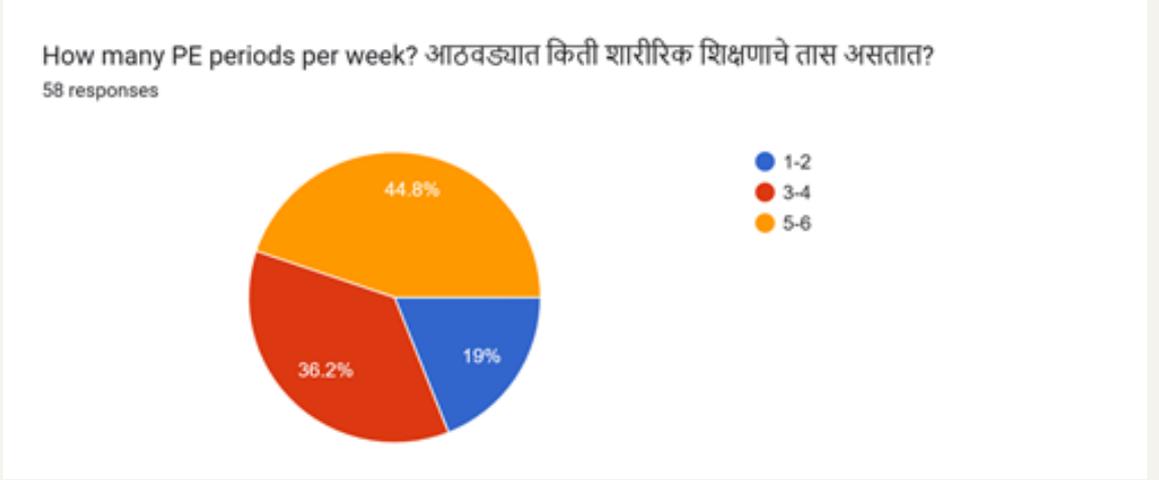
सदर अभ्यासामध्ये जागतिक आरोग्य संघटनेच्या "Promoting Physical Activity Through Schools" या धोरणात्मक दस्तऐवजाच्या संदर्भात शाळा-आधारित शारीरिक क्रियाशीलतेच्या पद्धतीचा अभ्यास करण्यासाठी वर्णनात्मक सर्वेक्षण संशोधन पद्धतीचा अवलंबण्यात आला आहे.

यासंबंधी महाराष्ट्रातील विविध शाळांमध्ये प्रत्यक्ष वस्तुस्थिती काय आहे हे अभ्यासण्यासाठी महाराष्ट्रीय मंडळाच्या चंद्रशेखर महाविद्यालयातील बीपीएड द्वितीय वर्षातील ९६ विद्यार्थी शिक्षक जे इंटरनॅशनल साठी महाराष्ट्रातील विविध भागात गेलेले आहेत त्यांच्यामार्फत माहिती संकलित केली. माहिती संकलनासाठी जागतिक आरोग्य संघटनेच्या धोरणातील प्रमुख घटकांवर आधारित इंग्रजी व मराठी भाषेत विकसित केलेली संरचित प्रश्नावली वापरण्यात आली. ही प्रश्नावली गुगल फॉर्मच्या माध्यमातून वितरित करण्यात आली. प्रश्नावली बंदिस्त (Close ended) व खुल्या (Open ended) अशा दोन्हीही प्रकारच्या प्रश्नांचा समावेश होता. प्रश्नावलीमध्ये पुढील विभागांचा समावेश होता: शाळेविषयी सामान्य माहिती, शारीरिक शिक्षणाच्या तासांची उपलब्धता व वारंवारिता, वर्गखोल्यांमधील शारीरिक क्रियाशीलतेच्या पद्धती, शाळेनंतरचे व शाळेबाहेरील शारीरिक उपक्रम, सक्रिय प्रवासाच्या (Active Travel) पद्धती, दिव्यांग विद्यार्थ्यांचा शारीरिक शिक्षण व क्रीडेमधील समावेश, शाळा प्रशासन व शिक्षकांचा शारीरिक क्रियाशीलतेसाठी पाठिंबा, इंटरनॅशनल विद्यार्थ्यांची मते व सूचना

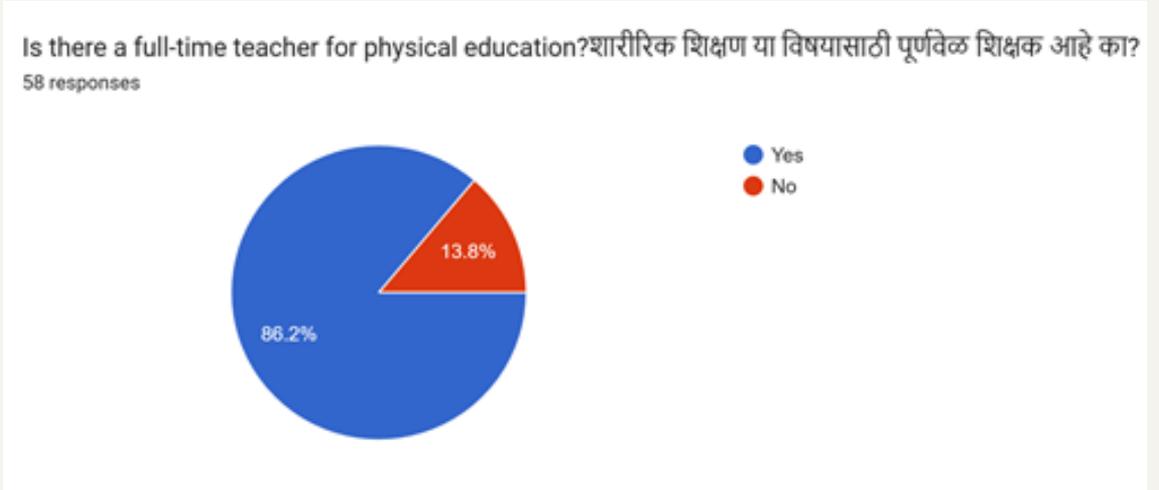
इंटरनॅशनल विद्यार्थ्यांना त्यांच्या शाळेतील प्रत्यक्ष निरीक्षण आणि शाळेतील कर्मचारीवर्गाशी संवादाच्या आधारे प्रश्नावली भरावयाच्या स्पष्ट सूचना देण्यात आल्या. उत्तरांमध्ये तर्क किंवा अंदाज न करता शाळेतील प्रत्यक्ष कार्यपद्धती प्रतिबिंबित व्हाव्यात याची दक्षता घेण्यात आली. सर्व प्रतिसाद निश्चित कालावधीत संकलित करण्यात आले.

## विश्लेषण आणि अर्थनिर्वचन

प्रस्तुत संशोधनात मिळालेल्या माहितीचे विश्लेषण खालील प्रमाणे



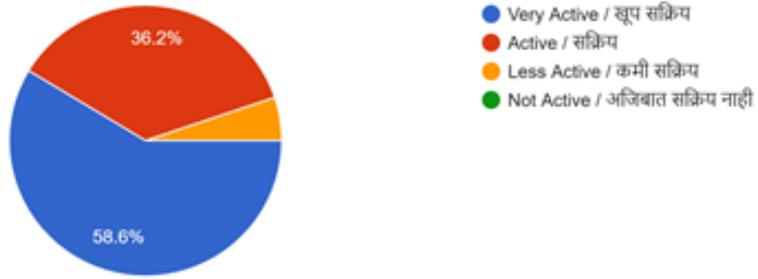
वरील माहितीनुसार ४४.८% शाळांमध्ये आठवड्यातून ३-४ शारीरिक शिक्षणाचे तास होतात, ३६.२% शाळांमध्ये ५-६ तास होतात, तर १९% शाळांमध्ये केवळ १-२ तास घेतले जातात. यावरून काही शाळांमध्ये समाधानकारक तासांची संख्या असली तरी सर्व शाळा जागतिक आरोग्य संघटनेच्या शिफारशीशी सुसंगत नाहीत, असे दिसते.



वरील माहितीनुसार ८६ % शाळांमध्ये पूर्णवेळ शारीरिक शिक्षण आहे तर १४% शाळांमध्ये नाही पूर्णवेळ शारीरिक शिक्षणाचा शिक्षक नाही.

Do students actively participate in PE classes? विद्यार्थी PE तासांमध्ये सक्रियपणे सहभाग घेतात का?

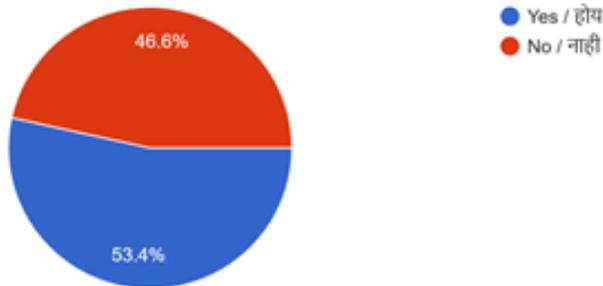
58 responses



विद्यार्थ्यांचा सहभाग पाहता ५९ % विद्यार्थी 'खूप सक्रिय', तर ३६% विद्यार्थी 'सक्रिय' असल्याचे आढळले. निष्कर्ष दर्शवितात की योग्य संधी मिळाल्यास विद्यार्थी मोठ्या प्रमाणात शारीरिक उपक्रमांमध्ये सहभागी होतात.

Are short physical activity breaks (3-5 min) used during classroom teaching? वर्गाध्यापनामध्ये 3-5 मिनिटांचे शारीरिक हालचालीचे ब्रेक घेतले जातात का?

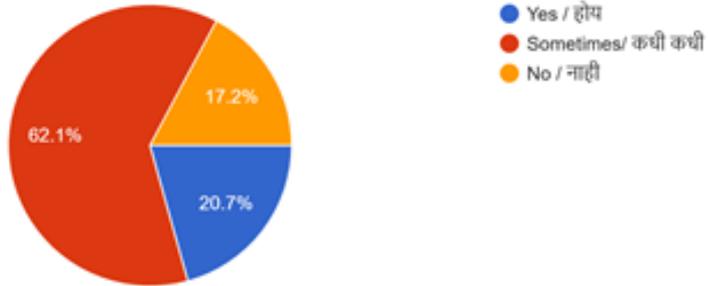
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५३% शाळांमध्ये वर्गाध्यापनादरम्यान लहान शारीरिक ब्रेक घेतले जातात, तर ४७% शाळांमध्ये असे ब्रेक घेतले जात नाहीत. यावरून Active Classroom संकल्पना अद्याप अर्धवट अंमलात असल्याचे दिसते.

Is physical activity integrated with academic subjects? इतर विषयांचे अध्यापन करताना विषय शिक्षक (गणित, भाषा इ.) शारीरिक हालचालींचा अंतर्भाव करतात का ?

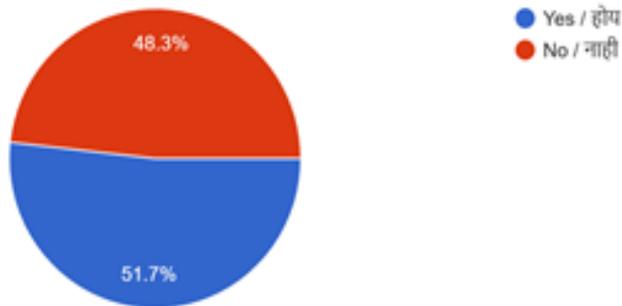
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फक्त २१ % शाळांमध्ये शैक्षणिक विषयांमध्ये शारीरिक हालचालींचा समावेश केला जातो, ६२ % ठिकाणी कधीकधी, तर १७% शाळांमध्ये अजिबात समावेश नाही. हा निष्कर्ष आंतरविषयक अध्यापनाच्या कमतरतेकडे लक्ष वेधतो.

Does the school conduct Before or after-school sports/physical activities? शाळा भरायच्या अगोदर किंवा नंतर क्रीडा किंवा शारीरिक उपक्रम होतात का?

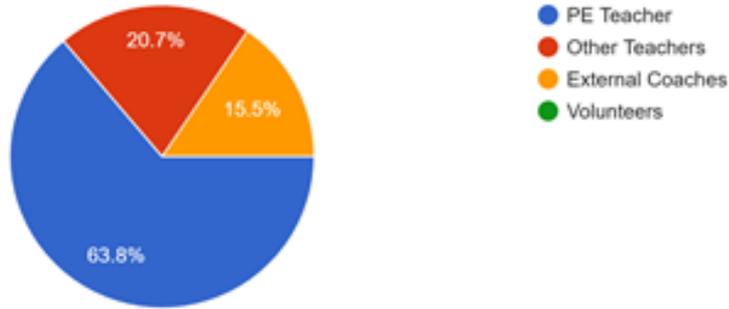
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५२% शाळांमध्ये before/after-school शारीरिक उपक्रम उपलब्ध आहेत, तर ४८% शाळांमध्ये असे उपक्रम नाहीत. त्यामुळे अनेक विद्यार्थ्यांना शाळेच्या वेळेव्यतिरिक्त शारीरिक क्रियाशीलतेच्या संधी मर्यादित आहेत.

## Who conducts these activities? हे उपक्रम कोण घेतात?

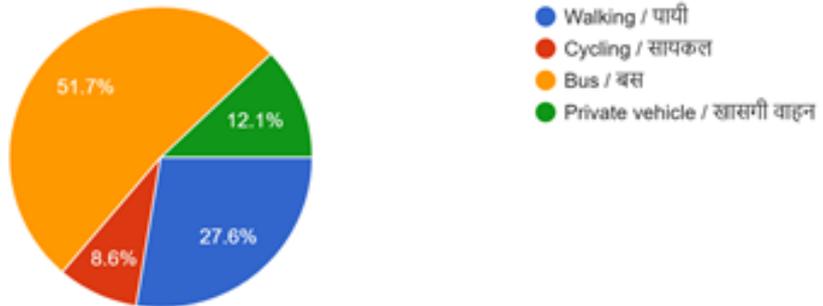
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उपलब्ध उपक्रमांपैकी ६४% शाळेत हे उपक्रम शारीरिक शिक्षण शिक्षकांद्वारे घेतले जातात, २०.७% इतर शिक्षकांद्वारे, तर केवळ १५.५% शाळेत हे उपक्रम बाह्य प्रशिक्षकांमार्फत घेतले जातात.

## How do most students travel to school? बहुतेक विद्यार्थी शाळेत कसे येतात?

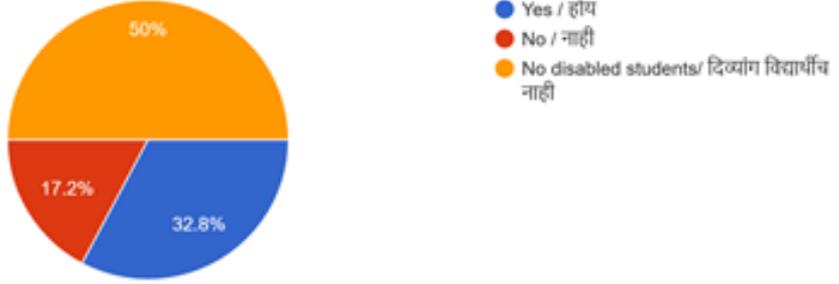
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वरील माहितीनुसार ५२ % विद्यार्थी बसने, २८% खासगी वाहनांनी, तर फक्त १२ % पायी आणि ९ % सायकलने शाळेत येतात. यावरून Active Travel चा वापर अत्यल्प असल्याचे स्पष्ट होते.

Are students with disability included in PE and sports? दिव्यांग विद्यार्थ्यांचा शा.शि व क्रीडेमध्ये समावेश होतो का?

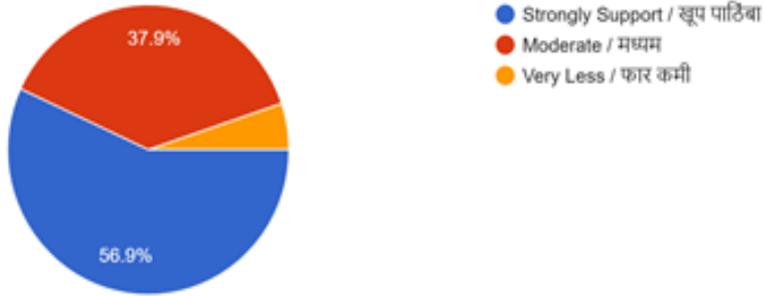
58 responses



३३% शाळांमध्ये दिव्यांग विद्यार्थ्यांचा समावेश शारीरिक शिक्षण व क्रीडेमध्ये केला जातो, १७% शाळांमध्ये शारीरिक शिक्षण व क्रीडेमध्ये दिव्यांग विद्यार्थ्यांचा समावेश केला जात नाही, तर ५०% शाळांमध्ये दिव्यांग विद्यार्थ्यांच नाहीत. हा निष्कर्ष समावेशक शारीरिक शिक्षणाच्या दृष्टीने मध्यम पातळीची अंमलबजावणी दर्शवितो.

Do you think the school management supports physical activities? तुमच्या मते शाळा व्यवस्थापन शारीरिक उपक्रमांना पाठिंबा देते का?

58 responses



६०% प्रतिसादकांच्या मते शाळा व्यवस्थापनाचा शारीरिक उपक्रमांना खूप पाठिंबा आहे, तर ३८% प्रतिसादकांच्या मते मध्यम पाठिंबा असल्याचे आढळले. शारीरिक उपक्रमांनी शाळा व्यवस्थापन चांगला पाठिंबा देत आहे ही सकारात्मक बाब समोर येते.

सदर अभ्यासामध्ये गुगल फॉर्म मधील खुल्या प्रकारच्या प्रश्नांद्वारे (open-ended responses) इंटरनेटिप विद्यार्थ्यांकडून शाळांमधील शारीरिक क्रियाशीलतेबाबतची मते, निरीक्षणे व सूचना संकलित करण्यात

आल्या. प्राप्त प्रतिसादांचे विषयानुसार (thematic) विश्लेषण करण्यात आले. त्यातून खालील प्रमुख विषय (themes) पुढे आले:

### १. क्रीडा साहित्य व पायाभूत सुविधांचा अभाव

बहुतेक प्रतिसादांमध्ये शाळांमध्ये योग्य क्रीडा साहित्य, मैदान व सुविधा अपुऱ्या असल्याचे स्पष्टपणे नमूद करण्यात आले आहे. "Equipment, ground", "शाळेमध्ये आवश्यक क्रीडा साहित्य असावे", "ग्राउंड कमी आहे" अशा प्रतिक्रियांमधून पायाभूत सुविधांचा अभाव हा शारीरिक क्रियाशीलतेतील मोठा अडथळा असल्याचे दिसून येते.

### २. शारीरिक शिक्षणाच्या तासांची मर्यादित संख्या

अनेक प्रतिसादांमध्ये शारीरिक शिक्षणासाठी दिलेला वेळ अपुरा असल्याचे नमूद करण्यात आले. विशेषतः इयत्ता ९वी-१०वी मध्ये शारीरिक शिक्षणाचे तास कमी किंवा नसणे, तसेच आठवड्यातून एकदाच ३०-३५ मिनिटांचा तास असणे, यामुळे विद्यार्थ्यांची शारीरिक क्रियाशीलता कमी होत असल्याचे निरीक्षण नोंदवले गेले.

### ३. प्रशिक्षित शारीरिक शिक्षण शिक्षकांची कमतरता

काही शाळांमध्ये पूर्णवेळ शारीरिक शिक्षण शिक्षक नसल्याचे नमूद करण्यात आले. "The student want to learn but there is no PE teacher" अशा प्रतिक्रियांमधून शिक्षकांच्या अनुपस्थितीमुळे उपक्रम प्रभावीपणे राबवले जात नसल्याचे स्पष्ट होते.

### ४. अभ्यासक्रमकेंद्री दबाव व शारीरिक शिक्षणाला दुय्यम स्थान

गुणात्मक प्रतिसादांमधून असे आढळले की शाळांमध्ये गणित, विज्ञान यांसारख्या विषयांना जास्त महत्त्व दिले जाते आणि शारीरिक शिक्षणाला दुय्यम स्थान मिळते. काही ठिकाणी शारीरिक शिक्षणाचा तास इतर विषयांसाठी वापरला जातो, असेही नमूद करण्यात आले आहे.

### ५. विद्यार्थ्यांची सकारात्मक वृत्ती व सहभागाची तयारी

महत्त्वाची बाब म्हणजे, अनेक प्रतिसादांमध्ये विद्यार्थी खेळात सहभागी होण्यास उत्सुक असतात असे स्पष्टपणे नमूद झाले आहे. "मुल खेळात खूप इच्छुक असतात", "They are very excited to play" या प्रतिक्रियांमधून विद्यार्थ्यांमध्ये नैसर्गिक प्रेरणा असल्याचे दिसते.

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# व्हॉलीबॉल अंडरहँड पास कौशल्याच्या मुल्यमापनासाठी प्रमाणित रेटिंग स्केलची निर्मिती

हृषिकेश मराठे

संशोधक

प्रो. डॉ. योगेश बोडके

प्राध्यापक, महाराष्ट्रीय मंडळाच्या चंद्रशेखर आगाशे शारीरिक शिक्षण महाविद्यालय पुणे

## ABSTRACT

*In volleyball, the underhand pass is considered one of the most fundamental and essential skills, particularly for effective serve reception, defence, and setting the ball accurately for attack. Despite its importance, the evaluation of underhand passing skill is often based on subjective observation, which limits a clear understanding of the skill acquisition process and the identification of specific technical strengths and weaknesses. In this context, the present study aimed to standardize a 5-point rating scale developed for the objective assessment of volleyball underhand passing skill.*

*The primary purpose of the study was to analyse the acquisition of the underhand pass skill and to establish the validity and reliability of the developed rating scale. A descriptive research design was adopted for the study. The sample consisted of selected volleyball players from sports complexes in the Maharashtra Mandala, Pune. The underhand passing skill was assessed using a researcher-developed 5-point rating scale. The scale included ten key technical components: preparatory stance, footwork, hand grip, point of contact, body coordination, directional control, height control, accuracy, consistency, and overall performance.*

*Content validity of the rating scale was established through expert judgment and a review of relevant coaching and skill-analysis literature. Reliability of the scale was examined using the test-retest method and inter-rater reliability, wherein assessments were conducted under similar conditions and by multiple trained observers. The results indicated a high level of agreement across observations, confirming the consistency of the measurement tool.*

The findings of the study suggest that the developed rating scale is valid, reliable, and practical for assessing volleyball underhand passing skill. The scale provides coaches, physical education teachers, and researchers with a systematic and objective tool to evaluate skill performance, monitor learning progression, and enhance training interventions. It also offers significant value for research related to skill acquisition and performance analysis in volleyball.

**Keywords** : Volleyball, Underhand Pass, Rating Scale, Skill Acquisition, Standardization

## सारांश

व्हॉलीबॉल खेळामध्ये अंडरहँड पास हे कौशल्य खेळाच्या सुरुवातीपासूनच अत्यंत महत्वाचे मानले जाते. रिसिंह, बचाव व सेटरकडे अचूक चेंडू पाठविण्यासाठी या कौशल्याचे प्रभावी अधिग्रहण आवश्यक असते. तथापि, अंडरहँड पास कौशल्याचे मूल्यमापन बहुतेक वेळा व्यक्तिनिष्ठ निरीक्षणावर आधारित असल्याने कौशल्य शिकण्याच्या प्रक्रियेतील सूक्ष्म तांत्रिक बाबी स्पष्टपणे समोर येत नाहीत. या पार्श्वभूमीवर प्रस्तुत संशोधनामध्ये व्हॉलीबॉल अंडरहँड पास कौशल्याचे वस्तुनिष्ठ, विश्वासाह व शास्त्रीय मूल्यमापन करण्याच्या दृष्टीने विकसित केलेल्या ५- पॉइंट रेटिंग स्केलचे प्रमाणित करण्यात आले आहे.

या संशोधनाचा मुख्य उद्देश अंडरहँड पास कौशल्य संपादनाचे विश्लेषण करणे तसेच विकसित रेटिंग स्केलची वैधता व स्वविश्वसनीयता निश्चित करणे हा होता. या अभ्यासासाठी वर्णनात्मक संशोधन पद्धतीचा अवलंब करण्यात आला. महाराष्ट्रीय मंडळ क्रीडा संकुलातील निवडक व्हॉलीबॉल खेळाडू या संशोधनाचा न्यादर्श होते. अंडरहँड पास कौशल्याचे मूल्यमापन करण्यासाठी संशोधकाने स्वतः विकसित केलेली रेटिंग स्केल संशोधन साधन म्हणून वापरण्यात आला. या स्केलमध्ये तयारीची स्थिती, पायांची हालचाल, हातांची पकड, शरीर समन्वय, दिशानियंत्रण, उंची नियंत्रण, अचूकता, सातत्य व एकूण कामगिरी असे दहा महत्वाचे तांत्रिक घटक समाविष्ट आहेत.

रेटिंग स्केलची आशय वैधता तज्ञ प्रशिक्षक व संबंधित साहित्याच्या आधारे निश्चित करण्यात आली, तर टेस्ट रिटेस्ट आणि इंटर टेस्टर रिलायबिलिटी पद्धतींचा वापर करून स्वविश्वसनीयता तपासण्यात आली. निष्कर्षांवरून सदर रेटिंग स्केल वैध, विश्वसनीय आणि प्रशिक्षण व संशोधनासाठी उपयुक्त असल्याचे स्पष्ट झाले. हा स्केल खेळाडू अंडरहँड पास कौशल्य कशा पद्धतीने शिकतो हे समजून घेण्यासाठी तसेच प्रशिक्षण प्रक्रियेत सुधारणा करण्यासाठी प्रभावी साधन ठरू शकतो.

## महत्वाच्या सज्ञा : व्हॉलीबॉल, अंडरहँड पास, रेटिंग स्केल, कौशल्य अधिग्रहण, मानकीकरण

### प्रस्तावना

व्हॉलीबॉल हा जगभर खेळला जाणारा वेगवान, तांत्रिक व सांघिक स्वरूपाचा खेळ असून त्यामध्ये खेळाडूंकडून चपळता, समन्वय, अचूकता व योग्य निर्णयक्षमता यांची अपेक्षा असते. या खेळातील यशस्वी कामगिरी अनेक मूलभूत कौशल्यांवर अवलंबून असते, ज्यामध्ये अंडरहँड पास (Underhand Pass) हे कौशल्य विशेष महत्वाचे मानले जाते. सर्व्ह रिसिव्ह, बचावात्मक खेळ आणि सेटरकडे अचूक चेंडू पोहोचविण्याची संपूर्ण प्रक्रिया या कौशल्यावर आधारित असल्यामुळे, अंडरहँड पासला व्हॉलीबॉलमधील "कणा" असे संबोधले जाते (McGown et al., 2001).

अंडरहँड पास हे कौशल्य दिसायला सोपे वाटले तरी प्रत्यक्षात ते अनेक तांत्रिक घटकांच्या समन्वयावर आधारित जटिल कौशल्य आहे. तयारीची स्थिती, गुडघे वाकलेली ठेवणे, योग्य पायांची हालचाल, हातांची अचूक पकड, मनगटावर योग्य संपर्क बिंदू, शरीराचा समतोल, दिशानियंत्रण, पासची उंची, अचूकता आणि सातत्य या सर्व घटकांचे एकत्रित कार्य झाल्यासच प्रभावी अंडरहँड पास साध्य होतो (Coleman, 2005). कौशल्य अधिग्रहणाच्या दृष्टीने पाहता, या घटकांपैकी कोणत्याही एका घटकातील त्रुटी संपूर्ण कौशल्याच्या गुणवत्तेवर परिणाम करू शकते.

क्रीडा मानसशास्त्र व मोटर लर्निंगच्या सिद्धांतानुसार, कौशल्य शिकण्याची प्रक्रिया ही टप्प्याटप्प्याने घडणारी असून त्यामध्ये बौद्धिक (Cognitive), संलग्न (Associative) आणि स्वयंचलित (Autonomous) असे टप्पे आढळतात (Fitts & Posner). या प्रत्येक टप्प्यावर खेळाडूला मिळणारा अभिप्राय आणि मूल्यमापनाची पद्धत अत्यंत महत्वाची ठरते. परंतु प्रत्यक्ष प्रशिक्षण व शालेय/महाविद्यालयीन स्तरावरील खेळामध्ये अंडरहँड पास कौशल्याचे मूल्यमापन बहुतेक वेळा प्रशिक्षकाच्या अनुभवावर किंवा निरीक्षणावर आधारित असते. अशा व्यक्तिनिष्ठ मूल्यमापनामुळे खेळाडू कौशल्य कशा प्रकारे शिकतो, कोणत्या घटकांमध्ये अडचणी येतात आणि प्रशिक्षणात नेमकी कोणती सुधारणा आवश्यक आहे, हे अचूकपणे समजून घेणे कठीण जाते.

आधुनिक क्रीडा प्रशिक्षण व क्रीडा विज्ञानामध्ये मात्र वस्तुनिष्ठ, मोजमापयोग्य आणि विश्वसनीय मूल्यमापन साधनांचा वापर करण्यावर भर दिला जात आहे. कौशल्याच्या केवळ अंतिम परिणामाऐवजी संपूर्ण हालचालीच्या गुणवत्तेचे विश्लेषण केल्यास प्रशिक्षण अधिक प्रभावी होते, असे क्रीडा कामगिरी विश्लेषणातील अभ्यासातून स्पष्ट झाले आहे (Hughes & Bartlett, 2002). म्हणूनच अंडरहँड पाससारख्या मूलभूत कौशल्यासाठी मानकीकृत रेटिंग स्केल विकसित करणे ही काळाची गरज ठरते.

या पार्श्वभूमीवर प्रस्तुत संशोधनामध्ये व्हॉलीबॉल अंडरहँड पास कौशल्यासाठी विकसित केलेल्या 5-बिंदू रेटिंग स्केलचे मानकीकरण करण्याचा प्रयत्न करण्यात आला आहे. या रेटिंग स्केलद्वारे अंडरहँड पास कौशल्याचे तांत्रिक घटकनिहाय मूल्यमापन करून कौशल्य अधिग्रहणाची प्रक्रिया समजून घेणे, प्रशिक्षकांना वस्तुनिष्ठ अभिप्राय देणे आणि शारीरिक शिक्षण व क्रीडा संशोधनासाठी एक विश्वसनीय साधन उपलब्ध करून देणे हा या अभ्यासाचा मुख्य हेतू होता.

वरील चर्चेतून स्पष्ट होते की व्हॉलीबॉलमधील अंडरहँड पास हे कौशल्य केवळ खेळातील एक तांत्रिक हालचाल नसून, ते कौशल्य अधिग्रहण (Skill Acquisition), समन्वय, निर्णयक्षमता आणि कामगिरीची सातत्यपूर्ण गुणवत्ता यांचा एकत्रित परिणाम आहे. क्रीडा कौशल्य शिकण्याच्या सिद्धांतानुसार, कोणतेही कौशल्य प्रभावीपणे आत्मसात होण्यासाठी त्याच्या घटक हालचालींचे वस्तुनिष्ठ निरीक्षण, अचूक अभिप्राय आणि सातत्यपूर्ण मूल्यमापन आवश्यक असते (Fitts & Posner). तथापि, विद्यमान प्रशिक्षण पद्धतींमध्ये अंडरहँड पास कौशल्याचे मूल्यमापन बहुतेक वेळा केवळ अंतिम परिणामावर जसे की पास यशस्वी झाला किंवा नाही यावर केंद्रित असल्याचे आढळते. अशा पद्धतीत कौशल्य शिकण्याच्या प्रक्रियेमधील महत्वाचे तांत्रिक टप्पे दुर्लक्षित राहतात.

क्रीडा कामगिरी विश्लेषणावरील संशोधनातून असे सूचित होते की मानकीकृत आणि घटकनिहाय मूल्यमापन साधने वापरल्यास खेळाडूंच्या कौशल्यातील बलस्थान व मर्यादा अधिक स्पष्टपणे ओळखता येतात (Hughes & Bartlett). यामुळे प्रशिक्षकांना प्रशिक्षण प्रक्रियेत आवश्यक ते बदल करता येतात तसेच खेळाडूंना योग्य व वेळेवर अभिप्राय मिळतो. म्हणूनच अंडरहँड पास कौशल्याच्या अभ्यासासाठी एक वैध, विश्वसनीय व व्यावहारिक रेटिंग स्केल विकसित करणे ही केवळ संशोधनात्मक गरज नसून शैक्षणिक व प्रशिक्षणात्मक दृष्टीनेही महत्वाची बाब ठरते.

या संशोधनाचे उद्दिष्ट म्हणजे व्हॉलीबॉल खेळातील अंडरहँड पास कौशल्याचे वस्तुनिष्ठ, शास्त्रीय व विश्वसनीय मूल्यमापन करण्यासाठी विकसित केलेल्या 5 पॉईंट रेटिंग स्केलचे प्रमाणित करण्यात आली.

## संशोधन पद्धती

सदर संशोधनासाठी वर्णनात्मक संशोधन पद्धतीचा अवलंब करण्यात आला होता. या अभ्यासाचा केंद्रबिंदू व्हॉलीबॉल अंडरहँड पास कौशल्यासाठी विकसित केलेल्या 5- पॉईंट रेटिंग स्केलचे प्रमाणीकरण करणे हा असल्याने, संशोधनाची रचना मूल्यमापन साधनाच्या विकास व प्रमाणीकरणावर आधारित होती.

रेटिंग स्केलची निर्मिती कौशल्य संपादन सिद्धांत, व्हॉलीबॉल प्रशिक्षण साहित्य आणि तज्ञ प्रशिक्षकांच्या मार्गदर्शनाच्या आधारे करण्यात आली. विकसित स्केलची आशय वैधता तपासण्यासाठी अंडरहँड पास कौशल्यातील सर्व आवश्यक तांत्रिक घटक समाविष्ट करण्यात आले.

स्केलची विश्वसनीयता तपासण्यासाठी टेस्ट रिटेस्ट आणि इंटर टेस्टर रिलायबिलिटी आणि या पद्धतीचा वापर करण्यात आला. संकलित माहितीचे विश्लेषण करण्यासाठी सरासरी आणि प्रमाणित विचलन, स्पेअरमन रँक ऑर्डर सहसंबंध यांसारख्या वर्णनात्मक सांख्यिकी तंत्रांचा उपयोग करण्यात आला. अशा प्रकारे संशोधनाची पद्धती रेटिंग स्केलच्या वैधता व विश्वसनीयतेच्या स्थापनेवर केंद्रित होती.

या संशोधनाचा न्यादर्श महाराष्ट्रीय मंडळ क्रीडा संकुलातील निवडक व्हॉलीबॉल खेळाडूंनी बनलेला होता. न्यादर्श निवडीसाठी यादृच्छिक नमुना निवड पद्धतीचा अवलंब करण्यात आला.

न्यादर्श म्हणून निवडलेल्या खेळाडूंना व्हॉलीबॉल खेळाचे मूलभूत प्रशिक्षण प्राप्त झालेले होते आणि ते नियमित सरावात सहभागी होते. रेटिंग स्केलचे मानकीकरण करताना विविध कौशल्य पातळ्यांवरील खेळाडूंचा समावेश करण्यात आला.

अभ्यासाच्या सुरुवातीला व्हॉलीबॉल अंडरहँड पास कौशल्यासाठी ५- पॉईंट रेटिंग स्केल विकसित करण्यात आली. या स्केलमध्ये तयारीची स्थिती, पायांची हालचाल, हातांची पकड, संपर्क, शरीर समन्वय, दिशानियंत्रण, उंची नियंत्रण, अचूकता, सातत्य आणि एकूण कामगिरी असे दहा तांत्रिक घटक समाविष्ट करण्यात आले.

यानंतर स्केलच्या मानकीकरणासाठी प्रत्यक्ष निरीक्षणाद्वारे माहिती संकलित करण्यात आली. सर्व खेळाडूंना संशोधनाच्या उद्देशाची माहिती देण्यात आली आणि निरीक्षणासाठी समान मैदान, समान चेंडू व समान सराव परिस्थिती राखण्यात आली. प्रत्येक खेळाडूकडून अंडरहँड पास कौशल्याचे ठराविकप्रयत्न करून घेण्यात आले.

प्रत्येक खेळाडूच्या कामगिरीचे मूल्यमापन संशोधक व तज्ञ निरीक्षकांनी रेटिंग स्केलच्या आधारे केले. प्रत्येक घटकासाठी १ ते ५ या दरम्यान गुण देण्यात आले. स्केलची विश्वसनीयता तपासण्यासाठी काही खेळाडूंचे मूल्यमापन ठराविक कालावधीनंतर पुन्हा करण्यात आले तसेच दोन निरीक्षकांद्वारे स्वतंत्रपणे गुणांकन करण्यात आले.

संकलित गुणांचे सांख्यिकी विश्लेषण करून रेटिंग स्केलची वैधता व विश्वसनीयता निश्चित करण्यात आली आणि अशा प्रकारे ५- पॉईंट रेटिंग स्केलचे प्रमाणित करण्यात आले.

## रेटिंग स्केलची विश्वसनीयता

### टेस्ट रिटेस्ट विश्वसनीयता

रेटिंग स्केलची विश्वसनीयता तपासण्यासाठी टेस्ट रिटेस्ट विश्वसनीयता टेस्ट रिटेस्ट विश्वसनीयता वापरण्यात आली. समान खेळाडूंवर समान परिस्थितीत दोन वेगवेगळ्या वेळेस अंडरहँड पास कौशल्याचे

मूल्यमापन करण्यात आले. दोन्ही वेळेच्या गुणांमधील सहसंबंध काढण्यात आला.

**तक्ता १ : टेस्ट रिटेस्ट विश्वसनीयता**

घटक	पूर्व कसोटी मध्यमान	पूर्व कसोटी प्रमाणित विचलन	उत्तर कसोटी मध्यमान	उत्तर कसोटी प्रमाणित विचलन	सहसंबंध गुणांक (१)
एकूण अंडरहॅंड पास गुण	34.60	15.12	34.92	15.08	0.86

तक्ता 1 मधील निष्कर्षावरून पूर्व व उत्तर कसोटी तील गुणांमध्ये उच्च सकारात्मक सहसंबंध ( $r = 0.86$ ) आढळून आला. हा सहसंबंध गुणांक 0.80 पेक्षा जास्त असल्यामुळे विकसित केलेला 5- पॉईंट रेटिंग स्केल विश्वसनीय असल्याचे स्पष्ट होते. त्यामुळे वेगवेगळ्या वेळेस वापरल्यासही स्केल सातत्यपूर्ण मोजमाप करतो, असे निष्कर्ष काढता येतात.

### इंटर टेस्टर रिलायबिलिटी

रेटिंग स्केलची निरीक्षकांमधील सुसंगती तपासण्यासाठी इंटर टेस्टर रिलायबिलिटी वापरण्यात आली. दोन तज्ञ निरीक्षकांनी एकाच खेळाडूंच्या अंडरहॅंड पास कौशल्याचे स्वतंत्रपणे मूल्यमापन केले.

**तक्ता २ : इंटर टेस्टर रिलायबिलिटी**

निरीक्षक	मध्यमान	प्रमाणित विचलन
निरीक्षक-1	35.10	4.98
निरीक्षक -2	34.75	5.02
सहसंबंध गुणांक (r)	0.93	

तक्ता २ मधील निष्कर्षावरून दोन्ही निरीक्षकांच्या गुणांमध्ये अत्यंत उच्च सहसंबंध आढळून आला. यावरून विकसित केलेला रेटिंग स्केल विविध निरीक्षकांकडून वापरल्यासही जवळजवळ समान परिणाम देतो, हे स्पष्ट होते. त्यामुळे हा स्केल उच्च दर्जाची इंटर टेस्टर रिलायबिलिटी पूर्ण करतो.

### निष्कर्ष

सदर संशोधनाचा मुख्य उद्देश व्हॉलीबॉल अंडरहॅंड पास कौशल्यासाठी विकसित केलेल्या ५-पॉईंट रेटिंग स्केलचे प्रमाणिकरण करण्यात आले होता. संशोधनातून प्राप्त निष्कर्षांच्या आधारे असे आढळून आले की विकसित केलेला रेटिंग स्केल वैध, विश्वसनीय आहे.

रेटिंग स्केलच्या विश्वसनीयतेच्या दृष्टीने पाहता, टेस्ट रिटेस्ट विश्वसनीय आणि इंटर टेस्टर रिलायबिलिटी या दोन्ही पद्धतींमधून उच्च सहसंबंध गुणांक प्राप्त झाले. या निष्कर्षांवरून असे स्पष्ट झाले की सदर रेटिंग स्केल वेगवेगळ्या वेळेस तसेच वेगवेगळ्या निरीक्षकांकडून वापरण्यात आल्यासही सुसंगत व स्थिर मोजमाप प्रदान करीत होता.

आशय वैधतेच्या संदर्भात, तज्ञ समितीने रेटिंग स्केलमधील सर्व पॉईंट्स अंडरहॅंड पास कौशल्याच्या तांत्रिक संरचनेचे योग्य प्रतिनिधित्व करीत असल्याचे नमूद केले. तयारीची स्थिती, पायांची हालचाल, हातांची पकड, संपर्क, शरीर समन्वय, दिशानियंत्रण, उंची नियंत्रण, अचूकता, सातत्य व एकूण काम गिरी हे पॉईंट्स अंडरहॅंड पास कौशल्याच्या प्रभावी अंमलबजावणीसाठी अत्यावश्यक असल्याचे तज्ञांच्या मतातून स्पष्ट झाले. त्यामुळे विकसित केलेल्या रेटिंग स्केलने आशय वैधता पूर्ण केली, असा निष्कर्ष नोंदविण्यात आला.

## चर्चा

अंडरहॅंड पास कौशल्याचे मूल्यमापन केवळ अंतिम परिणामांवर आधारित न ठेवता पॉईंट-निहाय तांत्रिक विश्लेषणाच्या माध्यमातून केल्यास कौशल्य अधिग्रहणाची प्रक्रिया अधिक सुस्पष्टपणे समजून येते, असे या अभ्यासातून आढळून आले.

एकूणच, प्रस्तुत संशोधनातून विकसित केलेला 5-पॉईंट अंडरहॅंड पास रेटिंग स्केल प्रमाणित मूल्यमापन साधन म्हणून म्हणता येईल. हा स्केल शारीरिक शिक्षण, क्रीडा प्रशिक्षण व क्रीडा संशोधन क्षेत्रात प्रभावीपणे वापरण्यास योग्य असल्याचे सिद्ध झाले. भविष्यात या स्केलचा वापर विविध वयोगट, कौशल्य पातळी व स्पर्धात्मक स्तरांवरील खेळाडूंचे करण्यात आल्यास अंडरहॅंड पास कौशल्य अधिग्रहणाविषयी अधिक व्यापक व सखोल निष्कर्ष प्राप्त होतील.

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# पुणे शहरातील व्यायामशाळांमधील सोयी-सुविधा व सदस्यांच्या समाधानाचा विश्लेषणात्मक अभ्यास

सुजित कुरकुटे

संशोधक

डॉ. योगेश बोडके

प्राध्यापक, महाराष्ट्र मंडळचे चंद्रशेखर आगाशे कॉलेज ऑफ फिजिकल एड्युकेशन, पुणे

## सारांश

बाल्यावस्थेतील शारीरिक हालचाल ही मुलांच्या सर्वांगीण विकासासाठी अत्यंत महत्वाची मानली जाते. प्राथमिक स्तरावर मुलांमध्ये मूलभूत हालचाली कौशल्ये विकसित होणे ही पुढील क्रीडा सहभाग, शारीरिक तंदुरुस्ती व आत्मविश्वासाची पायाभरणी ठरते. तथापि, सध्याच्या शालेय शारीरिक शिक्षण कार्यक्रमांमध्ये खेळाधारित, आनंददायी व विकासानुरूप हालचालींचा अभाव अनेक ठिकाणी आढळून येतो. या पार्श्वभूमीवर प्रस्तुत संशोधनामध्ये प्राथमिक शालेय मुलांमध्ये कारक कौशल्य क्षमता वाढवण्याच्या उद्देशाने एक संरचित ऑनिमल वॉक कार्यक्रम विकसित करण्यात आला.

ऑनिमल वॉक क्रिया या नैसर्गिक हालचालींवर आधारित असून त्यामध्ये प्राणी अनुकरणाद्वारे चालणे, उड्या, सरपटणे व संतुलन यांचा समावेश असतो. या अभ्यासात कार्यक्रमाची रचना करताना वयानुरूपता, हालचालींची प्रगतीशीलता, सुरक्षितता व सहभागात्मकता या तत्वांचा विचार करण्यात आला. तयार करण्यात आलेल्या कार्यक्रमांमध्ये बेअर वॉक, फ्रॉग जंप, क्रॅब वॉक, पेंग्विन वॉक, मंकी मूव्हमेंट यांसारख्या हालचालींचा समावेश करण्यात आला.

कार्यक्रमाची वैधता निश्चित करण्यासाठी शारीरिक शिक्षण क्षेत्रातील तज्ज्ञांचे मत संकलित करण्यात आले. तज्ज्ञांच्या सूचनांनुसार कार्यक्रमांमध्ये आवश्यक सुधारणा करून अंतिम कार्यक्रम निश्चित करण्यात आला. अभ्यासातून असे आढळून आले की ऑनिमल वॉक आधारित कार्यक्रम हा मुलांमध्ये समन्वय, संतुलन, स्नायू सामर्थ्य व हालचालींची आत्मविश्वासपूर्ण अंमलबजावणी यासाठी उपयुक्त ठरतो. प्रस्तुत

संशोधनातून प्राथमिक स्तरावरील शारीरिक शिक्षणासाठी एक नावीन्यपूर्ण, आनंददायी व परिणामकारक कार्यक्रम विकसित झाला असल्याचे स्पष्ट होते.

**महत्वाच्या सज्ञा :** अॅनिमल वॉक, कारक कौशल्य क्षमता, प्राथमिक मुले, मूलभूत हालचाली, शारीरिक शिक्षण

## प्रस्तावना

बाल्यावस्था ही मानवी विकासातील अत्यंत महत्त्वची आणि संवेदनशील अवस्था मानली जाते. या कालखंडात शारीरिक, मानसिक, सामाजिक व भावनिक विकास एकमेकांशी घट्टपणे संबंधित असतो. विशेषतः प्राथमिक वयोगटातील मुलांमध्ये हालचालींच्या माध्यमातून होणारा विकास हा पुढील आयुष्यातील शारीरिक सक्रियता, क्रीडा सहभाग व आरोग्यपूर्ण जीवनशैलीचा पाया ठरतो. संशोधन अभ्यासांनुसार, बाल्यावस्थेत विकसित झालेली मूलभूत हालचाली कौशल्ये ही पुढील जटिल क्रीडा कौशल्यांच्या अधिगमासाठी अत्यावश्यक असतात. (Gallahue & Ozmun, 2006).

कारक कौशल्य क्षमता म्हणजे मुलांची शरीर नियंत्रितपणे वापरण्याची, संतुलन राखण्याची, समन्वय साधण्याची व हालचाली अचूकतेने करण्याची क्षमता होय. ही क्षमता केवळ शारीरिक परिपक्वतेवर अवलंबून नसून नियोजित, विकासानुरूप व अर्थपूर्ण शारीरिक क्रियाकलापांवर मोठय प्रमाणावर अवलंबून असते (Haywood & Getchell, 2014). . तथापि, सध्याच्या सामाजिक व शैक्षणिक परिस्थितीत मुलांच्या दैनंदिन हालचालींमध्ये लक्षणीय घट झाल्याचे दिसून येते. वाढता स्क्रीन टाइम, मर्यादित मैदानी खेळ, शैक्षणिक दडपण व स्पर्धात्मक अभ्यासक्रम यामुळे मुलांमध्ये शारीरिक निष्क्रियता वाढत असल्याचे अनेक अभ्यासांमधून स्पष्ट झाले आहे (Bailey, 2006).

या परिस्थितीचा थेट परिणाम मुलांच्या कारक कौशल्य क्षमतेवर होत असून अनेक प्राथमिक शालेय मुले अपेक्षित संतुलन, समन्वय व हालचाल नियंत्रण विकसित करण्यात मागे पडत असल्याचे आढळते. परिणामी मुलांमध्ये शारीरिक क्रियाकलापांविषयी न्यूनगंड, आत्मविश्वासाचा अभाव व सहभागाची कमी रुची निर्माण होते. यामुळे भविष्यातील क्रीडा सहभाग व आरोग्यविषयक सवयींवर नकारात्मक परिणाम होण्याची शक्यता वाढते (Whitehead, 2010).

या पार्श्वभूमीवर आधुनिक शारीरिक शिक्षणामध्ये "शारीरिक साक्षरता" (Physical Literacy) ही संकल्पना महत्त्वची मानली जाते. शारीरिक साक्षरतेनुसार, प्रत्येक मुलामध्ये हालचालींचा आत्मविश्वास, प्रेरणा, कौशल्य व समज विकसित करणे हे शारीरिक शिक्षणाचे प्रमुख उद्दिष्ट असते (Whitehead, 2010). हे उद्दिष्ट साध्य करण्यासाठी खेळाधारित, आनंददायी व बालकेंद्रित कार्यक्रमांची आवश्यकता

असते. अशा कार्यक्रमांमुळे मुले केवळ शारीरिकदृष्ट्या सक्रिय राहत नाहीत, तर हालचालींचा आनंद घेण्यास शिकतात.

ऑनिमल वॉक आधारित हालचाली या बालकांच्या नैसर्गिक कल्पनाशक्तीशी व खेळप्रियतेशी निगडित असल्यामुळे प्राथमिक स्तरासाठी अत्यंत उपयुक्त मानल्या जातात. प्राणी अनुकरणाद्वारे चालणे, उड्या मारणे, सरपटणे व संतुलन राखणे या हालचालींमुळे संपूर्ण शरीराचा सहभाग घडून येतो. अशा क्रियांमुळे स्नायू सामर्थ्य, सांध्यांची स्थिरता, समन्वय व शरीरजाणीव विकसित होण्यास मदत होते (Clark & Metcalfe, 2002). विशेषतः ऑनिमल वॉक हालचाली या नैसर्गिक, बहुअंगी व कार्यात्मक स्वरूपाच्या असल्यामुळे त्या कारक कौशल्य विकासासाठी प्रभावी ठरतात.

शालेय पातळीवर ऑनिमल वॉक क्रिया बहुतांश वेळा असंरचित व तात्कालिक स्वरूपात राबविल्या जातात. त्यामध्ये हालचालींची शास्त्रीय मांडणी, प्रगतीशील क्रम, उद्दिष्टांची स्पष्टता व मूल्यमापनाचा अभाव दिसून येतो. त्यामुळे या क्रियांचा अपेक्षित शैक्षणिक व विकासात्मक लाभ पूर्णपणे प्राप्त होत नाही. म्हणूनच प्राथमिक शालेय मुलांसाठी एक संरचित, नियोजित व विकासानुरूप ऑनिमल वॉक कार्यक्रम विकसित करण्याची आवश्यकता प्रकर्षाने जाणवली.

या अभ्यासामध्ये कारक कौशल्य क्षमतेच्या वृद्धीसाठी ऑनिमल वॉक आधारित हालचालींचा शास्त्रीय आधारावर कार्यक्रम तयार करण्याचा प्रयत्न करण्यात आला आहे. प्रस्तुत संशोधन हे शारीरिक शिक्षणातील नावीन्य, बालकेंद्रित अध्यापन व हालचाल विकास यांचा समन्वय साधणारे असल्यामुळे शैक्षणिक दृष्टिकोनातून महत्वपूर्ण ठरते.

या अभ्यासाचे सामान्य उद्दिष्ट प्राथमिक शालेय मुलांमध्ये कारक कौशल्य क्षमता वाढवण्याच्या उद्देशाने एक संरचित ऑनिमल वॉक कार्यक्रम विकसित करणे हे होते.

## संशोधन पद्धती

प्रस्तुत अभ्यासामध्ये प्राथमिक शालेय मुलांमध्ये कारक कौशल्य क्षमता वाढवण्यासाठी संरचित ऑनिमल वॉक कार्यक्रम विकसित करण्यावर भर देण्यात आला होता. या उद्देशासाठी विकसनात्मक संशोधन पद्धती वापरण्यात आली. या पद्धतीद्वारे शैक्षणिक कार्यक्रमाची रचना, सुधारणा शास्त्रीय प्रक्रियेनुसार करण्यात आले.

हा अभ्यास मुख्यतः कार्यक्रम विकास व त्याच्या वैधतेवर केंद्रित असल्यामुळे प्रयोगात्मक संशोधनापेक्षा विकासात्मक संशोधन पद्धती अधिक योग्य ठरली. संशोधनामध्ये साहित्याचा आढावा, कार्यक्रमाची निर्मिती, तज्ज्ञ अभिप्राय, सुधारणा व अंतिम कार्यक्रम निश्चिती या टप्प्यांचा समावेश करण्यात आला.

प्रस्तुत अभ्यासामध्ये ऑनिमल वॉक कार्यक्रमाची विषयवैधता निश्चित करण्यासाठी उद्देशित न्यादर्शनविड पद्धती वापरण्यात आली.

न्यादर्श मध्ये पुढील तज्ज्ञांचा समावेश करण्यात आला-

१. शारीरिक शिक्षण विषयातील अनुभवी शिक्षक
२. शारीरिक शिक्षण महाविद्यालयातील प्राध्यापक
३. मूलभूत हालचाल शिक्षण क्षेत्रातील तज्ज्ञ

तज्ज्ञांची निवड करताना त्यांचा अध्यापन अनुभव, विषयातील ज्ञान व शालेय स्तरावरील अनुभव यांचा विचार करण्यात आला.

प्रस्तुत अभ्यासासाठी पुढील संशोधन साधनांचा वापर करण्यात आला-

- ऑनिमल वॉक कार्यक्रम संरचना तक्ता
- तज्ज्ञांचा अभिप्राय

तज्ज्ञ अभिप्राय पत्रकाद्वारे प्रत्येक हालचालीची उपयुक्तता, वयानुरूपता, सुरक्षितता, क्रमबद्धता व उद्दिष्ट यांचे मूल्यमापन करण्यात आले.

संशोधनाच्या प्रारंभी कारक विकास, मूलभूत हालचाली कौशल्ये, शारीरिक साक्षरता व खेळाधारित शिक्षण या संदर्भातील राष्ट्रीय व आंतरराष्ट्रीय साहित्याचा सखोल अभ्यास करण्यात आला. या आढाव्यातून ऑनिमल वॉक हालचालींचे शैक्षणिक महत्व, उपयोगिता व मर्यादा यांचा अभ्यास करण्यात आला.

साहित्याच्या आधारे प्राथमिक स्तरासाठी उपयुक्त असणाऱ्या ऑनिमल वॉक हालचालींची प्राथमिक यादी तयार करण्यात आली. या यादीमध्ये चाल, उडी, सरपटणे, संतुलन व सामर्थ्य या हालचाली घटकांचा समावेश करण्यात आला. उदा. बेअर वॉक, फ्रॉग जंप, क्रॅब वॉक, पॅग्विन वॉक, लिझर्ड क्रॉल इत्यादी.

निवडलेल्या ऑनिमल वॉक हालचालींच्या आधारे संरचित कार्यक्रमाचे प्रारूप तयार करण्यात आले. कार्यक्रमाची रचना करताना पुढील बाबींचा विचार करण्यात आला-

- वयानुरूपता
- हालचालींची प्रगतीशील मांडणी (सोपीऑनिमल ते अवघड)
- सुरक्षितता

- कालावधी
- सहभागात्मकता

कार्यक्रम आठवडानुसार व सत्रानुसार नियोजित करण्यात आले.

तयार केलेल्या प्रारूप कार्यक्रमावर तज्ज्ञांचे मत जाणून घेण्यासाठी अभिप्राय पत्रक वितरित करण्यात आले. तज्ज्ञांना प्रत्येक हालचालीबाबत पुढील मुद्द्यांवर मूल्यमापन करण्यास सांगण्यात आले-

- हालचालीची उपयुक्तता
- कारक कौशल्य विकासाशी सुसंगतता
- प्राथमिक मुलांसाठी योग्यतेची पातळी
- सुरक्षिततेचा स्तर
- अध्यापन सुलभता

तज्ज्ञांकडून प्राप्त अभिप्रायाच्या आधारे कार्यक्रमातील प्रत्येक घटकाची आशय वैधता तपासण्यात आली. ज्या हालचालींना बहुसंख्य तज्ज्ञांकडून मान्यता प्राप्त झाली त्या अंतिम कार्यक्रमात समाविष्ट करण्यात आल्या, तर कमी उपयुक्त ठरलेल्या हालचालींमध्ये सुधारणा करण्यात आली.

तज्ज्ञांच्या सूचनांनुसार कार्यक्रमाच्या रचनेत आवश्यक बदल करण्यात आले. हालचालींच्या क्रमामध्ये सुधारणा, काही हालचालींच्या कालावधीत बदल तसेच सुरक्षिततेशी संबंधित बाबी समाविष्ट करण्यात आल्या.

सर्व सुधारणा पूर्ण झाल्यानंतर प्राथमिक शालेय मुलांसाठी एक संरचित, विकासानुरूप व वैध अॅनिमल वॉक कार्यक्रम अंतिम स्वरूपात निश्चित करण्यात आला.

### **FITT तत्ववर आधारित अॅनिमल वॉक कार्यक्रमाची रचना**

प्रस्तुत संशोधनामध्ये प्राथमिक शालेय मुलांमध्ये मोटर कौशल्य क्षमता वाढवण्याच्या उद्देशाने अंतिम अॅनिमल वॉक कार्यक्रमाची रचना FITT तत्वे (वारंवारता, तीव्रता, वेळ आणि प्रकार) या शास्त्रीय तत्वच्या आधारे करण्यात आली. FITT तत्व हे शारीरिक उपक्रमांचे नियोजन करताना आंतरराष्ट्रीय स्तरावर स्वीकारलेले मार्गदर्शक तत्व मानले जाते. या तत्वच्या साहाय्याने कार्यक्रमाची प्रभावीता, सुरक्षितता व विकासानुरूपता सुनिश्चित करण्यात आली.

### **१. वारंवारता**

कार्यक्रमाची वारंवारता आठवड्यातून तीन सत्रे अशी निश्चित करण्यात आली. प्राथमिक वयोगटातील मुलांच्या शारीरिक क्षमतेचा विचार करता अतिप्रमाणात थकवा टाळण्यासाठी व नियमित हालचालींची सवय निर्माण करण्यासाठी ही वारंवारता योग्य ठरविण्यात आली. सातत्यपूर्ण सहभागामुळे मोटर कौशल्यांच्या अधिगम प्रक्रियेस चालना मिळेल, असा विचार करण्यात आला.

## २. तीव्रता

अॅनिमल वॉक कार्यक्रमाची तीव्रता मध्यम स्तराची ठेवण्यात आली. हालचाली करताना मुलांना श्वासोच्छ्वास वाढेल इतकी पण अती थकवा निर्माण होणार नाही अशी तीव्रता निश्चित करण्यात आली. तीव्रतेचे नियंत्रण हालचालींच्या वेग, पुनरावृत्ती व विश्रांती कालावधीद्वारे करण्यात आले.

## ३. कालावधी

प्रत्येक सत्राचा कालावधी 25 ते 30 मिनिटे असा निश्चित करण्यात आला. हा कालावधी प्राथमिक वयोगटातील मुलांच्या लक्ष केंद्रित क्षमतेनुसार योग्य असल्याचे मानले गेले. प्रत्येक सत्रामध्ये पुढील घटकांचा समावेश करण्यात आला-

- 5 मिनिटे उत्तेजक व्यायाम
- 15-20 मिनिटे अॅनिमल वॉक क्रिया
- 5 मिनिटे शिथिलीकरण व्यायाम

## ४. प्रकार

कार्यक्रमामध्ये समाविष्ट केलेल्या हालचाली या अॅनिमल वॉक आधारित, बहुअंगी व कार्यात्मक स्वरूपाच्या होत्या. हालचालींची निवड करताना मोटर कौशल्य विकासाचे प्रमुख घटक लक्षात घेण्यात आले, जसे-

- चालणे / धावणे आधारित हालचाली
- उडयंवर आधारित हालचाली
- सरपटणे हालचाली
- संतुलन हालचाली

यामध्ये बेअर वॉक, फ्रॉग जंप, क्रॅब वॉक, पॅन्विन वॉक, लिझर्ड क्रॉल, कांगारू जंप व फ्लेमिंगो स्टँड यांसारख्या क्रियांचा समावेश करण्यात आला.

## निष्कर्ष

प्रस्तुत संशोधनामध्ये प्राथमिक शालेय मुलांमध्ये मोटर कौशल्य क्षमता वाढवण्याच्या उद्देशाने एक संरचित अॅनिमल वॉक कार्यक्रम विकसित करण्यात आला. अभ्यासाचा मुख्य भर कार्यक्रमाच्या शास्त्रीय रचनेवर, विकासानुरूपतेवर व विषयवैधतेवर केंद्रित होता. संशोधनातून असे स्पष्ट झाले की अॅनिमल वॉक आधारित हालचाली या प्राथमिक स्तरासाठी अत्यंत उपयुक्त, आनंददायी व सहभागात्मक स्वरूपाच्या ठरतात.

कार्यक्रमाची रचना FITT तत्वच्या आधारे करण्यात आल्यामुळे हालचालींची वारंवारता, तीव्रता, कालावधी व प्रकार यामध्ये संतुलन साधले गेले. यामुळे कार्यक्रम केवळ खेळरूप स्वरूपात मर्यादित न राहता शास्त्रीय दृष्टिकोनातून नियोजित झाला. FITT तत्वाचा वापर केल्यामुळे सुरक्षितता, सातत्य व प्रगतीशीलता सुनिश्चित झाली असल्याचे तज्ज्ञ अभिप्रायातून स्पष्ट झाले.

अॅनिमल वॉक हालचालींच्या माध्यमातून मुलांमध्ये संपूर्ण शरीराचा सक्रिय सहभाग घडून येतो. बेअर वॉक, क्रेब वॉक, फ्रॉग जंप व लिझर्ड क्रॉल यांसारख्या हालचालींमुळे स्नायू सामर्थ्य, सांध्यांची स्थिरता, संतुलन व समन्वय यांचा एकत्रित विकास होण्याची क्षमता आढळून आली. हे निरीक्षण मोटर विकास सिद्धांताशी सुसंगत असल्याचे दिसून आले, ज्यामध्ये विविध प्रकारच्या हालचालींचा अनुभव मोटर कौशल्य अधिगमासाठी आवश्यक मानला जातो.

एकूणच, प्रस्तुत संशोधनातून असे निष्कर्ष काढण्यात आले की, FITT तत्वावर आधारित संरचित अॅनिमल वॉक कार्यक्रम हा प्राथमिक शालेय मुलांमध्ये मोटर कौशल्य क्षमता वाढवण्यासाठी उपयुक्त, व्यवहार्य व शैक्षणिक दृष्टिकोनातून महत्वपूर्ण आहे. हा कार्यक्रम शारीरिक शिक्षणातील नावीन्यपूर्ण अध्यापन पद्धतींना चालना देणारा असून बालकेंद्रित शिक्षणाच्या संकल्पनेशी सुसंगत असल्याचे आढळून आले.

## चर्चा

या अभ्यासातील निष्कर्ष Gallahue आणि Ozmun यांनी मांडलेल्या मूलभूत हालचाली कौशल्य सिद्धांताशी सुसंगत आढळून आले. त्यांच्या मते बाल्यावस्थेतील हालचालींचा विविध अनुभव मुलांमध्ये पुढील क्रीडा कौशल्यांच्या अधिगमासाठी मजबूत पाया निर्माण करतो. अॅनिमल वॉक कार्यक्रमांमध्ये समाविष्ट असलेल्या बहुअंगी हालचाली या या संकल्पनेशी थेट संबंधित असल्याचे दिसून आले.

तसेच Clark आणि Metcalfe यांच्या “Mountain of Motor Development” या संकल्पनेनुसार बाल्यावस्थेत योग्य हालचालींचे अनुभव न मिळाल्यास मोटर विकासामध्ये अडथळे निर्माण होऊ शकतात. प्रस्तुत कार्यक्रमाने विकासानुरूप हालचालींची संधी उपलब्ध करून दिल्यामुळे हा कार्यक्रम मोटर विकासाच्या दृष्टीने उपयुक्त ठरू शकतो.

शारीरिक साक्षरता या संकल्पनेच्या दृष्टीने पाहता, अॅनिमल वॉक कार्यक्रम हा केवळ शारीरिक क्षमतांपुरता मर्यादित न राहता मुलांमध्ये हालचालीविषयी आनंद, आत्मविश्वास व सहभागाची सकारात्मक भावना निर्माण करण्यास सक्षम असल्याचे दिसून आले. Whitehead यांनी नमूद केल्याप्रमाणे शारीरिक साक्षरतेचा पाया आनंददायी हालचालींवर आधारित असतो. अॅनिमल वॉक क्रिया या कल्पनाशक्तीवर आधारित असल्यामुळे मुलांचा सक्रिय सहभाग टिकवून ठेवण्यास मदत होते.

तज्ज्ञांच्या अभिप्रायानुसार कार्यक्रमातील हालचाली प्राथमिक वयोगटासाठी योग्य, सुरक्षित व अध्यापनास सुलभ असल्याचे मत नोंदविण्यात आले. यामुळे शालेय शारीरिक शिक्षणात हा कार्यक्रम सहजपणे समाविष्ट करता येईल, असा निष्कर्ष काढण्यात आला. विशेषतः मर्यादित साधनसामग्री असलेल्या शाळांसाठी हा कार्यक्रम उपयुक्त ठरू शकतो.

अभ्यासात प्रयोगात्मक अंमलबजावणी करण्यात आलेली नसली, तरी कार्यक्रम विकासाच्या दृष्टीने हा अभ्यास महत्वपूर्ण ठरतो. भविष्यात या कार्यक्रमाचा वापर करून प्रयोगात्मक संशोधन केल्यास मोटर कौशल्य क्षमतेवर होणाऱ्या प्रत्यक्ष परिणामांचे मोजमाप करता येईल.

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# प्राथमिक शालेय मुलांमध्ये कारक कौशल्य क्षमता वाढवण्यासाठी संरचित ऑनमल वॉक कार्यक्रमाचा विकास

प्रा. सतीश वाघमारे

संलग्नता : संशोधन अभ्यासक क्रीडा आणि शारीरिक शिक्षण विभाग, सावित्रीबाई फुले पुणे विद्यापीठ, पुणे.

डॉ. दादासाहेब बबन ढेंगळे

सहाय्यक प्राध्यापक, क्रीडा आणि शारीरिक शिक्षण विभाग, सावित्रीबाई फुले पुणे विद्यापीठ, पुणे

## ABSTRACT

*In recent years, rapid urbanization, sedentary lifestyles, and increasing health awareness have significantly enhanced the role of gymnasiums as important centres for physical fitness, mental well-being, and lifestyle management. Gymnasiums are no longer limited to bodybuilding or recreational exercise; rather, they function as comprehensive health support systems. However, variations in facilities, trainer quality, management practices, and member-oriented approaches across gymnasiums directly influence member satisfaction, retention, and growth. In this context, a systematic evaluation of gymnasiums is essential to understand the determinants of their effectiveness and sustainability.*

*The present study aims to analyse the facilities, trainer-related factors, management practices, and their influence on member satisfaction and membership growth in gymnasiums located in Pune city. A survey method was employed for the study, and data were collected from 39 gymnasiums/trainers across different areas of Pune city using a self-constructed questionnaire. The questionnaire consisted of both dichotomous (Yes/No) and multiple-response items. The collected data were analysed using descriptive statistical techniques, namely frequency and percentage.*

*The findings revealed that the majority of gymnasiums were registered and operated with a moderate membership base, indicating institutional stability. Most gymnasiums reported satisfactory availability of equipment, safety measures, and first-aid facilities, reflecting a growing emphasis on member safety and service quality. Trainers demonstrated high levels of professional satisfaction and actively engaged*

in knowledge upgradation through the internet and training programmes, which contributed to innovative training practices. Furthermore, facilities, trainer quality, and organised fitness programmes emerged as key factors influencing membership growth and retention. Although fee structures were largely perceived as reasonable, a certain degree of price sensitivity among members was observed.

The study concludes that adequate infrastructure, qualified and satisfied trainers, safety oriented practices, and continuous professional development play a decisive role in enhancing member satisfaction and ensuring the sustainable growth of gymnasiums. Adopting a member-centric and innovation-driven approach can significantly strengthen the overall effectiveness of gymnasiums in urban settings.

**Keywords** : Gymnasiums, Facilities, Member Satisfaction, Trainers, Fitness Management, Membership Growth, Pune City

## सारांश

### सारांश

सध्याच्या काळात वाढते शहरीकरण, बदलती जीवनशैली, शारीरिक निष्क्रियता आणि आरोग्यविषयक जागरूकता यामुळे व्यायामशाळांचे (Gymnasiums) महत्त्व लक्षणीयरीत्या वाढले आहे. व्यायामशाळा या केवळ शरीरसौष्ठव किंवा फिटनेसपुरत्या मर्यादित न राहता शारीरिक, मानसिक व सामाजिक आरोग्य संवर्धनाची महत्त्वाची केंद्रे बनत आहेत. तथापि, प्रत्येक व्यायामशाळेमध्ये उपलब्ध असलेल्या सोयी-सुविधा, मार्गदर्शकांची गुणवत्ता, व्यवस्थापन पद्धती व सदस्याभिमुख दृष्टिकोन यामध्ये फरक आढळतो, ज्याचा थेट परिणाम सदस्यांच्या समाधानावर, सहभागावर व सदस्यसंख्या वाढीवर होतो.

प्रस्तुत संशोधनाचा उद्देश पुणे शहरातील व्यायामशाळांमधील सोयी-सुविधा, मार्गदर्शकांची भूमिका, व्यवस्थापन वैशिष्ट्ये आणि त्यांचा सदस्यांच्या समाधानावर व व्यायामशाळेच्या सातत्यपूर्ण विकासावर होणारा परिणाम यांचा विश्लेषणात्मक अभ्यास करणे हा आहे. या अभ्यासासाठी सर्वेक्षण पद्धतीचा अवलंब करण्यात आला असून पुणे शहरातील विविध भागांतील ३९ व्यायामशाळा/मार्गदर्शकांकडून स्वनिर्मित मराठी प्रश्नावलीच्या माध्यमातून माहिती संकलित करण्यात आली. प्रश्नावलीत होय नाही तसेच बहुपर्यायी (Multiple Response) स्वरूपाचे प्रश्न समाविष्ट होते. संकलित माहितीचे विश्लेषण वारंवारता व टक्केवारी या सांख्यिकीय तंत्रांचा वापर करून करण्यात आले.

अभ्यासातून असे आढळून आले की बहुसंख्य व्यायामशाळा नोंदणीकृत असून त्यांच्याकडे मध्यम स्वरूपाची सदस्यसंख्या आहे. बहुतांश व्यायामशाळांमध्ये साधनसामग्री, सुरक्षितता उपाययोजना व प्रथमोपचार प्रशिक्षण समाधानकारक आढळले. मार्गदर्शकांमध्ये व्यावसायिक समाधानाची पातळी उच्च असून इंटरनेट व प्रशिक्षण कार्यक्रमांद्वारे ज्ञानवृद्धी करण्यावर भर दिला जातो. तसेच, सोयी-सुविधा, प्रशिक्षित मार्गदर्शक आणि विविध उपक्रम हे सदस्यसंख्या वाढ व सातत्य टिकविण्यासाठी निर्णायक घटक असल्याचे स्पष्ट झाले. या निष्कर्षावरून व्यायामशाळांचा सर्वांगीण विकास साधण्यासाठी सदस्याभिमुख, सुरक्षित व नवोपक्रमात्मक दृष्टिकोन आवश्यक असल्याचे अधोरेखित होते.

**महत्वाच्या सज्ञा :** व्यायामशाळा, सोयी-सुविधा, सदस्य समाधान, मार्गदर्शक, फिटनेस, व्यवस्थापन, पुणे शहर

## प्रस्तावना

आधुनिक काळात झपाट्याने वाढणारे शहरीकरण, तंत्रज्ञानाचा वाढता वापर, बसून करण्याच्या कामांचे प्रमाण आणि बदलती जीवनशैली यांमुळे शारीरिक निष्क्रियता ही एक गंभीर सार्वजनिक आरोग्य समस्या बनली आहे.

जागतिक स्तरावर शारीरिक निष्क्रियतेमुळे लड्डुपणा, मधुमेह, हृदयविकार, उच्च रक्तदाब तसेच मानसिक ताणतणाव यांसारख्या आजारांचे प्रमाण वाढत असल्याचे आढळून आले आहे. World Health Organization (WHO) नुसार, प्रौढांनी आठवड्याला किमान 150 मिनिटे मध्यम तीव्रतेचा शारीरिक व्यायाम करणे आवश्यक आहे, परंतु मोठ्या प्रमाणावर लोक या शिफारशी पूर्ण करू शकत नाहीत (WHO, 2020). या पार्श्वभूमीवर व्यायामशाळा या शारीरिक तंदुरुस्ती व आरोग्य संवर्धनासाठी महत्वाची भूमिका बजावत आहेत.

व्यायामशाळा या आज केवळ शरीरसौष्ठव किंवा वजन कमी करण्यापुरत्या मर्यादित न राहता फिटनेस, मानसिक स्वास्थ्य, ताणतणाव व्यवस्थापन आणि जीवनशैली सुधारणा यांचे सर्वांगीण केंद्र बनल्या आहेत. आधुनिक व्यायामशाळांमध्ये कार्डिओ प्रशिक्षण, शक्ती प्रशिक्षण, योग, कार्यात्मक व्यायाम, तसेच काही ठिकाणी समुपदेशन व आहारविषयक मार्गदर्शन दिले जाते. American College of Sports Medicine (ACSM) च्या मार्गदर्शक तत्वांनुसार, सुरक्षित व प्रभावी व्यायामासाठी योग्य साधनसामग्री, प्रशिक्षित मार्गदर्शक आणि वैयक्तिक गरजांनुसार कार्यक्रम असणे अत्यावश्यक आहे (ACSM, 2022).

तथापि, सर्व व्यायामशाळांमध्ये उपलब्ध असलेल्या सोयी-सुविधा, मार्गदर्शकांची गुणवत्ता, व्यवस्थापन पद्धती आणि सदस्याभिमुख दृष्टिकोन यामध्ये लक्षणीय फरक आढळतो. काही व्यायामशाळा उच्च दर्जाच्या

सुविधा, सुरक्षितता उपाययोजना आणि व्यावसायिक मार्गदर्शन पुरवितात, तर काही ठिकाणी या बाबी अपुऱ्या असल्याचे दिसून येते. या फरकांचा थेट परिणाम सदस्यांच्या समाधानावर, सहभागावर आणि व्यायामशाळेतील सातत्यावर होतो. संशोधनातून असे सूचित होते की दर्जेदार सुविधा, प्रशिक्षित मार्गदर्शक आणि सकारात्मक प्रशिक्षण वातावरण हे सदस्य टिकवून ठेवण्यासाठी आणि नवीन सदस्य आकर्षित करण्यासाठी महत्वाचे घटक आहेत (Kotler & Keller, 2016).

भारतीय संदर्भात, विशेषतः पुणे शहरासारख्या शैक्षणिक व आयटी केंद्रात, व्यायामशाळांची संख्या झपाट्याने वाढत आहे. मात्र, या वाढीबरोबरच गुणवत्तेचा, सुरक्षिततेचा आणि सदस्य समाधानाचा प्रश्नही महत्वाचा ठरतो. अनेक व्यायामशाळा व्यावसायिक स्पर्धेच्या दबावाखाली कार्यरत असून, सदस्यांच्या अपेक्षा पूर्ण करणे हे एक आव्हान बनले आहे. त्यामुळे व्यायामशाळांमधील सोयी-सुविधा, मार्गदर्शकांची भूमिका आणि व्यवस्थापन यांचा सदस्यांच्या समाधानाशी व सदस्यसंख्या वाढीशी असलेला संबंध शास्त्रीय पद्धतीने अभ्यासणे आवश्यक आहे.

या पार्श्वभूमीवर प्रस्तुत संशोधन पुणे शहरातील व्यायामशाळांमधील सोयी-सुविधा, मार्गदर्शकांची पार्श्वभूमी, व्यवस्थापन वैशिष्ट्ये आणि त्यांचा सदस्यांच्या समाधानावर व व्यायामशाळेच्या सातत्यपूर्ण विकासावर होणारा परिणाम यांचा विश्लेषणात्मक अभ्यास करण्याचा प्रयत्न करते. या अभ्यासातून प्राप्त निष्कर्ष व्यायामशाळा व्यवस्थापक, मार्गदर्शक तसेच धोरणकर्त्यांसाठी उपयुक्त ठरतील आणि शहरी फिटनेस व्यवस्थापन सुधारण्यास मदत करतील अशी अपेक्षा आहे.

वरील प्रस्तावनेत स्पष्ट केल्याप्रमाणे, वाढते शहरीकरण, बदलती जीवनशैली आणि शारीरिक निष्क्रियतेमुळे व्यायामशाळांचे महत्व लक्षणीयरीत्या वाढले आहे. World Health Organization तसेच इतर आरोग्यविषयक संस्थांनी नियमित शारीरिक क्रियाशीलतेचे महत्व अधोरेखित केले असले, तरी प्रत्यक्षात व्यायामशाळांमधील सोयी-सुविधा, मार्गदर्शकांची गुणवत्ता, सुरक्षितता उपाययोजना आणि व्यवस्थापन पद्धती यामध्ये विविधता आढळून येते. या घटकांचा थेट परिणाम सदस्यांच्या समाधानावर, सहभागावर आणि व्यायामशाळेच्या सातत्यपूर्ण विकासावर होत असल्याचे साहित्य व प्रत्यक्ष निरीक्षणातून दिसून येते. त्यामुळे केवळ व्यायामशाळांची संख्या वाढत आहे का यापेक्षा, त्या व्यायामशाळा सदस्यांच्या अपेक्षा कितपत पूर्ण करतात आणि आरोग्यसंवर्धनाच्या उद्दिष्टांना कितपत हातभार लावतात, हा प्रश्न अधिक महत्वाचा ठरतो. या पार्श्वभूमीवर पुणे शहरातील व्यायामशाळांमधील सोयी-सुविधा, मार्गदर्शकांची भूमिका, व्यवस्थापन वैशिष्ट्ये आणि त्यांचा सदस्यांच्या समाधानाशी व सदस्यसंख्या वाढीशी असलेला संबंध शास्त्रीय पद्धतीने अभ्यासणे आवश्यक वाटले. म्हणूनच प्रस्तुत संशोधनात या सर्व घटकांचा सखोल अभ्यास करून व्यायामशाळांच्या कार्यक्षमतेचे आणि सदस्याभिमुखतेचे विश्लेषण करणे यासाठी या संशोधन समस्येची निवड करण्यात आली.

या संशोधनाचा उद्देश पुणे शहरातील व्यायामशाळांमधील उपलब्ध सोयी-सुविधा, मार्गदर्शकांची भूमिका, व्यवस्थापन वैशिष्ट्यक आणि त्यांचा सदस्यांच्या समाधानावर तसेच सदस्यसंख्या वाढ व सातत्यावर होणारा परिणाम यांचा अभ्यास करणे हा होता. तसेच, व्यायामशाळांमध्ये सदस्याभिमुख दृष्टिकोन, सुरक्षितता उपाययोजना आणि व्यावसायिक मार्गदर्शन यांचे महत्व विश्लेषित करून शहरी व्यायामशाळांच्या कार्यक्षमतेबाबत समग्र आढावा घेणे हा या अभ्यासाचा मुख्य हेतू होता.

## संशोधन पद्धती

सदर अभ्यासासाठी वर्णनात्मक स्वरूपाची सर्वेक्षण पद्धत वापरण्यात आली होती. संशोधनासाठी प्राथमिक माहिती संकलनावर भर देण्यात आला होता. माहिती संकलनासाठी संशोधकांनी स्वनिर्मित मराठी प्रश्नावलीचा वापर केला होता. प्रश्नावलीत होय-नाही (Yes/No) तसेच बहुपर्यायी (Multiple Response) स्वरूपाचे प्रश्न समाविष्ट करण्यात आले होते, जे व्यायामशाळांची संस्थात्मक माहिती, सोयी-सुविधा, मार्गदर्शकांची पार्श्वभूमी, सदस्य समाधान, सुरक्षितता, शुल्क आणि सदस्यसंख्या वाढीशी संबंधित घटक यांचा अभ्यास करण्यासाठी उपयुक्त होते.

प्रश्नावली प्रत्यक्ष भेटीद्वारे तसेच आवश्यकतेनुसार मार्गदर्शकांकडून भरून घेण्यात आली होती. संकलित माहितीचे विश्लेषण वर्णनात्मक सांख्यिकीय तंत्रांचा वापर करून करण्यात आले होते. यामध्ये वारंवारता (Frequency) आणि टक्केवारी (Percentage) या पद्धतींचा उपयोग करण्यात आला होता. बहुपर्यायी प्रश्नांच्या बाबतीत प्रत्येक पर्याय स्वतंत्र प्रतिसाद म्हणून विचारात घेण्यात आला होता, त्यामुळे काही तक्त्यांमध्ये एकूण टक्केवारी 100 टक्क्यांपेक्षा अधिक दर्शविण्यात आली होती. प्राप्त निष्कर्ष तक्ता व विश्लेषणात्मक विवेचनाच्या माध्यमातून सादर करण्यात आले होते.

या संशोधनासाठी पुणे शहरातील व्यायामशाळांचा अभ्यास करण्यासाठी उद्देशिय न्यादर्श निवड पद्धतीचा अवलंब करण्यात आला होता. पुणे शहरातील विविध भागांतील कार्यरत व्यायामशाळा आणि तेथील मार्गदर्शक यांची निवड न्यादर्शनासाठी करण्यात आली होती. एकूण 39 व्यायामशाळा/मार्गदर्शकांकडून माहिती संकलित करण्यात आली होती.

न्यादर्श निवडताना व्यायामशाळेचे कार्यरत असणे, नियमित सदस्यसंख्या असणे आणि मार्गदर्शकांकडून माहिती देण्याची तयारी असणे या निकषांचा विचार करण्यात आला होता (Best & Kahn 2014). उद्देशित न्यादर्श निवड पद्धतीचा वापर केल्यामुळे अभ्यासासाठी संबंधित, उपयुक्त आणि वास्तवाधिष्ठित माहिती उपलब्ध झाली होती.

## सांख्यिकीय विश्लेषण

या अभ्यासात संकलित केलेली माहिती वर्णनात्मक स्वरूपाची असल्यामुळे तिचे विश्लेषण करण्यासाठी वारंवारता व टक्केवारी या सांख्यिकीय तंत्रांचा वापर करण्यात आला होता. बहुपर्यायी स्वरूपाच्या प्रश्नांसाठी प्रत्येक पर्याय स्वतंत्र प्रतिसाद म्हणून विचारात घेण्यात आला होता. त्यामुळे अशा प्रश्नांमध्ये एकूण टक्केवारी 100 टक्क्यांपेक्षा अधिक दर्शविण्यात आली आहे. प्राप्त निष्कर्ष तक्त्यांच्या माध्यमातून सादर करून त्यांचे विश्लेषणात्मक अर्थ लावण्यात आले आहे.

न्यादर्श आकार (N) = 39 व्यायामशाळा / मार्गदर्शक

**तक्ता १ :** व्यायामशाळांची नोंदणी स्थिती (Q1)

प्रतिसाद	संख्या	टक्केवारी (%)
होय	27	69.23
नाही	12	30.77
एकूण	39	100

सुमारे 69.23% व्यायामशाळा नोंदणीकृत असल्याचे आढळून आले. यावरून पुणे शहरातील व्यायाम शाळांमध्ये संस्थात्मक शिस्त व नियमपालनाची प्रवृत्ती वाढत असल्याचे स्पष्ट होते.

**तक्ता २ :** व्यायामशाळेतील सदस्यसंख्या (Q2 - बहुपर्यायी)

सदस्यसंख्या	संख्या	टक्केवारी (%)
100 पर्यंत	11	28.21
100-500	24	61.54
1000 पेक्षा अधिक	6	15.38

बहुसंख्य (61.54%) व्यायामशाळांमध्ये 100 ते 500 सदस्य असल्याचे दिसून आले. यावरून पुणे शहरातील व्यायामशाळा मध्यम स्वरूपाच्या असून सातत्यपूर्ण सदस्यसंख्या राखण्यावर त्यांचा भर असल्याचे दिसते.

**तक्ता ३ : सोयी-सुविधा व सुरक्षितता उपाययोजना (Q9, Q11, Q12)**

घटक	संख्या	टक्केवारी (%)
साधनसामग्री समाधानकारक	30	76.92
सुरक्षितता उपाययोजना	33	84.62
प्रथमोपचार प्रशिक्षण	28	71.79

सुरक्षितता उपाययोजना (84.62%) आणि साधनसामग्रीबाबतचे समाधान (76.92%) हे प्रमाण उच्च असल्याने व्यायामशाळा सदस्यांच्या सुरक्षिततेकडे गांभीर्याने पाहत असल्याचे स्पष्ट होते.

**तक्ता ४ : मार्गदर्शकांची भूमिका व व्यावसायिक समाधान (Q7, Q20)**

घटक	संख्या	टक्केवारी (%)
छंदातून मार्गदर्शन	22	56.41
मार्गदर्शनात समाधान	32	82.05

बहुसंख्य मार्गदर्शक छंदातून किंवा आवडीने या क्षेत्रात कार्यरत असून, 82.05% मार्गदर्शक आपल्या कार्याबाबत समाधानी असल्याचे दिसते. यामुळे प्रशिक्षणाची गुणवत्ता सुधारण्यास मदत होते.

**तक्ता ५ : सदस्यसंख्या वाढीस कारणीभूत घटक (Q17 - बहुपर्यायी)**

घटक	संख्या	टक्केवारी (%)
सोयी-सुविधा	27	69.23
मार्गदर्शक	22	56.41
शिबिरे	20	51.28

सोयी-सुविधा (69.23%) व प्रशिक्षित मार्गदर्शक (56.41%) हे सदस्यसंख्या वाढीसाठी प्रमुख घटक असल्याचे स्पष्ट झाले.

**तक्ता ६ : सदस्य समाधान व सहभाग (Q3, Q24)**

घटक	संख्या	टक्केवारी (%)
सदस्य अभिप्राय प्रणाली	31	79.49
सदस्य प्रतिसाद समाधानकारक	30	76.92

सदस्य अभिप्राय प्रणाली प्रभावी असल्यामुळे बहुसंख्य सदस्यांचा प्रतिसाद समाधानकारक असल्याचे दिसून येते, जे व्यायामशाळांच्या सदस्याभिमुख धोरणाचे द्योतक आहे.

**तक्ता ७ : शुल्क व सेवांबाबत धारणा (Q18, Q19)**

घटक	संख्या	टक्केवारी (%)
शुल्क समाधानकारक	29	74.36
शुल्काचा सदस्यसंख्येवर परिणाम	18	46.15

बहुसंख्य मार्गदर्शकांना शुल्क समाधानकारक वाटत असले तरी, सुमारे ४६% प्रतिसादकर्त्यांच्या मते शुल्काचा सदस्यसंख्येवर काही प्रमाणात परिणाम होत असल्याचे दिसते.

वरील तक्त्यांवरून असे स्पष्ट होते की पुणे शहरातील व्यायामशाळांमध्ये सोयी-सुविधा, सुरक्षितता उपाययोजना, मार्गदर्शकांचे समाधान आणि सदस्याभिमुख दृष्टिकोन हे घटक सदस्य समाधान व सदस्यसंख्या वाढीसाठी निर्णायक ठरतात. वर्णनात्मक सांख्यिकीय विश्लेषणातून प्राप्त झालेले निष्कर्ष संशोधन उद्दिष्टांशी सुसंगत असून व्यायामशाळांच्या सर्वांगीण विकासासाठी महत्वपूर्ण सूचनांची दिशा दर्शवितात.

**निष्कर्ष**

प्रस्तुत संशोधनातून असे निष्कर्ष निघतात की पुणे शहरातील व्यायामशाळांमधील सोयी-सुविधा, सुरक्षितता उपाययोजना, प्रशिक्षित व समाधानी मार्गदर्शक, तसेच विविध उपक्रम हे सदस्यांच्या समाधानावर आणि व्यायामशाळेच्या वाढ व सातत्यावर निर्णायक प्रभाव टाकतात. बहुसंख्य व्यायामशाळा संस्थात्मकदृष्ट्या स्थिर असून, त्या सदस्याभिमुख व सुरक्षित वातावरण निर्माण करण्याचा प्रयत्न करत असल्याचे दिसून येते.

मार्गदर्शकांचे व्यावसायिक समाधान आणि सतत ज्ञानवृद्धी करण्याची प्रवृत्ती प्रशिक्षणाच्या गुणवत्तेला बळकटी देते. तसेच, सोयी-सुविधा व मार्गदर्शकांची गुणवत्ता ही सदस्यसंख्या वाढीसाठी सर्वाधिक प्रभावी

घटक असल्याचे या अभ्यासातून स्पष्ट झाले आहे. जरी बहुसंख्य प्रतिसादकर्त्यांना शुल्क समाधानकारक वाटत असले, तरी किंमतीबाबत सदस्य संवेदनशील असल्याचेही लक्षात येते.

म्हणूनच, व्यायामशाळांच्या सर्वांगीण व शाश्वत विकासासाठी पायाभूत सुविधा सुधारणा, सुरक्षितता व आरोग्याभिमुख सेवा, मार्गदर्शकांचा व्यावसायिक विकास आणि सदस्याभिमुख धोरणे यांचा समन्वय आवश्यक आहे. अशा प्रकारचा समन्वय साधल्यास शहरी व्यायामशाळा केवळ फिटनेस केंद्र न राहता प्रभावी आरोग्य संवर्धन केंद्र म्हणून कार्य करू शकतील.

## चर्चा

प्रस्तुत अभ्यासाचा मुख्य उद्देश पुणे शहरातील व्यायामशाळांमधील सोयी-सुविधा, मार्गदर्शकांची भूमिका, व्यवस्थापन वैशिष्ट्ये आणि त्यांचा सदस्यांच्या समाधानावर व सदस्यसंख्या वाढीवर होणारा परिणाम यांचा अभ्यास करणे हा होता. अभ्यासातून प्राप्त निष्कर्षांनी व्यायामशाळा व्यवस्थापनात भौतिक सुविधा आणि मानवी घटक या दोन्हींचे महत्व अधोरेखित केले आहे.

अभ्यासात बहुसंख्य व्यायामशाळा नोंदणीकृत असल्याचे आढळून आले, जे संस्थात्मक शिस्त आणि नियमपालनाची वाढती प्रवृत्ती दर्शविते. मध्यम स्वरूपाची सदस्यसंख्या असलेल्या व्यायामशाळांचे प्रमाण अधिक असल्याने पुणे शहरातील व्यायामशाळा स्थिर व टिकाऊ कार्यप्रणालीकडे वाटचाल करत असल्याचे दिसून येते. सोयी-सुविधांच्या बाबतीत साधनसामग्री, सुरक्षितता उपाययोजना व प्रथमोपचार प्रशिक्षण समाधानकारक असल्याचे आढळले. हे निष्कर्ष व्यायामशाळांमध्ये सुरक्षित व नियोजित प्रशिक्षण वातावरण निर्माण करण्यावर दिल्या जाणाऱ्या भराशी सुसंगत आहेत.

मार्गदर्शकांच्या संदर्भात, बहुसंख्य मार्गदर्शक छंदातून किंवा आवडीने या क्षेत्रात कार्यरत असल्याचे आणि आपल्या भूमिकेबाबत समाधानी असल्याचे दिसून आले. उच्च व्यावसायिक समाधानामुळे प्रशिक्षणातील गुणवत्ता, नवोपक्रम आणि सदस्यांशी सकारात्मक संवाद वाढण्यास मदत होते. तसेच, इंटरनेट व प्रशिक्षण कार्यक्रमांद्वारे ज्ञानवृद्धी करण्यावर दिला जाणारा भर मार्गदर्शकांच्या व्यावसायिक विकासाचे द्योतक आहे.

सदस्यसंख्या वाढ व सातत्य टिकविण्यासाठी सोयी-सुविधा, मार्गदर्शकांची गुणवत्ता आणि शिबिरे/उपक्रम हे प्रमुख घटक असल्याचे निष्कर्ष दर्शवितात. सदस्य अभिप्राय प्रणाली व समाधानकारक प्रतिसाद यामुळे व्यायामशाळांमध्ये सदस्याभिमुख व्यवस्थापन दृष्टिकोन अस्तित्वात असल्याचे स्पष्ट होते. तथापि, काही प्रतिसादकर्त्यांनी शुल्काचा सदस्यसंख्येवर परिणाम होत असल्याचे नमूद केल्यामुळे किंमत-गुणवत्ता संतुलन राखण्याचे महत्व अधोरेखित होते.

एकूणच, अभ्यासातील निष्कर्ष पूर्वीच्या फिटनेस व सेवा-व्यवस्थापन विषयक संशोधनाशी सुसंगत असून, दर्जेदार सुविधा आणि प्रशिक्षित, समाधानी मार्गदर्शक हे सदस्य समाधान व संस्थात्मक यशाचे प्रमुख आधारस्तंभ असल्याचे स्पष्ट करतात.

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# Physical Performance Profiling of Elite National-Level Kho Kho Players

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**Dr. Shirish More**

CACPE, Pune

**Mr. Atharva Tapadia**

S & C Expert

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## ABSTRACT

*Kho Kho is one of the fastest and most dynamic indigenous sports in India, characterized by continuous chasing, rapid directional changes, explosive bursts of speed, and repeated high-intensity efforts. Unlike many team sports, Kho Kho requires players to maintain agility, balance, coordination, and neuromuscular efficiency while performing complex movement patterns under time pressure. The sport places significant demands on the lower limbs, particularly in terms of power generation, acceleration, deceleration, and reactive strength, making physical performance profiling essential for scientific training and injury prevention at the elite level.*

*The present study aimed to develop a comprehensive physical performance profile and assess the physical status of national-level male Kho Kho players based on selected power, speed, and reactive strength parameters. The sample consisted of fifteen male players who were actively participating in a national training camp and were considered among the top performers in the country. The athletes underwent a series of standardized performance tests, including countermovement jump (CMJ), squat jump (SJ), broad jump for lower-limb explosive power, 10-5 reactive agility test to assess change-of-direction ability, and 10 m and 20 m sprint tests to evaluate acceleration and speed capacity.*

*Descriptive statistical analysis of the collected data indicated that the players possessed moderate to high levels of lower-limb muscular power and acceleration ability, which are crucial for successful performance in Kho Kho. However, noticeable variability was observed in reactive strength and deceleration control among players, suggesting differences in neuromuscular efficiency and movement quality. These variations may have implications for both performance consistency and injury susceptibility,*

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*particularly in movements involving rapid stopping and direction changes.*

The findings of this study provide valuable insights into the physical strengths and limitations of elite Kho Kho players. The results can serve as a scientific basis for designing sport-specific conditioning programs that focus on enhancing reactive strength, agility, and deceleration ability while maintaining and further developing power and speed. Additionally, the study emphasizes the importance of individualized training and monitoring to optimize performance and minimize injury risk in high-performance Kho Kho athletes.

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**Keywords** : Kho Kho, Reactive Strength, Sprint Performance, Jumping Ability, Athlete Profiling

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## Introduction

Kho Kho is one of the oldest indigenous sports of India and has evolved from a traditional recreational activity into a highly competitive, structured sport with national and international recognition. The modern version of Kho Kho is characterized by high-intensity intermittent activity involving short bursts of sprinting, rapid accelerations and decelerations, sudden changes in direction, low-body positioning, and complex neuromuscular coordination. Unlike many conventional field sports such as football, hockey, or rugby, Kho Kho requires players to execute explosive movements within a confined space and time constraints while maintaining balance, agility, and spatial awareness. The unique nature of the game places substantial physical and physiological demands on athletes, particularly on the neuromuscular, musculoskeletal, and energy systems (Sharma & Subramanian, 2017).

The movement patterns in Kho Kho are largely dominated by repeated sprint efforts, lateral shuffling, quick directional changes, and prolonged isometric postures such as the “sit” position adopted by defenders. These actions require a combination of muscular power, reactive strength, eccentric braking capacity, and efficient stretch-shortening cycle (SSC) utilization (Young, 2006). Sprint performance in Kho Kho is not merely about straight-line speed but also about the ability to accelerate rapidly from a static or semi-static position, decelerate efficiently, and re-accelerate in a new direction. Studies in similar invasion and tagging sports suggest that agility, reactive strength, and lower-limb power are critical determinants of performance (Sheppard & Young, 2006).

Despite its growing competitive structure and inclusion in national leagues and international platforms, scientific research on the physical performance characteristics of elite Kho Kho players remains limited. Most available literature has focused on traditional fitness components such as endurance, flexibility, or general strength, with fewer studies examining sport-specific performance variables such as reactive strength, power output, and change-of-direction ability. This gap in empirical evidence highlights the need for systematic performance profiling of elite Kho Kho athletes to better understand the physical attributes required for success in the sport (Ghosh & Mandal, 2015).

Performance profiling is an essential tool in modern sports science as it provides objective data on an athlete's physical capabilities. Through structured assessment using valid and reliable field-based tests, coaches and sports scientists can identify both strengths and limitations in an athlete's performance profile. Such information is critical for designing individualized training programs that align with the specific demands of Kho Kho rather than relying on generalized conditioning models (Bompa & Haff, 2009).

Furthermore, performance profiling plays a vital role in injury prevention and risk management. Kho Kho involves frequent eccentric loading, rapid stopping, and high-impact landings, which can predispose athletes to lower-limb injuries such as hamstring strains, knee ligament injuries, and ankle sprains. By assessing parameters such as reactive strength, deceleration ability, and jump performance, potential biomechanical weaknesses can be detected early, allowing for targeted corrective training interventions (Komi, 2003).

In addition, baseline performance data serve as a reference point for monitoring training progress and evaluating the effectiveness of conditioning programs over time. Longitudinal tracking of physical performance helps in optimizing training load, preventing overtraining, and ensuring peak performance during competition phases. (Turner & Stewart, 2014). At the elite level, even small improvements in sprint speed, agility, or power can significantly influence match outcomes in a fast-paced sport like Kho Kho.

Given the increasing professionalism of the sport and the rising standards of competition, there is a growing need for evidence-based training and performance assessment in Kho Kho. However, the lack of standardized performance benchmarks for national-level players poses a challenge for coaches and practitioners. Establishing normative data for key physical performance variables is therefore crucial for talent identification, training prescription, and performance enhancement in Kho Kho.

Considering these factors, the present study was designed to establish a baseline physical performance profile of national-level Kho Kho players using commonly accepted field-based tests. By assessing variables such as jumping ability, sprint performance, and reactive agility, this study aims to contribute to the scientific understanding of the physical demands of Kho Kho and provide practical insights for coaches, trainers, and sports scientists working with elite athletes.

General objective of this study was to assess and establish the physical performance profile of national-level Kho Kho players based on selected power, speed, and reactive strength parameters.

## **Research Methodology**

The present study was designed to understand and describe the physical performance characteristics of national-level Kho Kho players. A descriptive cross-sectional research design was adopted, as the objective was to capture the current physical performance status of the athletes at a particular point in time rather than to examine the effects of any training intervention. Field-based performance tests that are widely accepted in sports science were used to assess key physical attributes relevant to Kho Kho performance.

The participants for this study were selected using a purposive sampling method, as the focus was specifically on elite-level athletes. The sample consisted of fifteen (N = 15) male national-level Kho Kho players who were attending a national training camp during the period of data collection. All players had prior experience in national competitions and were undergoing regular structured training.

Before testing, the purpose of the study and testing procedures were clearly explained to all participants in simple language. Each player voluntarily agreed to take part in the study, and informed consent was obtained. To ensure the accuracy and reliability of the data, only those players who were free from any injury or illness at the time of testing were included.

The testing was conducted over two consecutive days at the training venue in a familiar environment for the players. To minimize the influence of fatigue, participants were advised to avoid strenuous physical activity at least 24 hours before testing.

Each testing session began with a standardized warm-up of approximately 15 minutes, which included light jogging, dynamic stretching, and movement-specific drills related to jumping and sprinting.

The following performance parameters were assessed using standardized field-based tests:

Test	Purpose of Assessment
Countermovement Jump (CMJ)	Explosive power and efficiency of the stretch-shortening cycle
Squat Jump (SJ)	Pure concentric lower-limb power
Broad Jump	Horizontal power generation
10-5 Reactive Agility Test	Reactive strength and deceleration control
10 m Sprint	Acceleration ability
20 m Sprint	Short-distance speed maintenance

Before each test, the procedure was clearly demonstrated by the researcher, and players were allowed one familiarization attempt. Thereafter, two formal trials were conducted for each test, with sufficient rest intervals between attempts to prevent fatigue. The best performance of each athlete was recorded for further analysis.

## Statistical Analysis

The collected data were analysed using descriptive statistics to provide a clear picture of the players physical performance. The mean, standard deviation, minimum, and maximum values were calculated for all selected variables. These statistical measures helped in understanding both the average performance level and the variation among players.

**Table 1** : Descriptive Performance Profile of National Kho Kho Players

Variable	Mean $\pm$ SD
CMJ (cm)	41 $\pm$ 5.50
SJ (cm)	37 $\pm$ 3.87
Broad Jump (cm)	229 $\pm$ 12.48
10-5 Test (s)	1.81 $\pm$ 0.27
10 m Sprint (s)	7.72 $\pm$ 0.31
20 m Sprint (s)	7.37 $\pm$ 0.29

The descriptive statistics of the selected performance variables of national-level Kho Kho players ( $N = 15$ ) are presented in Table 1. The mean value for countermovement jump. (CMJ) was  $41.00 \pm 5.44$  cm, with scores ranging from 34 cm to 50 cm, indicating moderate to high levels of vertical explosive power among the players. The mean squat jump (SJ) performance was  $36.87 \pm 3.93$  cm, with a minimum of 30 cm and a maximum of 42 cm, reflecting relatively consistent concentric lower-limb power across the sample.

For horizontal power, as measured by the broad jump, the mean score was  $228.93 \pm 12.48$  cm, with values ranging from 198 cm to 245 cm. This suggests that most players possessed well-developed horizontal propulsion ability, which is critical for sprinting, diving, and rapid directional changes in Kho Kho.

Agility, assessed through the 10-5 test, showed a mean time of  $1.81 \pm 0.27$  seconds, with a range of 1.36 to 2.27 seconds. The relatively higher standard deviation indicates notable inter-individual variability in change-of-direction speed and deceleration control.

In terms of linear speed, the mean 10 m sprint velocity was  $7.73 \pm 0.46$  m/s, while the mean 20 m sprint velocity was  $7.47 \pm 0.52$  m/s. The narrow range of values suggests a relatively homogeneous speed profile among the players.

**Table 2 :** Performance categorization of national-level Kho Kho players based on Vertical Power, Concentric Power, Horizontal Power and Agility ( $N = 15$ )

Performance Variable	Category	Criterion	Number of Players (n)	Percentage (%)
Countermovement Jump (CMJ)	Excellent	$\geq 46$ cm	4	26.7
	Good	40-45 cm	5	33.3
	Needs Improvement	$< 40$ cm	6	40
Squat Jump (SJ)	High	$\geq 40$ cm	4	26.7
	Moderate	35-39 cm	7	46.6
	Low	$< 35$ cm	4	26.7
Broad Jump	Excellent	$\geq 240$ cm	4	26.7
	Good	225-239 cm	8	53.3
	Needs Improvement	$< 225$ cm	3	20

10-5 Agility Test	Excellent	$\leq 1.60$ s	5	33.3
	Moderate	1.61-1.80 s	4	26.7
	Needs Improvement	$> 1.80$ s	6	40

Based on performance benchmarks derived from the dataset:

### **Vertical power (CMJ):**

- Four players (26.7%) demonstrated superior vertical explosiveness ( $\geq 46$  cm).
- Five players (33.3%) showed moderate performance (40-45 cm).
- Six players (40%) recorded values below 40 cm, indicating a need for targeted strength and power training.

### **Concentric power (Sj):**

- Four players (26.7%) exhibited higher concentric power ( $\geq 40$  cm).
- Seven players (46.6%) demonstrated moderate concentric power (35-39 cm).
- Four players (26.7%) showed lower concentric power ( $< 35$  cm), suggesting inadequate force production capacity.

### **Horizontal power (Broad Jump):**

- Four players (26.7%) achieved excellent scores ( $\geq 240$  cm).
- Eight players (53.3%) demonstrated good horizontal power (225-239 cm).
- Three players (20%) fell below 225 cm, indicating the need for plyometric and sprint-specific training.

### **Agility (10-5 test):**

- Five players (33.3%) exhibited superior agility ( $\leq 1.60$  s).
- Four players (26.7%) demonstrated moderate agility (1.61-1.80 s).
- Six players (40%) recorded slower change-of-direction performance ( $> 1.80$  s), indicating deficits in braking and deceleration control.

### **Strength and Conditioning Trends**

Based on performance patterns, three distinct conditioning profiles emerged within the group:

**Power-dominant profile:**

A subset of players with high jump performance but moderate agility required enhanced eccentric braking, landing mechanics, and deceleration control training.

**Speed-agility dominant profile:**

Players who demonstrated superior agility but comparatively lower vertical and horizontal power required greater emphasis on maximal strength and rate of force development training.

**Developmental profile:**

A group of players exhibited below-average performance across multiple parameters, indicating the necessity for comprehensive strength, plyometric, and sprint mechanics training.

**Injury Risk Analysis**

A qualitative risk profiling based on performance deficits and biomechanical demands indicated that knee, quadriceps, and shin injuries were the most prevalent primary risk areas, followed by hamstring, lower back, and hip-related risks.

Players with high vertical power but poor agility scores demonstrated a potentially greater risk of knee overloading due to inadequate eccentric braking capacity.

Players with low squat jump and low broad jump scores were identified as being at higher risk for hamstring and hip strain due to insufficient force production and propulsion efficiency.

Players with slower 10-5 test times were considered more susceptible to knee and ligament-related injuries during rapid change-of-direction movements.

**Conclusion**

The present study examined the performance profile of national-level Kho Kho players based on selected neuromuscular and speed-related parameters, including countermovement jump, squat jump, broad jump, agility (10-5 test), and sprint velocity (10 m and 20 m). The findings indicate that the players, as a group, possess moderate to good levels of lower-limb explosive power and horizontal propulsion ability, which are essential for effective performance in Kho Kho. However, considerable inter-individual variability was observed across most performance measures, particularly in agility and change-of-direction ability.

While the majority of players demonstrated adequate vertical and horizontal power, a substantial proportion exhibited deficits in agility and deceleration control, suggesting that these qualities represent critical areas for further development. Additionally, the performance patterns revealed distinct conditioning profiles within the group, emphasizing the need for individualized rather than generalized training interventions.

From an injury prevention perspective, the study highlighted a higher susceptibility to knee- and hamstring-related risks, particularly among players with poor eccentric control and lower concentric strength. This underscores the importance of integrating targeted eccentric strengthening, landing mechanics training, and neuromuscular conditioning into regular training programs.

Overall, the results suggest that although the players possess a solid athletic foundation, systematic and player-specific conditioning strategies focusing on agility, rate of force development, and movement efficiency are necessary to optimize performance and reduce injury risk in elite Kho Kho players.

## Discussion

The present study sought to develop a performance profile of national-level Kho Kho players based on selected neuromuscular, power, agility, and speed-related variables. The findings provide meaningful insights into the physical characteristics, performance strengths, and potential limitations of the players, with important implications for training and injury prevention.

The mean values for countermovement jump ( $41.00 \pm 5.44$  cm) and squat jump ( $36.87 \pm 3.93$  cm) indicate that the players possessed moderate to good levels of vertical explosive power and concentric strength. This level of performance is consistent with the demands of Kho Kho, which requires repeated jumping, lunging, and explosive take-offs during chasing and defending actions. However, the observed variability in CMJ and SJ scores suggests that not all players were equally developed in terms of lower-limb power, highlighting the need for individualized strength and conditioning interventions rather than uniform team-based training.

The broad jump performance ( $228.93 \pm 12.48$  cm) reflected relatively strong horizontal power among the group. This is a positive finding, as horizontal force production is crucial in Kho Kho for rapid acceleration, diving, and directional changes. Players with superior broad jump scores likely have an advantage in initiating quick movements and covering distance efficiently during play. Conversely, players with lower broad jump scores may struggle with explosive forward propulsion, which could limit their effectiveness in high-intensity match situations.

Agility, as measured by the 10-5 test, demonstrated greater inter-individual variability compared to other variables ( $1.81 \pm 0.27$  s). A considerable proportion of players recorded slower times, indicating deficiencies in deceleration, braking ability, and change-of-direction mechanics. This is a critical finding because Kho Kho involves frequent and rapid directional shifts, evasive movements, and sudden stops. Players with poorer agility are not only at a performance disadvantage but may also be at a higher risk of non-contact knee injuries due to inadequate eccentric control during cutting and turning movements.

Sprint performance at 10 m and 20 m showed relatively homogeneous values across the group, suggesting that most players had developed a similar baseline level of linear speed. While this is beneficial for team balance, it also indicates limited differentiation in sprint qualities among elite players. Future training programs could focus on enhancing acceleration mechanics and maximal sprint efficiency to create a greater performance advantage.

The classification of players into distinct conditioning profiles—power-dominant, speed-agility dominant, and developmental—further supports the argument for individualized training. Power-dominant players require improved braking and landing mechanics, whereas speed-agility dominant players would benefit from greater emphasis on maximal strength and rate of force development. Players in the developmental category require a comprehensive approach combining strength training, plyometrics, and sprint mechanics.

From an injury prevention standpoint, the predominance of knee and hamstring risk observed in the study aligns with existing literature on field-based sports. The high frequency of accelerations, decelerations, unilateral loading, and sudden directional changes in Kho Kho likely contributes to increased musculoskeletal stress in these regions. Players with high vertical power but poor agility appear particularly vulnerable to knee overloading, whereas those with lower concentric strength and horizontal power may be more prone to hamstring and hip-related injuries.

Overall, the findings suggest that while national-level Kho Kho players demonstrate a solid foundation in power and speed, agility and eccentric control remain key areas for improvement. A structured, evidence-based conditioning program emphasizing change-of-direction training, eccentric strengthening, neuromuscular stability, and individualized load management is recommended to enhance performance while minimizing injury risk. Future research should consider longitudinal training interventions to assess the impact of targeted conditioning strategies on both performance and injury reduction in Kho Kho players.

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Note: The above journal publication is specifically on speed-agility correlation in Kho Kho players, a sport-specific measure critical for performance profiling.

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