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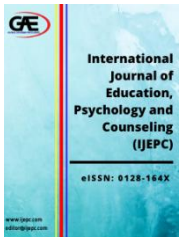


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# ISSUES AND CHALLENGES IN THE APPLICATION OF SPORTS SCIENCE IN THE ASPECT OF PHYSICAL FITNESS WITHIN THE COACHING PROCESS OF UNDER-17 FOOTBALL IN SAMARAHAN

Mohd Izdihar Qaedi Jidi[1]*, Zulakbal Abdul Karim[2], Abdul Rahaman Mohamed[3]

[1] Faculty of Sports Science and Coaching, Universiti Pendidikan Sultan Idris, Malaysia
Email: izdiharqaedi@gmail.com
[2] Faculty of Sports Science and Coaching, Universiti Pendidikan Sultan Idris, Malaysia
Email: zulakbal@fsskj.upsi.edu.my
[3] Faculty of Sports Science and Coaching, Universiti Pendidikan Sultan Idris, Malaysia
Email: abdulrahaman2803@gmail.com
* Corresponding Author

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**Abstract:**

This study examines the issues and challenges faced by under-17 football coaches in Samarahan in applying sports science in the coaching process, specifically in terms of physical fitness. Using a qualitative approach through semi-structured interviews with five active coaches, supplemented by observations and document reviews, this study reveals several key constraints such as the lack of formal educational background in sports science, an unstructured coaching pathway based primarily on experience, limited access to professional training courses and relevant academic resources, and a high dependence on informal learning. These constraints result in inconsistent and less effective application of scientific principles in training, which undermines the quality of youth athlete development. The study emphasises the urgent need for a practical, contextual, and continuous model for the application of sports science that can support grassroots coaches in enhancing their skills and training effectiveness. By integrating relevant theoretical frameworks, namely **Grounded Theory (Strauss & Corbin, 1990)**, the **Long-Term Athlete Development (LTAD) model** (Balyi et al., 2013), and the **Youth Physical Development (YPD) model** (Lloyd & Oliver, 2012), this research situates its findings within broader academic discourse. The implications of this study are critical for strengthening coaching development, aligning with Malaysia's National Football Development Programme (NFDP), and enhancing youth football performance.

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**Keywords:**

Sports Science, Football Coaching, Physical Fitness, Coaching Challenges, Under-17 Athletes, Grounded Theory, LTAD, YPD

## Introduction

Football has long been recognised as the most influential sport in the world, with its ability to unite various segments of society from different social, cultural, and geographical backgrounds (Varmus et al., 2022; Musculus & Lobinger, 2018). It is not merely a prestigious sport at the international level but also represents a cultural and social phenomenon that reflects values, identity, and collective aspirations. With an estimated more than 265 million players and 5 billion supporters worldwide (Nielsen Sports, 2021), football continues to maintain its position as the most widespread physical activity on a global scale.

One of football's most prominent features is its high accessibility. It does not require expensive or specialised equipment and facilities, making it easy to play in various contexts, from narrow alleyways to international stadiums (Shan, 2022). This characteristic creates participation opportunities for children and adolescents, including those from underprivileged communities. Early involvement in football not only develops physical skills but also instils life values such as discipline, cooperation, and teamwork (Duncan, 2023).

Beyond being a competitive sport, football is also recognised as a tool for social intervention and community development. Initiatives such as **Football for Hope** and **Street Football World** demonstrate football's use as a mechanism to address poverty, social exclusion, public health, and lack of access to education (FIFA, 2019; Giulianotti, 2015). Particularly in marginalised urban areas, football provides a positive environment that builds self-confidence and soft skills among adolescents.

Football also serves as a symbol of collective identity and cultural expression. In several countries, football clubs are not merely sporting entities but represent political struggles, social classes, and community histories. For instance, FC Barcelona is associated with Catalan aspirations, while Boca Juniors reflects Argentina's working-class identity (Giulianotti, 2015). This illustrates how sport can embody complex social and ideological narratives.

In Malaysia, football occupies a special place in society's imagination. It is both a symbol of national unity and a platform for interethnic interaction. Matches such as Malaysia versus Indonesia attract tens of thousands of supporters, reflecting high levels of public engagement (Junhar, 2019). Beyond the national team, Malaysians also show strong interest in local clubs like JDT and Selangor FC, as well as international clubs such as Liverpool and Barcelona. Football has also been institutionalised within the education system, primarily through co-curricular programmes in schools, where it is used for character development, leadership, and ethics. Teachers and coaches thus play dual roles: developing sporting talent and instilling moral values.

However, despite its popularity, Malaysian football development faces persistent challenges, particularly in integrating sports science into youth training. Grassroots coaches most of whom are teachers without formal sports science education often rely on personal experience or

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outdated practices (Sinar Harian, 2023). This gap reduces the quality of training and places young athletes at risk of injury or stagnation during crucial developmental years (Reilly, Bangsbo, & Franks, 2000). Addressing these issues requires a deeper exploration of the barriers coaches face and the development of a contextual model for applying sports science in grassroots football.

**Literature Review – Evolution of Coaching Research**

Research in football coaching has evolved beyond the transfer of technical skills. Contemporary coaching involves athlete psychology, sports science, coach behaviour, and interpersonal dynamics (Côté & Gilbert, 2009; Bompa, 1993). Coaches are now expected to act not only as instructors but also as leaders, mentors, and strategic planners capable of integrating scientific knowledge into training.

Zulakbal and Najib (2018) highlighted that grassroots coaches, particularly teachers, often lack sports science training and instead depend on personal experience. Similarly, Arifah and Norlena (2022) found that coaches without professional training tend to neglect critical aspects such as periodisation, recovery, load management, and performance analysis. Abdul Halim (2021) reinforced this view, identifying time constraints and dual roles as barriers to integrating sports science in school-based coaching.

**Previous Studies (2020–2025)**

To synthesise the evidence, Table 1 summarises recent studies examining sports science in coaching.

**Table 1. Summary of Previous Studies on Coaching and Sports Science (2020–2025)**

| Author(s) | Focus | Method | Key Findings |
|---|---|---|---|
| Cronin, Brown & Cruickshank (2023) | Well-being of high-performance coaches | Constructivist Grounded Theory | Balance between personal values and professional demands critical for sustainability |
| Abdul Rahaman et al. (2025) | Elite coaching in Malaysian Sports Schools | Evolved Grounded Theory | Two main themes: knowledge and management essential for effectiveness |
| Castro et al. (2022) | Youth athlete development | Qualitative case study | Holistic coaching integrates physical, technical, and psychosocial aspects |
| Quinaud et al. (2022) | Talent development under stress | Review | Importance of supportive environments and multidimensional growth |
| Hasrul Faizal (2021) | Football coaching in Malaysia | Grounded Theory | Identified six categories of effective coaching in state sports schools |

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**Key Gaps**

Despite NFDP's emphasis on coach education (KBS, 2015), its implementation has been limited in rural areas like Samarahan. Coaches lack exposure to professional workshops, CPD systems, and modern monitoring tools (Williams, Ford, & Drust, 2020). Additionally, locally contextualised models remain absent, leaving grassroots coaches without structured guidance to apply sports science effectively.

**Theoretical Framework**

This study is grounded in three complementary frameworks that underpin the analysis and interpretation of findings:

1. **Grounded Theory (Strauss & Corbin, 1990)**
   Grounded Theory is adopted as the methodological foundation because it allows categories and themes to emerge inductively from field data. This approach aligns with the study's aim of exploring the lived experiences of grassroots coaches in Samarahan. It avoids imposing pre-existing constructs, instead building a model contextualised to the participants' realities.

2. **Long-Term Athlete Development (LTAD) Model (Balyi et al., 2013)**
   The LTAD model provides a structured pathway for youth development, emphasising that training should be age-appropriate, stage-specific, and progressive. Its integration highlights the importance of tailoring physical fitness programmes to the biological and psychological stages of under-17 players.

3. **Youth Physical Development (YPD) Model (Lloyd & Oliver, 2012)**
   The YPD model accounts for biological maturation differences among adolescents, focusing on windows of trainability in speed, strength, and endurance. Its relevance is particularly strong in grassroots contexts, where players develop at varied rates.

**Research Methodology**

***Research Design***

This study adopts a **qualitative case study design** with a Grounded Theory approach to explore in depth the issues, challenges, and best practices in applying sports science to physical fitness training among under-17 football coaches in Samarahan. The case study design enables an in-context examination of real-world coaching challenges (Yin, 2018).

**Study Setting and Timeframe**

- **Location:** Samarahan District, Sarawak, Malaysia. Samarahan was selected as it represents a rapidly developing area with active youth football involvement but limited sports science integration.
- **Timeframe:** The study was conducted over **12 months (January–December 2023)**, covering both school and community football activities.

***Participants and Sampling***

Five coaches were selected using purposive sampling. Inclusion criteria included:

- Holding FAM/AFC coaching licenses.

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- At least three years of active coaching experience.
- Actively involved in under-17 football competitions.

The purposive approach ensured participants were "information-rich cases" (Patton, 2002) capable of offering deep insights into coaching realities.

**Data Collection Methods**

1. **Semi-structured interviews:**
    - Duration: 45–60 minutes each.
    - Focus: coaches' understanding of sports science, their application in physical fitness training, challenges faced, and coping strategies.
    - All interviews were audio-recorded with consent and transcribed verbatim.
2. **Observations:**
    - Informal observations of training sessions (fitness drills, warm-ups, and recovery practices).
    - Field notes captured coaches' practices and contextual challenges (e.g., equipment, facilities, attendance).
3. **Document review:**
    - Training schedules, attendance records, and NFDP-related reports were reviewed to triangulate data.

**Data Analysis**

Data were analysed using **thematic analysis** (Braun & Clarke, 2006).

- **Open coding:** Identified initial codes from transcripts and notes.
- **Axial coding:** Grouped related codes into categories (e.g., "knowledge gaps," "resource barriers").
- **Selective coding:** Synthesised categories into overarching themes.

To ensure credibility:

- **Member checking** was conducted by sharing transcripts and themes with participants for verification.
- **Triangulation** across interviews, observations, and documents strengthened reliability.

**Trustworthiness**

The study applied Lincoln and Guba's (1985) criteria: credibility, transferability, dependability, and confirmability. Thick descriptions of context ensure that findings are transferable to similar grassroots football environments.

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**Figure 2. Research Methodology Flowchart**
*(Flowchart: Research Problem → Sampling (5 coaches) → Data Collection (interviews, observations, documents) → Data Analysis (coding) → Emergent Themes → Development of Sports Science Application Model).*

## Research Findings

The study revealed several recurring themes that highlight the issues and challenges faced by under-17 football coaches in Samarahan when applying sports science in physical fitness training. The findings are categorised into key thematic areas, supported by evidence from interviews, observations, and document analysis.

### *Educational Background*

Most coaches lacked formal education in sports science. Instead, their qualifications were in unrelated fields such as education, engineering, and religious studies. This limited their exposure to fundamental principles such as training load management, exercise physiology, periodisation, and recovery. Consequently, their training methods relied heavily on personal experience or replication of their past playing days.

"I only use what I learned when I was a player. We don't have proper courses in sports science. So I just follow drills that worked for me before." *(Coach 2, Interview Transcript)*

**Table 2. Educational Background of Coaches**

| Coach | Formal Qualification | Sports Science Background | Years Coaching |
|---|---|---|---|
| C1 | B.Ed. (General) | None | 5 |
| C2 | B.Eng. | None | 7 |
| C3 | Diploma Religious Ed. | None | 6 |
| C4 | B.Ed. (PE minor) | Limited | 8 |
| C5 | Diploma Teaching | None | 4 |

### *Coaching Career Pathway*

The study revealed that coaching career pathways were informal and unsystematic. Coaches were appointed based on playing background or school requirements, without structured competency development or certification through official bodies such as the FAM or AFC.

This lack of systematic progression undermined coaches' confidence and hindered the consistent integration of sports science into practice.

**Figure 3. Coaching Pathway of Grassroots Coaches in Samarahan** (*Illustration: Entry via playing experience → Informal appointment → Limited training exposure → Reliance on experience → Gaps in sports science application*).

### *Courses and Training*

Limited access to professional courses was identified as a significant issue. Constraints included distance to training venues, cost, and time conflicts due to coaches' dual roles as teachers. Participation in professional development was therefore minimal.

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"The course is in KL or Kuching, but I am in Samarahan. I cannot leave my teaching job for one week." *(Coach 4)*

***Access to Scientific Resources***

Coaches reported difficulties in accessing relevant and comprehensible scientific resources. Most were in English with technical terms, which discouraged usage. Materials in Malay were scarce and lacked practical application. Coaches therefore relied on YouTube videos, social media posts, or peer advice, which were not always reliable.

**Table 3. Sources of Learning Used by Coaches**

| Source Type | Frequency of Use | Reliability |
|---|---|---|
| YouTube / Social Media | High | Low–Medium |
| Informal Peer Sharing | Medium | Medium |
| Academic Books / Articles | Low | High |
| Malay Training Modules (limited) | Very Low | Medium |

***Informal Learning Practices***

Due to limited formal training, coaches depended on informal learning such as peer exchanges, observing other teams, or watching online content. While this offered adaptability, it lacked systematic evaluation or validation.

***Knowledge Application***

Even when coaches possessed some sports science awareness, application in practice was inconsistent. Physical fitness sessions often lacked progressive overload, specificity, or recovery phases. Monitoring was subjective and based on visual judgment rather than objective data.

"We know about recovery and overtraining, but without proper tools, we just use our eyes to judge the players." *(Coach 3)*

***Facilities and Infrastructure***

The lack of proper facilities emerged as a major obstacle. Training often took place on shared fields with inadequate gym equipment. This limited coaches' ability to apply progressive or specific training.

**Figure 4. Facility Constraints in Samarahan Schools** (*Visual: Shared fields → Limited gym equipment → Reduced training quality → Inconsistent physical fitness outcomes*).

***Fitness Assessment Tools and Technology***

No access to modern monitoring technologies (e.g., GPS trackers, heart rate monitors) was reported. Coaches relied on manual recording or observation, which limited accuracy in tracking training load, recovery, and long-term player development.

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### *Training Time and Consistency*

Time constraints were significant due to coaches' primary role as teachers. Training was often restricted to after-school hours or weekends, limiting volume and quality. Inconsistent player attendance and weather disruptions further reduced training effectiveness.

**Table 4. Training Constraints Reported by Coaches**

| Constraint | Example | Impact |
|---|---|---|
| Limited Time | Training after school only | Reduced training volume |
| Player Absenteeism | Students missing due to exams | Inconsistent sessions |
| Weather | Rain cancelling outdoor training | Disrupted periodisation |

### Summary of Findings

The findings converge on three overarching issues:

1. **Knowledge Gap:** Lack of formal sports science education and structured career pathways.
2. **Resource Constraints:** Limited access to facilities, technology, and comprehensible resources.
3. **Time and Contextual Challenges:** Dual roles, limited training hours, and inconsistent attendance.

These factors collectively hinder the effective application of sports science principles in grassroots football.

## Discussion

### *Lack of Formal Education in Sports Science*

The findings revealed that most grassroots coaches in Samarahan lacked formal sports science education, which significantly limited their ability to apply principles such as periodisation, training load management, and recovery. This aligns with Cushion et al. (2010), who emphasised that coaches without systematic education often depend on intuition and outdated practices. Studies by Sellathurai and Draper (2022) and Martindale, Collins, and Daubney (2005) further support that scientific knowledge is essential to design training programmes that match athlete development stages and reduce injury risks.

### *Unsystematic Coaching Pathways*

Coaches' career development was largely informal, based on playing experience or school appointments. This lack of structured certification undermined confidence and contributed to inconsistent coaching practices. Karim and Razak (2018) and Ismail et al. (2024) noted that competency-based pathways are critical to ensure coaches stay relevant to modern demands. Without structured CPD, grassroots coaches remain stagnant, repeating outdated practices (Hubball & García, 2020).

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***Barriers to Professional Training***

Constraints in accessing formal training included financial limitations, distance to urban centres, and time conflicts due to teaching responsibilities. Consequently, coaches relied heavily on informal learning, echoing Loo et al. (2024), who found similar patterns among rural educators. While informal learning provides adaptability, He et al. (2018) argued it lacks rigour and risks perpetuating ineffective practices.

***Resource and Facility Limitations***

Access to resources was a major challenge. Coaches reported difficulties in understanding English-language texts and a lack of contextual materials in Malay. This aligns with Osman and Yusoff (2020), who stressed the importance of developing locally adapted resources. Similarly, Fitri et al. (2022) found that inadequate facilities reduce training quality and compromise athlete safety.

***Overreliance on Informal Learning***

Although informal learning (peer exchanges, YouTube) provided quick solutions, its unstructured nature limited knowledge validation. Nelson et al. (2006) stressed that informal learning must be complemented by structured, evidence-based frameworks. Otherwise, reliance on intuition risks reinforcing ineffective practices and limiting innovation in grassroots coaching.

***Time and Training Consistency***

Dual roles as teachers limited the time coaches could dedicate to structured training. Knight et al. (2015) found that inconsistent training undermines long-term athlete development. Similarly, Christensen (2013) emphasised that consistent application of progressive overload is critical for physiological adaptation, which was lacking in Samarahan's context.

## Conclusion

This study examined the **issues and challenges in applying sports science to physical fitness training in grassroots football coaching in Samarahan**. It found three overarching constraints:

1. **Knowledge Gaps:** Coaches lacked formal education in sports science and structured career pathways.
2. **Resource Constraints:** Limited access to facilities, monitoring technology, and comprehensible scientific resources.
3. **Time and Contextual Challenges:** Dual teaching roles, inconsistent training schedules, and player absenteeism.

These constraints hindered the effective integration of sports science principles, leading to inconsistent training quality and potential risks to youth athlete development.

## Contributions

***Academic Contributions***

This study integrates **Grounded Theory, LTAD, and YPD frameworks** to contextualise grassroots coaching in Malaysia, expanding literature on sports science application in

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Southeast Asia. It highlights the gap between theoretical principles and field realities, contributing to the discourse on bridging science and practice.

**Practical Contributions**

The proposed **Sports Science Application Model** offers practical strategies for coaches:

- Emphasising accessible CPD (modular, online training).
- Developing locally adapted resources in Malay.
- Encouraging structured monitoring of training loads.
- Leveraging peer-based reflective learning.

***Policy Contributions***

The findings support Malaysia's **National Football Development Programme (NFDP)** by identifying barriers and recommending scalable solutions for grassroots implementation. Improved policy frameworks could:

- Subsidise CPD for rural coaches.
- Provide portable assessment kits to schools.
- Integrate sports science literacy into teacher training programmes.

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