Sports Skills Acquisition Evolution in Physical Education: A Thematic Analyses & Systematic Review of Literature

Jhon Roy A. Estopil, Bryan Lee Cancio, Oman Abiera Belisario

[a] *jhonroyestopil@gmail.com*

[a] *Suankularb Wittayali Thonburi School, 201 Moo 6, Karnchanapisek Road (Bang Khun Thian - Phra Pradaeng Expressway), Tha Kham, Bangkhunthein District, Bangkok 10150, Thailand*

Abstract

Teaching sports skills in physical education highlighted an issue of a low level of fundamental sports skills among students. To address this issue, this study aims to come up with a framework that could help physical education teachers enhance sports skills acquisition among students. Additionally, the study also answered the research question; How has the process of sports skills acquisition evolved in physical education? Using a systematic review analysis, data were obtained and analyzed systematically using codes, themes, and categories where possible patterns, content similarities, and research characteristics can be transcribed as essential themes to address the research problem. The results of the study consolidated the final themes that answered the research question. The final themes include "Cognitive Skills, Training, Assessment, and Technology." Therefore, for the students in physical education to acquire sports skills, it is essential to focus on developing cognitive skills, enhancing training activity interventions, improving assessment strategies, and integrating technological applications to have a well-structured physical education program for sports development in meeting their diverse needs and abilities. Thus, this study can be replicated, compared, and contrasted by other research enthusiasts in the future who have similar interests in the field of physical education, who are passionate about fostering an active engagement in physical education, exploring the significant development of acquiring skills in sports, best practices, challenges, and innovations that have influenced the evolution of sports skills in physical education over time.

Keywords: Sports Program, Sports Skills Acquisition, Technological Applications, Systematic Review, Thematic Analysis.

1. Introduction

Acquiring skills in sports involves various aspect of sports science and physical education that considers the relationship between motor abilities, cognitive functions, and environmental influences affecting skill enhancement and athletic achievement (Herrebrøden et al., 2024). Despite the impact and benefits of physical activity, issues of teaching sports in physical education are becoming problematic due to the low level of development in fundamental sports skills among students (Duncan et al., 2021). Likewise, studies like those by Fransen et al. (2024) where discrepancies in the evaluation methods used to test sports skill acquisition had led to difficulties in giving feedback and intervention outcomes for sports skills development. In preventing these problems from worsening, there is a need for a consistent intervention approach that can adapt to the rising global trends in sports training and skill acquisition.

In the global context relative to the acquisition of fundamental skills in sports and physical education, research conducted in the United Kingdom, Ireland, and Austria shows that students often do not master the fundamental sports skills at the expected age-related developmental level of movement competence in physical education (Duncan et al., 2021). Traditional training methods often fall short in keeping up with the evolving world of sports and the unique capabilities of athletes. This can lead to students not acquiring skills in sports as noted by Barker et al. (2022) and Liu (2023). Moreover disparities, in access to training facilities and technology, among countries result in training opportunities ultimately hindering the systematic and effective enhancement of students' sports abilities (Fernandez et al., 2023).

In the Philippines integrating sports into education faces challenges concerning sports facilities and the limited technological expertise of coaches and physical educators (De Los Santos, 2019). These barriers are more noticeable, in regions with demographic disadvantages which are also made even more complex during the shift to distance learning affecting practical sports teaching methods (Samosa et al., 2022). Hence, innovative sports training interventions and educational approaches such as task-based learning and the use of digital technology, like video demonstrations for observational learning, are encouraged. These training interventions can offer more adaptive and inclusive learning experiences to foster students' holistic development and sports performance (Samosa et al., 2022; Panganiban & San Miguel, 2023).

Various research studies on sports skill acquisition tend to focus primarily on enhancing traditional and standardized training methods rather than incorporating cutting-edge technological advancements to modernize training culture and environments. Thus, the integration of environmental aspects to enhance learning and performance represents a crucial shift toward understanding the athlete-environment interaction (Liu, 2023). This study aims to address the gap between traditional training standards and modern digital technology introducing advanced simulation engagements to create more realistic and effective training platforms. The study also explores the integration of empathetic and outcome-based practical learning strategies, specifically in the Philippines, which aims to bridge the gap not just within traditional methodological approaches and existing literature but also enhance the practical application and theoretical understanding of sports acquisition in all settings.

2. Theoretical Framework

The study relies on two main theoretical frameworks: the Achievement Goal Theory (Chazan et al., 2021), and the Constructivist Theory (Vygotsky 1979/1966; Taylor & Boyer, 2019). By integrating these theories, the study seeks to understand how the process of sports skills acquisition in physical education has evolved.

Achievement Goal Theory focuses on individuals' goals based on their perception of competence. It explains that individuals pursue their target objectives according to how competent and motivated they will feel. This theory helps us explore how students' perceptions of their abilities in sports influence their motivation to participate and acquire sports skills (Chazan et al., 2021). Constructivist Theory, on the other hand, is built on Piaget's idea that active interaction with the sports environment aids cognitive growth (Bodner, 1986; Vygotsky, 1979/1966). This theory emphasizes the impact of sports interventions and sports cultural contexts on acquiring significant sports skills they need for sports development and performance.

3. Methods

This study employs a systematic review analysis that follows established methodologies such as Colaizzi's (1978) or Moustakas's (1994) approach which involves identifying significant statements, formulating meanings, clustering themes, developing a comprehensive description, and the inclusion and exclusion criteria. Moustakas's method encompasses phases like reduction, abstraction variation, and synthesis. The study investigates how sports skill acquisition has evolved dynamically in physical education. Utilizing various research methods to explore the learning strategies and experiences of physical education students, student-athletes, the instructional strategies of coaches, trainers of sports, and exercise science. Moreover, this study explores individual active engagement in various sports, exploring the significant development, best practices, challenges, and innovations that have influenced the evolution of sports skills over time.

The participants of the various studies include physical education students enrolled in physical education classes from various schools or universities regardless of gender and sports skill levels. The study also includes students and athletes of various sports, coaches, trainers, or Physical educators who have significant experience in physical education for several years. Participants of various studies included in the review are mostly in the adolescence stage and have met a standard physical fitness level of good to excellent based on pre-test and post-practical assessment tests.

The data was obtained, transcribed, and analyzed thematically by using coding and thematic analysis, which are crucial in explaining how the process of sports skill acquisition evolved in physical education. Thematic analysis is a standard method that identifies themes, codes, and categories from the data. It also involves analyzing and reporting patterns within the data, providing a rich and nuanced understanding of the research question (Denzin & Lincoln, 2018). On the other side, descriptive analysis systematically organizes and summarizes textual or visual data, which involves identifying patterns, themes, and categories within the gathered data (Creswell, 2018).

Furthermore, six phases were followed, adopted from Braun and Clarke's (2006) thematic analysis framework. The initial phase involves immersing in the transcriptions, reading the transcripts, and treating them as raw data. Afterward, notes were prepared for generating initial codes, a repeated process for each review of the literature gathered. The second phase focuses on generating initial codes, marking the beginning of systematic data analysis. Codes were assigned to data features relevant to the research questions. The third phase transitions into searching for themes, where coded data is scrutinized to identify patterns and overlaps, constructing coherent and meaningful themes. The fourth phase includes reviewing potential themes and assessing and developing themes within the extracted data gathered. Once the more apparent themes are identified, they become the extracted codes, with a verified review of themes within the analyzed dataset. Each theme's meaningful connection to research questions was also considered.

Subsequently, in the fifth phase, essential themes are to be defined and named, directly addressing this study's research questions. Finally, the sixth phase encompasses discussing and interpreting each theme and comprehensively analyzing research findings. This six-phase approach ensures a thorough and systematic data exploration, offering valuable insights into the research questions. More importantly, this study aims to address the research question: How has the process of sports skills acquisition in physical education evolved?

Table 1. Significant Statements and Formulated Meanings

Significant Results	Codes	Formulated Meaning
Skill acquisition interventions target novice participants with various interventions focusing on attention, instruction, practice design, and perceptual training.	R1	Skill acquisition for novices involves tailored interventions that focus on key areas of learning to enhance skill development effectively.
The Acquisition Framework for Excellence (SAFE) emphasizes key principles for skill development.	R2	SAFE outlines an evidence-based framework focusing on long-term learning balance, quality of practice, and competitive simulations tailored to individual differences.
Skill acquisition in sports is influenced by instruction, feedback, effective practice organization, and high-level skills training including neurophysiology.	R3	Effective skill acquisition incorporates diverse learning methods, structured practice, and a deep understanding of the neurophysiological aspects of learning.
Unpredictable practice routines in badminton enhance action fidelity between practice and competition.	R4	Incorporating unpredictability in practice routines leads to better action fidelity, enhancing skill transfer to competitive scenarios.
Skills development in interceptive sports is enhanced by constraint-led training.	R5	Adopting constraint-led training improves skill acquisition in interceptive sports by focusing on the interaction of individual, task, and environmental constraints.
Virtual reality offers controlled environments for performance enhancement and skill learning.	R6	Virtual reality technologies provide immersive, controlled settings that allow athletes to experiment and enhance decision-making and

		skill proficiency.
Knowledge of performance feedback aids in acquiring complex motor skills like volleyball serving.	R7	Effective feedback, especially varied bandwidths of performance knowledge, is critical for learning complex motor skills efficiently.
Kinesio-cultural approaches recommend familiarity with movement landscapes for skill development.	R8	Emphasizing Kinesio-cultural perspectives in coaching involves using familiar movement landscapes to foster adaptable and flexible skill acquisition.
Cognitive models information processing, and ecological dynamics in skill development	R9	Cognitive information processing is an important component in work-based learning environments and enhances self-awareness and continuous improvement.
A Constraint-Led Approach emphasizes creativity and decision-making in skill development.	R10	The constraint-led approach fosters creativity and decision-making, crucial for enhancing performance and skill retention in sports.
Digital games offer insights into skill acquisition from novice to expert through practice behaviors.	R11	Analyzing digital gameplay reveals how consistent practice and engagement lead to skill development, applicable in physical education.
Combining narrow and wide bandwidth knowledge enhances the retention of complex motor skills.	R12	Using a combination of feedback types optimizes the learning and retention of complex motor skills, essential for effective education in physical skills.
Predictable routines in badminton training can lead to maladaptive learning, unlike unpredictable routines.	R13	Unpredictable training routines in badminton encourage more adaptable and effective learning compared to predictable routines.
Constraints-led training in interceptive sports enhances skill development.	R14	Implementing constraints-led training strategies in sports significantly improves skill development by adapting to athlete and environmental interactions.
Maximizing potential through digital games illustrates the impact of varied practice on skill acquisition.	R15	Digital games demonstrate that varied and engaging practice methods can significantly enhance skill acquisition, relevant to educational practices.

Table 2. Formulated Meanings and Clustered Themes

Formulated Meaning	Codes	Clustered Themes
Skill acquisition for novices involves tailored interventions that focus on key areas of learning to enhance skill development effectively.	R1	Tailored Interventions
SAFE outlines an evidence-based framework focusing on long-term learning balance, quality of practice, and competitive simulations tailored to individual differences.	R2	Competitive Training Frameworks
Effective skill acquisition incorporates diverse learning methods, structured practice, and a deep understanding of the neurophysiological aspects of learning.	R3	Neurophysiological Skill Practice

Incorporating unpredictability in practice routines leads to better action fidelity, enhancing skill transfer to competitive scenarios.	R4	Unpredictable Practice Routines
Adopting constraint-led training improves skill acquisition in interceptive sports by focusing on the interaction of individual, task, and environmental constraints.	R5	Constrain-led Environment Tasks
Virtual reality technologies provide immersive, controlled settings that allow athletes to experiment and enhance decision-making and skill proficiency.	R6	Technological Integration through VR
Effective feedback, especially varied bandwidths of performance knowledge, is critical for learning complex motor skills efficiently.	R7	Effective Feedback Mechanism
Emphasizing Kinesio-cultural perspectives in coaching involves using familiar movement landscapes to foster adaptable and flexible skill acquisition.	R8	Kinesio-cultural Movement Adaptability
Cognitive information processing is an important component in work-based learning environments and enhances self-awareness and continuous improvement.	R9	Cognitive Processing Skills
The constraint-led approach fosters creativity and decision-making, crucial for enhancing performance and skill retention in sports.	R10	Problem Solving and Decision Making
Analyzing digital gameplay reveals how consistent practice and engagement lead to skill development, applicable in physical education.	R11	Digital Gameplay Engagement
Using a combination of feedback types optimizes the learning and retention of complex motor skills, essential for effective education in physical skills.	R12	Overall Feedback for Skill Retention
Unpredictable training routines in badminton encourage more adaptable and effective learning compared to predictable routines.	R13	Unpredictable Training
Implementing constraints-led training strategies in sports significantly improves skill development by adapting to athlete and environmental interactions.	R14	Environmental Adaptation
Digital games demonstrate that varied and engaging practice methods can significantly enhance skill acquisition, relevant to educational practices.	R15	Digital Engagement Method

Table 3. Clustered Themes and Emergent Themes

Clustered Themes	Emergent Themes
Neurophysiological Skill Practice	
Kinesio-cultural movement adaptability and flexibility	
Cognitive Skill Practice	Cognitive Skills
Creative Problem Solving, and Decision-Making	
Training Interventions	
Competitive training framework	Training Program
Unpredictable Practice Routines	
Constraint-led Environmental Tasks	
Unpredictable training adaptability	
Effective Feedback Mechanism	Assessment
Skill Retention Evaluation	
Technological Integration through VR	
Digital Gameplay Engagement	Technology
Digital engagement method	

4. Results and Discussion

Sports skill acquisition is a multidisciplinary field that explores the complex procedure involved in skill learning, development, and mastery in a sports-specific setting. This incorporates concepts related to sports psychology, anatomy, and physiology to better understand how students or athletes develop and hone their sports skills. Consolidating various studies related to sports skill acquisition, the results of the study accommodate themes that address the process of evolution of sports skill acquisition in physical education. These themes include the training program, analytical skills in sports, sports technology, skill evaluation, and a portion of focus on physical activities that enhance sports-related activities and intervention used for skill acquisition

4..1 Cognitive Skills

Understanding how the brain learns helps in designing training programs aligned with neurological processes. Adaptability, seen as similar to the "kinescape" of movement, is essential for athletes to respond to the dynamic nature of sports environments. Studies also highlight the correlation between cognitive functions like attention and working memory with core motor skills, emphasizing the importance of both cognitive and motor skill development. The constraint-led approach in sports education enhances analytical skills like creativity and decision-making, facilitating skill acquisition and performance improvement.

Cognitive skills are crucial in sports skill acquisition as they enable coaches and practitioners to dissect complex motor tasks and understand the key components for effective learning. Understanding the neurophysiology of learning also allows for the development of training programs that align with how the brain processes and retains new motor skills (Hodges & Williams, 2020). (R3)

Adaptability as a cognitive skill is conceptualized as becoming familiar with a “kinescape” a landscape of movement. Adaptability skills are crucial as they enable athletes to navigate and respond to the dynamic and

complex nature of the sports environment (R8)

The result of the study aligns with the study findings on cognitive functions such as attention window (AW) and working memory which are partly associated with specific core motor skills, and there is a strong correlation between the sum of all cognitive and all motor skills tests. The tests include sprinting, change of direction, dribbling, ball control, and ball juggling (Scharfen & Memmert, 2019). (R9)

Constraint-led approach in sport and physical education pedagogy involves the manipulation of task, individual, and environmental constraints to enhance skill acquisition and performance. The study believes that this approach improves analytical skills such as creativity, decision-making, and transfer of learning which are crucial for sports skill acquisition. (R10)

4.2 Training Program

The training is an organized methodical approach to acquiring and mastering new abilities, which makes it essential for sports skills acquisition. Effective training activities in sports are intended to improve practice quality, which is critical for learning. This adjusts instructions to individual characteristics, strikes a balance between repetition and practice tailored to a particular competition, and frequently uses a "hands-off" approach to promote self-reflection and problem-solving. The results of the study align with the skill acquisition framework for excellence (SAFE), which is an athlete-centered training program that enhances athlete's unique sports qualities. This training program is a tailored approach that improves learning and performance and motivates players to participate more fully in the learning process, which in turn fosters intrinsic motivation and focus on the sports-specific tasks given to them (Williams and Hodges, 2023).

The result of the study is aligned with the review conducted by Choo et al. (2024) highlights the importance of structured interventions, including attention, instruction and demonstration, practice design, and perceptual training, which are all integral components of a comprehensive training program. (R1)

A structured training program is essential for skill acquisition because it provides a systematic approach that includes well-defined goals, a detailed schedule, and assigned responsibilities Williams and Hodges, 2023). (R2)

The result of this study agrees with the study of Fernandez et al. (2023) which emphasized the development of instructional material for volleyball skills acquisition is a significant part of structured training programs in facilitating skill development. It was mentioned that materials are designed to provide systematic guidance and support, enabling students to acquire and refine essential volleyball skills despite the limitations of remote education. (R4)

The training program has been instrumental in my sports skill acquisition journey. It's not just about practicing; it's about practicing with purpose. The structured approach, combining theoretical knowledge with practical application, has allowed me to understand the 'why' behind the skills I am developing. The feedback from coaches, the focus on motor learning stages, and the emphasis on self-regulation have all contributed to a more effective learning environment. The program has helped me refine my techniques, improve my performance, and has given me tools to self-assess and adapt my approach to different situations in my sport (Gottwald et al., 2023). (R5)

The result of the study is paralleled to the findings found on the biomechanical differences between different types of trials (hand-feed, multi-feed, and match play) and concluded that unpredictable practice routines in a training program are more beneficial for skill acquisition and development in badminton (Smith et al., 2022). (R13)

4.3 Assessment

Skill evaluation includes feedback which plays a crucial role in guiding learners towards improved motor skills and performance. It is highlighted that feedback can refine the motor system by helping learners develop appropriate movement patterns through implicit processes. Skill evaluation in sports skill acquisition involves assessing an athlete's performance, providing feedback, and identifying areas for improvement.

Feedback is crucial as it offers specific guidance on technique, strategy, and overall performance, helping athletes understand their strengths and weaknesses. The result of the study aligns with the skill evaluation mechanism which emphasizes task-intrinsic feedback, which is information obvious to the learner and received through sensory inputs like visual, auditory, tactile, and proprioceptive cues, and augmented feedback, which is external or artificial feedback provided by educators or coaches (R7)

The feedback provided during the acquisition phase, especially the combination of wide and narrow bandwidth KP, helped me understand the development of my performance better. It allowed me to adjust my technique and focus on specific aspects of the skill, leading to improvements in my overall execution of the volleyball serve (R12).

4.4 Technology

Technology refers to the use of digital tools and virtual reality (VR) in sports to aid skill acquisition and training. These technologies have become crucial, especially when traditional methods are unavailable, as they allow athletes to continue their engagement and improve their skills. VR technology, in particular, is gaining popularity for its ability to simulate competitive environments, improve sensorimotor capabilities, and aid in skill acquisition by replicating critical reaction time scenarios. Overall, technology provides a way to enhance training by offering real-time feedback and accurately tracking performance metrics.

The result of this study is also in parallel to the findings of the study about digital sports technologies which have been instrumental in facilitating continued sports engagement and skill acquisition when traditional methods were not available (R6)

The result of the study aligns with the result found in the study about VR technology emphasizing its increased popularity for collecting various physiological skill aspects, identifying and improving sensorimotor capabilities, replicating competitive and critical reaction time environments, and facilitating skill acquisition in sports. (R11)

Technology offers a means to enhance training methodologies, provide real-time feedback, and track performance metrics accurately (R15)

Fig. 1. Clustered Themes and Emergent Themes

5. Implication and Future Directions

Sports skill acquisition has evolved in physical education, encompassing numerous aspects of sports psychology, anatomy, and physiology. This development emphasizes structured training programs, analytical skills, sports technology, and talent evaluation.

5.1 Implication

The following implications were drawn:

Firstly, a training program is a crucial part of learning essential sports skills since it provides a structured, methodical approach to learning new abilities and uses efficient training techniques that enhance the level of training. Moreover, various studies related to sports skill acquisition highlight the value of structured interventions, which are important elements of a comprehensive training strategy that involve a practical approach, cognitive development, focus, instructions, and performance.

Secondly, the constraint-led method also improves analytical abilities such as creativity and decision-making, which helps with skill learning and performance advancement. Subsequently, sports technology, which provides real-time feedback and precisely tracks performance indicators, has become more and more vital in sports skill acquisition and training. Examples of this technology include virtual reality (VR) and digital game engagement.

Lastly, feedback is also a vital component of skill evaluation since it helps learners build appropriate movement patterns through implicit processes, which in turn helps students improve their motor skills and performance.

5.2 Future Direction

Based on the results of various studies, physical educators, coaches, and future researchers can use the following practical interventions and program activities to enhance physical education.

To physical education teachers, enhancing cognitive skills that recognize how the brain processes information and create training curricula that suit develop critical thinking and problem-solving skills. In addition, adaptability, cognitive abilities such as working memory and concentration, and problem-solving techniques for athletes to successfully negotiate ever-changing sporting situations. Also, implementing a constraint-led approach in sports education can help students acquire new skills and improve their performance by strengthening analytical abilities like creativity and decision-making.

To the coaches, the enhancement of training for structured physical activity programs that provide thorough and specified objectives, a timetable, and individual tasks. With the help of this training approach, students are guaranteed to receive structured supervision and support, which helps them develop and hone critical abilities.

Teachers, coaches, and researchers in the field of sports science and physical education, should utilize assessment methods including feedback and evaluation systems to help students become more proficient in their motor abilities. Through this process, feedback can assist learners in developing proper movement patterns, which can help improve the motor system. As such, the process of skill evaluation includes rating an athlete's performance, offering criticism, and pinpointing areas in need of development

Lastly, incorporating virtual reality (VR) technology is becoming more practical because it can replicate important response time situations, enhance sensorimotor abilities, and simulate competitive environments which can enhance sports skills learning. Thus, incorporating virtual reality (VR) and digital tools into sports to facilitate training and skill development is greatly encouraged.

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