



**International Alliance for Health, Physical
Education, Dance and Sport
(IAHPEDS)**

**FULL-TEXT
PROCEEDINGS BOOK**

ISBN: 979-8-9990977-1-2

2026 World Congress

June 24-28, 2026

İstanbul, Türkiye



All the full-text papers included in this book were reviewed by the Scientific Committee

Please cite this Full-Text Proceedings Book as follows:

Ersoz, G. & Wright, S.C. (Eds.) (2026). Book of Full-Text Papers from the 3rd International Alliance for Health, Physical Education, Dance and Sport (IAHPEDS) World Congress: Breaking Down Barriers through Sport, Health, Physical Education and Dance for Everyone. VA: Fredericksburg, IAHPEDS.

Publisher: International Alliance for Health, Physical Education, Dance and Sport (IAHPEDS)

Website : <https://iahpeds.org/>
Place : Fredericksburg, VA, USA
Email : info@iahpeds.org





Congress Presidents

Dr. Gregory J. Soukup – President of Congress and IAHPEDS (Profesör, Incarnate Word University)

Dr. Salih Pınar – IAHPEDS IAHPEDS Europe & Middle East Responsible (Profesör, Gedik University)

Congress General Secretariat

Dr. Gözde Ersöz -Congress Secretary

Oktay Akyüz – Assistant Congress Secretary

Organization Coordinators

Dr. Mehmet YORULMAZLAR (Marmara University)

Dr. Çetin YAMAN (Marmara University)

Dr. Ayşe Türksoy Işım (İstanbul University – Cerrahpaşa)

Dr. Tuna USLU (İstanbul University – Cerrahpaşa)

Organizing Committee

Dr. Aysel Pehlivan (Kurul Başkanı)

Dr. Ani Agopyan

Dr. Ahmet Sansi

Dr. Arif Çetin

Dr. Aydın Pekel

Dr. Ayşe Oya Erkut

Dr. Bahar Saygılı

Dr. Bahar Ünsal Yılmaz

Dr. Cem Akyüz

Dr. Çağla Karacan Şimşek

Dr. Emir Turam

Dr. Erdem Çakaloğlu

Dr. Eser Ağgön

Dr. Fatih Çatıkkaş

Dr. Gülsüm Hatipoğlu Özcan

Dr. Halil Korkmaz

Dr. Hanife Banu Ataman Yancı

Dr. Hülya Ünlü

Dr. Nuri Topsakal

Dr. Merve BAL

Dr. Muazzez Şaşmaz Ataçoğlu

Dr. Murat Tutar

Dr. Selçuk Akpınar

Dr. Selçuk Bora Çavuşoğlu

Scientific Committee

Dr. Steven Wright – *Chair of the Scientific Committee*

Dr. Hayri Ertan – *President of the Scientific Committee for Turkish Proceedings*

Dr. Adil Deniz Duru

Dr. Asiye Filiz Çamlıgüney

Dr. Courtney Flowers

Dr. Dilara Sevimay Özer

Dr. Emily Dow

Dr. Emin Süel

Dr. Fran Meyer

Dr. Gregory Soukup

Dr. Holly Alperin

Dr. İlker Yücesir

Dr. İrfan Gülmez

Dr. Leyla Tavacıoğlu

Dr. Naoki Suzuki

Dr. Nusret Ramazanoğlu

Dr. Olanrewaju Adeola Ipinmoroti

Dr. Osman Ateş

Dr. Shawn Cradit

Dr. Tyler Nolting

Dr. Yaşar Tatar





Dr. Semih Yılmaz
Dr. Serap Mungan Ay
Dr. Sibel Taşralı Nalbant
Dr. Sinan Avcı
Dr. Sinan Bozkurt
Dr. Şeval Kaygusuz
Dr. Ufuk Alpkaya
Dr. Utku Tuna
Dr. Yeliz Pınar

Dr. Yavuz Lima
Dr. Walter Ho
Dr. Xiaolu Liu
Dr. Xiaofen Hamilton





Supporting Institutions



Organization Partners



Sponsor Partners





İÇİNDEKİLER / CONTENTS

Kongre Künyesi ve Yayın Bilgileri	i
Kongre Düzenleme ve Bilim Kurulları	iii
Destekleyen Kurumlar, Kuruluş Ortakları ve Sponsorlar	v
FT-1: Lauve Wellbeing: The Power of Values and the Physical Dimension for Community Health and Development	1
FT-2: Vaccine Hesitancy as a Systemic Response: Experiences of Hispanic Female Nurses in South Texas	9
FT-3: Health Locus of Control and Emotional Intelligence as Predictors of Resilience Among Children-Athletes During Competitions in Ijebu-Ode, Ogun State, Nigeria	18
FT-4: Perceived Effects of Exercise Participation on Mental Health and Well-Being Among Secondary School Students in Benin Metropolis, Nigeria	28
FT-5: Using Motion Capture Data to Support Natural Science Perspectives on Movement in Physical Education	38
FT-6: A Bibliometric Analysis of the Literature on Concussion in Child and Adolescent Athletes..	49
FT-7: Selective and Developmental Effects of SEL-Based Dance Education on Social-Emotional Competencies: A Mixed-Methods Perspective	61
FT-8: The Effect of Physical Activity on Smartphone Addiction: A Meta-Analysis	74
FT-9: Physical Education Classes Barriers Scale: Validity and Reliability Study	85
FT-10: Examining the Relationship Between Physical Activity and Gaming and Internet Addiction: A Correlation-Based Meta-Analysis	97
FT-11: Peak Expiratory Flow Rate Response of Female Obesity Following 12-week Aerobic Dance Circuit Training in Tertiary Institutions in Oyo State, Nigeria	110
FT-12: Digital Technologies for the Professional Learning of PE Teachers and Sports Coaches: A Systematic Review	121
FT-13: Role of Yoga in Breaking Social and Cultural Barriers Among Mahatma Gandhi University, Telangana, India Students	131
FT-14: The Effects of Face-to-Face and Online HIFT Training on Physical Fitness in Sedentary Individuals	138
FT-15: Bibliometric Analysis of Parental Attitudes in Sports Using the VOSviewer Application ..	147
FT-16: AI-Supported Curriculum Design for Game-Based Approaches in Physical Education: A Qualitative Study of Teachers' Curriculum Decision-Making	163





FT-17: From Data to Movement: How AI Empowers Educators and Athletes to Overcome Barriers	174
FT-18: The Effects of an Inclusive Sports Project on the Attitudes of Sports High School Students Toward Individuals With Special Needs	185



FULL-TEXT PAPERS



FT-1

Lauve Wellbeing: The Power of Values and the Physical Dimension for Community Health and Development

*Timothy Lynch, Yew Chung College of Early Childhood Education, YCCECE, Yew Chung
Yew Wah Education Network, Hong Kong, China; Xiaofen D. Hamilton, Chenhao Wu, Yucen
Li, The University of Texas at Austin, USA; Gregory J. Soukup, University of the Incarnate
Word, USA; Wendy Goff, Australian Catholic University, Australia
timothy.lynch@yccece.edu.hk*

Abstract

Lauve Wellbeing is an evidence-based online education platform grounded in 30 years of research and critical reflection across diverse global educational contexts. The acronym 'Lauve' represents Learning Approach Using Values Education, a framework developed through sustained school and community leadership experience spanning six countries. This manuscript examines how Lauve Wellbeing translates complex research into accessible, practical resources that enable optimal personal and collective performance while preparing children and community members for lifelong learning. Central to this approach is the recognition that the physical dimension enhances opportunities for developing Learning Values and holistic wellbeing. Drawing on research from Physical Education and Wellbeing: Global and Holistic Approaches to Child Health and Academic Learning (2nd ed., Lynch, 2024), this paper presents evidence from six international case studies demonstrating that educators bear a responsibility to present the nine universal competencies identified by the OECD in developmentally appropriate, inclusive, and contextually meaningful ways. Three curriculum pillars - Community, Metacognition, and Values - structure the framework, while the Singapore model is examined as an exemplar of successful integration. Findings indicate that deep implementation of Learning Values produces measurable improvements in both academic outcomes and community wellbeing. With endorsement from the International Alliance for Health, Physical Education, Dance and Sport (IAHPEDS), Lauve Wellbeing offers practical pathways for educational recovery in the post-COVID-19 era and beyond.

Keywords: *values education, physical education, wellbeing, universal competencies*

INTRODUCTION

Contemporary educational systems face mounting pressure to address the complex interplay between children's health, wellbeing, and academic achievement. The COVID-19 pandemic intensified long-standing vulnerabilities in schools worldwide, disrupting social development, reducing physical activity, and elevating mental health concerns among children and young people (Lynch, 2024). As communities rebuild, there is growing recognition that narrow academic frameworks are insufficient to prepare learners for a rapidly changing world. Holistic approaches that integrate values education with physical development have consequently emerged as a compelling and evidence-supported pathway toward sustainable educational improvement and community health.





Lauve Wellbeing is an online education platform designed for community and school leaders (including governors), coaches, teachers, parents, and initial teacher educators. The acronym 'Lauve' stands for Learning Approach Using Values Education, reflecting a framework refined over three decades of rigorous research and practitioner inquiry across global educational contexts (Lynch, 2024). The platform's foundational premise is that wellbeing encompasses far more than the absence of illness - it constitutes a holistic state integrating physical, emotional, cognitive, social, and spiritual dimensions that must be cultivated intentionally and consistently throughout childhood and community life.

This manuscript pursues three interconnected purposes: first, to articulate the theoretical foundations and evidence base underpinning Lauve Wellbeing; second, to demonstrate how the physical dimension functions as a powerful vehicle for developing universal competencies and enhancing community wellbeing; and third, to present practical implementation evidence from diverse international educational contexts. The work draws substantially on Lynch's (2024) Physical Education and Wellbeing: Global and Holistic Approaches to Child Health and Academic Learning (2nd ed.), translating its comprehensive research findings into accessible guidance for practitioners and community leaders.

Research Problem and Significance

Values education presents inherent challenges. The Organisation for Economic Co-operation and Development (OECD) acknowledge that 'incorporating values and attitudes in curriculum design and implementation does not come without its challenges—values and attitudes can be intensely contested constructs' (OECD, 2021, p. 48). These difficulties are amplified by the multi-layered ecosystem of relationships, diverse lived experiences, and varied belief systems characterising contemporary educational communities. Lauve Wellbeing addresses these complexities by providing a structured yet flexible framework that supports genuine belief in, and deep implementation of, Learning Values across diverse contexts.

Physical education, understood as 'education through movement' (Pangrazi, 2001), offers distinctive opportunities for whole-child development. Research consistently demonstrates that the physical dimension is not peripheral but rather a fundamental vehicle through which children develop cognitive, social, emotional, and moral capacities (Lynch, 2024). Positioning physical education as 'every teacher's friend in enhancing children's wellbeing now and in the future' (Lynch, 2019, p. 210) underscores its potential as a unifying educational force.

METHODS

The Lauve Wellbeing framework is grounded in 30 years of evidence-based research conducted across multiple continents and diverse educational contexts. The research employed interpretivist paradigms within a constructionist epistemology, utilising multiple qualitative and mixed methods approaches to develop deep understanding of values education and physical education implementation in practice.

Research Design and Measures

The research design drew on case study methodology (Merriam, 1998) as the primary approach, enabling contextually rich investigation of how values education and quality physical education are enacted across diverse school and community settings. Data collection methods included semi-structured interviews, classroom observations, reflective journals, document analysis, and a large-scale national survey. This multi-method strategy supported triangulation and strengthened the credibility and transferability of findings across contexts.



Participants

Research participants spanned six international contexts and included school principals, classroom teachers, physical education specialists, initial teacher educators, pre-service teachers, and community leaders. The Australian national survey engaged 376 school principals across all states and territories. Qualitative case studies involved purposively selected participants in the United Kingdom, British Schools Overseas (Africa), Qatar, Brunei Darussalam, and Australia, providing cross-cultural breadth and contextual depth.

Data Collection

Data were collected through semi-structured interviews exploring participants' understandings, experiences, and practices related to values education and physical education. Classroom and school observations generated contextual evidence of implementation quality. Reflective journals documented participants' evolving professional thinking. Document analysis examined curriculum policies, school improvement plans, and national frameworks. The Australian survey gathered quantitative data on resource allocation, time provision, and perceptions of implementation quality.

Data Analyses

Qualitative data were analysed thematically following established procedures for theme creation, data triangulation, peer debriefing, and member checking to ensure trustworthiness (Merriam, 1998). Survey data were analysed descriptively and inferentially to identify patterns across states and territories. Cross-case analysis enabled identification of common principles and contextual variations in implementation. Findings informed the iterative development of the Lauve Wellbeing framework, with each research cycle contributing to refinement of the platform's theoretical and practical components.

RESULTS

Theoretical Foundations: Constructivist and Sociocultural Approaches

Across all six case study contexts, constructivist and sociocultural approaches emerged as foundational to effective values education and physical education implementation. Consistent with Piaget, Bruner (1960; 1986), and Vygotsky's frameworks, effective practitioners created environments where children actively constructed meaning through movement and social interaction. As Arthur et al. (2015, p. 427) articulate, educators who recognise 'active learning' or 'play-based learning' enable children to develop across emotional, social, physical, and cognitive domains simultaneously.

Play-based learning was consistently identified as a powerful vehicle for values development. The Australian Government Department of Education (2022, p. 8) notes that in play, 'children integrate their emotions, thinking and motivation that assists to strengthen brain functioning. They exercise their agency, intentionality, capacity to initiate and lead learning.' Vygotsky's zone of proximal development, where tasks 'are too difficult for a child to perform independently but are possible with the assistance of more knowledgeable others' (Arthur et al., 2015, p. 431), was evident in physical education settings where peer scaffolding facilitated both motor and values learning.

Universal Competencies and the Three Curriculum Pillars

The OECD (2021) identifies nine universal competencies directly related to Learning Values: Reflection, Collaboration and cooperation, Learning to learn, Respect, Responsibility, Empathy, Self-regulation, Persistence, and Trust (p. 48). Research findings across all contexts confirmed that these competencies are most effectively developed when organised within the three curriculum pillars of Community, Metacognition, and Values.

The Community pillar, centered on belonging and authentic partnerships, emerged as foundational across contexts. Environments where all members genuinely belonged and felt valued created the psychological safety necessary for risk-taking, collaboration, and deep learning (Lynch, 2024). The Metacognition pillar, focused on thinking about learning, was consistently associated with improved self-direction and academic engagement. Physical education provided particularly rich contexts for metacognitive development through inquiry-based movement problem-solving. The Values pillar, addressing global citizenship through the nine OECD competencies, required explicit pedagogical attention and consistent modelling by adults throughout the school community.

Quality Physical Education as Vehicle for Values Development

UNESCO defines quality physical education (QPE) as 'the most effective means of providing all children and youth with the skills, attitudes, values, knowledge and understanding for lifelong participation in society' (2015, p. 6). Across research contexts, QPE consistently provided naturally occurring situations requiring collaboration, respect, responsibility, self-regulation, and persistence. Bailey et al. (2009) confirm physical education's multiple educational benefits spanning physical, affective, social, and cognitive domains. Children's enjoyment and motivation were enhanced when teachers promoted intrinsic motivation, perceived physical competence, and mastery-oriented environments (Alderman et al., 2006).

Through carefully designed movement experiences, children engaged in authentic reflection on their own performance, cooperated with peers in games and dance, developed movement competence through persistent practice, respected others' contributions and differences, took responsibility for their own behaviour and safety, developed empathy through shared physical challenges, self-regulated emotions in competitive situations, and built trust through positive interactions. These findings confirm the physical dimension's unique capacity to develop universal competencies in holistic and embodied ways.

The Singapore Model as Exemplar

Singapore provided a compelling exemplar of successful integration of values education and physical education within a high-performing educational system. The Singapore model demonstrated that academic excellence and values education are mutually reinforcing rather than competing priorities (Lynch, 2024; OECD, 2023). Key enabling factors included clear articulation of values across the system, systematic and sustained teacher preparation, consistent implementation across all learning areas, and strong community partnerships. The Singapore case challenged deficit narratives positioning wellbeing and academic achievement as incompatible, demonstrating instead that a strong values foundation accelerates rather than impedes academic outcomes.

Case Study Evidence Across Six Contexts

UK maintained school research revealed significant challenges related to teacher confidence and competence in physical education delivery, particularly among generalist classroom teachers. Whole school approaches and sustained professional learning were identified as critical enablers of improvement. British Schools Overseas (Africa) case studies highlighted the importance of contextual adaptation while maintaining core values principles and standards. Initial teacher education research identified critical gaps in pre-service preparation and underscored the need for specialised physical education pedagogy training.



Qatar research examined secondary-trained physical education specialists' transition to primary contexts, revealing developmental appropriateness as a central challenge. The Australian national survey of 376 principals across all states and territories identified systemic barriers related to resource allocation, time provision, and teacher qualifications. Brunei Darussalam case studies provided insights into cultural adaptation and community engagement in holistic physical education implementation.

Deep Implementation and Collective Belief

A critical finding across all contexts was the distinction between surface-level and deep implementation of values education. Schools where values appeared on display boards and websites without genuine integration into daily practice demonstrated minimal impact on wellbeing or academic outcomes. Deep implementation, characterised by leadership commitment, collective understanding, consistent enactment across all school life, and contextual adaptation, produced measurable improvements. Research confirms that deep implementation creates a strong wellbeing platform where all members genuinely belong and are valued, which in turn supports and accelerates students' learning (Lynch, 2026). The Lauve Wellbeing platform directly addresses this implementation gap through practical, accessible resources for both leaders and teachers, parents, and initial teacher educators.

DISCUSSION

These findings extend existing scholarship on values education and physical education by demonstrating the distinctive contribution of the physical dimension to universal competency development across culturally diverse contexts. Consistent with Quennerstedt and Larsson (2015), movement cultures in physical education provide embodied learning opportunities unavailable in sedentary classroom environments. The nine OECD competencies are not abstract ideals to be taught didactically but lived values enacted through physical challenge, social interaction, and reflective practice.

The identification of deep versus surface implementation as a critical variable aligns with Stenhouse's (1975) curriculum theory, which emphasises that educational values must be genuinely understood and enacted by practitioners rather than imposed through prescription. Tinning's (1990; 1999; 2004) sustained critique of ideology in physical education is directly relevant: without critical practitioner awareness and genuine commitment, values education risks remaining performative rather than transformative. Lauve Wellbeing's emphasis on collective belief and leadership modelling addresses this risk directly.

The post-COVID-19 context lends urgency to these findings. Research documents significant pandemic-related declines in physical activity, heightened anxiety, disrupted social relationships, and compromised mental health among children and young people (Lynch, 2024). Holistic recovery frameworks that integrate physical, emotional, social, and cognitive dimensions are therefore not merely desirable but essential. Lauve Wellbeing's evidence-based structure and practical accessibility position it as a timely resource for educational recovery at both school and community levels.

The whole school approach emerges from this research as a non-negotiable condition for sustained implementation success. Fragmented programmes and isolated initiatives consistently failed to produce lasting change. Coordinated action across curriculum, pedagogy, assessment, school culture, and community partnerships - underpinned by shared leadership commitment - was the distinguishing feature of high-impact contexts.





This finding resonates with Westbrook et al.'s (2013) systematic review of pedagogy and curriculum in diverse educational systems, which identifies coherent, system-wide approaches as foundational to sustainable improvement.

The IAHPEDS endorsement of Lauve Wellbeing reflects recognition of the platform's alignment with international best practices in health, physical education, dance, and sport. The platform's foundation in universal competencies while maintaining flexibility for contextual adaptation enables its application across diverse national and cultural contexts, fulfilling IAHPEDS's global mandate to promote quality physical education and holistic child development.

CONCLUSIONS

Lauve Wellbeing represents a significant and timely contribution to global efforts to enhance children's health, wellbeing, and education through the integration of values education and quality physical education. Grounded in 30 years of evidence-based research across six international contexts, the platform provides accessible, practical guidance for the full range of educational community members - from school governors and community leaders to classroom teachers, parents, and initial teacher educators.

The research confirms that the physical dimension provides unique and powerful opportunities for developing the nine universal competencies identified by the OECD, and that deep implementation of Learning Values - structured through the three curriculum pillars of Community, Metacognition, and Values - creates the conditions for both enhanced wellbeing and improved academic outcomes. The Singapore model demonstrates that these goals are mutually reinforcing, challenging persistent false dichotomies between holistic development and academic achievement.

As educational systems navigate post-pandemic recovery and prepare learners for an increasingly complex world, Lauve Wellbeing offers evidence-based pathways that bridge research to practice. With IAHPEDS endorsement and a foundation in universal competencies adaptable to diverse cultural contexts, the platform is positioned to support educational communities globally in realising the transformative potential of values-based, physically active, and community-centred approaches to education. Future research should examine long-term outcomes of deep implementation and explore mechanisms through which the physical dimension contributes to sustained universal competency development across diverse populations and educational systems.

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgments: The authors acknowledge the support of the International Alliance for Health, Physical Education, Dance and Sport (IAHPEDS) in endorsing Lauve Wellbeing and supporting dissemination of evidence-based approaches to child health and education.

Conflicts of Interest: Timothy Lynch is the founder of Lauve Wellbeing. The remaining authors declare no conflicts of interest.

Author Note: TL conceptualized the Lauve Wellbeing framework and led manuscript preparation. XDH, CW, and YL contributed to literature review and theoretical framework development. GJS provided expertise on international physical education perspectives and IAHPEDS alignment.





WG contributed insights on Australian educational contexts and implementation strategies. All authors reviewed and approved the final manuscript.

REFERENCES

- Alderman, B., Beighle, A., & Pangrazi, R. (2006). Enhancing motivation in physical education. *Journal of Physical Education, Recreation and Dance*, 77(2), 41–51.
<https://doi.org/10.1080/07303084.2006.10597828>
- Arthur, L., Beecher, B., Death, E., Dockett, S., & Farmer, S. (2015). *Programming and planning in early childhood settings* (6th ed.). Cengage Learning.
- Australian Government Department of Education. (2022). *Belonging, being and becoming: The early years learning framework for Australia (V2.0)*. Australian Government Department of Education for the Ministerial Council.
- Bailey, R., Armour, K., Kirk, D., Jess, M., Pickup, I., & Sandford, R. (2009). The educational benefits claimed for physical education and school sport: An academic review. *Research Papers in Education*, 24, 1–27.
- Bruner, J. S. (1960). *The process of education*. Harvard University Press.
- Bruner, J. S. (1986). *Actual minds, possible worlds*. Harvard University Press.
- Lynch, T. (2019). *Physical education and wellbeing: Global and holistic approaches to child health and academic learning*. Springer. <https://doi.org/10.1007/978-3-030-23928-7>
- Lynch, T. (2024). *Physical education and wellbeing: Global and holistic approaches to child health and academic learning* (2nd ed.). Springer. <https://doi.org/10.1007/978-3-031-72874-7>
- Lynch, T. (2026). *Lauve Wellbeing: Research findings*.
https://www.timothylyncheducation.com/_files/ugd/842c5e_916d1c0a868b4477ab69040063184978.pdf
- Merriam, S. B. (1998). *Qualitative research and case study applications in education*. Jossey-Bass.
- Organization for Economic Co-operation and Development. (2021). *OECD learning compass 2030*. OECD Publishing.
- Organization for Economic Co-operation and Development. (2023). *PISA 2022 results*. OECD Publishing.
- Pangrazi, R. P. (2001). *Dynamic physical education for elementary school children* (13th ed.). Allyn and Bacon.
- Quennerstedt, M., & Larsson, H. (2015). Learning movement cultures in physical education practice. *Sport, Education and Society*, 20(5), 565–572.
- Stenhouse, L. (1975). *An introduction to curriculum research and development*. Heinemann.
- Tinning, R. (1990). *Ideology and physical education: Opening Pandora's box*. Deakin University Press.
- Tinning, R. (1999). Pedagogies for physical education. In C. Hardy & M. Mawer (Eds.), *Learning and teaching in physical education* (pp. 125–140). Falmer Press.
- Tinning, R. (2004). Rethinking the preparation of HPE teachers: Ruminations on knowledge, identity, and ways of thinking. *Asia-Pacific Journal of Teacher Education*, 32(3), 241–253.
- UNESCO. (2015). *Quality physical education: Guidelines for policymakers*. UNESCO Publishing.
- Westbrook, J., Durrani, N., Brown, R., Orr, D., Pryor, J., Boddy, J., & Salvi, F. (2013). *Pedagogy, curriculum, teaching practices and teacher education in developing countries*. Education Rigorous Literature Review. Department for International Development.





FT-2

Vaccine Hesitancy as a Systemic Response: Experiences of Hispanic Female Nurses in South Texas

Kathryn Shepperd Martinez, University of the Incarnate Word; Noralyn Davel Pickens, Texas Woman's University; Becky Spencer, Texas Woman's University; Jessica Gullion, Texas Woman's University

Abstract

Vaccine hesitancy is often described as a matter of personal belief or misinformation. This qualitative case study explored how workplace structures influenced vaccine decision-making among Hispanic female registered nurses in South Texas during the COVID-19 pandemic. Guided by Stake's multiple-case study methodology and informed by the SAGE vaccine hesitancy matrix, five nurses participated in two semi-structured interviews each, supplemented by demographic questionnaires and artifacts. Analysis involved descriptive coding, cross-case assertions, and strategies to ensure trustworthiness, including triangulation and member checking. Participants described vaccine hesitancy shaped not only by the rapid development of the COVID-19 vaccine, but also by inequities in pay, rationing of PPE, inconsistent communication from hospital leadership, and mandates issued without adequate informational support. Ethical concerns and feelings of disempowerment further deepened distrust in their institutions. These findings highlight that systemic workplace conditions, rather than personal beliefs alone, can significantly shape health workers' attitudes toward vaccines. While limited in scope, this study offers transferable insights into the intersection of trust, ethics, and workforce empowerment. Implications include the need for transparent communication, structural support for frontline staff, and culturally responsive approaches to vaccine promotion.

Keywords: vaccine mandate, empowerment, workplace conditions, case study, qualitative research

INTRODUCTION

Vaccine hesitancy is recognized as a major global health concern (World Health Organization, 2025). It is defined as a "delay in acceptance or refusal of vaccination despite availability" and is complex and context-specific, varying across time, place, and vaccines (SAGE Working Group on Vaccine Hesitancy, 2014a, p. 7). Sustained vaccine confidence is particularly critical among healthcare professionals, who serve as trusted sources of health information. As highly trusted healthcare providers, nurses play a central role in educating parents, supporting school-based immunization compliance, and reinforcing community confidence in vaccines (Brenan & Jones, 2024; MacDonald & Dubé, 2015). When nurses experience vaccine hesitancy, the implications extend beyond individual decision-making to influence community vaccination rates.





In 2026, the United States reported more than 900 confirmed measles cases across 24 jurisdictions, following 2,280 cases in 2025—a resurgence of a potentially deadly disease declared eliminated in 2000 (Centers for Disease Control [CDC], 2026). Among children under five who contracted measles in 2025, 18% were hospitalized, and three died (CDC, 2026). This resurgence has occurred alongside declining MMR vaccination rates, which have fallen below 92% nationally, with 95% required as a threshold to prevent outbreaks (CDC, 2025). As immunization rates decrease, outbreaks of vaccine-preventable diseases reemerge.

Statement of the Problem

Although COVID-19 vaccine hesitancy among healthcare workers has been explored, less is known about how hesitancy emerged among nurses who had previously complied with routine immunizations. Existing research on healthcare workers has largely focused on demographic correlates—such as age, education, race, gender, and political affiliation—rather than the processes through which hesitancy developed. Hispanic nurses, who have demonstrated higher levels of COVID-19 vaccine hesitancy than White nurses, remain underexamined in qualitative research (Browne et al., 2021). The absence of in-depth exploration of how vaccine hesitancy developed within this population limits understanding of the mechanisms that contributed to emerging hesitancy among previously vaccine-accepting nurses.

Brief Literature Review

Vaccine hesitancy is shaped by religious, philosophical, cultural, and political influences (SAGE Working Group on Vaccine Hesitancy, 2014a). During the pandemic, racial and ethnic minorities experienced higher morbidity and mortality along with lower vaccine uptake (Khubchandani et al., 2021; Shekhar et al., 2021). Research also shows that nurses' hesitancy influences community attitudes and vaccine acceptance (Viskupič et al., 2025; de Graaf et al., 2023).

However, emerging evidence suggests that workplace structures—such as mandatory vaccination, PPE shortages, inconsistent messaging, and lack of leadership transparency—were central in shaping nurses' vaccine decisions (Shanafelt et al., 2020). These structural influences have not been fully examined among Hispanic nurses in the southern U.S., representing a gap in the literature.

Significance of the Study

Understanding how vaccine hesitancy emerges among Hispanic nurses is essential for improving vaccine uptake and designing responsive educational strategies. This population experiences workplace inequities, discrimination, and undervaluation (Moceri, 2014), which may influence perceptions of vaccine mandates and institutional messaging. This article provides insight into the roles of institutional trust, workplace conditions, and power dynamics in vaccine decision-making among Hispanic nurses, informing university faculty, healthcare leaders, and public health stakeholders as they prepare future health promotion efforts.

Purpose of the Study

The purpose of this multiple-case study was to explore and gain understanding of COVID-19 vaccine hesitancy among Hispanic female registered nurses in South Texas.

Research Question

What were the experiences of COVID-19 vaccine-hesitant Hispanic female registered nurses in South Texas during the COVID-19 pandemic?





Theoretical Framework

The theoretical framework used to guide the study was the Strategic Advisory Group of Experts (SAGE) vaccine hesitancy matrix (SAGE Working Group on Vaccine Hesitancy, 2014a). The matrix categorizes determinants into contextual influences, individual and group influences, and vaccine or vaccination-specific issues, thereby allowing researchers to examine how broader sociopolitical and organizational factors intersect with personal beliefs and specific vaccine characteristics to shape acceptance behaviors. The matrix is shown in Figure 1.

CONTEXTUAL INFLUENCES Influences arising due to historic, socio-cultural, environmental, health system/institutional, economic or political factors	a. Communication and media environment b. Influential leaders, immunization program gatekeepers and anti- or pro-vaccination lobbies. c. Historical influences d. Religion/culture/ gender/socio-economic e. Politics/policies f. Geographic barriers g. Perception of the pharmaceutical industry
INDIVIDUAL AND GROUP INFLUENCES Influences arising from personal perception of the vaccine or influences of the social/peer environment	a. Personal, family and/or community members' experience with vaccination, including pain b. Beliefs, attitudes about health and prevention c. Knowledge/awareness d. Health system and providers-trust and personal experience. e. Risk/benefit (perceived, heuristic) f. Immunisation as a social norm vs. not needed/harmful
VACCINE/ VACCINATION-SPECIFIC ISSUES Directly related to vaccine or vaccination	a. Risk/ Benefit (epidemiological and scientific evidence) b. Introduction of a new vaccine or new formulation or a new recommendation for an existing vaccine c. Mode of administration d. Design of vaccination program/Mode of delivery (e.g., routine program or mass vaccination campaign) e. Reliability and/or source of supply of vaccine and/or vaccination equipment f. Vaccination schedule g. Costs h. The strength of the recommendation and/or knowledge base and/or attitude of healthcare professionals

Figure 1: SAGE Working Group Determinants of Vaccine Hesitancy Matrix

Note. Adapted from *The Report on SAGE Working Group on Vaccine Hesitancy*, by the SAGE Working Group on Vaccine Hesitancy, 2014a.

METHODS

Design

This study employed Stake's (2006) multiple case study methodology. The quintain was the emergence of COVID-19 vaccine hesitancy among previously vaccine-accepting Hispanic female registered nurses during the pandemic. Each participant represented a case. Cross-case analysis was used to compare similarities and differences across cases. The SAGE vaccine hesitancy matrix (SAGE Working Group on Vaccine Hesitancy, 2014a) informed interview question development and provided a structure for examining intersecting influences on vaccine decision-making. Findings were compared to the matrix.





Setting and Participants

The study was conducted in South Texas during 2020–2022. Inclusion criteria were: (a) Hispanic female identity, (b) licensed registered nurse, (c) employment in South Texas during the COVID-19 pandemic (2020–2022), (d) self-identified COVID-19 vaccine hesitancy, and (e) English-speaking. Nurses who left nursing before March 2022 were excluded. Participants were recruited using purposive and snowball sampling. Five registered nurses met criteria and enrolled. The study was approved by the Texas Woman's University Institutional Review Board. Written informed consent was obtained; pseudonyms were used to protect confidentiality.

Data Collection

Data collection included two semi-structured interviews with each participant, a demographic questionnaire, field notes, artifacts, and reflexive journaling. Interviews, conducted in person, were audio recorded and transcribed verbatim. A semi-structured interview guide ensured attention to contextual, individual/group, and vaccine-specific influences, with probing questions used to deepen exploration. Field notes captured nonverbal communication and contextual details. Participants shared workplace messages, news, and social media content that influenced their vaccine decisions. Member checking was used to clarify and confirm participants' perspectives. Fifteen semi-structured interview questions covered workplace / PPE (Q1-3), vaccine information/trust (Q4-8), life impacts (Q9-10), and prior attitudes (Q11-15), mapping to Figure 2 domains (full interview guide available upon request).

Data Analyses

Data were coded in NVivo and reviewed by the first author, then discussed with the second author to interpret each case within its historical, cultural, political, and educational context. Analysis was iterative, with ongoing reanalysis leading to new themes, and the third and fourth authors were consulted to confirm interpretations. Themes were evaluated based on the frequency with which they were mentioned. Prominent themes, called assertions in Stake methodology, were identified. These assertions were triangulated to see if they were consistent with what is known about the quintain. The first author maintained a reflective journal to identify potential bias (Berger, 2015). Data triangulation incorporated field notes and participant-provided artifacts to illustrate the environment shaping decision-making (Schwandt et al., 2007); controversial or critical data were collaboratively reviewed by all authors (Stake, 2006). The second and third authors reviewed recruitment, documentation, and analytic procedures to evaluate dependability, and all meetings and discussions were documented in an audit trail.

RESULTS

Participants

The sample consisted of five Hispanic female registered nurses who worked in acute care in hospitals in South Texas during the COVID-19 pandemic between 2020 and 2022. All participants reported prior acceptance of routine vaccinations, including annual influenza vaccination. Four of the five participants ultimately received the COVID-19 vaccine following employer mandates, although all described significant internal conflict and self-identified as vaccine hesitant during the decision-making process. Demographic characteristics are summarized in Table 1.





Table 1: Participant Demographic Data

Characteristic	n	Characteristic	n
Age (Years)		Nursing education	
20–29	1	Associate degree	1
30–45	3	Bachelor's degree	3
46–55	1	Diploma	1
Marital status		Covid-19 Vaccination	
Married	3	Two doses/boosters	4
Never married/single	2	Two doses	1
Ethnicity /Race		Vaccine required	
Hispanic	5	Yes	5
Flu vaccine		Annual income (\$)	
Accepted	5	51,000–100,000	1
		Over 100,000	4

Cross-Case Findings

Across all cases, nurses who had never previously been vaccine-hesitant developed COVID-19 vaccine hesitancy within the context of diminished workplace trust. Hesitancy did not stem from prior ideological opposition to vaccines. Instead, it emerged during the pandemic as participants experienced structural and organizational conditions that altered their perceptions of institutional integrity.

PPE rationing and shifting employer messaging were described as critical events in shaping participant views about their employers. Being required to reuse protective equipment intensified suspicion toward hospital leadership. Participants interpreted these changes not merely as logistical adaptations but as indicators that front-line staff safety was secondary to institutional priorities.

Participants described feeling expendable and positioned low in the hospital hierarchy, referring to themselves as “the bottom of the barrel” and “second stream.” They worked alongside travel nurses who were paid significantly more, while permanent staff were expected to work extended hours for less pay. Hospital signage stating, “Heroes Work Here” was initially encouraging but later described as “weaponized” and perceived as pressure to the participants to continue working despite exhaustion and to comply with institutional expectations. This combination of pay disparities, status inequities, and messaging that discouraged questioning administration intensified distrust and contributed to vaccine hesitancy.

Concerns about the rapid development of the COVID-19 vaccine were universal across cases. However, these concerns were intertwined with distrust in hospital administration rather than rooted in longstanding vaccine opposition. Participants reported receiving minimal information about vaccine safety or side effects from their employers. The mandate to vaccinate functioned as a decisive turning point. While mandates increased vaccine uptake, they simultaneously heightened suspicion of the hospital administration and reduced the nurses’ perceptions of professional autonomy.



Importantly, although all participants identified as Hispanic, they consistently reported that ethnicity did not directly influence their vaccine decisions. Structural workplace conditions were identified as the primary drivers of emerging hesitancy.



Figure 2: Cross-Case Assertions Aligned with the SAGE Vaccine Hesitancy Matrix

As illustrated in Figure 2, the cross-case assertions align predominantly with the contextual influences domain of the SAGE vaccine hesitancy matrix. Vaccine-specific concerns regarding rapid development and limited long-term safety data functioned as secondary influences. Individual cultural identity factors were not identified as primary determinants across cases.

Collectively, these findings indicate that vaccine hesitancy among these nurses emerged from institutional distrust and workplace conditions rather than from preexisting anti-vaccine beliefs.

DISCUSSION

This qualitative multiple-case study explored how workplace structures influenced vaccine decision-making among Hispanic female registered nurses during the COVID-19 pandemic. Consistent with the SAGE vaccine hesitancy framework, vaccine decision-making was shaped by contextual and institutional influences rather than individual knowledge deficits alone (SAGE Working Group on Vaccine Hesitancy, 2014a). While prior research documents disparities experienced by Hispanic nurses in the workplace (Moceri, 2014), the present findings suggest that structural workplace conditions were more salient determinants of emerging hesitancy than cultural identity.



Participants in this study were not historically vaccine-hesitant; instead, hesitancy emerged within organizational environments characterized by inconsistent communication, perceived inequities, and diminished professional agency. Rapid vaccine development was cited as a concern; however, speed alone did not fully explain participants' hesitancy. Similar to findings reported among healthcare workers nationally (Browne et al., 2021; Rich-Edwards et al., 2022), concerns about vaccine safety were intertwined with trust in institutions. In this study, distrust was amplified by PPE rationing, limited transparency about vaccine rollouts, and mandates implemented without meaningful dialogue.

These findings reinforce research suggesting that confidence in institutions is central to vaccine acceptance (SAGE Working Group on Vaccine Hesitancy, 2014a). Workplace communication emerged as a primary structural determinant. Participants expected clinical education and transparent discussion regarding PPE shortages and vaccine data. When information was perceived as incomplete or inconsistent, it was interpreted as institutional disregard. Organizational trust has been shown to influence employee engagement and empowerment (Goedhart et al., 2017), and erosion of trust may undermine compliance-based health policies even when vaccination uptake increases.

Mandates functioned as both a driver of vaccination and a catalyst for mistrust. While mandates are associated with increased vaccination rates, they may simultaneously increase resistance and perceived coercion (SAGE Working Group on Vaccine Hesitancy, 2014b). Participants described their decisions as employment-driven rather than conviction-driven, highlighting a critical distinction for health promotion practice: structural compliance does not necessarily equate to restored confidence. They did not see their ethnicity or cultural heritage as a factor in their vaccine decision-making process.

Ethical concerns also shaped hesitancy. Participants reported distress related to PPE rationing and compensation disparities. PPE rationing is an extreme measure that should only occur in the absence of PPE and not as a precautionary measure (Binkley & Kemp, 2020). Ethical frameworks for vaccine mandates emphasize that voluntary acceptance strategies should be exhausted before coercive approaches are implemented (Olick et al., 2021). When mandates were layered onto environments already marked by perceived inequity, mistrust deepened.

Implications for Health Promotion

For health educators and prevention professionals, these findings underscore that vaccine hesitancy among healthcare workers cannot be addressed solely through informational campaigns. Confidence, as described in the SAGE model (2014a), is built through transparent communication, ethical leadership, and structural support. Empowerment literature further indicates that nurses' perceptions of agency and organizational support are linked to workplace satisfaction and performance (Goedhart et al., 2017).

Effective vaccine promotion within healthcare systems should therefore include:

- Transparent and ongoing communication during emerging public health crises
- Acknowledgment of uncertainty as evidence evolves
- Attention to structural inequities that undermine trust
- Opportunities for frontline staff engagement in the decision-making processes

Limitations

This study is limited by the researcher's interpretation of participants' accounts within the context of the evolving healthcare climate during the COVID-19 pandemic. The extensive impact of the



pandemic on professional practice and organizational environments may have influenced participants' reflections and the meanings constructed during interviews. As a multiple-case study, the findings are bounded by the specific cases examined—five Hispanic female registered nurses in South Texas—and are not intended to be generalized. Rather, the study provides contextualized understanding of these particular cases within their institutional and sociopolitical settings.

CONCLUSIONS

The analysis of participant comments illuminated the experiences and challenges of the vaccine-hesitant registered nurses in this study. Effectively guiding nurses through the complexities of newly emerging diseases and related vaccinations requires the dissemination of information to bedside nurses by transformational nursing leaders. These leaders play a pivotal role in facilitating the understanding of the implications of vaccine hesitancy for themselves and on a population level. When the information is incomplete or recommendations are still in progress, the nurses should be given as much information as is available and kept up to date. When supplies and staffing are inadequate, leaders should remain transparent in their communications with staff.

Although the intensity of their views varied, the participants' experiences led them to distrust their employers, and when the COVID-19 vaccine was mandated, their suspicions increased their vaccine hesitancy when they had never previously been vaccine hesitant. The details that surround rollouts of new vaccines play an important role in vaccine acceptance among registered nurses because of the ripple effect on the general population that occurs when nurses are hesitant to take a vaccine during a pandemic.

The findings from this study have contributed knowledge about vaccine hesitancy by exploring the experiences of five female Hispanic registered nurses during the COVID-19 pandemic. Measures that address vaccine hesitancy in the general population may not be sufficient for addressing vaccine hesitancy in registered nurses who are exposed regularly to dangerous pathogens. Addressing healthcare worker hesitancy is critical to vaccine uptake in the general population.

Author's Note

This research was completed in partial fulfillment of a dissertation by the first author.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interests: The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

- Berger, R. (2015). Now I see it, now I don't: Researcher's position and reflexivity in qualitative research. *Qualitative Research*, 15(2), 219–234. <https://doi.org/10.1177/1468794112468475>
- Binkley, C. E., & Kemp, D. S. (2020). Ethical rationing of personal protective equipment to minimize moral residue during the COVID-19 pandemic. *Journal of the American College of Surgeons*, 230(6), 1111–1113. <https://doi.org/10.1016/j.jamcollsurg.2020.03.031>



- Brenan, M., & Jones, J. (2024, January 22). *Ethics ratings of nearly all professions down in U.S.* Gallup. <https://news.gallup.com/poll/608903/ethics-ratings-nearly-professions-down.aspx>
- Browne, S. K., Feemster, K. A., Shen, A. K., Green-McKenzie, J., Momplaisir, F. M., Faig, W., Offit, P. A., & Kuter, B. J. (2021). Coronavirus disease 2019 (COVID-19) vaccine hesitancy among physicians, physician assistants, nurse practitioners, and nurses in two academic hospitals in Philadelphia. *Infection Control and Hospital Epidemiology*, 43(10), 1424–1432. <https://doi.org/10.1017/ice.2021.410>
- Centers for Disease Control and Prevention. (2025). *Vaccination coverage and exemptions among kindergarteners*. <https://www.cdc.gov/schoolvaxview/data/index.html>
- Centers for Disease Control and Prevention. (2026, February 12). *Measles cases and outbreaks*. <https://www.cdc.gov/measles/data-research/index.html>
- de Graaf, Y., Oomen, B., Castro-Sánchez, E., Geelhoed, J., & Maria Vrijhoef, H. J. (2023). Nurses' roles, views and knowledge regarding vaccines and vaccination: A pan-European survey. *International Journal of Care Coordination*, 26(3-4), 129–136. <https://doi.org/10.1177/2053434523120752>
- Goedhart, N. S., van Oostveen, C. J., & Vermeulen, H. (2017). The effect of structural empowerment of nurses on quality outcomes in hospitals: A scoping review. *Journal of Nursing Management*, 25(3), 194–206. <https://doi.org/10.1111/jonm.12455>
- Khubchandani, J., Sharma, S., Price, J. H., Wiblehauser, M. J., Sharma, M., & Webb, F. J. (2021). COVID-19 vaccination hesitancy in the United States: A rapid national survey. *Journal of Community Health*, 46(2), 270–277. <https://doi.org/10.1007/s10900-020-00958-x>
- MacDonald N., & Dubé, E. (2015). Unpacking vaccine hesitancy among healthcare providers. *EBioMedicine*, 2(8), 792–793. <https://doi.org/10.1016/j.ebiom.2015.06.028>
- Moceri, J. T. (2014). Hispanic nurses' experiences of bias in the workplace. *Journal of Transcultural Nursing*, 25(1), 15–22. <https://doi.org/10.1177/1043659613504109>
- Olick, R. S., Shaw, J., & Yang, Y. T. (2021). Ethical issues in mandating COVID-19 vaccination for health care personnel. *Mayo Clinic Proceedings*, 96(12), 2958–2962. <https://doi.org/10.1016/j.mayocp.2021.10.020>
- Rich-Edwards, J. W., Rocheleau, C. M., Ding, M., Hankins, J. A., Katuska, L. M., Kumph, X., Steege, A. L., Boiano, J. M., & Lawson, C. C. (2022). COVID-19 vaccine uptake and factors affecting hesitancy among US nurses, March-June 2021. *American Journal of Public Health*, 112(11), 1620–1629. <https://doi.org/10.2105/AJPH.2022.307050>
- SAGE Working Group on Vaccine Hesitancy. (2014a). *Report of the SAGE working group on vaccine hesitancy*. https://www.asset-scienceinsociety.eu/sites/default/files/sage_working_group_revised_report_vaccine_hesitancy.pdf
- SAGE Working Group on Vaccine Hesitancy. (2014b). *Appendices to the report of the SAGE working group on vaccine hesitancy*. https://cdn.who.int/media/docs/default-source/immunization/sage/2014/october/2-sage-appendices-background-final.pdf?sfvrsn=2259f1bf_4
- Schwandt, T. A., Lincoln, Y. S., & Guba, E. G. (2007). *Judging interpretations: But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation*. *New Directions for Evaluation*, 2007(114), 11–25. <https://doi.org/10.1002/ev.223>
- Shanafelt T, Ripp J, Trockel, M. Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *JAMA*. 2020;323(21):2133–2134. <https://doi.org/10.1001/jama.2020.5893>



- Shekhar, R., Sheikh, A. B., Upadhyay, S., Singh, M., Kottewar, S., Mir, H., Barrett, E., & Pal, S. (2021). COVID-19 vaccine acceptance among health care workers in the United States. *Vaccines*, 9(2), 119. <https://doi.org/10.3390/vaccines9020119>
- Stake, R. E. (2006). *Multiple case study analysis*. Guilford Press.
- Viskupič, F., Wiltse, D. L., & Stenvig, T. E. (2025). Nurses' attitudes about RSV vaccination for pregnant women and infants: Evidence from a cross-sectional survey. *PLOS one*, 20(9), e0331326. <https://doi.org/10.1371/journal.pone.0331326>
- World Health Organization. (2025). *Increases in vaccine-preventable disease outbreaks threaten years of progress, warn WHO, UNICEF, Gavi*. <https://www.who.int/news/item/24-04-2025-increases-in-vaccine-preventable-disease-outbreaks-threaten-years-of-progress--warn-who--unicef--gavi>
- Zhou, F., Jatlaoui, T., Leidner, A., Carter, R., Dong, X., Daskalakis, D., Santoli, J., Stokley, S., & Peacock, G. (2024). Health and economic benefits of routine childhood immunizations in the era of the Vaccines for Children Program -United States, 1994- 2023. *MMWR. Morbidity and Mortality Weekly Report*, 73, 682–685. <https://doi.org/10.15585/mmwr.mm7331a2>



FT-3

Health Locus Of Control and Emotional Intelligence as Predictors of Resilience Among Children-Athletes During Competitions in Ijebu-Ode, Ogun State, Nigeria

Adeogun Adekunle Olanrewaju, Tai Solarin Federal University of Education, Ijebu-Ode,
Ogun State, Nigeria

adeogunao@tasued.edu.ng

Abstract

Child athlete resilience remains a critical concern in Nigerian sports; however, psychological factors influencing competitive performance are insufficiently understood. This study examined the influence of health locus of control and emotional intelligence on the resilience of children-athletes during competitions in Ijebu-Ode, Ogun State, Nigeria. Three hypotheses and one research question guided the investigation, exploring how health locus of control and emotional intelligence affect resilience, and whether gender differences exist in resilience levels. Using purposive and simple random sampling techniques, 300 children-athletes from various sports disciplines participated. Standardized instruments were adapted and administered through questionnaires. Data analysis employed linear regression and an independent t-test at 0.05 significance level. Health locus of control significantly influenced children-athletes' resilience during competition ($F(24,275) = 2.544, p < 0.05$), accounting for approximately 11.0% of variance (Adjusted $R^2 = 0.110$). However, emotional intelligence showed no significant influence on resilience ($F(10,289) = 1.578, p > 0.05$), accounting for only 1.9% of variance (Adjusted $R^2 = 0.019$). No significant gender difference emerged in resilience levels ($t = 0.865, df = 298, p > 0.05$); male athletes demonstrated slightly higher resilience (mean = 3.4599) versus female athletes (mean = 3.3628). Children-athletes demonstrated positive reactions to sport-related stressors (weighted mean = 3.61). The study confirms that health locus of control, rather than emotional intelligence, influences children-athletes' competitive resilience in Nigerian sports. Results warrant coaches and health educators to develop strategies that positively shape children-athletes' health beliefs and perceptions toward life circumstances, fostering achievement while prioritizing athlete health and well-being for optimal performance.

Keywords: youth sport psychology, adaptive coping, competitive stress, internal health beliefs, Nigerian athletes.

INTRODUCTION

Attainment of excellence in sport is a multifactorial phenomenon. Competitive strain, physical loads, and the anticipation of environmental uncertainty are among the athletic stressors that contribute to



optimal functioning (Guo et al., 2025). Resilience, among the psychological factors that help athletes to survive and recover from such a misfortune, has received growing empirical attention (Gupta & McCarthy, 2022). Resilience is widely defined as a dynamic, positive, adaptive process in conditions of substantial stress or adversity (VanMeter & Cicchetti, 2020). It is increasingly being seen as a psychological characteristic that can be trained as opposed to being a dispositional characteristic.

Children-athletes are in a very incidental place of development: children-athletes are at the age of maturation transition and must face the requirements of competitive sport at once. Studies also suggest that the main factors that help to develop resilience in this formative stage are the stable relationship with the adults of importance, the cognitive-appraisal processes within the individual, and the abilities of the affective self-regulation (Parveen & Pal, 2024). Health locus of control (HLOC) and emotional intelligence (EI) are two psychological constructs that have been hypothesized to be behind resilience in sport in youth.

The concept of health locus of control was introduced, conceptualized within the framework of the Social Learning Theory by Rotter (1966), the levels to which health consequences can be attributed to either internal (personal behavior and choice) or external (chance, powerful other) factors. Empirical studies continuously link an internal HLOC orientation to adaptive health behaviors, increased self-efficacy, and increased resilience (Rogowska & Zmaczyńska-Witek, 2025). School-based Physical Education offers the strategic possibility to support internal HLOC among school-going athletes by affirming the student agency, providing timely feedback, promoting independent problem solving, and modeling health promoting behavior (Kang et al., 2024).

Emotional intelligence is the ability to recognize, judge and manage both personal emotions as well as those of other people (Buşu, 2020). It has also been identified that athletes who indicate a high degree of emotional intelligence can regulate arousal, remain motivated during stress, and develop parallel foundations of supportive interpersonal relationships - factors that overall promote resilience. Pathak and Goltz (2021) argue that because emotionally demanding situations are avoided and better managed by individuals with higher EI, they are better at interpreting the affective state and controlling the mood. Although there is a significant theoretical foundation, limited empirical data have been collected so far to link EI and resilience in the youth sport population in sub-Saharan African communities.

Research Problem

Athletes with low resilience are more prone to competitive stressors that disrupt performance and future sport involvement (Li et al., 2025). Although there is cumulative evidence on resilience in Western societies, there is a scarcity of empirical research to explore the psychosocial factors of resilience among Nigerian child athletes. To fill this gap, the current research compares HLOC and EI as important predictors of resilience in children-athletes who compete in Ijebu-Ode, Ogun State. Along with it, gender disparities in resilience are discussed.

Significance of the study

Results warrant coaches and health educators to develop strategies that positively shape children-athletes' health beliefs and perceptions of life circumstances, fostering achievement while prioritizing athletes' health and well-being for optimal performance.

Purpose of the study

The following specific objectives were met in this study:

1. Examined the influence of health locus of control on children athletes' resilience during competition.
2. Established the influence of emotional intelligence on children athletes' resilience during competition.
3. Found the influence of gender on children athletes' resilience during competition.

Research questions

The following research question was answered in this study;

1. Do children athletes react positively when faced with sport-related stressors that inhibit sport performance during competitions?

Hypotheses

The following hypotheses were tested in this study:

1. There will be no significant influence of health locus of control on children athletes' resilience during competitions
2. There will be no significant influence of emotional intelligence on children athletes' resilience during competitions.
3. There will be no significant gender difference in children athletes' resilience during competition.

METHODS

Participants

The targeted population included all child-athletes living in Ijebu-Ode, Ogun State. It was carried out through a multistage sampling process in the following way: Stage 1 implemented purposive sampling to determine three preeminent youth sports: association football, basketball, and athletics. Stage 2 used simple random sampling to enlist 300 child-athletes in these fields. The sample size obtained complies with the standard practices of regression analyses (Jenkins & Quintana-Ascencio, 2020). Most of the respondents (about 65%) were between 15 and 18 years and above. There were more male athletes (about 62% on average) than female ones. The majority of respondents were Christian and of Yoruba ethnicity (53%), which reflected the geopolitical structure of the research population. The most commonly covered sport was football (45%), then athletics (average 29%) and basketball (average 23%).

Data Collection

Ahead of the data collection, ethical approval was sought at the appropriate institutional review board. The participants were also completely informed of the study, and their parents or guardians gave consent, and the athletes themselves gave consent. The principal investigator collected the data with the assistance of four trained research assistants.



Data Analyses

Frequency counts and percentages were utilized as descriptive statistics to summarize demographic characteristics. Multiple linear regression was used to consider the effect of Health-Locus of Control (HLOC; Hypothesis 1) and Emotional Intelligence (EI; Hypothesis 2) on resilience. Gender differences in resilience were compared using an independent-samples t-test (Hypothesis 3). All inferential tests were conducted at α 0.05 using SPSS version 25.

The study used a correlational research design of a descriptive nature, thus fitting the purpose of the study to establish the relationships between psychological variables without experimental control (Devi et al., 2022). It has been generally recognized that this methodological approach is effective for studying behavioral patterns and hypersocial predictors validly.

Three standardized and validated tools were modified for the Nigerian sporting context. The internal, powerful others, and chance dimensions of perceived health control are evaluated with the help of the Health Locus of Control Scale (Oguntuase & Sun, 2022). The Emotional Intelligence Inventory (Davies, as cited in the instrument manual) measures the affective self-awareness, empathy, emotional regulation and interpersonal sensitivity. The Connor-Davidson Resilience Scale Wojujutari et al. (2024) It is a 25-item instrument that is used to assess adaptive capacities in five dimensions of resilience, and it has been widely validated in sports populations.

RESULTS

Research Question: Do children athletes react positively when faced with sport-related stressors that inhibit sport performance during competitions?

Table 1 provides a summary of resilience behaviors self-reported by children-athletes in competition. The weighted mean obtained ($M = 3.61$) exceeds the set criterion means of 2.50; this implies that children-athletes tend to react adaptively to stressors in sports.

Table 1. Summary of Resilience Responses During Competition ($n = 300$)

Resilience Item	Not at all (%)	Rarely (%)	Often (%)	Always (%)
Adapts to changes during competition	3.0	9.3	28.7	34.7
Deals with whatever arises	2.3	10.7	44.7	42.0
Finds humor in adversity	1.3	12.7	36.3	10.3
Coping with stress builds strength	3.3	10.0	39.7	35.7
Believes in achieving goals despite obstacles	1.7	8.0	42.3	18.7



Resilience Item	Not at all (%)	Rarely (%)	Often (%)	Always (%)
Perceives self as strong in adversity	1.0	13.0	40.7	39.3
Weighted Mean = 3.61 (Criterion = 2.50) — Positive Adaptation Confirmed				

Hypothesis 1: There will be no significant influence of health locus of control on children athletes' resilience during competitions

Multiple linear regression revealed that HLOC significantly predicted children-athletes' resilience ($F(24,275) = 2.544, p < 0.05$). The regression model explained 18.2% of the total variance in resilience ($R^2 = 0.182$), with an adjusted R^2 of 0.110 (11.0% after accounting for model complexity). The multiple regression coefficient was $R = -0.426$. The null hypothesis was therefore rejected. Table 2 presents the regression summary.

Table : Regression Summary — Influence of HLOC on Children-Athletes' Resilience

Model	R	R ²	Adj. R ²	F	p
HLOC → Resilience	-0.426	0.182	0.110	2.544	< 0.05*

* $p < 0.05$; $df = (24, 275)$

Hypothesis 2: There will be no significant influence of emotional intelligence on children athletes' resilience during competitions.

Multiple linear regression indicated that EI did not significantly predict children-athletes' resilience ($F(10,289) = 1.578, p > 0.05$; $R^2 = 0.052$; Adj. $R^2 = 0.019$). The null hypothesis was therefore accepted. These results suggest that EI, as measured in this study, did not exert a statistically significant direct influence on resilience in this population (Table 3).

Table 3: Regression Summary — Influence of EI on Children-Athletes' Resilience

Model	R	R ²	Adj. R ²	F	p
EI → Resilience	0.228	0.052	0.019	1.578	ns

ns = not significant; $df = (10, 289)$





Hypothesis 3: There will be no significant gender difference in children athletes' resilience during competition.

An independent-samples t-test showed no statistically significant gender difference in resilience ($t(298) = 0.865$, $p > 0.05$; Levene's $F = 0.701$, $p > 0.05$, equal variances assumed). The null hypothesis was therefore accepted. Nevertheless, male athletes recorded a marginally higher mean resilience score ($M = 3.46$, $SD = [not\ reported]$) compared to female athletes ($M = 3.36$). Table 4 summarizes these findings.

Table 4. Independent-Samples t-Test for Gender Differences in Resilience

Group	N	M	T	Df	p
Male Athletes	—	3.460	0.865	298	ns
Female Athletes	—	3.363			

ns = not significant ($p > .05$)

DISCUSSION

Health Locus of Control and Resilience

The significant influence of HLOC on resilience supports the theoretical proposition that internal health beliefs are an important protective factor in the context of competition stress. This finding corroborates Papoulidi and Maniadaki (2025), who reported the correlation between internal HLOC, resilience, and favorable health outcomes among school-age people. Internally oriented HLOC adolescents have an impression that events are within their control, a factor that makes them develop more adaptive coping styles and motivation in the face of competition (Guo et al., 2025). The adjusted R^2 of 11.0% indicates that HLOC is a significant but partial predictor of resilience, implying that other contextual and interpersonal predictors, including coach support and interpersonal relationships with peers and family, also play a significant role. Physical Education practitioners are therefore positioned to leverage HLOC-enhancing pedagogical strategies, such as autonomy-supportive instruction, growth-focused feedback and health education, as a way to enhance resilience in youth athletes.

Emotional Intelligence and Resilience

The insignificant impact of EI on resilience diverges from several established theoretical frameworks (Métais et al., 2022). Although athletes with higher EI have been identified as better equipped to regulate arousal, remain motivated during stress, and cultivate supportive interpersonal relationships, these capacities did not translate into a statistically significant prediction of resilience in the present sample. Troth et al. (2023) argue that individuals with higher EI manage emotionally demanding situations more adaptively by accurately interpreting affective states and regulating mood; however, the direct pathway from such competencies to resilience may be more complex in youth sport contexts than existing theoretical models suggest.





It is also noteworthy that limited empirical data have been conducted so far to link EI and resilience in youth sport populations in sub-Saharan African communities, meaning the present findings contribute to a relatively sparse evidence base rather than contradicting a well-established one. Several methodological and contextual explanations may account for this discrepancy, and these are addressed in the limitations of this study.

Gender and Resilience

The non-significance of the gender gap in resilience aligns with the emerging evidence that the gender gap in psychological hardiness is narrowing in modern youth sport cohorts (Abulela et al., 2025). The slightly positive scores of the resilience of male athletes are consistent with the argument of (Dariotis & Chen, 2022); Jayanthi et al. (2022), where exposure of male adolescents to competitive risk-taking situations gradually increases their resilience based on experiential learning. On the other hand, the activities of female athletes in high-performance sport can be a protective factor that balances the risk-taking behaviors Schinke et al. (2024), which would ensure similar resilience rates. All these findings suggest that gendered resilience development programming should be applied instead of sex-differentiated sport psychology interventions.

Adaptive Responses to Sport-Related Stressors

The positive adaptive response of children-athletes corresponds to the fact stated by Crane et al. (2025) that people are normally oriented to adaptive response rather than rumination whenever things are going badly. Ungar (2019) assume that a high level of resilience has a protective role in a variety of fields: stress resistance, the quality of interpersonal relationships, psychological well-being, and illness recovery, whereas low resilience has the propensity of maladaptive coping and psychological disorder. The results confirm that, despite the under-resourced provision related to the sport setting, child athletes may acquire strong adaptive capabilities in the case of the supportive impact of the coaches, families and community stakeholders.

Limitation

The instruments employed may not have adequately captured the specific EI competencies most salient to resilience in youth sport (e.g., stress inoculation, challenge appraisal). Second, Cuartero and Tur (2021) suggested that EI functions as a predictor of resilience, but not its cause, and mediating variables might reduce the direct relationship between EI and resilience. Third, cultural peculiarities of the Nigerian sport milieu might be moderating the EI -resilience nexus differently, which has not been considered by the standardized tools adapted. These possible mediators and moderators should be investigated by future studies using path analytic or structural equation modeling models.

CONCLUSION

This study provides empirical evidence that HLOC is a significant predictor of resilience among children-athletes competing in Ijebu-Ode, Ogun State, Nigeria, while EI did not demonstrate a significant direct predictive effect in this sample. There was no major gender variance in resilience, whereas the male athletes had slightly higher resiliency scores. Competitive stressors also positively affected child athletes as a population, with good adaptive habits.





Practical implications can be found in the fact that coaches and Physical Education experts should use the HLOC-strengthening programs, which include attributions retraining, autonomy-supportive styles of coaching, and educating young athletes about health literacy as the fundamental elements of their development. Longitudinal and experimental study designs are recommended to establish causal relationships and evaluate the long-term efficacy of such interventions.

Funding: This research received no external funding.

Acknowledgments: The author acknowledges the four trained research assistants who assisted with data collection and questionnaire administration. Sincere appreciation is also extended to the child-athletes and their parents/guardians who willingly participated in this study, as well as the teachers and sport administrators in Ijebu-Ode, Ogun State, Nigeria, who facilitated access to the participants. The author further acknowledges the institutional support of the Department of Health and Safety Promotion, Tai Solarin Federal University of Education, Ijebu-Ode, Ogun State, Nigeria.

Conflicts of Interest: The author declares no conflicts of interest.

Author Note: Adeogun Adekunle Olanrewaju, Department of Health and Safety Promotion, Tai Solarin Federal University of Education, Ijebu-Ode, Ogun State, Nigeria. Correspondence concerning this article should be addressed to Adeogun Adekunle Olanrewaju. Email: adeogunao@tasued.edu.ng

REFERENCES

- Abulela, M. A., Nickodem, K., & Rodriguez, M. C. (2025). Measurement invariance and cohort trends for social and emotional learning measures across four statewide administrations: conventional fit statistics versus the RMSEA. *Journal of Psychoeducational Assessment*, 43(2), 178-198.
- Buşu, A.-F. (2020). Emotional intelligence as a type of cognitive ability. *Revista de Ştiinţe Politice. Revue des Sciences Politiques*(66), 204-215.
- Crane, M. F., Scopano, L., Van Bergen, P., Wiggins, M., Gucciardi, D., Karin, E., Forbes, D., & Kangas, M. (2025). Reflection to Resilience: A Qualitative Study of Non-Ruminative Self-Reflection, Rumination, and Resilience in Emerging Adults. *Emerging Adulthood*, 21676968251412925.
- Cuartero, N., & Tur, A. M. (2021). Emotional intelligence, resilience and personality traits neuroticism and extraversion: predictive capacity in perceived academic efficacy. *Nurse Education Today*, 102, 104933.
- Dariotis, J. K., & Chen, F. R. (2022). Stress coping strategies as mediators: toward a better understanding of sexual, substance, and delinquent behavior-related risk-taking among transition-aged youth. *Deviant behavior*, 43(4), 397-414.
- Devi, B., Lepcha, N., & Basnet, S. (2022). Application of correlational research design in nursing and medical research. *Journal of Xi'an Shiyou University, Natural Sciences Edition*, 65(11), 60-69.





- Guo, C., Chen, F., & Wang, Y. (2025). The psychological impact of competitive sports participation on adolescent athletes: An analysis of coping mechanisms and performance outcomes. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, 43(2), 24.
- Gupta, S., & McCarthy, P. J. (2022). The sporting resilience model: A systematic review of resilience in sport performers. *Frontiers in psychology*, 13, 1003053.
- Jayanthi, N., Schley, S., Cumming, S. P., Myer, G. D., Saffel, H., Hartwig, T., & Gabbett, T. J. (2022). Developmental training model for the sport specialized youth athlete: a dynamic strategy for individualizing load-response during maturation. *Sports health*, 14(1), 142-153.
- Jenkins, D. G., & Quintana-Ascencio, P. F. (2020). A solution to minimum sample size for regressions. *PLoS One*, 15(2), e0229345.
- Kang, X., Meng, Q., & Su, C.-H. (2024). School-based team sports as catalysts for holistic student wellness: a narrative review. *Behavioral Sciences*, 14(7), 528.
- Li, Y., Ren, Y., Du, Z., Li, M., & Jiang, J. (2025). Competitive pressure, psychological resilience, and coping strategies in athletes' pre-competition anxiety. *Scientific Reports*, 15(1), 35467.
- Métais, C., Burel, N., Gillham, J. E., Tarquinio, C., & Martin-Krumm, C. (2022). Integrative review of the recent literature on human resilience: From concepts, theories, and discussions towards a complex understanding. *Europe's journal of psychology*, 18(1), 98.
- Oguntuase, S. B., & Sun, Y. (2022). Effects of mindfulness training and locus of control on self-efficacy of professional football players in Nigeria. *Journal of Physical Education & Sport*, 22(5).
- Papoulidi, A., & Maniadaki, K. (2025). The mediating role of self-efficacy in the relationship between locus of control and resilience in primary school students. *European Journal of Investigation in Health, Psychology and Education*, 15(7), 138.
- Parveen, U., & Pal, R. (2024). The impact of forgiveness in emotional regulation and resilience in the face of adversity among young adults. *International Journal for Multidisciplinary Research*, 6(2), 1-11.
- Pathak, S., & Goltz, S. (2021). An emotional intelligence model of entrepreneurial coping strategies. *International Journal of Entrepreneurial Behavior & Research*, 27(4), 911-943.
- Rogowska, A. M., & Zmaczyńska-Witek, B. (2025). Health Locus of Control. In *The Palgrave Encyclopedia of Disability* (pp. 1-9). Springer.
- Schinke, R. J., Giffin, C., Cosh, S., Douglas, K., Rhind, D., Harwood, C., Si, G., & Papaionnou, A. (2024). International society of sport psychology position stand: Mental health through occupational health and safety in high-performance sport. In *Mental Health in Sport and Physical Activity* (pp. 21-49). Routledge.
- Troth, A. C., Townsend, K., Loudoun, R., & Burgess, M. (2023). Frontline managers' task-related emotion regulation, emotional intelligence, and daily stress. *Australian Journal of Management*, 48(1), 108-129.





- Ungar, M. (2019). Designing resilience research: Using multiple methods to investigate risk exposure, promotive and protective processes, and contextually relevant outcomes for children and youth. *Child abuse & neglect*, 96, 104098.
- VanMeter, F., & Cicchetti, D. (2020). Resilience. In *Handbook of clinical neurology* (Vol. 173, pp. 67-73). Elsevier.
- Wojujutari, A. K., Idemudia, E. S., & Ugwu, L. E. (2024). Evaluation of reliability generalization of Conner-Davison Resilience Scale (CD-RISC-10 and CD-RISC-25): A Meta-analysis. *PLoS One*, 19(11), e0297913.





FT-4

Perceived Effects of Exercise Participation on Mental Health and Well-Being Among Secondary School Students in Benin Metropolis, Nigeria

¹Mary Abidemi Faleke, ²Abibat Motunrayo Adebola, ³Salman Adebayo Babawande

^{1,2,3}Department of Health and Safety Promotion, Tai Solarin Federal University of Education, Ijebu-Ode, Ogun State, Nigeria

falekema@tasued.edu.ng

Abstract

Adolescent mental health challenges such as anxiety, depression, and low self-esteem are increasingly prevalent among Nigerian secondary school students, yet exercise remains underutilized as an intervention. This study examined how exercise participation affects mental health and well-being among secondary school students in Benin Metropolis, Nigeria. One research question and four hypotheses guided the study, focusing on how exercise type, intensity, and duration affect psychological outcomes. Using stratified sampling, 100 students from six secondary schools completed structured questionnaires. Data were analyzed with SPSS version 23 using chi-square and Analysis of Variance at a 0.05 significance level. Exercise type (cluster mean = 3.12), intensity (cluster mean = 2.72), and duration (cluster mean = 3.0) significantly impacted student mental health and well-being. Exercise demonstrated measurable effects on specific mental health outcomes, including anxiety, depression, and self-esteem (cluster mean = 3.0). Significant gender-based differences emerged in perceived exercise effects on mental health ($F(1, 148) = 103.639, p < .001$). Exercise frequency is significantly related to mental health outcomes ($\chi^2(9) = 174.800, p = .000$), while physical activity type significantly impacted mental well-being ($\chi^2(7) = 111.760, p < .001$). Socio-economic factors, particularly access to sports facilities and equipment, significantly influenced mental well-being ($\chi^2(8) = 94.440, p < .001$). Structured physical exercise positively impacts adolescent mental health in Nigerian schools, though effects vary by gender and socio-economic status. Integrating exercise into school programs offers a practical, accessible strategy for improving students' psychological well-being.

Keywords: *Adolescents, physical activity, anxiety, socio-economic status, gender differences*

INTRODUCTION

The attainment of psychological well-being during adolescence is a multifactorial phenomenon shaped by the interplay of biological, social, and environmental determinants. Secondary school represents a formative developmental stage characterized by significant cognitive, emotional, and social transitions that render young people particularly susceptible to mental health challenges, including anxiety, depression, and diminished self-esteem (Andermo et al., 2020; Uktamovna, 2025). For many adolescents, these vulnerabilities are compounded by academic pressure, sedentary lifestyles, and constrained opportunities for structured recreational activity.



In Benin Metropolis, the mental health of secondary school students has emerged as a pressing public health concern. The World Health organization (2022) defines mental health as a dynamic state in which individuals realize their potential, manage daily stressors effectively, and contribute meaningfully to community life. Physical activity has been identified as a key determinant of this state, with evidence consistently demonstrating its efficacy in reducing anxiety and depression, improving sleep quality, enhancing self-esteem, and strengthening cognitive function (Mahindru et al., 2023; Wang & Zhou, 2025). Neurobiologically, exercise benefits are mediated partly by upregulation of brain-derived neurotrophic factor (BDNF) and release of endorphins associated with mood elevation.

For adolescents in particular, regular physical activity has been linked to lower rates of internalizing disorders, greater social connectedness, and improved academic performance (Liu et al., 2022; Zhang et al., 2024). School-based physical activity programs have demonstrated promise as low-cost, scalable mental health interventions, particularly in low- and middle-income countries where access to clinical mental health services remains constrained (Ahmed et al., 2023; Munyangane et al., 2026). Despite growing global evidence, the specific context of secondary school students in Benin Metropolis has not been adequately investigated. The moderating roles of exercise type, intensity, duration, gender, and socio-economic status on perceived psychological outcomes remain insufficiently understood. The present study addresses this gap.

Research Problem

The increasing prevalence of mental health disorders among secondary school students in Benin Metropolis represents a pressing public health challenge. Although growing evidence base supports the exercise mental health relationship globally, the perceived effects of exercise participation on the mental health of students in this specific socio-cultural context remain largely unexplored. This gap is particularly significant given the ecological diversity of Benin Metropolis, where differential access to sports facilities, socio-economic disparities, and varying cultural attitudes toward exercise may shape both participation patterns and psychological outcomes.

Significance of the Study

This study offers evidence-based insights for multiple stakeholders. Educational institutions may draw on the results to refine school policies on physical education and student well-being. Health professionals may utilize the evidence to design exercise-based preventive interventions targeting adolescent mental health. Policymakers may incorporate outcomes into frameworks for recreational infrastructure investment and physical education programming. For the academic community, this study adds to the growing body of knowledge on the exercise–mental health nexus within African secondary school contexts and provides an empirical foundation for future longitudinal inquiry.

Purpose of the Study

The following specific objectives were addressed:

1. Examine the relationship between exercise frequency and mental health outcomes among secondary school students.
2. Establish the influence of physical activity type on students' mental well-being.
3. Determine gender-based differences in the perceived effects of exercise on mental health.

4. Assess the relationship between socio-economic factors and mental well-being among students engaging in physical exercise.

Research Question

The following research question was answered in this study:

1. Do secondary school students in Benin Metropolis perceive exercise participation as positively influencing their mental health and well-being across dimensions of anxiety, depression, and self-esteem?

Hypotheses

The following null hypotheses were tested:

1. There is no statistically significant relationship between exercise frequency and mental health outcomes of secondary school students.
2. Physical activity type does not significantly influence the mental well-being of secondary school students.
3. There are no significant gender-based differences in the perceived effects of exercise on mental health.
4. Socio-economic factors such as access to sports facilities do not significantly relate to the mental well-being of secondary school students.

METHODS

Research Design and Measures

The study adopted a cross-sectional survey design, appropriate for examining associations between variables in a defined population at a single point in time (Maier et al., 2023). A self-constructed, structured questionnaire served as the primary instrument, comprising two sections: Section A solicited demographic information; Section B contained Likert-scale items (Strongly Agree = 4 to Strongly Disagree = 1) derived from the research questions. The decision criterion was set at a mean threshold of 2.50. Face and content validity were established by the researcher's supervisor and two subject-matter experts, with revisions incorporated accordingly. Reliability was confirmed via the test-retest method (two-week interval, $n = 20$ pilot respondents), yielding a satisfactory Pearson's Product-Moment Correlation Coefficient ($r .82$).

Participants

The target population comprised secondary school students in Benin Metropolis who engage in exercise, stratified by gender, class level, and school affiliation. Proportionate stratified sampling was employed across six participating secondary schools, yielding a total sample of 100 students: Edokpolor Grammar School ($n = 19$), U.P.S.S. ($n = 11$), Idia College ($n = 22$), U.D.S.S. ($n = 17$), Brano High School ($n = 10$), and Edaiken Grammar School ($n = 21$). Respondents ranged primarily from 12 to 18 years of age.



Data Collection

Ethical clearance was obtained from the relevant institutional review board, and all participants provided informed written consent. Respondents and parents/guardians were fully informed of study objectives, and participation remained voluntary. The principal investigator and two trained research assistants administered questionnaires directly, providing standardized verbal instructions. Questionnaires were retrieved on-site immediately upon completion, yielding a 100% response rate ($N = 100$).

Data Analyses

Frequency counts and percentages summarized demographic characteristics. Means and standard deviations addressed each research question, with the 2.50 criterion mean as the decision threshold. Chi-square analysis tested Hypotheses 1, 2, and 4; between-subjects ANOVA (two-group) tested Hypothesis 3. All inferential tests were conducted at $\alpha = .05$ using SPSS Version 23.

RESULTS

Demographic Characteristics

The study enrolled 100 secondary school students from six schools. Males accounted for 54.7% ($n = 82$) and females for 45.3% ($n = 68$). The majority of students (32.0%) were aged 12–14 years, followed by 11–12 years (26.0%), 10–11 years (21.3%), and 15 years and above (20.7%). İdia College contributed the largest proportion of respondents (22.0%; $n = 33$).

Research Question: Do secondary school students in Benin Metropolis perceive exercise participation as positively influencing their mental health and well-being across dimensions of anxiety, depression, and self-esteem?

Table 1 presents descriptive findings across all exercise-related variables. Every cluster mean exceeded the 2.50 decision threshold, confirming that students broadly perceive exercise as a meaningful contributor to psychological well-being.





Table 1. Descriptive Statistics for Exercise-Related Variables and Mental Health Perceptions (n = 100)

Exercise Variable	Items (n)	Cluster Mean	SD Range	Decision
Exercise Type (aerobic, resistance, combination)	5	3.12	.396– .767	Agreed
Exercise Intensity (low, moderate, high)	5	2.72	.554– .671	Agreed
Exercise Duration (short, medium, long)	5	3.00	.496– .702	Agreed
Specific Mental Health Outcomes (anxiety, depression, self-esteem)	5	3.00	.471– .707	Agreed
Individual Moderating Factors (personality, health, genetics)	5	3.00	.471– 1.006	Agreed
Physical Activity Guidelines	5	2.97	.496– .702	Agreed
Cost-Effectiveness of Exercise-Based Promotion	5	2.94	.496– .707	Agreed

Note. Criterion mean = 2.50. All cluster means exceed the decision threshold. Source: Field Survey, 2024.

Exercise type (cluster mean = 3.12) yielded the highest cluster score. Students affirmed that combined cardio and strength training yields broader mental health benefits (mean = 3.19) and that resistance training promotes confidence and positive body image (mean = 3.13). However, students disagreed that running or cycling alone produces happiness and stress reduction (mean = 2.30), indicating that contextual and social factors are perceived as integral to the psychological benefits of exercise. Exercise intensity (cluster mean = 2.72) showed that high-intensity activities (mean = 2.96) and moderate-intensity activities (mean = 2.91) were perceived more favorably, while low-intensity exercise was undervalued (mean = 2.26). Exercise duration (cluster mean = 3.00) confirmed that longer sessions are rated most highly (mean = 3.42) and that even brief bouts of physical activity are beneficial (mean = 3.13).

Hypothesis Testing

Table 2 presents a summary of all hypothesis test outcomes.



Table 2. Summary of Hypothesis Test Results

Hypothesis	Test	Statistic	df	p	Decision
H1: Exercise frequency – mental health	Chi-square	$\chi^2 = 174.800$	9	< .001	Rejected
H2: Physical activity type – mental well-being	Chi-square	$\chi^2 = 111.760$	7	< .001	Rejected
H3: Gender – perceived exercise effects	ANOVA	F(1,148) = 103.639	1, 148	< .001	Rejected
H4: Socio-economic factors – mental well-being	Chi-square	$\chi^2 = 94.440$	8	< .001	Rejected

Note. All tests were conducted at $\alpha = .05$ using SPSS Version 23. All null hypotheses were rejected.

Hypothesis 1 was rejected. Chi-square analysis revealed a statistically significant relationship between exercise frequency and mental health outcomes ($\chi^2(9) = 174.800$, $p < .001$), supporting a dose-response pattern in which habitual, structured exercise yields the most pronounced mental health benefits. Hypothesis 2 was rejected. A statistically significant association between physical activity type and mental well-being was confirmed ($\chi^2(7) = 111.760$, $p < .001$), with aerobic and combination modalities associated with more favorable outcomes. Hypothesis 3 was rejected. Between-subjects ANOVA (two-group) revealed significant gender-based differences ($F(1, 148) = 103.639$, $p < .001$), with female students reporting stronger gains in self-esteem and social connectedness, and male students more frequently citing stress relief and mood regulation. Hypothesis 4 was rejected. Socio-economic factors, particularly access to sports facilities, were significantly associated with mental well-being ($\chi^2(8) = 94.440$, $p < .001$), with students in better-resourced schools reporting more favorable psychological outcomes.

DISCUSSION

Exercise Type and Mental Health

The finding that exercise type significantly influences mental health outcomes (cluster mean = 3.12) is consistent with the broader empirical literature. The perceived superiority of combination exercises integrating cardio and resistance training aligns with meta-analytic evidence indicating that aerobic and combined modalities are associated with improved mood, reduced stress, and enhanced self-efficacy (Recchia et al., 2023). The broad agreement that resistance training supports confidence and body image (mean = 3.13) corroborates findings linking strength-based activity to enhanced self-concept among adolescents. The disagreement with the item that running or cycling alone produces mood benefits (mean = 2.30) may reflect the limited prevalence of sustained aerobic activity in this setting, or that social participation and enjoyment are perceived as indispensable to exercise's psychological benefits





a view consistent with contemporary multidimensional models of the exercise–mental health relationship (Mahindru et al., 2023; Wang & Zhou, 2025).

Exercise Intensity and Duration

The cluster mean of 2.72 for exercise intensity indicates that students broadly perceive intensity as a relevant determinant of mental health outcomes. Consistent with Chen et al. (2024) who demonstrated that both high- and moderate-intensity exercise are associated with meaningful reductions in anxiety and depressive symptoms, the present findings show that high-intensity activities such as running and HIIT (mean = 2.96) and moderate-intensity activities such as brisk walking and swimming (mean = 2.91) were both perceived favourably. The undervaluation of low-intensity exercise (mean = 2.26) warrants attention from physical education practitioners, given evidence that even light physical activity produces meaningful psychological effects through mood regulation and social engagement. Results also confirm that exercise duration positively influences perceived mental health outcomes (cluster mean = 3.00), with longer sessions rated most highly (mean = 3.42), consistent with (Singh et al., 2023). Equally important is student recognition of brief exercise episodes (mean = 3.13), validating the practical value of incorporating short-duration physical activity breaks into the school day.

Exercise and Specific Mental Health Outcomes

The cluster mean of 3.00 for exercise–mental health outcome items confirms a clear perceived relationship between regular exercise and reductions in anxiety, depression, and improvements in self-esteem. These findings corroborate Recchia et al. (2023) whose systematic review established that regular physical activity is associated with significant reductions in anxiety and depressive symptoms and enhanced quality of life. The gradient in item means from 3.42 for general anxiety/depression reduction to 2.57 for specific constructs such as self-perception may reflect heterogeneity in students' personal exercise experiences or limited awareness of the neurobiological pathways, including endorphin release and BDNF upregulation, that mediate the exercise–mental health relationship.

Exercise Frequency and Mental Health Outcomes

The statistically significant chi-square result for Hypothesis 1 ($\chi^2(9) = 174.800$, $p < .001$) confirms a meaningful association between exercise frequency and mental health outcomes, consistent with Song et al. (2025) whose meta-analysis demonstrated that higher exercise frequency is associated with greater reductions in anxiety and depression. The dose-response nature of this relationship suggests that policies promoting habitual, structured exercise participation rather than occasional or incidental activity are likely to yield the most pronounced mental health benefits among secondary school populations.

Gender-Based Differences in Perceived Exercise Effects

The statistically significant ANOVA result for Hypothesis 3 ($F(1, 148) = 103.639$, $p < .001$) confirms that gender significantly moderates the perceived effects of exercise on mental health. Female students reported stronger perceived benefits in self-esteem and social connectedness, while male students more frequently associated exercise with stress relief and mood regulation, consistent with Recchia et al. (2023) who found that gendered social norms and differential exposure to competitive sport shape how



exercise is experienced psychologically. These findings call for gender-responsive exercise curricula that acknowledge differential motivations and perceived benefits across genders.

Socio-Economic Factors and Mental Well-Being

The statistically significant chi-square results for Hypothesis 4 ($\chi^2(8) = 94.440, p < .001$) confirms that access to sports facilities and equipment is significantly associated with students' mental well-being. Students attending better-resourced schools reported higher physical activity engagement and more favorable psychological outcomes, consistent with Guthold et al. (2020) who established that adolescents from higher socio-economic backgrounds have greater access to organized sport and recreational infrastructure. This structural finding underscores that individually targeted behavior change strategies are insufficient without corresponding improvements in the physical environments enabling exercise participation. Equitable investment in school sport infrastructure is therefore both a health and a social justice imperative.

CONCLUSION

This study provides empirical evidence that exercise participation has significant perceived effects on the mental health and well-being of secondary school students in Benin Metropolis, Nigeria. All seven exercise-related cluster means exceeded the 2.50 decision threshold, and all four null hypotheses were rejected, confirming that exercise frequency, physical activity type, gender, and socio-economic factors are statistically significant determinants of mental health outcomes. These findings affirm that physical exercise constitutes an integral component of holistic student development in the Nigerian educational system.

Structured physical activity programs sensitive to exercise type, intensity, duration, gender, and socio-economic context hold significant potential as low-cost, scalable mental health interventions. Policymakers, school administrators, and physical education practitioners are encouraged to leverage these findings in designing evidence-based, contextually grounded exercise programs that position physical activity as a central pillar of student mental health promotion. Longitudinal and experimental studies are warranted to establish causal pathways and evaluate the sustained efficacy of structured school-based physical activity programs.

Limitation

Several limitations merit acknowledgement. The cross-sectional design precludes causal inference, and reliance on self-reported data introduces the possibility of recall and social desirability biases. The study does not account for pre-existing medical conditions or concurrent therapeutic interventions.

Funding: This research received no external funding.

Acknowledgements: The authors acknowledge the two trained research assistants who supported data collection and questionnaire administration, and the students, school administrators, and physical education teachers across the six participating secondary schools in Benin Metropolis.

Conflicts of Interest: The author declares no conflicts of interest.





REFERENCES

- Ahmed, S. K., Dabrowski, A., Dix, K., & Carslake, T. (2023). School-based interventions that support mental health and psychosocial wellbeing in low-and middle-income countries.
- Andermo, S., Hallgren, M., Nguyen, T.-T.-D., Jonsson, S., Petersen, S., Friberg, M., Romqvist, A., Stubbs, B., & Elinder, L. S. (2020). School-related physical activity interventions and mental health among children: a systematic review and meta-analysis. *Sports medicine-open*, 6(1), 25.
- Chen, Z., Huang, H., Liu, R., & Tang, Z. (2024). Effects of internet-based exercise intervention on depression and anxiety: A systematic review and meta-analysis. *Medicine*, 103(8), e37373.
- Guthold, R., Stevens, G. A., Riley, L. M., & Bull, F. C. (2020). Global trends in insufficient physical activity among adolescents: a pooled analysis of 298 population-based surveys with 1· 6 million participants. *The lancet child & adolescent health*, 4(1), 23-35.
- Liu, J., Peng, P., Zhao, B., & Luo, L. (2022). Socioeconomic status and academic achievement in primary and secondary education: A meta-analytic review. *Educational Psychology Review*, 34(4), 2867-2896.
- Mahindru, A., Patil, P., & Agrawal, V. (2023). Role of physical activity on mental health and well-being: a review. *Cureus*, 15(1), e33475.
- Maier, C., Thatcher, J. B., Grover, V., & Dwivedi, Y. K. (2023). Cross-sectional research: A critical perspective, use cases, and recommendations for IS research. In (Vol. 70, pp. 102625): Elsevier.
- Munyangane, O. L., Thaga, L. F., & Vele, R. (2026). Physical Activity Interventions for Mental Health Among Youth in South Africa: A Scoping Review. *International journal of environmental research and public health*, 23(2), 243.
- Recchia, F., Bernal, J. D., Fong, D. Y., Wong, S. H., Chung, P.-K., Chan, D. K., Capio, C. M., Yu, C. C., Wong, S. W., & Sit, C. H. (2023). Physical activity interventions to alleviate depressive symptoms in children and adolescents: a systematic review and meta-analysis. *JAMA pediatrics*, 177(2), 132-140.
- Singh, B., Olds, T., Curtis, R., Dumuid, D., Virgara, R., Watson, A., Szeto, K., O'Connor, E., Ferguson, T., & Eglitis, E. (2023). Effectiveness of physical activity interventions for improving depression, anxiety and distress: an overview of systematic reviews. *British journal of sports medicine*, 57(18), 1203-1209.
- Song, H., Ge, S., Wang, Y., Ran, L., & Zhang, H. (2025). Aerobic exercise strategies for anxiety and depression among children and adolescents: a systematic review and meta-analysis. *Frontiers in Public Health*, 13, 1555029.
- Uktamovna, R. Z. (2025). The transformative journey of adolescence: a study of the physical, cognitive, emotional, and social changes during the teenage years. *Spanish Journal of Innovation and Integrity*, 39, 169-172.





- Wang, B., & Zhou, H. (2025). Physical Activity and Adolescent Depression: The Moderating Effects of Self-Esteem, Sleep Quality and Social Support in Mental Health Interventions. *International Journal of Mental Health Nursing*, 34(4), e70126.
- Zhang, G., Feng, W., Zhao, L., Zhao, X., & Li, T. (2024). The association between physical activity, self-efficacy, stress self-management and mental health among adolescents. *Scientific Reports*, 14(1), 5488.
- World Health Organization (2022). *World mental health report: Transforming mental health for all*. World Health Organization.



FT-5

Using Motion Capture Data to Support Natural Science Perspectives on Movement in Physical Education

Naoki Suzuki, Tokyo Gakugei University, Japan

nsuzuki@u-gakugei.ac.jp

Abstract

Physical education (PE) can connect bodily experience with academic learning when movement is externalized through motion capture, video, graphs, and scientific explanation. Yet movement data become educationally meaningful only when students can interpret them and return to practice with concrete revision targets. This proceedings report examined how movement-data-informed PE lessons supported students' short-term perceptions and how different representations functioned as bridges between bodily experience and natural science perspectives. Two Japanese high school cases were analyzed: a long-jump PE-Physics-PE sequence at School A using motion-capture and force-related data (pre $n = 23$; post $n = 22$), and a basketball free-throw lesson at School B using video, trajectory, angle, speed, and form-related representations (pre $n = 34$; post $n = 35$). Questionnaire data were summarized descriptively; optional free responses were used as contextual evidence. Both cases showed high post-lesson positive response rates across four domains. School A suggested a disciplinary-integration bridge, where force-related data connected PE with physics concepts. School B suggested a self-regulation bridge, where trajectory visualization supported revision of shooting form. The findings contribute a representational bridge model for XR-oriented PE: a capture-annotate-revise loop in which teacher-guided interpretation links movement data to specific bodily revision before the next attempt.

Keywords: *representational bridge; embodied data; visual feedback; self-regulation; interdisciplinary learning*

INTRODUCTION

Physical education (PE) is often taught through demonstration, repetition, verbal cues, and students' own bodily feeling. These approaches are indispensable, but they also create a familiar pedagogical problem: learners may know that a movement did not work without being able to identify what happened in the movement, why the error occurred, or what specifically should be adjusted next. Movement learning therefore involves not only physical performance but also noticing, interpretation, and self-correction.

Motion capture, video analysis, and other XR-oriented movement-data systems can make aspects of movement visible that are difficult to perceive from bodily feeling alone. A take-off angle, release trajectory, ground reaction pattern, timing sequence, or body position may help students reinterpret movement through natural science perspectives. Yet data visibility is not the same as learning. Numbers,





graphs, and images do not speak for themselves; students must be able to make sense of them, regard them as relevant, and translate them into renewed action.

This paper develops the concept of a representational bridge to describe this pedagogical process. In PE, the bridge often begins with a productive mismatch between what movement feels like from inside and what data show from outside. This distinction matters because movement knowledge is partly tacit (Polanyi, 1966) and grounded in the lived body (Merleau-Ponty, 1945/2012). Motion capture therefore does more than display an objective body; it helps students translate felt jumping, throwing, or shooting into scientific language such as force, angle, timing, and trajectory, and then return that translation to renewed action.

Research Questions/Problems

RQ1. What descriptive response patterns were observed in students' self-reported perceptions after two movement-data-informed PE cases incorporating natural science perspectives?

RQ2. How did the two cases differ in representation type, and how did those representations shape the bridge between bodily experience, scientific interpretation, and renewed practice?

Brief Literature Review

Movement data, feedback, and sense-making

Technology-supported movement learning is often examined through feedback research. Video and visual feedback can support motor learning in PE when students understand what they are seeing and connect feedback to concrete movement goals (Han et al., 2022; Mödinger et al., 2022; Potdevin et al., 2018; Zhou et al., 2021). Learning analytics research similarly emphasizes that feedback becomes useful only when learners make meaning from data in context (Banihashem et al., 2022; Lim et al., 2020).

This study extends that logic to movement-data-informed PE. The key issue is not whether data are accurate or attractive, but whether they become actionable. A graph, posture image, or trajectory line becomes pedagogical only when it helps students revise what they intend to do with the body. Representation must therefore be selective and situated in the movement problem (Kirk & MacPhail, 2002; Mayer, 2014).

XR, embodied learning, and the body-data relation

XR and mixed-reality research argues that emerging technologies support learning when they connect perception, action, and representation rather than presenting information as detached content. This requires alignment among design, theory, and task (Johnson-Glenberg, 2018; Lindgren & Johnson-Glenberg, 2013; Radianti et al., 2020).

This is especially important in PE because students must re-enter movement with a changed bodily intention. Embodied and enactive perspectives treat knowing as grounded in perception and action (Barsalou, 2008; Merleau-Ponty, 1945/2012; Varela et al., 1991). Motion capture data matter when they help students re-describe felt movement and convert external representation into embodied self-correction.



Conceptual positioning of the representational bridge

The representational bridge concept specifies what movement data must do pedagogically. It is not merely a feedback loop, visualization, or analytics display. It names the designed passage from bodily experience to external representation, from representation to scientific interpretation, and from interpretation back to renewed bodily practice. Drawing on distributed cognition and professional vision (Goodwin, 1994; Hutchins, 1995), it emphasizes that the object of knowledge must return to the moving body.

Table 1. Conceptual positioning of the representational bridge concept.

Concept	Primary focus	What the representational bridge adds
Visual feedback	Showing learners video, images, or performance information.	Emphasizes whether the representation becomes a concrete revision target for renewed practice.
Learning analytics sense-making	Helping learners interpret educational data in context.	Extends sense-making to embodied re-entry: interpretation must return to movement, not only cognition.
Embodied/XR learning	Connecting perception, action, and representation through immersive or mixed environments.	Specifies a PE design cycle linking bodily experience, scientific explanation, and movement revision.
Representational bridge	Linking felt movement, externalized movement data, scientific interpretation, and re-embodied action.	Names the pedagogical condition under which motion capture data become meaningful for PE learning.

Note. The concept is used here as a design-level analytic construct rather than as a validated scale.

For this proceedings report, the bridge was operationalized through three observable design indicators: (1) a felt movement problem or uncertainty, (2) externalization through data, image, graph, or trajectory, and (3) re-embodiment through a specific revision target for the next attempt. This operationalization keeps the concept from remaining a metaphor and links the two cases to a common analytic structure.

Significance of the Study

This study reframes motion capture data in PE as educational translation. Visibility alone is not learning. Data become educational when teachers select representations that help learners connect bodily experience, scientific concepts, and renewed practice, consistent with the idea that teaching transforms content into learnable forms (Shulman, 1987).

Purposes of the Study



The purpose of this study was to examine short-term student perception patterns after two movement-data-informed PE cases and to clarify how different representations, including motion-capture/force-related data and video/trajectory-based data, supported natural science perspectives on movement. Because the available project summary did not consistently include individual-level matched data across both cases, this proceedings manuscript treats the findings as design-level evidence rather than causal proof of learning gains.

METHODS

Research Design and Measures for Quantitative Study

This study used an exploratory descriptive case design to capture emergent phenomena in authentic PE settings. The cases were selected from a larger demonstration project because both connected PE with natural science perspectives. The methodological priority was to describe how motion capture and related representations functioned in real classroom ecologies, not to isolate variables experimentally.

Students responded to project-developed questionnaire items designed for practical monitoring. The items were reviewed by project researchers and PE practitioners and organized into four domains: self-regulated motor learning, interest in natural science perspectives on movement, reduction of psychological burden, and motor perception/perceived competence. They captured short-term perceptions rather than validated psychometric constructs.

Participants

The present paper focuses on two Japanese high school cases. The two participating schools are referred to as School A and School B throughout the manuscript to protect institutional anonymity. The School A case involved a three-step-approach long-jump lesson sequence. Pre-lesson questionnaire responses were obtained from 23 students and post-lesson responses from 22 students. The School B case involved a basketball free-throw lesson. Pre-lesson responses were obtained from 34 students and post-lesson responses from 35 students. Across the two cases, the project summary therefore included 57 pre-lesson responses and 57 post-lesson responses, although these were not consistently matched at the individual level. Gender, ethnicity, and age percentages were not systematically available in the anonymized project summary provided for this proceedings report; school-level demographic profiles were not disclosed by the participating institutions. No identifiable student data are reported.

Table 2. Overview of the two cases included in the proceedings report.

Case	Movement task	Main representations used	Pre n	Post n
School A	Three-step-approach long jump	Motion capture, force-related data, graphs, and physical explanation	23	22
School B	Basketball free throw	Video/image data, trajectory, angle, speed, and form-related representations	34	35



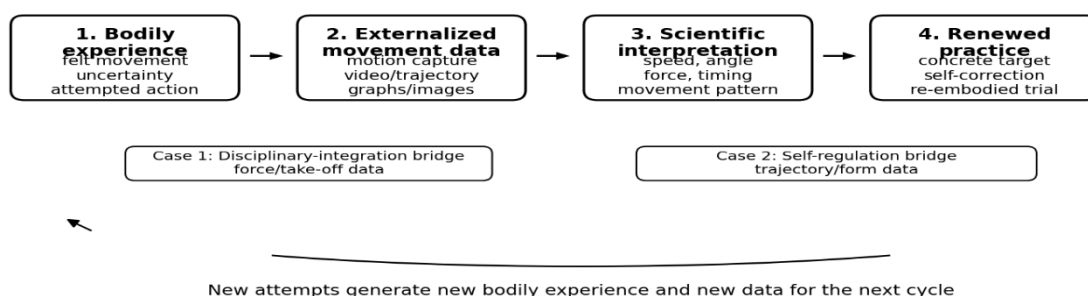
Data Collection

Data were collected before and after the lessons through five-point student questionnaires. Optional free responses were summarized into broad categories. The procedures were part of a school-based demonstration project; this manuscript uses only anonymized, aggregated data. The first author coordinated the broader project but did not teach the lessons; analysis was conducted from anonymized summaries to reduce direct classroom confirmation bias.

Instructional Context and Representational Bridge Model

In School A, long-jump data were interpreted through angle, speed, force, timing, and take-off characteristics in a PE-Physics-PE sequence. In School B, basketball free throws were examined through video and trajectory-related representations such as angle, speed, trajectory, and form. The cases were treated as contrasting bridge functions: a disciplinary-integration bridge in Case 1 and a self-regulation bridge in Case 2.

Representational Bridge Model for Movement-Data-Informed PE



Note. The model shows how students move from bodily experience to externalized movement data, scientific interpretation, and renewed practice. The same recursive loop can function as a disciplinary-integration bridge when science concepts reorganize movement understanding, or as a self-regulation bridge when visualized data guide the next attempt.

Figure 1. Conceptual bridge model showing Case 1 as a disciplinary-integration bridge and Case 2 as a self-regulation bridge in movement-data-informed PE.

Data Analyses

Analysis focused on descriptive patterns. Positive response rates were calculated as responses of 4 or 5, with 3 treated as neutral. Group-level means are reported where available. Because consistently matched individual files were not available across both cases, paired t-tests are not reported here. Optional free responses were summarized as mathematics/physics-related comments, movement-sense-related comments, and ICT challenge comments. Verbatim quotations were not available.





RESULTS

Post-Lesson Positive Response Patterns

Both cases showed high post-lesson positive response rates across the four practical outcome domains. In School A, positive responses were 92% for self-regulated motor learning, 93% for interest in mathematics/physics perspectives, 86% for reduced psychological burden, and 82% for motor perception. In School B, positive responses were 88%, 80%, 89%, and 89%, respectively. These values indicate that students in both cases tended to report positive perceptions after lessons that connected PE movement with natural science perspectives.

Table 3. Post-lesson positive response rates by outcome domain.

School	Self-regulated motor learning	Math/physics interest	Reduced psychological burden	Motor perception
School A	92%	93%	86%	82%
School B	88%	80%	89%	89%

Note. Percentages are rounded to whole numbers and are descriptive, not benchmark-based evidence of success.

Group-Level Mean Patterns

Available group-level means were higher after the lessons in the domains most closely connected to each instructional design. In School A, self-regulated motor learning increased descriptively from 3.73 to 4.33, and mathematics/physics interest increased from 3.15 to 4.46. In School B, mathematics/physics interest increased from 3.44 to 3.96. The largest descriptive change was observed in School A students' mathematics/physics interest (+1.31), which may reflect the more explicit PE-Physics-PE sequence and the use of force-related explanation as a tool for movement revision.

Table 4. Group-level means for selected outcome domains.

School	Outcome domain	Pre mean	Post mean	Descriptive change
School A	Self-regulated motor learning	3.73	4.33	+0.60
School A	Math/physics interest	3.15	4.46	+1.31
School B	Math/physics interest	3.44	3.96	+0.52

Note. Inferential statistics are intentionally omitted because individual-level matching was not consistently available in the project summary.

How Representation Type Shaped the Bridge



The two cases differed not only by sport but also by the educational role that movement data played. In School A, motion-capture and force-related data functioned as a disciplinary-integration bridge: students could reinterpret long-jump performance through physics concepts such as force, angle, timing, and take-off characteristics. In School B, video and trajectory information functioned as a self-regulation bridge: students could notice release angle, ball path, and shooting form as targets for the next attempt. The meaning of comparison is therefore not that one case was better than the other, but that different representations organized different kinds of bodily-scientific sense-making.

Table 5. Representation type and bridge mechanism across cases.

Case	Educational role of data	Intended pedagogical tension	Re-embodiment target
School A	Disciplinary-integration bridge between PE and physics.	Felt long-jump effort was re-described through force, timing, angle, and take-off data.	Revise take-off target, body position, and timing in renewed jumping practice.
School B	Self-regulation bridge within repeated free-throw practice.	Felt shooting form was compared with visible trajectory, release, and ball-path information.	Revise release angle, trajectory, and form cues in the next shot.

Note. The third column describes pedagogical tensions inferred from the instructional structure, not verified individual student trajectories.

Contextual Free-Response and Mismatch Patterns

Optional free responses supported the survey patterns and revealed limits. Students more often mentioned mathematics/physics perspectives and movement sense than ICT challenges: 41% and 59% in School A, and 49% and 51% in School B. ICT challenge comments were lower, at about 5% and 6%, but these rates still matter. They indicate that graphs, trajectories, and device operations can create access demands. The bridge therefore requires scaffolding; otherwise, representations may interrupt intuitive movement rather than deepen it.

Table 6. Contextual free-response theme mentions.

School	Math/physics comments	Movement-sense comments	ICT challenge comments
School A	41%	59%	5%
School B	49%	51%	6%

Note. These counts are descriptive and were not treated as a full qualitative analysis.

DISCUSSION

What the Representational Bridge Adds

The findings shift the question from whether motion capture data are useful to how movement data become actionable. Feedback and learning analytics research identifies interpretation as central to meaningful data use (Banihashem et al., 2022; Lim et al., 2020). This report adds that, in PE, interpretation must loop back to the body. Students translate bodily feeling into public, scientific language and then translate that language back into revised bodily intention. In professional vision terms (Goodwin, 1994), teachers help students see their own movement as an inspectable object of knowledge rather than only as bodily intuition.

The concept also clarifies mismatch. Data can disturb bodily certainty: force may be dispersed despite felt effort, timing may be late despite felt coordination, or trajectory may be flatter than expected. Such discrepancies become productive only when teachers convert them into manageable revision targets. Mismatch is therefore not an error to eliminate; it is the hinge through which motion capture becomes education rather than display.

Force-Related Data and Trajectory-Based Data as Different Bridges

The cross-case contrast suggests that different representations support different forms of movement understanding. In School A, force-related and motion-capture data created a bridge between PE and physics. The larger descriptive shift in mathematics/physics interest may reflect the explicit PE-Physics-PE structure, in which scientific concepts were returned to the movement task rather than taught as detached explanation. In School B, trajectory and video representations created a bridge for practice regulation: students could look at ball path and form as concrete cues for the next free throw. The two cases therefore show different educational roles for XR-oriented data. One emphasizes conceptual integration across subjects; the other emphasizes self-regulated refinement within repeated practice.

Design Principles for Movement-Data-Informed PE

The results and limitations generate practical design principles for PE teachers and researchers using motion capture or XR-oriented systems. These principles follow the bridge model and emphasize that richer visualization requires teacher scaffolding so that mismatch becomes inquiry rather than confusion.

Table 7. Design principles for movement-data-informed PE.

Design principle	Why it matters	Teacher move
Begin with a felt movement problem.	Prevents data from appearing as detached information.	Ask students what felt difficult before showing data.
Externalize movement selectively.	Reduces cognitive load and supports usable interpretation.	Highlight one or two task-relevant variables.
Use productive mismatch carefully.	Turns disagreement between feeling and data into inquiry.	Compare what it felt like with what the data show.
Translate data into usable science.	Connects movement to force, angle, timing, or trajectory.	Name the concept and its practical movement meaning.

Return interpretation to practice.	Makes data meaningful through re-embodiment.	Set one concrete revision target before the next attempt.
Design for representational access.	Prevents data from creating new participation thresholds.	Scaffold graph, image, and trajectory interpretation.

Implications for XR-Oriented Physical Education

For XR-oriented PE, the central design question is not whether richer visualizations can be produced, but whether they help students move from experience to interpretation to action. Future systems should implement a three-step capture-annotate-revise loop: capture movement, annotate it with usable science concepts, and prompt a specific bodily revision before the next attempt. Motion capture, augmented overlays, and head-mounted displays may strengthen this loop, but can also overload students if representations are too complex. Interpretability, task relevance, and re-embodiment should therefore take priority over visual sophistication.

Limitations

This study has several limitations. There was no control or comparison group, so causal interpretation is not warranted; history, maturation, selection, novelty, and instructor characteristics remain plausible threats to internal validity (Shadish et al., 2002). Although the author was not the classroom teacher, expectancy effects from researcher-teacher collaboration cannot be excluded. Individual-level matching was not consistently available, the questionnaire was developed for project monitoring, free responses were available only as categorized summaries, and objective performance data were not consistently available. The contribution is therefore a design model for emergent classroom phenomena, not proof of performance improvement.

CONCLUSIONS

In response to RQ1, both cases showed high post-lesson positive response rates across the four practical outcome domains, with the largest available descriptive shift in School A students' interest in mathematics/physics perspectives. In response to RQ2, the cases showed that representation type mattered: force-related motion-capture data appeared to support scientific reinterpretation of long-jump take-off, while video and trajectory-based data supported visual noticing of free-throw form and ball path.

The main contribution is the representational bridge model. Motion capture data should not be treated as a technological add-on or automatic evidence of learning. Its value lies in helping students move from bodily experience to externalized data, from data to scientific interpretation, and from interpretation back to renewed practice. We define this as the capture-annotate-revise loop: capture a meaningful movement event, annotate it with usable science concepts, and prompt a specific bodily revision. Future XR systems should be judged less by data richness than by re-embodiment success. This loop depends on teachers' pedagogical improvisation: framing data as meaningful, managing perceptual mismatch, and guiding students back to embodied revision. The teacher turns motion capture from a mirror of movement into a pedagogical resource for reconstructing bodily knowledge.





Funding:

This work was supported by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan, as part of a 2025 fiscal year demonstration project on the use of advanced technologies and educational data for next-generation schools and educational settings.

Acknowledgments:

The author thanks the participating schools, teachers, and students for their cooperation in the lesson implementation and data collection.

Conflicts of Interest:

The author declares no conflicts of interest.

Author Note:

A separate manuscript based on one anonymized case examines qualitative reception of analysis-based feedback in greater depth. The present paper reports descriptive questionnaire patterns across two cases and develops the representational bridge model as a design-level framework.

REFERENCES

- Banihashem, S. K., Noroozi, O., van Ginkel, S., Macfadyen, L. P., & Biemans, H. J. A. (2022). A systematic review of the role of learning analytics in enhancing feedback practices in higher education. *Educational Research Review*, 37, 100489. <https://doi.org/10.1016/j.edurev.2022.100489>
- Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology*, 59, 617-645. <https://doi.org/10.1146/annurev.psych.59.103006.093639>
- Goodwin, C. (1994). Professional vision. *American Anthropologist*, 96(3), 606-633. <https://doi.org/10.1525/aa.1994.96.3.02a00100>
- Han, Y., Syed Ali, S. K. B., & Ji, L. (2022). Feedback for promoting motor skill learning in physical education: A trial sequential meta-analysis. *International Journal of Environmental Research and Public Health*, 19(22), 15361. <https://doi.org/10.3390/ijerph192215361>
- Hutchins, E. (1995). *Cognition in the wild*. MIT Press.
- Johnson-Glenberg, M. C. (2018). Immersive VR and education: Embodied design principles that include gesture and hand controls. *Frontiers in Robotics and AI*, 5, 81. <https://doi.org/10.3389/frobt.2018.00081>
- Kirk, D., & MacPhail, A. (2002). Teaching games for understanding and situated learning. *Journal of Teaching in Physical Education*, 21(2), 177-192. <https://doi.org/10.1123/jtpe.21.2.177>





- Lim, L.-A., Dawson, S., Gašević, D., Joksimović, S., Fudge, A., Pardo, A., & Gentili, S. (2020). Students' sense-making of personalised feedback based on learning analytics. *Australasian Journal of Educational Technology*, 36(6), 15–33. <https://doi.org/10.14742/ajet.6370>
- Lindgren, R., & Johnson-Glenberg, M. (2013). Emboldened by embodiment: Six precepts for research on embodied learning and mixed reality. *Educational Researcher*, 42(8), 445-452. <https://doi.org/10.3102/0013189X13511661>
- Mayer, R. E. (2014). Cognitive theory of multimedia learning. In R. E. Mayer (Ed.), *The Cambridge handbook of multimedia learning* (2nd ed., pp. 43-71). Cambridge University Press. <https://doi.org/10.1017/CBO9781139547369.005>
- Merleau-Ponty, M. (2012). *Phenomenology of perception* (D. A. Landes, Trans.). Routledge. (Original work published 1945)
- Möding, M., Woll, A., & Wagner, I. (2022). Video-based visual feedback to enhance motor learning in physical education: A systematic review. *German Journal of Exercise and Sport Research*, 52(3), 447–460. <https://doi.org/10.1007/s12662-021-00782-y>
- Polanyi, M. (1966). *The tacit dimension*. Doubleday.
- Potdevin, F., Vors, O., Huchez, A., Lamour, M., Davids, K., & Schnitzler, C. (2018). How can video feedback be used in physical education to support novice learning in gymnastics? Effects on motor learning, self-assessment and motivation. *Physical Education and Sport Pedagogy*, 23(6), 559-574. <https://doi.org/10.1080/17408989.2018.1485138>
- Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. *Computers & Education*, 147, 103778. <https://doi.org/10.1016/j.compedu.2019.103778>
- Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Houghton Mifflin.
- Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 57(1), 1-23. <https://doi.org/10.17763/haer.57.1.j463w79r56455411>
- Varela, F. J., Thompson, E., & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience*. MIT Press.
- Zhou, Y., Shao, W., & Wang, L. (2021). Effects of feedback on students' motor skill learning in physical education: A systematic review. *International Journal of Environmental Research and Public Health*, 18(12), 6281. <https://doi.org/10.3390/ijerph18126281>





FT-6

A Bibliometric Analysis of the Literature on Concussion in Child and Adolescent Athletes

Ayşe Yaren KURDEN¹, Gözde ERSÖZ AY¹

¹ Marmara University, Faculty of Sport Sciences, İstanbul, Türkiye, 0000-0002-1763-4531

¹ Marmara University, Faculty of Sport Sciences, İstanbul, Türkiye, 0000-0002-4848-1929

Correspondence: yaren.kurden@marmara.edu.tr

Abstract

Concussion is a major health risk for youth athletes in contact sports, requiring age-specific rehabilitation due to neurodevelopmental sensitivities. The surging volume of publications over the last decade necessitates a review of current knowledge patterns and research gaps. The aim of this study was to examine the structure and direction of the literature on concussion in child and adolescent sports over the last years and to reveal emerging research trends. A systematic search covering the years 2015-2026 was conducted via the Web of Science Core Collection. The search utilized keywords including ("child*" OR "adolescent*" OR "youth" OR "pediatric*" OR "high school") AND ("concussion" OR "mild traumatic brain injury" OR "mTBI") AND ("sport*" OR "athlete*" OR "physical activity"). To exclude studies focused solely on the clinical dimension, the dataset was limited to the categories of "Sport Sciences," "Psychology," "Psychology Applied," and "Psychology Multidisciplinary". The final dataset of 1,647 articles were analyzed using author citation analysis, keyword co-occurrence analysis, and temporal overlay visualization by using VOSviewer (v.1.6.20). Results indicate a broadening of thematic emphasis from biomechanical assessments toward an integrated biopsychosocial framework that emphasises mental health, sleep, and active multidisciplinary rehabilitation in youth concussion management.. Terms including "mental health," "sleep," "anxiety," and "depression" were linked to the most recent average publication years (APY $\geq$ 2022), according to the temporal overlay visualisation. Author citation analysis shows that the literature is shaped around figures such as Michael Mccrea (3894), Steven P. Broglio (3176), Grant L. Iverson (2724), and Kathryn Schneider (2518), while at the country level, the USA (31044) and Canada (8688) are the leaders in citations. These results reflect an emerging emphasis in the literature on complementing traditional 'return-to-play' protocols with neurocognitive monitoring and psychosocial support in pediatric concussion management.

Keywords: Concussion, bibliometric analysis, child athletes, adolescent athletes





INTRODUCTION

Sports are environments in which injuries are common due to the fundamental nature of physical activity (Maffulli et al., 2010). In particular, contact sports such as basketball, American football, rugby, soccer, and ice hockey carry a high risk of serious injuries such as concussions. Concussions are frequently referred to as a "silent epidemic" or an "invisible injury" due to the severe incidents that occur at both amateur and professional levels, consequently becoming a subject of intense debate and concern within the sporting community (David, 2020).

A sport-related concussion is a traumatic brain injury caused by a direct impact to the head, neck, or body while participating in sports or physical activity, resulting in the rapid transmission of force to the brain (Patricios et al., 2023). As the Concussion in Sport (CIS) group defines a concussion as "a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces" (McCrory et al. 2009), this condition has become a critical focus for the health and safety of young athletes. This condition reflects a functional neurological disorder rather than structural tissue damage as it arises from stresses created in the neuronal tissues within the skull by sudden acceleration, deceleration, and rotational forces (Patricios et al., 2023). There are three primary types of concussion-related symptoms: somatic (headache, loss of balance, and sensory sensitivity), psychological and behavioral (mood swings, depressive tendencies, irritability, and sleep disturbances), and cognitive (confusion, amnesia, and difficulty concentrating) (Meehan & Bachur, 2009). While the most commonly diagnosed symptoms were headache, dizziness, and disorientation a persistent or chronic headache emerges as the most prominent long-term consequence (Cournoyer & Tripp, 2014).

The negative effects of these symptoms create a significant risk of injury, especially within the youth population and in female team sports. A study on female youth team sports by Cairo et al. (2022), reported that concussions are a major risk of injury. According to the study, the head is the third most frequently injured body area and concussions are the third most prevalent type of injury. This study also represented that the annual incidence rate of concussions in this group was 9.4 per 100 participants (Cairo et al., 2022). According to a retrospective study on youth athletes older age, female sex, and a previous history of head trauma are significant risk factors for sport-related concussions. Notably, athletes who have previously suffered a concussion were three to five times more likely to experience another injury, highlighting the necessity of focused preventative measures and safeguarding practices in youth sports (Tsushima et al., 2019).

A systematic review evaluating the treatment of sport-related concussions in children and adolescents by Davis et al. (2017) indicated that the recovery period usually lasts less than four weeks. It was emphasized that before athletes may resume full participation in sports, they must effectively return to school. Additionally, current guidelines suggest a brief initial resting period followed by the progressive introduction of symptom-limited physical and cognitive activity, as opposed to strict rest.

Despite increased awareness of the psychological implications of concussions, there is still a lack of comprehensive mapping of how research trends have changed over the last decade. The primary aim of this study was to bibliometrically map the literature on sport-related concussions in child and adolescent athletes from 2015 to 2026. This study used co-occurrence and temporal overlay analyses to reveal the change in research emphasis from acute clinical diagnostics to a multidimensional framework that





includes sport psychology, mental health implications, and proactive safeguarding practices within youth sports.

METHOD

Bibliographic records were retrieved on April 7, 2026, from English-language articles published in the Web of Science (WoS) Core Collection databases between 2015 and 2026. In order to ensure an exhaustive representation of the existing literature the following search query was employed across the databases: ("child*" OR "adolescent*" OR "youth" OR "pediatric*" OR "high school") and ("concussion" OR "mild traumatic brain injury" OR "mTBI") and ("sport*" OR "athlete*" OR "physical activity"). To exclude studies focusing only on the clinical aspect, Web of Science categories were restricted to categories of "Sport Sciences", "Psychology", "Psychology Applied" and "Psychology Multidisciplinary". The initial database search yielded 1,647 records from Web of Science. VOSviewer (v.1.6.20) software was used to examine co-authorship networks, author citation impact, country citation relationships, co-citation of authors, and the temporal overlay of keyword usage. This search strategy provided a comprehensive capture of the concussion phenomena by integrating cross-disciplinary perspectives, ranging from clinical neurology to sport psychology. Filtering was applied primarily to exclude non-informative generic terms, and the threshold for keyword co-occurrence was set to a minimum of 10 occurrences. For instance, only keywords with at least 10 times occurrences and at least 10 publications per author were required for the citation analysis and the largest connected component consisting of 93 authors was visualized to enhance the clarity of the network. Both chronological changes and thematic structure were analyzed using two complementary visualisations: keyword co-occurrence network analysis was used to identify distinct thematic clusters based on associative link strength, while temporal overlay visualisation mapped the average publication year onto the same network structure to show temporal broadening in research focus without confusing publication timelines with longitudinal frequency growth.

RESULTS

A search of the Web of Science (WoS) database on concussion in child and adolescent athletes revealed 1647 studies which met the inclusion criteria. The final dataset covered the period between 2015 and April 7, 2026.

The co-authorship network analysis

The co-authorship network analysis was conducted to examine collaborative patterns and identify major research clusters within the field. To reduce network complexity and focus on researchers with sustained productivity, a minimum threshold of 10 publications per author was applied. Among the 107 authors who met this criterion, those belonging to the largest connected component were included in the visualization to ensure network coherence and interpretability. One hundred and five authors were distributed across 10 distinct clusters. The dense connectivity observed across the network suggests a relatively integrated research structure characterized by established collaborative groups linked through several highly connected authors. Evaluation of individual productivity metrics indicated that Howell was the most prolific author in the dataset with 86 publications, followed by Michael Mccrea with 61, Steven P. Broglio with 61 and Anthony Kontos with 61 publications.



When collaboration strength was assessed using Total Link Strength (TLS), which reflects the overall extent of an author's collaborative relationships, Michael Mccrea occupied the highest total link strength in the network with a TLS of 207. David Howell and Steven P. Broglio followed with TLS values 179 and 177, respectively. These researchers appear to play an important role in connecting different collaborative subgroups within the literature. The visual representation of the co-authorship network is presented in Figure 1.

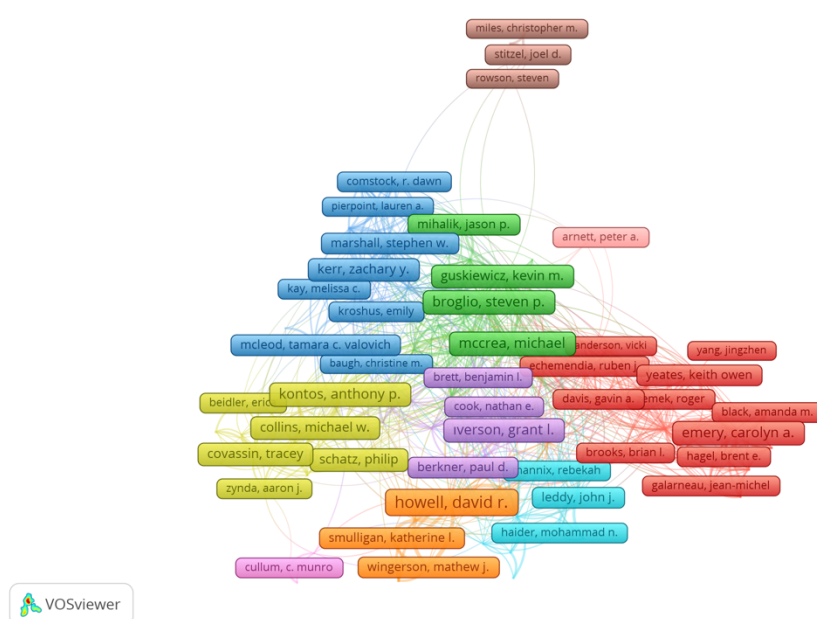


Figure 1: Author co-authorship network

The author citation analysis

In order to determine the citation relationships, scientific impact, and intellectual networks among researchers in the concussion literature of child and adolescent athletes, Figure 2 presents the network map of the author citation analysis carried out using the criteria of at least 10 publications and at least 50 citations. The analysis included 107 connected authors and identified seven major clusters. According to these criteria, Michael Mccrea with 3894 citations, Steven P. Broglio with 3176 citations, Grant L. Iverson with 2724 citations, and Kathryn Schneider with 2518 citations were found to be the most cited authors in the concussion literature in the dataset.



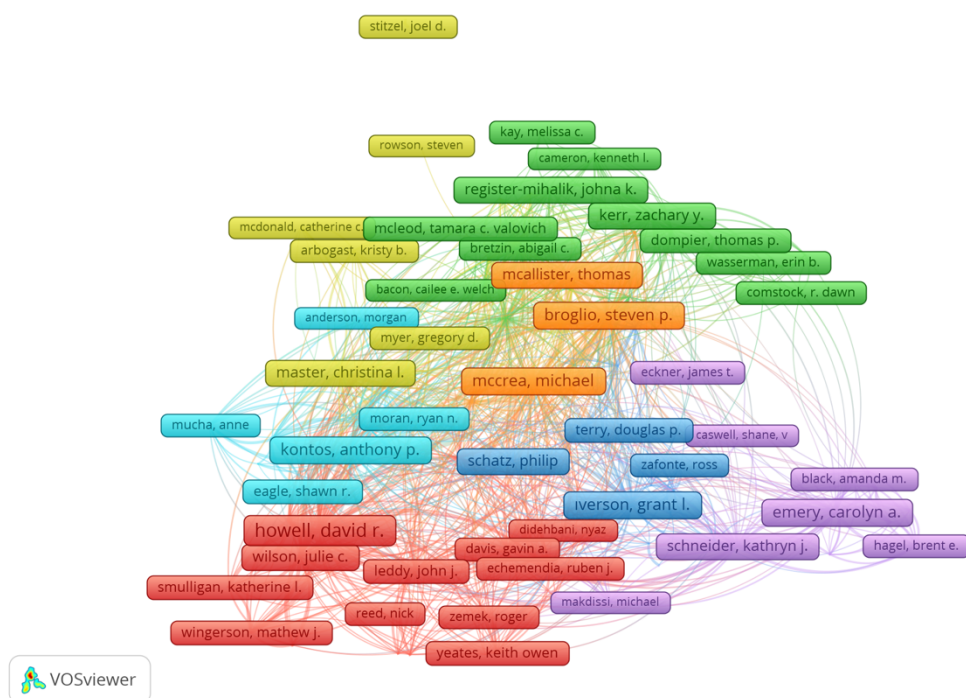


Figure 2: Author citation network

Country citation analysis

Figure 3 displays a network map of citations received by publications in the Web of Science database broken down by country of origin. Based on the criteria that a country had published at least five studies and receive at least 50 citations an analysis was carried out in this context of 19 connected countries. Five clusters and 155 linkages were found in the analysis. The USA (31,044 citations), Canada (8688 citations), and Australia (6492 citations) were the nations with the highest number of citations. These countries also ranked in the top three in terms of total link strength, with 5894, 3308, and 2151 connections, respectively.



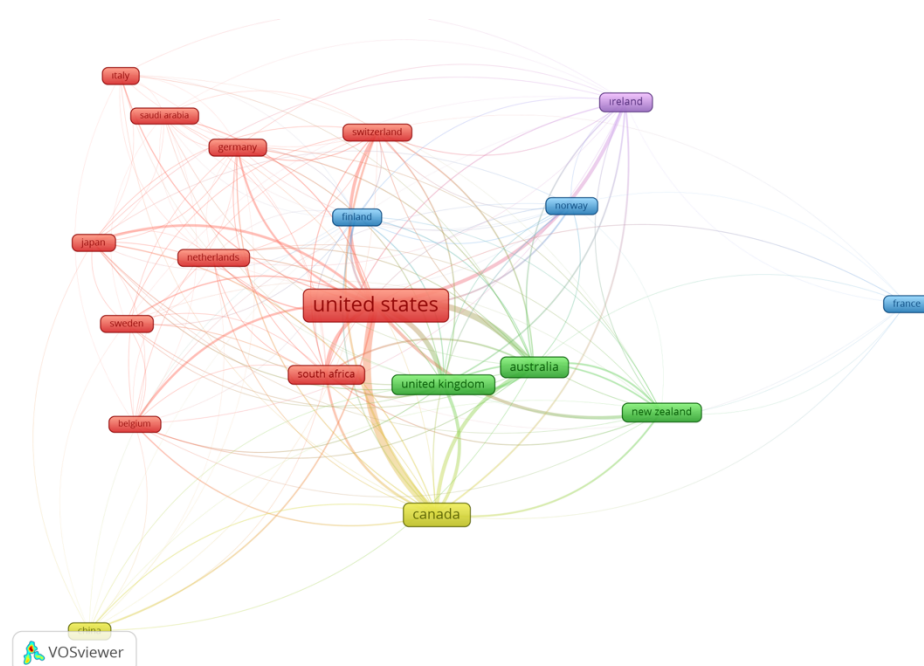


Figure 3: Country-level citation network

Keyword Co-occurrence Network Analysis

A keyword co-occurrence network analysis was conducted to map the conceptual framework and identify the dominant thematic orientations within the literature (Figure 4). To ensure a highly specific and rigorous thematic focus, generic methodological indices and demographic terms (such as human, humans, male, female) were systematically excluded during the data-refinement stage. Singular and plural forms of keywords were examined and standardized into a unified form using a thesaurus file. A minimum threshold of 10 occurrences per keyword was maintained, and the top-performing keywords based on network centrality were visualized. The final conceptual map yielded seven distinct clusters, indicating a highly integrated yet multi-dimensional research landscape surrounding sports-related concussions in youth populations. The network was largely structured around “concussion” ($n = 839$, $TLS = 1,497$) and “mild traumatic brain injury” ($n = 358$, $TLS = 651$). The major red cluster formed the empirical core of, trauma epidemiology, injury prevention, biomechanics, and discipline-specific risks (e.g., ice hockey, lacrosse). The green cluster focused on neuromotor and functional recovery, with a strong emphasis on mild traumatic brain injury, balance, postural stability, dual-tasking, and gait. The light blue cluster captured specific sensory and physiological subdomains, including vestibular, oculomotor, and vision deficits along with sex differences. The dark blue cluster highlighted the developmental and psychological intersection of child groups, capturing paediatric, child, and comorbid psychiatric complications, such as depression, anxiety, and ADHD. The yellow and orange clusters represented clinical diagnosis, sports medicine frameworks, and standardised baseline neurocognitive tests, impact, and trauma epidemiology. Finally, the purple cluster represented stake.











American collegiate frameworks, rather than just reflecting the volume of research. This changing environment is further demonstrated by the temporal overlay networks and keyword co-occurrence. The results show a thematic broadening from a mostly acute biomechanical paradigm to an integrated biopsychosocial framework. Foundational research has mostly examined mechanical impact dynamics, acute physical trauma, and baseline motor control (e.g., biomechanics, postural stability, impact). However, the temporal overlay shows that research has gradually changed to include emotive and psychological dimensions. According to the 6th International Consensus Statement on Concussion in Sport (Patricios et al., 2023), paediatric concussions require a specific, multi-system approach that goes beyond immediate physical symptoms. Terms like mental health, anxiety, and depression are associated with more recent average publication years, indicating that mental health and sport psychology have developed as important topic elements. Furthermore, comprehensive reviews and meta-analytic research provide strong support for the negative mental health outcomes and affective symptoms that follow paediatric concussions (Gornall et al., 2021). In addition to conventional return-to-play procedures, the temporal integration of terminology such as education, knowledge and concussion education highlights an emerging focus on proactive baseline education, school based accommodations and structured "return-to-learn" frameworks (Halstead et al., 2018; Purcell et al., 2019). Importantly, these patterns show a historical shift in theme attention rather than a clear increase in volume since temporal overlay visualisations show the average publication timelines of words rather than longitudinal keyword frequency growth per se. When taken as a whole, these results highlight the necessity of coordinated, multidisciplinary management systems that assist young athletes' academic reintegration and psychological resilience in a variety of international situations.

CONCLUSION

This bibliometric analysis has revealed the intellectual structure, collaboration mechanisms, and thematic evolution of youth sport related concussion research from 2015 to 2026. The results showed an expansion of themes explored in the literature from an acute, biomechanical focus toward an integrated biopsychosocial framework that increasingly includes active interdisciplinary rehabilitation, mental health, and emotional symptoms. The literature is still mostly concentrated in North American contexts, leaving non-Western sports systems under-represented, even though international consensus statements continue to form the fundamental intellectual basis. Future studies should focus on international cooperative networks and comprehensive management strategies that protect young athletes' physical and mental wellbeing.

LIMITATIONS

This study has several limitations. First, in order to ensure proper metadata standardisation, data were only retrieved from the Web of Science Core Collection. This may have resulted in the exclusion of relevant studies that were only indexed in other databases like Scopus, PubMed, or SPORTDiscus. Second, including only English-language peer-reviewed papers and reviews may have brought linguistic and publication bias and under-represented important literature and regional research from non-Western contexts. Third, the dataset covered publications from January 1, 2015, to April 7, 2026; therefore, the data for 2026 represented only a partial publication year. In addition, recently published articles were inherently disadvantaged by citation time-lag dynamics, which lead to lower citation





metrics and link strengths in comparison to previous foundational literature. Lastly, although author keywords effectively captured broad thematic domains, highly specialized sub themes would not have met the co-occurrence criterion if not explicitly identified as core keywords by the original authors.

REFERENCES

- Cairo, A. L., Räisänen, A. M., Shill, I. J., Black, A. M., & Emery, C. A. (2022). High injury and concussion rates in female youth team sport: An opportunity for prevention. *International Journal of Sports Medicine*, 43(7), 608–615. <https://doi.org/10.1055/a-1697-2195>
- Cournoyer, J., & Tripp, B. L. (2014). Concussion knowledge in high school football players. *Journal of Athletic Training*, 49(5), 654–658. <https://doi.org/10.4085/1062-6050-49.3.34>
- David, P. (2020). Respecting the rights of the child in sports: Not an option. In B. Nastasi, S. Hart, & S. Naser (Eds.), *International handbook on child rights and school psychology* (377-388). Springer. https://doi.org/10.1007/978-3-030-37119-7_24
- Davis, G. A., Anderson, V., Babl, F. E., Gioia, G. A., Giza, C. C., Meehan, W. P., Moser, R. S., Purcell, L., Schatz, P., Schneider, K. J., Takagi, M., Yeates, K. O., & Zemek, R. (2017). What is the difference in concussion management in children as compared with adults? A systematic review. *British Journal of Sports Medicine*, 51(12), 949–957. <https://doi.org/10.1136/bjsports-2016-097415>
- Gornall, A., Takagi, M., Morawakage, T., Liu, X., & Anderson, V. (2021). Mental health after paediatric concussion: A systematic review and meta-analysis. *British Journal of Sports Medicine*, 55(18), 1048–1058. <https://doi.org/10.1136/bjsports-2020-103548>
- Halstead, M. E., Walter, K. D., & Moffatt, K. (2018). Sport-related concussion in children and adolescents. *Pediatrics*, 142(6), e20183074. <https://doi.org/10.1542/peds.2018-3074>
- Maffulli, N., Longo, U. G., Gougoulas, N., Loppini, M., & Denaro, V. (2010). Long-term health outcomes of youth sports injuries. *British Journal of Sports Medicine*, 44(1), 21–25.
- McCrory, P., Meeuwisse, W., Johnston, K., Dvorak, J., Aubry, A., Molloy, M., & Cantu, R. (2009). Consensus statement on concussion in sport: The 3rd International Conference on Concussion in Sport held in Zurich, November 2008. *British Journal of Sports Medicine*, 43(Suppl. 1), i76–i90. <https://doi.org/10.1136/bjism.2009.058248>
- Meehan, W. P., III, & Bachur, R. G. (2009). Sport-related concussion. *Pediatrics*, 123(1), 114–123. <https://doi.org/10.1542/peds.2008-0309>
- Patricios, J. S., Schneider, K. J., Dvorak, J., Ahmed, O. H., Blauwet, C., Cantu, R. C., Davis, G. A., Echemendia, R. J., Makdissi, M., McNamee, M., Broglio, S., Emery, C. A., Feddermann-Demont, N., Fuller, G. W., Giza, C. C., Guskiewicz, K. M., Hainline, B., Iverson, G. L., Kutcher, J. S., . . . Meeuwisse, W. (2023). Consensus statement on concussion in sport: The 6th





International Conference on Concussion in Sport–Amsterdam, October 2022. British Journal of Sports Medicine, 57(11), 695–711. <https://doi.org/10.1136/bjsports-2023-106898>

Purcell, L. K., Davis, G. A., & Gioia, G. A. (2019). What factors must be considered in ‘return to school’ following concussion and what strategies or accommodations should be followed? A systematic review. British Journal of Sports Medicine, 53(1), 33–44. <https://doi.org/10.1136/bjsports-2017-097853>

Tsushima, W. T., Siu, A. M., Ahn, H. J., Chang, B. L., & Murata, N. M. (2019). Incidence and risk of concussions in youth athletes: Comparisons of age, sex, concussion history, sport, and football position. *Archives of Clinical Neuropsychology*, 34(1), 60–69. <https://doi.org/10.1093/arclin/acy019>





FT-7

Selective and Developmental Effects of SEL-Based Dance Education on Social-Emotional Competencies: A Mixed-Methods Perspective

Bijen Filiz, Afyon Kocatepe University, Faculty of Sports Sciences, Türkiye,
Nurgül Erol, Afyon Kocatepe University, Institute of Health Sciences, Türkiye
Mehmet Gökay Kılıç, Afyon Kocatepe University, Institute of Health Sciences, Türkiye
Sevda Kılınç Çırakoğlu, Afyon Kocatepe University, Institute of Health Sciences, Türkiye
bijenfiliz@aku.edu.tr

Abstract

This study aimed to examine the selective and developmental effects of social-emotional learning (SEL)-based dance education on university students' social-emotional competencies. A mixed-methods, quasi-experimental pretest–posttest control group design was employed, integrating quantitative (ANCOVA) and qualitative (process-based reflective) data. The experimental group ($n = 37$) participated in a 12-session SEL-based dance program, while the control group ($n = 36$) followed the standard curriculum. Data were collected using the Social-Emotional Learning Skills Scale (SELS-S) and daily reflective self-evaluation forms. ANCOVA results did not yield statistically significant group differences across the SEL subdimensions. However, effect size analyses revealed moderate to large practical effects, particularly in stress management and relationship skills, while smaller effects were observed in self-esteem–related skills. These findings indicate that the intervention produced domain-specific effects rather than uniform improvements across all competencies. In addition, process-based findings from reflective evaluations demonstrated consistent and progressive improvements across all SEL domains over the course of the intervention. These results highlight the developmental and cumulative nature of social-emotional competencies, which may not be fully captured through traditional outcome-based analyses. Overall, the findings suggest that SEL-based dance education can serve as an effective pedagogical approach for supporting domain-specific and developmentally sensitive improvements in social-emotional competencies. The study also underscores the importance of integrating statistical, practical, and process-based evidence when evaluating SEL interventions in higher education contexts.

Keywords: *social-emotional learning, dance education, higher education, quasi-experimental design, mixed-methods, effect size*





INTRODUCTION

Social-emotional learning (SEL) has emerged as a critical framework for fostering students' personal, social, and academic development across educational contexts. While a growing body of research highlights the benefits of SEL interventions, evidence regarding their effectiveness remains mixed, particularly in higher education settings and short-term interventions. One key limitation of existing studies is the reliance on pretest–posttest comparisons, which may overlook the developmental and process-oriented nature of social-emotional competencies. Consequently, there is an increasing need for research designs that capture not only overall effects but also domain-specific and developmental changes, as well as variations in intervention effectiveness across individuals. Addressing this need, the present study adopts a mixed-methods perspective to examine the selective and developmental effects of SEL-based dance education on university students' social-emotional competencies.

SEL encompasses the development of self-awareness, self-management, social awareness, relationship skills, and responsible decision-making, all of which are critical for students' academic success and overall well-being (Li et al., 2025). Beyond academic achievement, these competencies are increasingly recognized as essential life skills that support resilience, adaptability, and employability in higher education and beyond (Manjare, 2024). In this regard, SEL equips individuals with the ability to navigate complex social environments, manage challenges effectively, and sustain meaningful interpersonal relationships.

A growing body of research highlights the benefits of SEL interventions in enhancing psychosocial competencies, including emotional intelligence, empathy, and self-regulation (Nanda et al., 2025). In teacher education contexts, SEL-based and mindfulness-oriented approaches have demonstrated promising outcomes, particularly in fostering self-compassion, emotional awareness, and reflective capacities among pre-service teachers (Wu & Qin, 2025). Moreover, the development of self-awareness and empathy has been associated with improvements in critical thinking, decision-making, and interpersonal effectiveness among university students (Koçak et al., 2025). Despite these positive findings, most studies rely on traditional outcome-based evaluations, often overlooking how SEL competencies develop over time and across different domains.

In recent years, there has been increasing interest in embodied and movement-based approaches to SEL, particularly those integrating dance and physical activity. Theoretical perspectives such as Bandura's social cognitive theory, Goleman's emotional intelligence framework, and Vygotsky's sociocultural theory suggest that learning occurs through social interaction, observation, and experiential engagement (Dong & Zhang, 2024). Within this context, dance provides a unique pedagogical medium through which students can express emotions, engage in social interaction, and develop self-awareness in an experiential and embodied manner (Zhou & Larsen, 2025). Consistent with embodiment theory, which posits that cognitive and emotional processes are grounded in sensorimotor experiences, dance-based learning environments may offer particularly effective opportunities for enhancing emotional regulation and social competence (Zafeiroudi et al., 2025).

Empirical studies further support the role of dance and movement-based interventions in fostering social-emotional development. Dance education has been associated with improvements in self-awareness, emotional expression, and interpersonal skills, while its collaborative and expressive nature provides a natural context for developing core SEL competencies (Zych & Llorent, 2019;





Vereshchahina-Biliavska et al., 2024). Additionally, structured dance activities have been shown to promote self-reflection, emotional engagement, and social connectedness, contributing to broader developmental outcomes (Schwender et al., 2025). However, despite these promising findings, their effectiveness remains inconsistent when evaluated solely through pretest–posttest comparisons, highlighting a methodological limitation in the literature.

A critical limitation in the existing literature is the tendency to assess SEL outcomes as aggregate scores, which may obscure domain-specific effects and fail to capture the developmental and process-oriented nature of social-emotional competencies. Furthermore, relatively few studies examine how intervention effects vary depending on individuals' baseline competencies or incorporate process-based data that reflect ongoing changes during the intervention.

In response to these limitations, the present study adopts a mixed-methods approach to examine the selective and developmental effects of SEL-based dance education on university students' social-emotional competencies. Specifically, the study investigates (a) whether the intervention produces domain-specific effects across SEL subdimensions, (b) whether its effectiveness varies depending on students' baseline levels, and (c) how social-emotional competencies develop over time based on reflective self-evaluations. Therefore, this study aims to examine the selective and developmental effects of SEL-based dance education using both outcome-based and process-based measures.

METHODS

Research Design

This study employed a mixed-methods, quasi-experimental pretest–posttest control group design to examine the selective and developmental effects of SEL-based dance education on university students' social-emotional competencies. In this design, quantitative (ANCOVA) and qualitative (process-based reflective) data were collected concurrently and integrated during interpretation, providing a comprehensive understanding of intervention effects. The quantitative component was designed to assess the effect of the intervention on post-test outcomes by controlling for baseline differences, while the qualitative component aimed to capture students' developmental trajectories through reflective self-evaluations conducted after each session. Due to institutional and practical constraints, random assignment of participants to experimental and control groups was not feasible. Therefore, intact classes were used, and participants were assigned based on their existing class structures. One class was designated as the experimental group, which received the SEL-based dance education program, while the other served as the control group and continued with the standard curriculum. This approach is consistent with quasi-experimental research designs commonly used in educational settings where randomization is not possible. The intervention consisted of 12 structured sessions integrating dance activities with SEL principles, focusing on the development of core competencies, including self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. The control group did not receive any additional intervention during this period.





Participants

Participants were selected using purposive sampling based on predefined inclusion criteria. Given the use of intact classes, group allocation was based on naturally occurring class structures, with one class assigned as the experimental group and the other as the control group (Yıldırım & Şimşek, 2018). To address potential selection bias, baseline differences between groups were controlled statistically in the analyses. The inclusion criteria were as follows: (a) not having previously taken a Rhythm Education and Dance course, (b) being enrolled as a first-year university student, and (c) having no physical limitations that would prevent participation in the intervention. The experimental group consisted of 37 first-year students enrolled in the Department of Physical Education and Sports Teaching, whereas the control group comprised 36 first-year students from the Department of Recreation Education. The participants' ages ranged from 18 to 20 years.

Instruments

Social-emotional learning skills scale (SELS-S)

The Social-Emotional Learning Skills Scale (SELS-S), developed by Kabakçı and Korkut Owen (2008), was used to assess university students' social-emotional competencies. The scale consists of 40 items rated on a 4-point Likert-type format and includes four subscales: relationship skills, problem-solving skills, stress management skills, and skills that enhance self-esteem. In the original study, the reported reliability coefficients (Cronbach's alpha) for the subscales ranged from .61 to .87. In the present study, the internal consistency coefficients were found to be .80 for relationship skills, .80 for problem-solving skills, .81 for stress management skills, and .79 for self-esteem-related skills, indicating acceptable to good reliability.

Reflective daily self-evaluation form

To capture process-based changes in students' social-emotional competencies, a reflective daily self-evaluation form was developed by the researcher in alignment with core SEL domains. The form consisted of 10 items representing five key dimensions: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. During the intervention, students completed the form at the end of each session by rating their experiences on a 5-point Likert-type scale. The form was designed to capture students' immediate perceptions of their behaviors, emotional responses, and social interactions during each session. The collected data were analyzed using percentage-based descriptive analysis to identify patterns and trends across sessions. This process-oriented approach enabled the examination of developmental changes over time and provided complementary insights to the quantitative findings (Sodums et al., 2023). Content validity of the reflective form was established through expert review.

Intervention

SEL-based dance education program

Prior to the study, ethical approval was obtained from the *** University Scientific Research and Publication Ethics Committee (11.01.2019/2019-16). Participants were informed that their involvement was voluntary and would not affect their academic evaluation. Written informed consent was obtained from all participants before data collection. At the beginning of the study, both the experimental and control groups completed the SELS-S as a pre-test. Following this, the experimental group participated in a 12-session SEL-based dance education program, while the control group continued with the



standard curriculum, which did not include any structured SEL or dance-based activities. The intervention was designed in accordance with established SEL frameworks, emphasizing sequential, active, focused, and explicit instructional principles (Sollom, 2021). Each session targeted core SEL competencies—self-awareness, self-management, social awareness, relationship skills, and responsible decision-making—through structured and experiential learning activities using dance as the primary medium (Rajan & Aker, 2020).

Each session followed a consistent structure. The sessions began with a brief mindfulness activity (approximately 10 minutes) related to the lesson theme, followed by a warm-up phase designed to prepare the body and enhance group cohesion. The main phase consisted of dance-based activities focusing on body awareness, nonverbal communication, and emotional expression through movement and music. These activities were designed to promote both individual reflection and social interaction. At the end of each session, a group reflection and discussion was conducted, allowing students to share their experiences and insights related to the targeted SEL competencies. Additionally, participants completed a daily reflective self-evaluation form, which was used to monitor process-based changes throughout the intervention.

The instructional process was collaboratively implemented: the dance instructor was responsible for the technical aspects of movement and choreography, while the researcher facilitated the SEL components and reflective processes. Upon completion of the intervention, the SELS-S was re-administered to both groups as a post-test. The duration and structure of the intervention were designed to ensure sufficient exposure for observable developmental changes. A detailed overview of the SEL-based dance education program is presented in Table 1.

Table 1. SEL-based dance education program

Session	SEL Domain	Learning Objective	Activity
1	Self-awareness	Developing self-respect and respect for others; practicing self-control	Icebreaker and team-building activities
2	Self-awareness	Building mutual trust and generating logical solutions to problems	Icebreaker and team-building activities
3	Self-awareness	Enhancing self-control and problem-solving skills	Creating a dance sequence based on one's cultural/geographical background
4	Self-management	Managing emotions and setting personal goals	Developing a dance sequence based on one's cultural/geographical background
5	Self-management	Regulating emotions related to success and failure	Designing an individual practice routine
6	Responsible decision-making	Developing self-motivation, self-confidence, and responsibility	Creating original dance movements
7	Responsible decision-making	Improving problem-solving and evaluating decision outcomes	Teaching learned dance movements to peers
8	Relationship skills	Building and maintaining positive relationships	Learning dance steps collaboratively
9	Relationship skills	Enhancing collaboration, active listening, and conflict resolution	Creating a group choreography
10	Social awareness	Recognizing diversity and fostering creativity and expression	Presenting culturally inspired dance movements
11	Social awareness	Developing empathy and collaborative skills	Teaching culturally inspired dance movements to peers



Session	SEL Domain	Learning Objective	Activity
12	Social awareness	Strengthening collaboration and self-expression	Creating a final group choreography

Note. The program was designed following SEL competencies and structured progressively from individual awareness to social interaction and collaboration.

Statistical Analysis

All statistical analyses were conducted using IBM SPSS (Version 25.0). Descriptive statistics (means and standard deviations) were calculated for all variables. Preliminary analyses were performed to assess baseline equivalence and to examine the assumptions of parametric testing. Independent samples t-tests were conducted on pre-test scores to evaluate group equivalence. The assumption of homogeneity of variances was tested using Levene's test, and no significant violations were observed. The primary analyses were conducted using analysis of covariance (ANCOVA) to examine the effects of the intervention on post-test scores across SEL subdimensions. In each model, the post-test score was entered as the dependent variable, group (experimental vs. control) as the independent variable, and the corresponding pre-test score as the covariate. This approach allowed for adjustment of baseline differences between groups. Prior to conducting ANCOVA, key assumptions—including linearity, normality of residuals, and homogeneity of regression slopes—were evaluated. The homogeneity of regression slopes assumption was tested through the group $\times$ pre-test interaction. As no consistent violations were detected, the ANCOVA results were interpreted based on main effects. Effect sizes were reported using partial eta squared (η^2) for ANCOVA results and Cohen's d based on post-test mean differences to assess practical significance. This dual approach enabled interpretation of meaningful differences even in the absence of statistical significance. For the process-based component, data from the reflective self-evaluation forms were analyzed using percentage-based descriptive analysis. Changes across sessions were examined to identify developmental trends in each SEL domain, providing complementary evidence to the quantitative findings. The level of statistical significance was set at $p < .05$.

RESULTS

The results for each SEL subdimension are presented below.

1. Findings regarding the SELS-S

An independent samples t-test was conducted to examine baseline differences between the experimental and control groups. The results indicated that there were no statistically significant differences between the groups in pre-test scores ($p = .246$), supporting the assumption of group equivalence prior to the intervention. A series of analyses of covariance (ANCOVA) were conducted to evaluate the effects of the SEL-based dance education program on post-test scores, controlling for pre-test differences. In addition, interaction effects were examined; however, no consistent interaction patterns were observed, and the results were therefore interpreted based on main effects.



Table 2. Descriptive and ANCOVA results for SELS-S subdimensions

Variable	Group	Pre-test M (SD)	Post-test M (SD)	Adj. Mean	F (1,69)	p	η^2	Cohen's d
Problem-solving	Experimental	3.08 (0.32)	3.31 (0.35)	3.31	0.080	0.778	0.001	0.68
	Control	2.98 (0.44)	3.08 (0.33)	3.08				
Self-esteem- related skills	Experimental	3.14 (0.35)	3.28 (0.36)	3.28	0.564	0.455	0.008	0.33
	Control	3.11 (0.46)	3.16 (0.37)	3.16				
Stress management skills	Experimental	3.09 (0.35)	3.29 (0.27)	3.30	1.079	0.302	0.015	1.05
	Control	3.15 (0.42)	3.00 (0.28)	3.01				
Relationship skills	Experimental	3.36 (0.33)	3.40 (0.26)	3.40	3.822	0.055	0.052	0.93
	Control	3.28 (0.47)	3.13 (0.32)	3.13				

Note. Adjusted means were estimated controlling for pre-test scores. Cohen's d values were calculated based on post-test mean differences. Effect sizes of 0.20, 0.50, and 0.80 represent small, moderate, and large effects. Higher scores indicate higher levels of social-emotional competence.

As shown in Table 2, the experimental group demonstrated consistent improvements across all subdimensions of social-emotional learning, whereas the control group showed smaller gains and declines in stress management and relationship skills. Although ANCOVA results did not indicate statistically significant group differences, the effect sizes suggest meaningful practical differences across several domains. In particular, large effects were observed in stress management ($d = 1.05$) and relationship skills ($d = 0.93$), while a moderate effect was found in problem-solving skills ($d = 0.68$). In contrast, the effect size for self-esteem-related skills was small ($d = 0.33$). Overall, these findings indicate that the intervention produced domain-specific improvements, with stronger effects observed in socially interactive and regulation-related competencies.

2. Findings from the Daily Reflective Self-Evaluation Form

The findings derived from students' reflective evaluations conducted at the end of each session are presented below.

Self-awareness

Students' daily reflective evaluations regarding self-awareness are presented in Figure 1.





Figure 1: Percentage change in self-awareness across sessions

As shown in Figure 1, students' self-awareness increased from 41% in the first session to 59% in the sixth session and stabilized at 56% in the final session. Overall, an increase of approximately 15 percentage points was observed, indicating a positive development in students' self-awareness over the course of the intervention.

Self-management

Students' daily reflective evaluations of self-management are presented in Figure 2.



Figure 2: Percentage change in self-management across sessions

As shown in Figure 2, students' self-management increased from 62% in the first session to 68% in the final session, indicating a modest improvement over the course of the intervention.

Responsible decision-making

Students' daily reflective evaluations of responsible decision-making are presented in Figure 3.





Figure 3: Percentage change in responsible decision-making across sessions

As shown in Figure 3, students' responsible decision-making increased from 64% in the first session to 72% in the final session, indicating a moderate improvement over the course of the intervention.

Relationship skills

Students' daily reflective evaluations of relationship skills are presented in Figure 4.



Figure 4: Percentage change in relationship skills across sessions

As shown in Figure 4, students' relationship skills increased from 66% in the first session to 73% in the final session, indicating a moderate improvement over the course of the intervention.

Social awareness

Students' daily reflective evaluations of social awareness are presented in Figure 5.





Figure 5: Percentage change in social awareness across sessions

As shown in Figure 5, students' social awareness increased from 65% in the first session to 74% in the final session, indicating a moderate improvement over the course of the intervention.

The analysis of students' daily reflective evaluations revealed a consistent upward trend across all social-emotional competencies throughout the intervention period (Figures 1–5). Self-awareness increased from 41% to 56%, with a peak at 59%, while self-management showed a modest improvement from 62% to 68%. Responsible decision-making improved from 64% to 72%, relationship skills from 66% to 73%, and social awareness from 65% to 74%. Overall, these findings indicate progressive development across all domains, with more pronounced gains in self-awareness and social awareness. These results suggest that the SEL-based dance intervention contributed to gradual and cumulative improvements in students' perceived social-emotional competencies over time.

DISCUSSION

The present study aimed to investigate the effectiveness of SEL-based dance education on the social-emotional competencies of university students using a quasi-experimental design. The findings revealed a nuanced pattern. Although the ANCOVA results did not indicate statistically significant group differences across the SEL subdimensions, the descriptive findings and effect size analyses suggest meaningful domain-specific improvements in favor of the experimental group.

The descriptive analysis indicated that the experimental group demonstrated increases across all subdimensions from pre-test to post-test, whereas the control group showed smaller gains and declines, particularly in stress management and relationship skills. These patterns suggest that social-emotional competencies may not develop spontaneously in university settings and may require structured interventions. This interpretation aligns with prior research emphasizing the importance of intentional SEL-based programs in fostering psychosocial development (Xavier et al., 2023). This may also be related to the relatively high baseline scores observed in the sample, which may have limited the magnitude of detectable change.

Despite the absence of statistically significant group differences, the effect size findings provide important insight into the practical impact of the intervention. In particular, large effects were observed in stress management and relationship skills, while moderate effects were found in problem-solving skills. These results suggest that SEL-based dance education may be especially effective in enhancing



competencies related to emotional regulation and interpersonal interaction. This finding is consistent with previous studies highlighting the role of dance and arts-based education in improving emotional awareness, social interaction, and psychological well-being (Zych & Llorent, 2019; Vereshchahina-Biliavska et al., 2024).

In contrast, the relatively small effect observed in self-esteem-related skills suggests that such constructs may be more stable and less responsive to short-term interventions. This is in line with previous research indicating that self-related constructs often require longer-term and more intensive interventions to produce measurable change (Papadopoulos, 2020).

Another important finding of the study emerges from the process-based data. Reflective self-evaluation results indicated consistent improvements across all SEL domains, including self-awareness, self-management, responsible decision-making, relationship skills, and social awareness. These findings highlight the developmental nature of social-emotional learning and suggest that changes may occur gradually over time. This supports the notion that process-oriented measures can capture meaningful developmental trajectories that are not fully reflected in pretest-posttest comparisons (Nanda et al., 2025).

The findings also reinforce the potential of arts-based and movement-oriented interventions in higher education contexts. Previous research has shown that participation in dance and other creative activities can enhance emotional intelligence, reduce stress, and improve social competencies (Guo, 2024). The present findings extend this literature by suggesting that SEL-based dance education may produce selective and developmentally sensitive improvements, particularly in domains involving social interaction and emotional regulation.

From a broader perspective, the divergence between statistical significance and practical effect sizes underscores the importance of interpreting intervention outcomes beyond p-values alone. Especially in studies with relatively small samples or short intervention durations, effect size measures and process-based data provide valuable complementary evidence for understanding intervention effectiveness.

Taken together, the results suggest that SEL-based dance education does not produce uniform effects across all domains but instead generates domain-specific and developmentally progressive improvements. These findings highlight the importance of designing SEL interventions that are experiential, interactive, and sensitive to individual and contextual differences.

Several limitations should be considered when interpreting the findings. First, the use of a quasi-experimental design without random assignment may limit the generalizability of the results. Second, the relatively small sample size may have reduced the statistical power of the analyses. Third, the duration of the intervention may not have been sufficient to produce statistically detectable changes in all SEL domains. Future research should employ larger samples, longer intervention periods, and randomized designs where possible.

CONCLUSIONS

This study examined the selective and developmental effects of SEL-based dance education on university students' social-emotional competencies. The findings suggest that SEL-based dance



education can serve as an effective pedagogical tool for supporting specific dimensions of social-emotional development in higher education. The results further emphasize the importance of designing SEL interventions that are experiential, interactive, and embodied in nature. In addition, the study highlights the value of incorporating process-oriented assessments, such as reflective evaluations, to capture developmental changes over time. In conclusion, although the intervention did not yield statistically significant differences across all measures, the findings provide evidence of meaningful, domain-specific, and developmentally progressive improvements in social-emotional competencies. These results underscore the potential of SEL-based dance education as a complementary approach for fostering social-emotional development in higher education settings.

Funding: The authors received no financial support for the research, authorship, and/or publication of this article

Acknowledgments: We thank all participants who contributed to data collection.

Conflicts of Interest: No potential conflict of interest was reported by the authors.

REFERENCES

- Dong, Z., & Zhang, Y. (2024). Unveiling the potential of fine arts education in enhancing resilience among Chinese gifted students. *Frontiers in Psychology*, 15, 1402725. <https://doi.org/10.3389/fpsyg.2024.1402725>
- Guo, Y. (2024). Potentials of arts education initiatives for promoting emotional wellbeing of Chinese university students. *Frontiers in Psychology*, 15, 1349370. <https://doi.org/10.3389/fpsyg.2024.1349370>
- Kabakçı, Ö.F., & Korkut Owen, F. (2008). 6-8. Sınıftaki öğrencilerin sosyal- duygusal öğrenme becerilerinin bazı değişkenlere göre incelenmesi. *Eğitim ve Bilim*, 33(148), 77- 86. <https://educationandscience.ted.org.tr/article/view/766>
- Koçak, G. N., Çetin, M. Ç., Kara, M., Genç, M., Lekesiz, G., Açıkbaş, F. C., & Kara, N. Ş. (2025). A quasi-experimental research on developing students' life skills through purposeful leisure time activities. *Frontiers in Psychology*, 16, 1634943. <https://doi.org/10.3389/fpsyg.2025.1634943>
- Li, W., Chong, Z. Y., Mao, Y., Zhang, W., Xu, W., Li, M., Wang, Y., & Xiong, H. (2025). The impacts of a teaching personal and social responsibility intervention on social and emotional competence in physical education: A quasi-experimental study. *International Journal of Mental Health Promotion*, 27(2), 161-177. <https://doi.org/10.32604/ijmhp.2025.059090>
- Manjare, S. O. (2024). Beyond academics: The transformative role of social-emotional learning (SEL) in higher education. *FMDB Transactions on Sustainable Humanities and Society*, 1(4), 188-199. <https://doi.org/10.69888/ftshs.2024.000348>
- Nanda, S., Satapathy, D., Panda, G., & Pradhan, D. K. (2025). Socio-emotional learning and competencies in 21st-century education: A systematic review of teacher and student perspectives. *Discover Education*, 4(1), 1-16. <https://doi.org/10.1007/s44217-025-00796-w>





- Papadopoulos, D. (2020). Effects of a social-emotional learning-based program on self-esteem and self-perception of gifted kindergarten students: A pilot study. *Journal for the Education of Gifted Young Scientists*, 8(3), 1275-1290. <https://doi.org/10.17478/jegys.779438>
- Rajan, R. S., & Aker, M. (2020). The impact of an in-school dance program on at-risk preschoolers' social-emotional development. *Journal of Dance Education*, 24(1), 1-8. <https://doi.org/10.1080/15290824.2020.1766689>
- Schwender, T. M., Rudi, H., & Stortz, S. (2025). Creating, framing, reflecting—dance as embodied reflective practice in professional development for physical education teachers. *Frontiers in Education*, 10, 1-12. <https://doi.org/10.3389/feduc.2025.1542371>
- Sodums, D. J., Kim, S., Gallucci, C. E., Natadiria, M., Bar, R. J., Gardner, S., & Tafler, M. (2023). Impact of sharing dance older adults on physical and psychosocial outcomes. *Canadian Journal on Aging / La Revue Canadienne Du Vieillessement*, 43(2), 297-310. <https://doi.org/10.1017/s0714980823000570>
- Sollom, M. (2021). A quasi-experimental study on social emotional learning and primary prevention. *Journal of Educational and Developmental Psychology*, 11(2), 1. <https://doi.org/10.5539/jedp.v11n2p1>
- Vereshchahina-Biliavska, O., Соловей, В., Burska, O., Hrinchenko, T., & Moskvichova, Y. (2024). Music education within the concept of integrated arts education and its impact on social and emotional skills of students. *Pedagogika*, 153(1), 199-219. <https://doi.org/10.15823/p.2024.153.10>
- Wu, Y., & Qin, L. (2025). Enhancing wellbeing among pre-service teachers through a mindfulness-based social and emotional learning curriculum: A quasi-experimental study in China. *Frontiers in Psychology*, 16, 1405676. <https://doi.org/10.3389/fpsyg.2025.1405676>
- Xavier, A., Vagos, P., Palmeira, L., Menezes, P., Patrão, B., Mendes, S., & Tavares, M. (2023). The me and the us of emotions: A cluster-randomized controlled trial of the feasibility and efficacy of a compassion-based social-emotional learning program for children. *Frontiers in Psychology*, 14, 1-15. <https://doi.org/10.3389/fpsyg.2023.1196457>
- Yıldırım, A., & Şimşek, H. (2018). *Sosyal bilimlerde nitel araştırma yöntemleri*. Seçkin Yayın.
- Zafeiroudi, A., Tsartsapakis, I., Trigonis, I., Kouli, O., Goulimaris, D., & Kouthouris, C. (2025). Embodied mindfulness through movement: A scoping review of dance-based interventions for mental well-being in recreational populations. *Healthcare*, 13(17), 2230. <https://doi.org/10.3390/healthcare13172230>
- Zhou, C., & Larsen, D. M. (2025). *Developing creativity in STEM education*. Research Portal Denmark, 433. <https://local.forskningsportal.dk/local/dki-cgi/ws/cris-link?src=sdu&id=sdu-eb8c309b-d8f3-426c-a705-284472fe0455&ti=Developing%20Creativity%20in%20steM%20Education>
- Zych, I., & Llorent, V. J. (2019). An intervention program to enhance social and emotional competencies in pre-service early childhood education teachers. *Psychology Society & Education*, 12(1), 17-30. <https://doi.org/10.25115/psyce.v0i0.2374>





FT-8

The Effect of Physical Activity on Smartphone Addiction: A Meta-Analysis

Mehmet Güllü¹, Sezer Alagöz², Mehmet Akarsu³

¹ Professor, İnönü University, Faculty of Sport Sciences, Department of Physical Education and Sports
Teaching, ORCID: 0000-0002-0930-7178

² Master's Student, İnönü University, Institute of Health Sciences, Department of Physical Education and Sport
Teaching, ORCID: 0009-0000-6948-3889

³ Assistant Professor, İnönü University, Faculty of Sport Sciences, Department of Physical Education and Sports
Teaching, ORCID: 0000-0002-8149-801X
Correspondence: mehmet.gullu@inonu.edu.tr

Abstract

The aim of this study is to examine the effect of physical activity on smartphone addiction. Sixteen individual studies were included after reviewing articles in the relevant literature. The data from these studies were combined and analyzed using correlation meta-analysis. Analyses were conducted using the Jamovi program (version 2.6.44), employing methods necessary for meta-analysis such as effect size analysis, publication bias tests, heterogeneity tests, forest plot, and funnel plot. A random-effects model was used. The findings indicate a statistically significant and negative correlation between physical activity and smartphone addiction ($r = -0.31$, 95% CI $[-0.44, -0.17]$, $p < .001$), suggesting a moderate relationship. The results show that as the level of physical activity increases, the level of smartphone addiction tends to decrease. The analysis revealed a high level of heterogeneity ($I^2 = 99.34\%$), which may be due to differences in sample characteristics, measurement tools, and cultural factors. Publication bias analyses (Egger and Begg tests) were not significant. The findings demonstrate that physical activity has not only physical but also psychosocial protective functions and may alleviate digital addiction behaviors through mechanisms such as stress reduction, increased self-regulation, and emotional regulation. Physical activity may therefore be considered an effective public health strategy and a behavioral balance tool in combating increasing digital addiction, especially among young individuals. Future studies should examine the relationship between the type, duration, and intensity of physical activity and digital addiction, and investigate the psychological and neurophysiological processes involved using longitudinal designs.

Keywords: Physical Activity, smartphone addiction, phone addiction, meta-analysis





INTRODUCTION

With the rapid advancement of technology, digital tools have become indispensable parts of our daily lives. This technological progress has not only transformed the way people communicate, learn, and entertain themselves, but has also led to the emergence of a new type of behavioral addiction defined as digital addiction. Digital addiction is characterized by individuals using digital devices compulsively, habitually, and uncontrollably (Dresp & Hutt, 2022). Similarly, the continuous development of technology is making individuals increasingly dependent on digital environments and is creating patterns similar to traditional addictive behaviors (Yengin, 2019). Smartphone addiction, which ranks high on the list of current behavioral addictions, is one of the subtypes of digital addiction. Smartphones have become an important tool for communication, entertainment, education, and social interaction, but their excessive and uncontrolled use has negative consequences for individuals' physical, psychological, and social functioning (Zhu, Zhang, Lan & Song, 2025). This addiction is particularly prevalent among young adults and university students, negatively impacting sleep quality, academic performance, and mental health (Hassan et al., 2021). Recent research suggests that physical activity may have a protective effect against smartphone addiction. Individuals with higher levels of physical activity have lower levels of smartphone addiction; exercise has been shown to have a regulatory effect on stress, boredom, and negative emotions associated with addiction (Shi, Wang & Liu, 2025); (Qi, Zhou, Li & Liu, 2025). Indeed, studies have shown that increasing the frequency and intensity of physical exercise leads to significant reductions in symptoms of mobile phone addiction (Lai et al., 2025). In this context, studies systematically evaluating the effect of physical activity on smartphone addiction are becoming increasingly important. A meta-analysis in this field has shown that exercise-based interventions significantly reduce the level of smartphone addiction, and that programs lasting 12 weeks or more are particularly effective (Liu, Xiao, Yang & Loprinzi, 2019). Similarly, systematic review findings also confirm an inverse relationship between physical activity and smartphone addiction, and that regular exercise can reduce the risk of addiction (Pirwani & Szabo, 2024).

Accordingly, this study aims to examine the effect of physical activity on smartphone addiction using meta-analysis techniques. The research aims to synthesize data from individual studies and calculate the overall effect size to reveal the function of physical activity in preventing smartphone addiction from a broader perspective.

METHOD

Research Design

This study examines the effect of physical activity on smartphone addiction, the extent and direction of the relationship, using a correlational meta-analysis method. The results of studies on the same topic may differ, and this can be due to factors such as sample size and study quality. Meta-analysis is a method that gathers many individual and independent studies on a specific topic and statistically re-analyzes their findings (Cumming, 2012; Ellis, 2010; Petticrew and Roberts, 2006). This meta-analysis included studies examining the effect of physical activity on smartphone addiction. This allows the effects of individual studies to be examined separately. The analyses were conducted using a random effects model.

Data Collection Process

To identify existing studies on the subject in the literature, a search was conducted in Google Scholar, PubMed, and Web of Science databases. Both Turkish and English keywords were used during the search. In Turkish, the terms "Physical Activity", "smartphone", "phone", and "psychology" were used together, while in English, the keywords "Physical Activity", "smartphone", "mobile phone", and



"Addiction" were used together. The search results were summarized, and the abstract and keyword fields were filled, and the obtained studies were checked for duplicates. The meta-analysis included 16 independent studies published in peer-reviewed journals that thoroughly examined smartphone addiction, providing Pearson's overall r (r) and reported or calculable information (OR). While almost all studies provided Pearson results (r), one study (Kim, 2020) recorded the odds ratio (OR) obtained from regression analysis as a correlation measure. First, OR values were converted to Cohen's d values via logarithmic transformation ($d = \ln(OR) \times (\sqrt{3} / \pi)$), then converted to the distribution of the d value ($r = d / \sqrt{(d^2 + 4)}$) (Chinn, 2000). The obtained values were subjected to Fisher's Z before the meta-analysis and, after analyzing the ease of interpretation perspective, were reformulated and interpreted. Thanks to this approach, studies reporting different indicators were combined in a common effect size metric, and comparability was ensured in the analysis. Within the scope of the meta-analysis, effect sizes and heterogeneity analyses were calculated using the Jamovi program (version 2.6.44).

Data Collection Tools

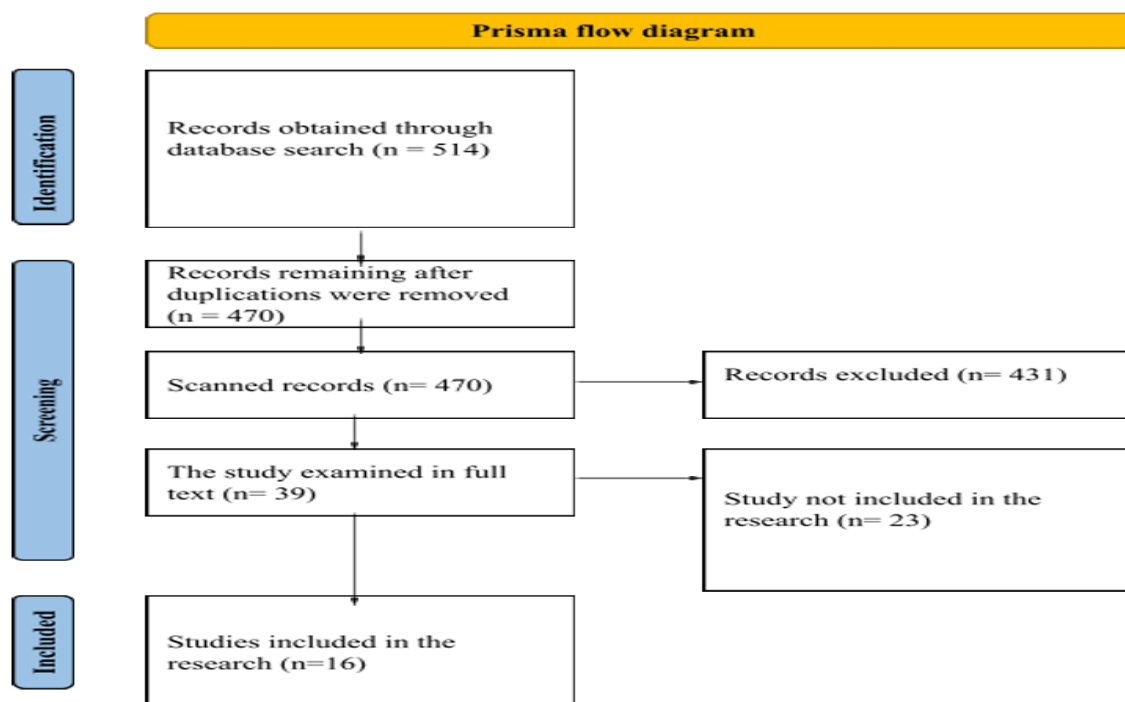


Figure 1. PRISMA flowchart of the meta-analysis study selection process (adapted from PRISMA 2020, Page et al., 2021).





Table 1. Characteristics of the studies included in the meta-analysis.

Study	Correlation (r)	Sample (n)	Country	Physical Activity Scale	Smartphone Addiction Scale
1. Ding (2021)	-0,445	1801	China	Physical Activity	MPATS
2. Barot (2023)	-0,805	106	India	IPAQ	Smartphone Scale
3. Gong (2023)	-0,300	643	China	Physical Activity	Smartphone Scale
4. Tong (2023)	-0,664	4621	China	Physical Activity	MPATS
5. Ke (2024)	-0,124	608	China	Physical Activity	MPATS
6. Qin (2025)	-0,130	527	China	IPAQ-SF	Smartphone Scale
7. Zhu (2024)	-0,101	4670	China	Physical Activity	MPATS
8. Ding (2025)	-0,293	1392	China	Physical Activity	MPATS
9. Musaoğlu (2023)	-0,209	400	Turkey	IPAQ-SF	Smartphone Scale
10. Tanır (2021)	-0,258	236	Turkey	IPAQ-SF	Smartphone Scale
11. Haripriya (2019)	-0,335	113	India	IPAQ-SF	Smartphone Scale
12. Başkan (2021)	-0,063	140	Turkey	IPAQ-SF	Smartphone Scale
13. Guo (2022)	-0,158	1433	China	Physical Activity	MPATS
14. Li (2021)	-0,235	2077	China	Physical Exercise	Self-rating Questionnaire
15. Numanoğlu (2022)	-0,112	288	Turkey	IPAQ-SF	Smartphone Scale
16. Kim (2022)	-0,200	53.534	Korea	Physical Exercise	KYRBS

The characteristics of the studies included in the meta-analysis are presented in Table 1. The total sample size for the 16 studies was 72,589.



RESULTS

Table 2. Overall effect size and heterogeneity statistics (random-effects model)

Intercept	Estimate	se	Z	p	CI Lower Bound	CI Upper Bound
	-0.306	0.0672	-4.56	<.001	-0.438	-0.175
Heterogeneity	Tau	Tau ²	I ²	H ²	df	Q
	0.264	0.0695 (SE= 0.0263)	99.34%	150.556	15.000	1834.079

Analyses were performed using the Fisher r-to-z transformation, and for ease of interpretation, the results were reported by converting them back to the r coefficient. The random effects model results in Table 2 show a statistically significant and negative correlation between physical activity and smartphone addiction ($r = -0.31$, 95% CI [-0.44, -0.17], $p < .001$). This effect size indicates a moderate relationship. The findings reveal that as the level of physical activity increases, the level of smartphone addiction tends to decrease. However, a high level of heterogeneity was detected among the studies included in the analysis ($Q(16) = 1834.079$, $p < .001$; $I^2 = 99.34\%$). This suggests that there is a significant level of variation between studies, and these differences may be due to variations in measurement tools, sample characteristics, or age groups. Furthermore, the calculated 95% prediction interval is found to be in a wide range. This suggests that the actual effect size may be weaker or even more different in some individual studies, supporting the high heterogeneity between studies.

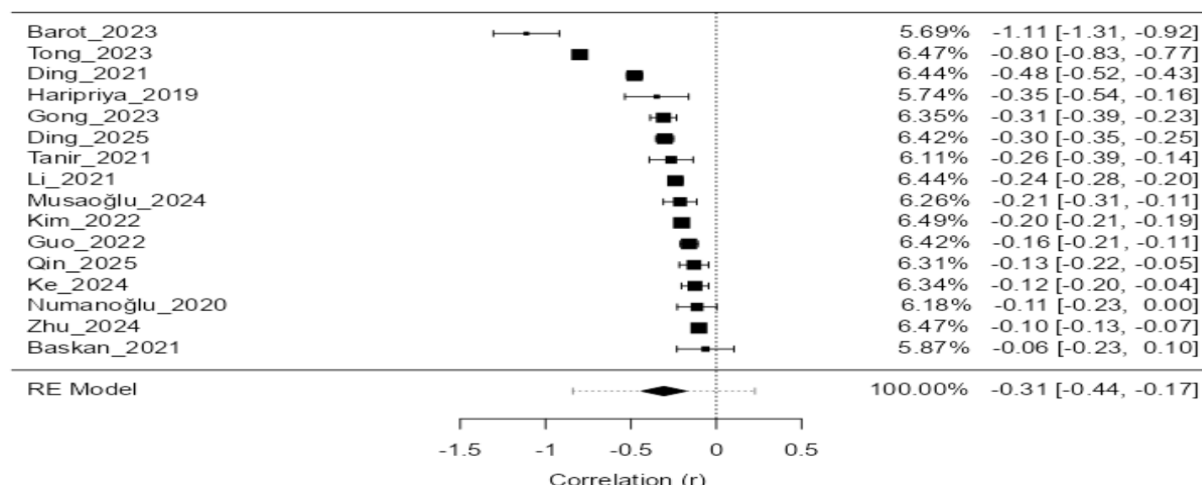


Figure 2. Forest plot according to random effects model.

The forest plot in Figure 2 shows the individual effect sizes and confidence intervals of the 16 studies included in the meta-analysis. The vast majority of studies have negative effect sizes, and the overall effect size obtained from the random effects model is also negative and significant ($r = -0.31$, 95% CI





[-0.44, -0.17]). However, the width of the confidence intervals indicates significant differences between studies. While some studies' confidence intervals intersected the zero line, in others, the overall effect size showed a strong negative influence.

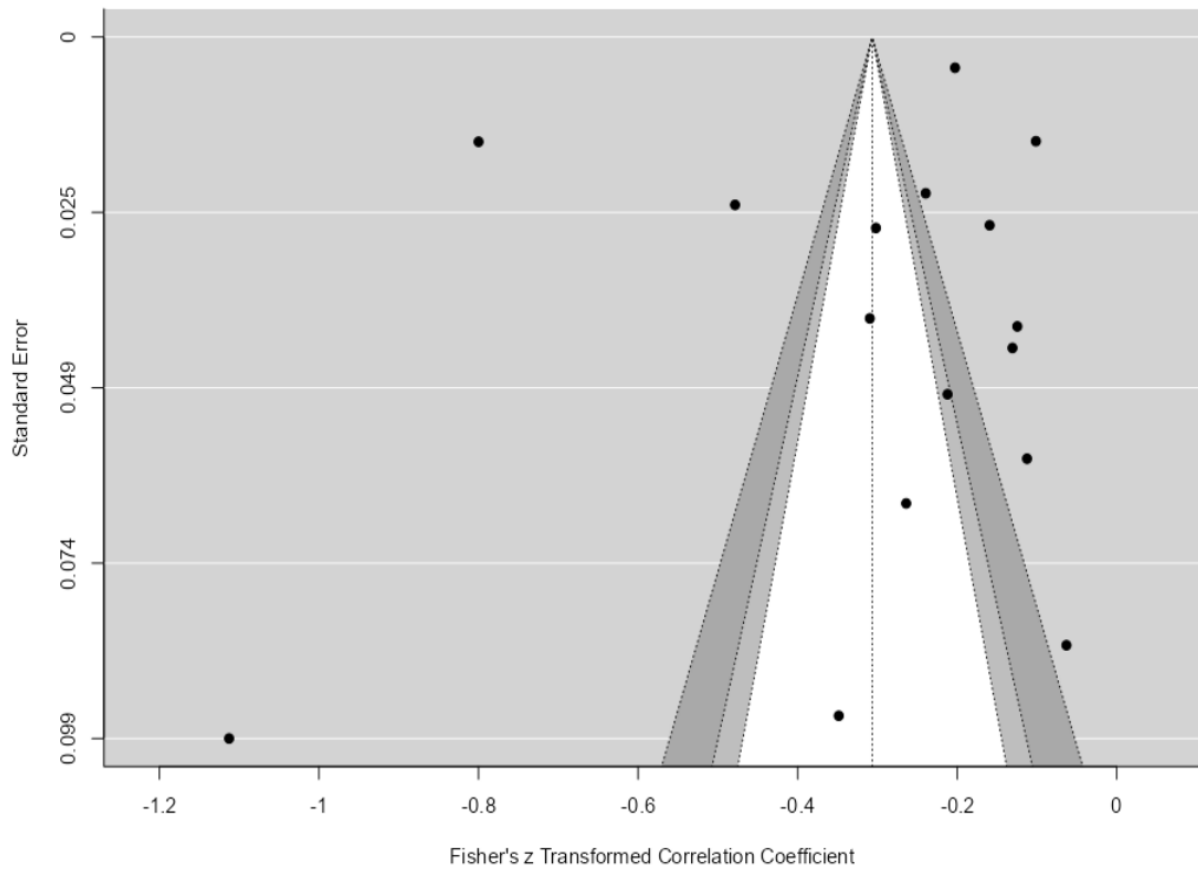


Figure 3. Funnel plot regarding publication bias.

Figure 3 shows the funnel plot created to assess publication bias. Examination of the plot reveals that the studies exhibit a relatively symmetrical distribution around the overall effect size. Furthermore, the Begg and Mazumdar rank correlation test and the Egger regression test results were not statistically significant ($p > .05$). These findings indicate that there is no significant publication bias in the meta-analysis. Outlier and influencer study analyses identified one study as a potential outlier; however, removing this study did not significantly alter the overall effect size.





DISCUSSION

This meta-analysis study revealed a statistically significant and negative association between physical activity and smartphone addiction ($r = -0.31, p < .001$). This finding indicates that the tendency towards smartphone addiction decreases as the level of physical activity increases, supporting the idea that physical activity can be an important protective factor not only in terms of bodily function but also behavioral regulation. The findings are consistent with the literature showing that physical activity alleviates digital addiction behaviors through psychosocial mechanisms such as stress reduction, increased self-control, psychological resilience, and emotional regulation (Qi et al., 2025); (Ye et al., 2025); (Zhao et al., 2022); (Wang, 2025); (Liu et al., 2025)). While the obtained effect size is moderate, it is significant when compared to similar studies conducted in the field of behavioral addictions. This suggests that physical activity has a regulatory effect not only at the physiological but also at the psychological level. The analysis results showed a high level of heterogeneity ($I^2 = 99.34\%$). This may be due to differences in the sample sizes, cultural contexts, types of physical activity, and measurement tools used in the included studies. Furthermore, the variety of measurement tools used and self-report-based data collection methods may have increased the variance. Therefore, it is recommended that future studies test variables such as age, gender, culture, exercise frequency, and exercise type using moderator analyses. The lack of significance in the publication bias analyses (Egger and Begg tests) indicates that the results are not affected by systematic bias. This also increases the statistical reliability of the study. However, given the high heterogeneity, caution should be exercised regarding the generalizability of the findings, and the results should be evaluated within the cultural and methodological context. In conclusion, this meta-analysis demonstrates that physical activity has a moderating role in smartphone addiction and emphasizes that in combating digital addiction, physical activity should be considered not only as a health-based behavior but also as a behavioral balance mechanism.

CONCLUSION

Current research findings reveal a statistically significant inverse relationship between physical activity levels and smartphone addiction. The moderate effect observed demonstrates that physical activity plays a critical role in combating smartphone addiction. Given the increasing prevalence of sedentary lifestyles and high screen time among young people, promoting and sustaining physical activity should be considered a strategic public health initiative to prevent both smartphone and digital addiction. The results indicate that school and community-based sports programs should be designed to support not only physical development but also digital self-regulation. Additionally, exercise habits acquired within the family can be a supportive factor in helping young people develop healthy technology use behaviors. In summary, physical activity should be considered not only a tool for maintaining physical health but also a strong, protective shield against the addiction risks of the digital age. Future studies are recommended to conduct detailed investigations into the relationship between the type, duration, and intensity of physical activity and digital addiction; furthermore, the psychological and neurophysiological processes involved in this relationship should be investigated using longitudinal designs.





REFERENCES

- Abu Hassan, L. F., Demong, N. A., Mohd Salleh, M. Z., Omar, E. N., & Alwi, A. (2021). Dijital bağımlılık ve üniversite öğrencileri arasındaki akademik performans. *İş Araştırmalarında İlerlemeler Uluslararası Dergi*.
- Baskan, Ö., Çorum, M., & Büyükyılmaz, G. (2023). Üniversite öğrencilerinde akıllı telefon bağımlılığı ile fiziksel aktivite, yorgunluk ve uyku kalitesinin ilişkisinin incelenmesi [Investigation of the relationship between smartphone addiction, physical activity, fatigue and sleep quality in university students]. *Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi (Gümüşhane University Journal of Health Sciences)*, 12(1), 299–305.
- Chinn, S. (2000). A simple method for converting an odds ratio to effect size for use in meta-analysis. *Statistics in Medicine*, 19(22), 3127–3131.
[https://doi.org/10.1002/1097-0258\(20001130\)19:22](https://doi.org/10.1002/1097-0258(20001130)19:22)
- Cumming, G. (2012). *Understanding the new statistics: Effect sizes, confidence intervals, and meta-analysis*. Routledge.
- Ding, Z.-C., Yan, J., & Fu, J. (2021). Internet and mobile phone addiction self-control mediate physical exercise and subjective well-being in young adults using IoT. *Mobile Information Systems*, 2021, Article ID 9923833. <https://doi.org/10.1155/2021/9923833>
- Ding, Z., Qi, X., Fang, T., Xiao, L., Yin, D., & Sun, Z. (2025). A cross-sectional study on the impact of physical exercise on mobile phone addiction: The chain mediating role of perceived stress and self-acceptance. *Frontiers in Psychology*, 16, 1671549.
<https://doi.org/10.3389/fpsyg.2025.1671549>
- Dresp-Langley, B., & Hutt, A. (2022). Dijital bağımlılık ve uyku. *Uluslararası Çevre Araştırmaları ve Halk Sağlığı Dergisi*, 19(11), 6910.
<https://doi.org/10.3390/ijerph19116910>
- Ellis, P. D. (2010). *The essential guide to effect sizes: Statistical power, meta-analysis, and the interpretation of research results*. Cambridge University Press.
- Gong, Y., Yang, H., Bai, X., Wang, Y., & An, J. (2023). The relationship between physical exercise and smartphone addiction among Chinese college students: The mediating effect of core self-evaluation. *Behavioral Sciences*, 13, 647.
<https://doi.org/10.3390/bs13080647>
- Guo, K.-L., Ma, Q.-S., Yao, S.-J., Liu, C., Hui, Z., Jiang, J., & Lin, X. (2022). The relationship between physical exercise and mobile phone addiction tendency of university students in China: A moderated mediation model. *Frontiers in Psychology*, 13, 730886.
<https://doi.org/10.3389/fpsyg.2022.730886>
- Haripriya, S., Samuel, S. E., & Megha, M. (2019). Correlation between smartphone addiction, sleep quality and physical activity among young adults. *Journal of Clinical and*





Diagnostic Research, 13(10), YC05–YC09.

<https://doi.org/10.7860/JCDR/2019/42168.13212>

Ke, Y., Liu, X., Xu, X., He, B., Wang, J., Zuo, L., & Yang, G. (2024). Self-esteem mediates the relationship between physical activity and smartphone addiction of Chinese college students: A cross-sectional study. *Frontiers in Psychology*, 14, 1256743. <https://doi.org/10.3389/fpsyg.2023.1256743>

Kim, J., & Lee, K. (2022). The association between physical activity and smartphone addiction in Korean adolescents: The 16th Korea Youth Risk Behavior Web-Based Survey, 2020. *Healthcare*, 10, 702. <https://doi.org/10.3390/healthcare10040702>

Lai, C., Cai, P., Liao, J., Li, X., Wang, Y., Wang, M., Ye, P., Chen, X., Hambly, B. D., Yu, X., Bao, S., & Zhang, H. (2025). Exploring the relationship between physical activity and smartphone addiction among college students in Western China. *Frontiers in Public Health*, 13, 1530947. <https://doi.org/10.3389/fpubh.2025.1530947>

Li, Y., Sun, Q., Sun, M., Sun, P., Sun, Q., & Xia, X. (2021). Physical exercise and psychological distress: The mediating roles of problematic mobile phone use and learning burnout among adolescents. *International Journal of Environmental Research and Public Health*, 18, 9261. <https://doi.org/10.3390/ijerph18179261>

Liu, N., Han, X., Dai, X., & Zhang, G. (2025). Dual-pathway protection: Physical activity buffers the relationship between perceived stress and problematic smartphone use via social anxiety by a moderated mediation model in Chinese college students. *Frontiers in Public Health*, 13, 1681556. <https://doi.org/10.3389/fpubh.2025.1681556>

Liu, S., Xiao, T., Yang, L., & Loprinzi, P. D. (2019). Akıllı telefon bağımlılığını tedavi etmek için alternatif bir yaklaşım olarak egzersiz: Rastgele kontrollü denemelerin sistematik inceleme ve meta-analizi. *Uluslararası Çevre Araştırmaları ve Halk Sağlığı Dergisi*, 16(20), 3912. <https://doi.org/10.3390/ijerph16203912>

Musaoğlu, Ö., Işık, Ö., & Çiçek, G. (2024). Akıllı telefon bağımlılığı ile fiziksel aktivite düzeyleri arasındaki ilişki: Spor bilimleri öğrencileri üzerine bir araştırma. *Ondokuz Mayıs Üniversitesi Spor ve Performans Araştırmaları Dergisi*, 15(3), 379–390.

Numanoğlu-Akbaş, A., Suner-Keklik, S., & Yakut, H. (2020). Investigation of the relationship between smartphone addiction and physical activity in university students. *Baltic Journal of Health and Physical Activity*, Suppl(1), 63–73. <https://doi.org/10.29359/BJHPA.2020.Suppl.1.07>

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>

Petticrew, M., & Roberts, H. (2006). *Systematic reviews in the social sciences: A practical guide*. Blackwell Publishing.





- Pirwani, N., & Szabo, A. (2024). Could physical activity alleviate smartphone addiction in university students? A systematic literature review. *Preventive Medicine Reports*, 42, 102744. <https://doi.org/10.1016/j.pmedr.2024.102744>
- Qi, J., Zhou, X., Li, J., & Liu, B. (2025). The impact of regular physical exercise on mobile phone addiction tendency among Chinese college students: The mediating role of trait boredom and the moderating role of self-control. *Frontiers in Psychology*, 16, 1671836. <https://doi.org/10.3389/fpsyg.2025.1671836>
- Qin, X., Liu, L., Yan, Y., Guo, X., Yang, N., & Li, L. (2025). Smartphone addiction and sleep quality in the physical activity-anxiety link: A mediation-moderation model. *Frontiers in Public Health*, 13, 1512812. <https://doi.org/10.3389/fpubh.2025.1512812>
- Shi, B., Wang, D., & Liu, M. (2025). The impact of physical exercise on mobile phone addiction among college students: A study based on Chinese universities. *Frontiers in Psychology*, 16, 1524520. <https://doi.org/10.3389/fpsyg.2025.1524520>
- Tanır, H. (2021). The risk of physical activity and smartphone addiction in sports high school students: An example of a state school. *Pakistan Journal of Medical & Health Sciences*, 15(2), 706–711.
- The jamovi project (2024). jamovi. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>
- Tong, W., & Meng, S. (2023). Effects of physical activity on mobile phone addiction among college students: The chain-based mediating role of negative emotion and e-health literacy. *Psychology Research and Behavior Management*, 16, 3647–3657. <https://doi.org/10.2147/PRBM.S419799>
- Ye, Z., Zhang, T., Peng, Y., Rao, W., & Jia, P. (2025). Effects of physical activity on smartphone addiction in Chinese college students: Chain mediation of self-control and stress perception. *BMC Public Health*, 25. <https://doi.org/10.1186/s12889-025-22720-5>
- Yengin, D. (2019). Digital addiction as technology addiction. *Turkish Online Journal of Design, Art and Communication*, 9(2), 203–214. <https://doi.org/10.7456/10902100/007>
- Zhao, Z., Zhao, S., Wang, Q., Zhang, Y., & Chen, C.-H. (2022). Effects of physical exercise on mobile phone addiction in college students: The chain mediation effect of psychological resilience and perceived stress. *International Journal of Environmental Research and Public Health*, 19, 15679. <https://doi.org/10.3390/ijerph192315679>
- Zhu, W., Liu, J., Lou, H., Mu, F., & Li, B. (2024). Influence of smartphone addiction on sleep quality of college students: The regulatory effect of physical exercise behavior. *PLoS ONE*, 19(7), e0307162. <https://doi.org/10.1371/journal.pone.0307162>





Zhu, W., Zhang, Y., Lan, Y., & Song, X. (2025). Smartphone dependence and its influence on physical and mental health. *Frontiers in Psychiatry*, 16.
<https://doi.org/10.3389/fpsy.2025.1281841>





FT-9

Physical Education Classes Barriers Scale: Validity and Reliability Study

Mehmet Akarsu¹, Mehmet Güllü²

¹ Assistant Professor, İnönü University, Faculty of Sport Sciences, Department of Physical Education and Sports
Teaching, ORCID: 0000-0002-8149-801X

² Professor, İnönü University, Faculty of Sport Sciences, Department of Physical Education and Sports
Teaching, ORCID: 0000-0002-0930-7178

Correspondence: mehmet_akarsu@inonu.edu.tr

Abstract

Participation in physical education classes is influenced by various physical, psychological, and social factors. Identifying these barriers is essential for increasing student participation and improving the quality of physical education lessons. However, there is no specific measurement tool designed to assess the factors that prevent students from participating in physical education classes. The aim of this study is to develop a valid and reliable measurement tool to identify the barriers that hinder students' participation in physical education classes. An exploratory sequential mixed-methods design was employed. The study was conducted with four distinct student groups enrolled in middle schools in Malatya. First, scale items were generated through face-to-face interviews with 16 students, followed by expert evaluations using the Lawshe technique to assess content validity. Data were collected from 570 students for the Exploratory Factor Analysis, from 325 students for the Confirmatory Factor Analysis, and from 28 students for the test-retest reliability procedure. EFA was performed using IBM SPSS Statistics (Version 25 for Windows; IBM Corp., Armonk, NY, USA), and CFA was conducted using IBM SPSS AMOS 24. EFA revealed a unidimensional structure consisting of 10 items. CFA results indicated good model fit (CFI=0.962; RMSEA=0.070; TLI=0.947; GFI=0.950; NFI=0.941; IFI=0.963). Reliability analyses demonstrated strong internal consistency and stability, with a Cronbach's Alpha of 0.89, Composite Reliability of 0.890, and a test-retest correlation of $r=0.91$. In conclusion, the developed scale is a valid and reliable instrument for measuring the barriers that hinder students' participation in physical education classes.

Keywords: Physical education, barrier, scale development, validity, reliability





INTRODUCTION

According to data from the Ministry of Health, 22.5% of children in Türkiye aged 6 to 18 are overweight or obese (Ministry of Health, 2022). The primary reason for these high rates observed during childhood is the lack of physical activity (Boyle Jones & Walters, 2008). One of the key settings for addressing this deficiency is physical education classes, as children spend the majority of their day at school and are physically active predominantly during physical education lessons (İlbak et al., 2025). Despite the importance of physical education, school administrators and teachers of other subject areas argue that courses included in high-stakes examinations are more valuable. Parents generally support this view and believe that physical education lessons and sports activities negatively affect children's academic achievement (Yılmaz, 2018). Contrary to these assumptions, researchers emphasize that activities implemented during physical education classes enhance academic performance by increasing blood flow to the brain, improving mood, and enhancing mental alertness (Bailey, 2006).

A substantial body of research demonstrates that physical education classes enable students to assess their physical fitness levels (Fairclough & Stratton, 2005), recognize themselves and their bodies, become aware of their abilities, respect individual differences, and support their moral development (Mouratidou, Goutza & Chatzopoulos, 2007). They also contribute to increased self-esteem and self-confidence (Gaurav & Sukhbir, 2011), as well as fostering responsibility and an understanding of fair play (Ludwiczak & Bronikowska, 2022). In addition, physical education helps cultivate lifelong physical activity habits and supports the continuation of health-related behaviors acquired during childhood into adulthood (Pangrazi & Corbin, 2000; Akarsu et al., 2025).

The numerous positive effects of physical education on students have been documented through scientific studies conducted in various contexts and time periods. However, an examination of the literature reveals several barriers that hinder the provision of high-quality physical education. For instance, Morgan and Hansen (2008) reported that the barriers to physical education include financial constraints, limited sports facilities, inadequate equipment, lack of time, large class sizes, negative personal experiences, low levels of interest, and insufficient teacher knowledge. Similarly, Barroso et al. (2005) identified the devaluation of physical education and large class sizes as major obstacles. Jenkinson and Benson (2010) further noted that barriers to physical education and physical activity largely stem from institutional factors and that students are negatively influenced by their peers.

A review of the literature reveals the existence of a scale developed to identify barriers to delivering quality physical education (Kinnunen & Lewis, 2013). However, no such instrument tailored to the Turkish context has been identified. Determining the barriers to delivering more effective physical education lessons is considered essential for fostering healthier individuals. In line with this importance, the aim of the present study is to develop a valid and reliable scale to identify barriers to physical education lessons.

METHOD

Research Design

This study employed an exploratory sequential design, one of the mixed research methods. Mixed-methods research integrates both quantitative and qualitative approaches within a single study by collecting and analyzing data and synthesizing the resulting findings to draw conclusions (Creswell, 2008; Doyle, Brady & Byrne, 2009). In an exploratory sequential design, qualitative data are first explored, and the findings obtained are subsequently used to guide the quantitative phase (Creswell, 2014). In the present study, individual interviews were initially conducted using qualitative research techniques. The interview method enables the collection of in-depth information by asking targeted



questions to relevant individuals (Taylor, Bogdan & DeVault, 2015). Therefore, one-on-one interviews were carried out with each student. The survey model was employed to ensure validity and reliability. In the survey model, a situation that occurred in the past or continues to exist in the present is described within its natural context without any intervention (Büyüköztürk, 2009). For this reason, the survey model was preferred to establish validity and reliability.

Study Group

The scale development process in this study was conducted with four distinct student groups. These groups consisted of middle school students enrolled in the central districts of Malatya during the 2022-2023 academic year. The first study group included 16 students, comprising two girls and two boys from each grade level. Individual interviews were conducted with these students to gather their views regarding the barriers to participating in physical education classes. The second study group, used for the exploratory factor analysis (EFA), consisted of 570 students (248 boys and 322 girls). Of these students, 102 were 10 years old, 11 were 11 years old, 162 were 12 years old, 104 were 13 years old, and 24 were 14 years old. Additionally, 162 students were in the 5th grade, 210 in the 6th grade, 100 in the 7th grade, and 98 in the 8th grade. The third study group, used for confirmatory factor analysis (CFA), included 325 students (140 boys and 185 girls). Of these, 60 were 10 years old, 100 were 11 years old, 91 were 12 years old, 61 were 13 years old, and 13 were 14 years old. Grade distribution included 98 students in the 5th grade, 110 in the 6th grade, 58 in the 7th grade, and 59 in the 8th grade. The fourth study group, formed for the test-retest application, consisted of 28 participants (14 boys and 14 girls) selected equally from each grade level (7 students from each grade). Among these participants, 5 were 10 years old, 7 were 11 years old, 9 were 12 years old, 6 were 13 years old, and 3 were 14 years old.

Development of the Measurement Tool

A comprehensive literature review was conducted during the preparation of the draft scale measuring middle school students' barriers to physical education lessons; however, no previously developed scale addressing this topic was identified. Therefore, the scale was developed following the steps below:

1. Preparation of the scale draft,
2. Establishment of scale validity
3. Establishment of scale reliability

Ethical Considerations

Ethical approval for administering the scale was obtained from the Ethical Committee of İnönü University (Decision No. 21/1, dated 17.11.2022).

RESULTS

Preparation of the Scale Draft

Prior to developing the barrier scale for physical education lessons, an extensive literature review was conducted (Koçak et al., 2002; Kinnunen & Lewis, 2013; Sofo & Asola, 2016; Yılmaz, 2018; Wee & Chin, 2020). Following the literature review, the steps below were implemented in preparing the draft scale:

1. Semi-structured, face-to-face individual interviews were conducted with the first study group. Additional probing questions were asked depending on the flow of the interview to obtain more detailed responses. Parental consent was obtained, and all interviews were audio-recorded.
2. The recordings were transcribed by one researcher and independently reviewed by two researchers who generated initial codes. The codes were compared, and overlapping codes were removed. The final scale draft consisted of 21 items.

3. A 5-point Likert-type scale was used for the draft, with response options ranging from “(1) Strongly Disagree” to “(5) Strongly Agree.”

Scale Validity

Validity refers to the degree to which a measurement tool measures the intended construct (Çelik, 2000). According to Yılmaz (1998), validity reflects how well a measurement tool serves its intended purpose. Various types of validity exist, including content validity, construct validity, criterion validity, face validity, and predictive validity (Tavşancıl, 2002). In this study, the scale was evaluated based on content and construct validity.

Content Validity

Content validity concerns how well each item within the scale serves the overall purpose (Tekin, 2004). For this purpose, a draft form was created to assess whether each item was appropriate for measuring barriers related to physical education lessons. The form included the options “Appropriate,” “Not Appropriate,” and “Needs Revision” for each item, along with an additional section for expert comments.

Expert evaluations were obtained from five physical education teachers with over five years of professional experience and five faculty members from departments of physical education and sports. Expert opinions were analyzed using the Lawshe technique, which calculates content validity ratios (CVR). Items with a CVR lower than 0.99 were removed from the scale (Lawshe, 1975). Accordingly, four items that did not meet the CVR threshold were eliminated, resulting in a final draft of a 14-item positive Likert-type scale.

Construct Validity

Construct validity refers to identifying the variables or constructs measured by the scale (Altunışık et al., 2005). To establish construct validity, both EFA and CFA were performed. The draft scale was administered to the second study group for the EFA, and the resulting item structure was administered to the third study group for the CFA.

Exploratory Factor Analysis

Prior to analysis, the normality of the data was examined. Skewness and kurtosis values for each item were found to fall within the acceptable range of -1.5 to +1.5, which indicates normal distribution (Tabachnick, Fidell & Ullman, 2013). In addition, the suitability of the data for factor analysis was evaluated using the Kaiser-Meyer-Olkin (KMO) coefficient, Bartlett’s Test of Sphericity, and Cronbach’s Alpha reliability coefficient.

The KMO sampling adequacy value was .920, indicating a highly suitable sample. Bartlett’s Test of Sphericity was significant ($\chi^2(45) = 2488.164$, $p < .001$), confirming sufficient inter-item correlations to proceed with factor analysis. These results verified the appropriateness of the dataset for factor analysis (Bayram, 2004).

Cronbach’s Alpha for internal consistency was .895, demonstrating strong reliability and high inter-item correlations. Item-level analyses revealed that items 4, 5, 7, and 9 had factor loadings below .30 and were therefore removed to enhance scale integrity and measurement precision. The remaining 10 items loaded onto a single factor, which explained 51.737% of the total variance. This value exceeds the commonly accepted minimum threshold of 50% in social sciences, indicating that the items collectively represent a unified construct (Yaşlıoğlu, 2017; Streiner, 1994). The total explained variance is presented in Table 1.

Table 1: Total Variance Explained

Component	Initial Eigenvalues		Rotation Sums of Squared Loadings			
	Total	% Variance	Total	% Variance	Total	% Variance
1	5.174	51.737	51.737	51.74	51.737	51.737





As shown in Table 1, the eigenvalue of the first component is 5.174, accounting for 51.74% of the total variance. This indicates that the scale has a unidimensional structure and that the majority of the items load onto a single factor. A graphical representation of the analysis results is presented in the scree plot below in Figure 1.

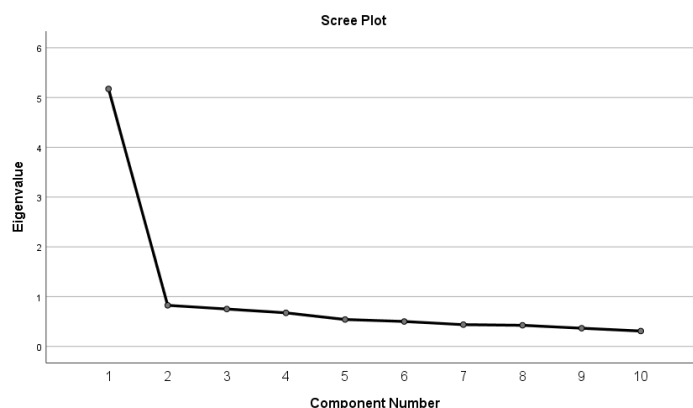


Figure 1: Scree Plot

As shown in the scree plot in Figure 1, the eigenvalue of the first component is markedly high, followed by a sharp decline in subsequent components. This pattern indicates that the scale possesses a unidimensional structure and that only one factor explains a meaningful portion of the variance. The eigenvalues of the remaining components fall below 1, demonstrating that they do not contribute significantly to the overall variance.

Table 2: Factor Loadings

Items	Factor Loadings
I do not want to participate in physical education classes because I do not want to get tired.	0.744
I do not want to participate in physical education classes because I do not want to sweat.	0.763
I do not want to participate in physical education classes because I do not want to get injured or sick.	0.764
I do not want to participate in physical education classes because I feel embarrassed.	0.748
I do not want to participate in physical education classes because I do not want to change my clothes.	0.663
Physical education classes do not interest me.	0.705
Physical education is unnecessary.	0.729
I consider myself unskilled in sports.	0.613
I do not want to participate in physical education classes because I do not get along with my friends.	0.707
I do not want to participate in physical education classes because my friends do not include me.	0.743



Upon examining Table 2, it is observed that the factor loadings of the 10 items in the scale range from 0.764 to 0.613. These values indicate that each item strongly represents the theme of “barriers to physical education classes” and supports the underlying construct. Moreover, the fact that all factor loadings are well above the commonly accepted threshold of 0.30 demonstrates high internal consistency of the scale.

Table 3: Confirmatory Factor Analysis Results

χ^2	df	χ^2/df	p	CFI	TLI	GFI	NFI	IFI	RMSEA
77.6	38	2.589	<.001	0.962	0.947	0.950	0.941	0.963	0.070

The CFA results presented in Table 3 indicate that the proposed model demonstrates a good level of fit with the data. The χ^2/df ratio was found to be 2.589, which falls within the acceptable range based on the recommended criterion of < 3 (Kline, 2015). The model fit indices CFI (0.962) and TLI (0.947), both of which are very close to the 0.95 benchmark, indicate strong structural fit (Bentler, 1990; Hu & Bentler, 1999). In addition, the GFI (0.950), NFI (0.941), and IFI (0.963) values exceeding the 0.90 threshold further support the adequacy of the model's overall fit (Hair et al., 1998). The RMSEA value of 0.070, falling within the acceptable range of 0.05 to 0.08, suggests that the model exhibits a satisfactory level of fit (Bayram, 2010; Hu & Bentler, 1999).

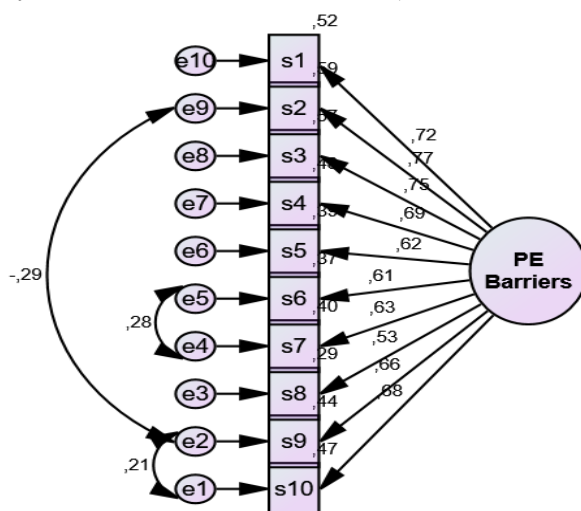


Figure 2: CFA Path Diagram

According to the CFA model presented in the figure, the 10 items included in the “Barriers to Physical Education Classes” scale load significantly onto a single-factor structure. The factor loadings range from .53 to .77, indicating that each item adequately represents the underlying factor (Tabachnick et al., 2013). This pattern supports the unidimensional nature of the scale and demonstrates that the items collectively reflect a common construct. In addition, reasonable model modifications were made to improve model fit by defining correlation paths between items s2 and s9, s6 and s7, and s9 and s10 (Byrne, 2010).



Table 4: Item Analysis Results

Item No	Items	Standardized Factor Loadings	Standard Error
1.	I do not want to participate in physical education classes because I do not want to get tired.	0.721	0.072
2.	I do not want to participate in physical education classes because I do not want to sweat.	0.769	0.067
3.	I do not want to participate in physical education classes because I do not want to get injured or sick.	0.752	0.088
4.	I do not want to participate in physical education classes because I feel embarrassed.	0.691	0.053
5.	I do not want to participate in physical education classes because I do not want to change my clothes.	0.624	0.071
6.	Physical education classes do not interest me.	0.606	0.069
7.	Physical education is unnecessary.	0.630	0.057
8.	I consider myself unskilled in sports.	0.535	0.056
9.	I do not want to participate in physical education classes because I do not get along with my friends.	0.660	0.055
10.	I do not want to participate in physical education classes because my friends do not include me.	0.685	0.063

According to Table 4, the standardized factor loadings of the items range from 0.535 to 0.769. These values indicate that all items significantly represent the associated factor. The highest factor loading belongs to the item "I do not want to participate in physical education classes because I do not want to sweat" (0.769), demonstrating that this item has the strongest relationship with the factor. The lowest loading belongs to the item "I consider myself unskilled in sports" (0.535); however, this value remains within the acceptable threshold (Byrne, 2010). The relatively low standard errors (ranging between 0.053 and 0.088) also indicate the reliability of the measurement model.

When the EFA and CFA results are evaluated together, it is evident that the 10-item Barriers to Physical Education Classes Scale possesses a valid structure. The findings indicate that the scale demonstrates adequate construct validity and meets the criteria recommended in the literature (Bayram, 2004; Meydan & Şeşen, 2011; Şimşek, 2007).

Scale Reliability

The reliability and convergent validity of the developed measurement tool were assessed using Composite Reliability (CR), Average Variance Extracted (AVE), and the test-retest reliability coefficient. The analyses revealed that the CR value for the developed scale structure was 0.890, the AVE value was 0.450, and Cronbach's Alpha was 0.89. Since the CR value exceeds 0.70, the scale demonstrates a high level of internal consistency. Although the AVE value is slightly below the 0.50 threshold, this serves as a borderline indication regarding the degree to which the latent construct is represented; nevertheless, the high CR value compensates for this limitation to some extent (Fornell & Larcker, 1981). The test-retest correlation coefficient ($r = 0.91$) indicates strong temporal reliability. Therefore, the scale can be considered to exhibit an overall acceptable degree of structural validity. Within this framework, the reliability indicators support that the measurement tool is both reliable and valid.



DISCUSSION

The “Barriers to Physical Education Classes Scale” developed in this study provides a comprehensive and reliable measurement tool aimed at identifying the factors that hinder students’ participation in physical education classes. The findings demonstrate that the scale has a unidimensional structure and that the factors influencing students’ decisions to participate in physical education cluster around a common construct. The EFA results revealed that a single factor explained 51.74% of the total variance, which surpasses the threshold commonly accepted in the social sciences (Streiner, 1994; Yaşlıoğlu, 2017) and presents strong evidence for construct validity. Similarly, the goodness-of-fit indices obtained from the CFA including CFI, TLI, GFI, and RMSEA fall within acceptable ranges (Kline, 2015; Hu & Bentler, 1999), demonstrating that the scale aligns well with the theoretical model.

The Cronbach’s Alpha coefficient of 0.89 indicates high internal consistency among the scale items, and the high CR and test–retest correlation coefficients show that the scale offers both consistent and stable measurements over time. Although the AVE value is slightly below the 0.50 threshold, the high CR value offsets this limitation and supports the scale’s convergent validity (Fornell & Larcker, 1981). An examination of the scale items indicates that the barriers preventing students from participating in physical education classes extend beyond physical factors, encompassing psychological and social components as well. Feelings of embarrassment, perceived incompetence, peer relationships, and lack of teacher engagement contribute to students’ reluctance to participate. These findings align with earlier studies by Morgan and Hansen (2008) and Jenkinson and Benson (2010). Additionally, external factors such as parental attitudes and the prioritization of academic subjects over physical education further diminish students’ motivation to attend the class (Yılmaz, 2018).

In this context, the developed scale enables the examination of not only individual attitudes but also systemic and environmental barriers. Consequently, it can contribute to the development of comprehensive strategies aimed at enhancing the quality of physical education lessons. School administrators, teachers, and policymakers can use this tool to identify barriers supported by empirical data and design intervention programs accordingly.

CONCLUSION

In conclusion, this study identifies the barriers to participation in physical education classes on a scientific basis and provides a tool that can guide both practice and research in this area. The developed scale serves as an effective measurement tool that can be used in both academic research and field applications.

Funding

This research received no external funding.

Conflict of Interest

The authors declare no conflict of interest.



REFERENCES

- Akarsu, M., Güllü, M., Polat Günata, G., Kızılkaya, A., Aydın, S., Özcan, E., Norman, G., and Kurhan, C. O. (2025). The mediating role of physical literacy in the relationship between e-health literacy and a sustainable healthy lifestyle among adolescents. *Healthcare*, 13(15), 1870. <https://doi.org/10.3390/healthcare13151870>
- Altunışık, R., Coşkun, R., Bayraktaroğlu, S., and Yıldırım, E. (2005). Sosyal bilimlerde araştırma yöntemleri: SPSS uygulamalı. Sakarya: Sakarya Kitabevi.
- Bailey, R. (2006). Physical education and sport in schools: A review of benefits and outcomes. *Journal of School Health*, 76(8), 397-401. <https://doi.org/10.1111/j.1746-1561.2006.00132.x>
- Barroso, C. S., McCullum-Gomez, C., Hoelscher, D. M., Kelder, S. H., and Murray, N. G. (2005). Self-reported barriers to quality physical education by physical education specialists in Texas. *Journal of School Health*, 75(8), 313-319. <https://doi.org/10.1111/j.1746-1561.2005.00042.x>
- Bayram, N. (2004). Sosyal bilimlerde SPSS ile veri analizi. Bursa: Ezgi Kitabevi.
- Bayram, N. (2010). Yapısal eşitlik modellemesine giriş: AMOS uygulamaları. Bursa: Ezgi Kitabevi.
- Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107(2), 238-246. <https://doi.org/10.1037/0033-2909.107.2.238>
- Boyle, S. E., Jones, G. L., and Walters, S. J. (2008). Physical activity among adolescents and barriers to delivering physical education in Cornwall and Lancashire, UK: A qualitative study of heads of PE and heads of schools. *BMC Public Health*, 8(1), 1-9. <https://doi.org/10.1186/1471-2458-8-273>
- Büyükoztürk, Ş. (2009). Sosyal bilimler için veri analizi el kitabı. Ankara: Pegem Akademi Yayıncılık.
- Byrne, B. M. (2010). Structural equation modeling with AMOS: Basic concepts, applications, and programming (2nd ed.). New York: Routledge.
- Çelik, D. (2000). Okullarda ölçme değerlendirme nasıl olmalı? Ankara: Milli Eğitim Basımevi.
- Creswell, J. W. (2009). Research design: Qualitative, quantitative, and mixed methods approaches (3rd ed.). Thousand Oaks, CA: SAGE Publications.
- Creswell, J. W. (2014). Research design: Qualitative, quantitative, and mixed methods approaches (4th ed.). Thousand Oaks, CA: SAGE Publications.



- Doyle, L., Brady, A.-M., and Byrne, G. (2009). An overview of mixed methods research. *Journal of Research in Nursing*, 14(2), 175-185. <https://doi.org/10.1177/1744987108093962>
- Fairclough, S., and Stratton, G. (2005). 'Physical education makes you fit and healthy': Physical education's contribution to young people's physical activity levels. *Health Education Research*, 20(1), 14-23. <https://doi.org/10.1093/her/cyg101>
- Fornell, C., and Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50. <https://doi.org/10.1177/002224378101800104>
- Gaurav, D., and Sukhbir, S. (2011). Self-confidence and decision making between psychology and physical education students: A comparative study. *Journal of Physical Education and Sport Management*, 2(6), 62-65.
- Hair, J. F., Anderson, R. E., Tatham, R. L., and Black, W. C. (1998). *Multivariate data analysis* (5th ed.). Upper Saddle River, NJ: Prentice Hall.
- Hu, L. T., and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1-55. <https://doi.org/10.1080/10705519909540118>
- İlbak, İ., Akarsu, M., Cepicka, L., and Valach, P. (2025). The mediating role of physical activity attitude in the relationship between physical literacy and a sustainable healthy lifestyle in adolescents. *Frontiers in Psychology*, 16, 1661080. <https://doi.org/10.3389/fpsyg.2025.1661080>
- Jenkinson, K. A., and Benson, A. C. (2010). Barriers to providing physical education and physical activity in Victorian state secondary schools. *Australian Journal of Teacher Education*, 35(8), 1-17. <https://doi.org/10.14221/ajte.2010v35n8.1>
- Kinnunen, D. A., and Lewis, D. K. (2013). A case study of preservice physical education teachers' attitudes toward and perceived barriers to quality physical education. *Journal of Education and Practice*, 4(8), 123-133.
- Kline, R. B. (2015). *Principles and practice of structural equation modeling* (4th ed.). New York: Guilford Publications.
- Koçak, S., Harris, M. B., İşler, A. K., and Çiçek, Ş. (2002). Physical activity level, sport participation, and parental education level in Turkish junior high school students. *Pediatric Exercise Science*, 14(2), 147-154. <https://doi.org/10.1123/pes.14.2.147>
- Lawshe, C. H. (1975). A quantitative approach to content validity. *Personnel Psychology*, 28(4), 563-575.





- Ludwiczak, M., and Bronikowska, M. (2022). Fair play in a context of physical education and sports behaviours. *International Journal of Environmental Research and Public Health*, 19(4), 2452. <https://doi.org/10.3390/ijerph19042452>
- Meydan, C. H., and Şeşen, H. (2011). Yapısal eşitlik modellemesi AMOS uygulamaları. Ankara: Detay Yayıncılık.
- Morgan, P. J., and Hansen, V. (2008). Classroom teachers' perceptions of the impact of barriers to teaching physical education on the quality of physical education programs. *Research Quarterly for Exercise and Sport*, 79(4), 506-516. <https://doi.org/10.1080/02701367.2008.10599517>
- Mouratidou, K., Goutza, S., and Chatzopoulos, D. (2007). Physical education and moral development: An intervention programme to promote moral reasoning through physical education in high school students. *European Physical Education Review*, 13(1), 41-56. <https://doi.org/10.1177/1356336X07072675>
- Pangrazi, R. P., and Corbin, C. B. (2000). Health foundations: Toward a focus on physical activity promotion. *International Journal of Physical Education*, 37(2), 40-49.
- Sağlık Bakanlığı. (2022). Türkiye'de obezitenin görülme sıklığı. <https://hsgm.saglik.gov.tr/tr/obezite/turkiyede-obezitenin-gorulme-sikligi.html>
- Şimşek, Ö. (2007). Yapısal eşitlik modellemesine giriş. Ankara: Ekinoks.
- Sofo, S., and Asola, E. F. (2016). Barriers to providing quality physical education in primary schools in Ghana. *IOSR Journal of Sports and Physical Education*, 3(3), 45-48. <https://doi.org/10.9790/6737-03034548>
- Tabachnick, B. G., Fidell, L. S., and Ullman, J. B. (2013). Using multivariate statistics (6th ed.). Boston, MA: Pearson.
- Tavşancıl, E. (2002). Tutumların ölçülmesi ve SPSS ile veri analizi. Ankara: Nobel Yayın Dağıtım.
- Taylor, S. J., Bogdan, R., and DeVault, M. (2015). Introduction to qualitative research methods: A guidebook and resource (4th ed.). Hoboken, NJ: John Wiley & Sons.
- Tekin, H. (2004). Eğitimde ölçme ve değerlendirme (17. baskı). Ankara: Yargı Yayınevi.
- Wee, E. H., and Chin, N. (2020). Perceived barriers to the provision of physical education in Malaysian primary schools. *IOSR Journal of Sports and Physical Education*, 7(4), 22-28. <https://doi.org/10.9790/6737-07042228>
- Yaşlıoğlu, M. M. (2017). Sosyal bilimlerde faktör analizi ve geçerlilik: Keşfedici ve doğrulayıcı faktör analizlerinin kullanılması. *İstanbul Üniversitesi İşletme Fakültesi Dergisi*, 46(Özel Sayı), 74-85. <http://dergipark.ulakbim.gov.tr/iuisletme>





- Yılmaz, H. (1998). Eğitimde ölçme ve değerlendirme (3. baskı). Ankara: Mikro Basım Yayın Dağıtım.
- Yılmaz, U. (2018). Beden eğitimi ve sınıf öğretmenlerinin beden eğitimi ve fiziksel aktivite engellerine ilişkin algılarının değerlendirilmesi (Yüksek lisans tezi). Akdeniz Üniversitesi, Sağlık Bilimleri Enstitüsü, Hareket ve Antrenman ABD.





FT-10

Examining the Relationship Between Physical Activity and Gaming and Internet Addiction: A Correlation-Based Meta-Analysis

Mehmet Güllü¹, Sezer Alagöz², Mehmet Akarsu³

¹ Professor, İnönü University, Faculty of Sport Sciences, Department of Physical Education and Sports Teaching, ORCID: 0000-0002-0930-7178

² Master's Student, İnönü University, Institute of Health Sciences, Department of Physical Education and Sport Teaching, ORCID: 0009-0000-6948-3889

³ Assistant Professor, İnönü University, Faculty of Sport Sciences, Department of Physical Education and Sports Teaching, ORCID: 0000-0002-8149-801X

Correspondence: mehmet.gullu@inonu.edu.tr

Abstract

The aim of this study is to examine the relationship between physical activity and internet addiction and gaming addiction using a correlation-based meta-analysis method. While there are studies in the literature investigating the effect of physical activity on digital addictions, comprehensive quantitative syntheses based on correlation coefficients are limited. In this context, a total of 16 independent studies (9 on internet addiction and 7 on gaming addiction) meeting the inclusion criteria were included in the meta-analysis as a result of searches conducted in Google Scholar, PubMed, and Web of Science databases. Pearson correlation coefficients were used in the analyses, Fisher's z-transform was applied, and the analysis was conducted using a random effects model. The combined effect size for internet addiction was found to be $r = -0.237$ (95% CI [-0.400, -0.073], $p = .004$); and for gaming addiction, $r = -0.218$ (95% CI [-0.410, -0.027], $p = .025$). A negative and statistically significant relationship was found between physical activity and addiction in both types of addiction. High levels of heterogeneity were observed ($I^2 = 97.91\%$ for internet; $I^2 = 96.25\%$ for gaming). In conclusion, physical activity appears to be a potential protective factor in reducing digital addiction tendencies; however, due to the correlational design, causal inferences cannot be made, and future longitudinal and experimental studies are needed.

Keywords: Physical Activity, gaming addiction, internet addiction, meta-analysis





INTRODUCTION

The rapid development of technology has both positive and negative effects on individuals, one of which is digital addiction. Digital addiction is a phenomenon characterized by the uncontrolled use of online platforms such as the internet, social media, or digital games, impairing psychological, social, and behavioral functioning. This situation creates addictive behavior in the individual through neurological and psychological mechanisms similar to substance addiction (Ginige, 2017; Wallace, 2014). Digital addiction can be divided into many subtypes. The most common types of digital addiction are gaming and internet

addiction. Internet addiction disorder (IAD) is defined as the loss of the individual's ability to control their internet use, while gaming addiction is classified as "internet gaming disorder" in DSM-5 and is characterized by loss of functionality as a result of excessive time spent on digital games (Griffiths, 2014; Cheng et al., 2025). Recent research has shown that physical activity plays a protective and regulatory role on digital addictions. For example, physical exercise reduces depressive symptoms associated with internet addiction and strengthens self-control (Du & Zhang, 2022). Similarly, studies on adolescents have shown that regular physical activity improves mental well-being by reducing internet addiction and learning burnout (Wang et al., 2023). Furthermore, physical exercise has been identified as a protective factor mitigating the effects of internet addiction in stressful situations such as cyberbullying (Lin et al., 2020). Studies on this topic may differ due to methodological differences, sample size variations, and age groups. Meta-analysis combines the data from these studies to reliably demonstrate the overall effect size (Zhang et al., 2023). While there are studies in the literature that address the effect of physical activity on internet addiction, existing findings vary. Additionally, studies specific to gaming addiction are limited. Furthermore, existing meta-analysis mostly exclude correlation-based studies. Therefore, meta-analysis that systematically examine the relationship between physical activity and both gaming and internet addiction through correlational data are important in filling the knowledge gap in this area. This study aims to systematically examine the relationship between physical activity and gaming and internet addiction in the existing literature. By integrating the increasing correlational findings of recent years, the study aims to reveal the overall effect of physical activity on gaming and internet addiction.

METHOD

Research Design

This study investigated the effect of physical activity on gaming addiction and internet addiction, as well as the dimension and direction of the relationship, using a correlation-based meta-analysis method. Correlation meta-analysis aims to calculate the overall level of relationship between variables by combining Pearson correlation coefficients obtained from different studies (Borenstein et al., 2009). This correlation-based meta-analysis included studies examining the relationship between physical activity and gaming addiction and internet addiction.

Data Collection Process

To find relevant studies in the literature, searches were conducted in Google Scholar, PubMed, and Web of Science databases. Both Turkish and English keywords were used during the search. In Turkish, the terms "Physical Activity", "Gaming Addiction", and "Internet Addiction" were used together, while in English, the keywords "physical activity", "Gaming Addiction", and "Internet Addiction" were used



concurrently. The examined studies were also checked for duplicates. Sixteen studies (9 for internet addiction and 7 for gaming addiction) were included in the meta-analysis, meeting the following criteria: quantitatively examining the relationship between physical activity and gaming and internet addiction; providing Pearson correlation coefficient (r) reports or statistically significant data (OR) from which r can be calculated; and being published in peer-reviewed journals. The method used in this study is correlation meta-analysis, which relies on Pearson correlation coefficient (r) values to indicate the magnitude and direction of the relationship between the variables examined. In the meta-analysis, Fisher's z -transform was applied to approximate the normal distribution of correlation coefficients and stabilize their variances. This transformation reduces potential bias in cases where correlation values have extremes, ensuring reliable calculation of the mean correlation (Welz et al., 2020). One study (Li, 2021) presented the odds ratio (OR) values obtained from logistic regression analysis as a measure of relationship. Initially, the OR value was converted to Cohen's d value ($d = \ln(\text{OR}) \times (\sqrt{3} / \pi)$) using the formula, and then the d value was converted to the correlation coefficient (r) ($r = d / \sqrt{(d^2 + 4)}$). The analyses were conducted using a random effects model. In the study, the I^2 statistic and τ^2 variance value were also calculated to determine heterogeneity. The results were obtained using the "MAJOR" plugin in Jamovi (version 2.6.44) software.

Data Collection Tools

Figure 1. PRISMA flowchart of the meta-analysis study selection process (adapted from PRISMA 2020, Page et al., 2021).

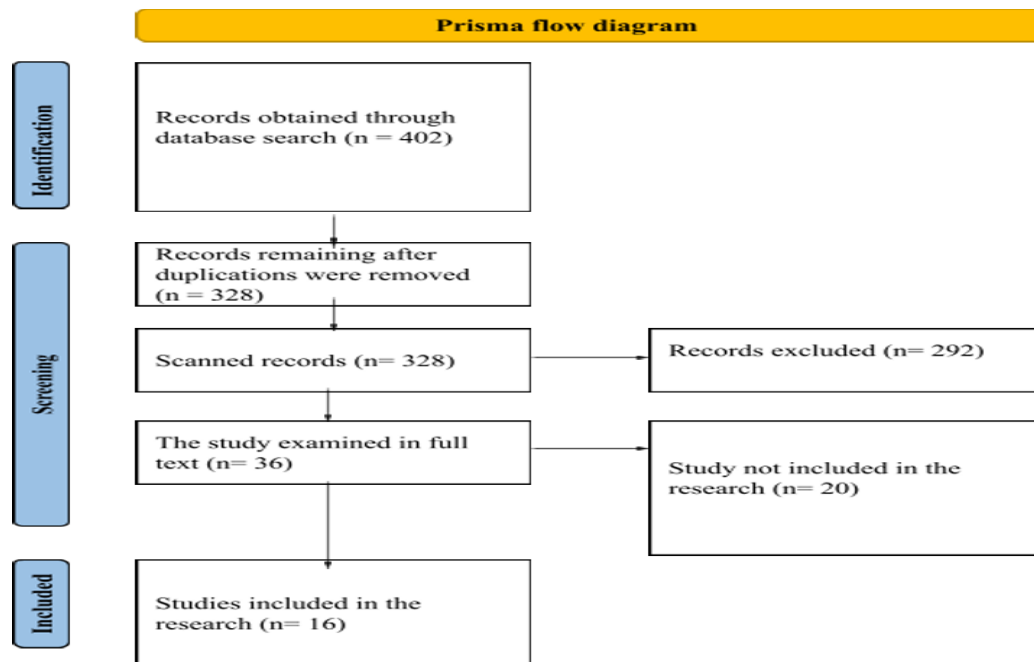




Table 1. Characteristics of the studies included in the meta-analysis.

Study	Correlation (r)	Sample (n)	Country	Physical Activity Scale	Addiction Scale	Addiction Type
1. Alagöz (2022)	-0,025	409	Turkey	CBPAQ	Internet Addiction Test	INTERNET
2. Xu & Tang (2024)	-0,290	1081	China	PARS-3	CIAS-R	INTERNET
3. Liu (2024)	-0,124	1607	China	PAQ-based measure	Internet Addiction Scale	INTERNET
4. Li (2021)	-0,110	1454	China	Physical Exercise duration	Internet Addiction Test	INTERNET
5. Liu (2025)	-0,260	807	China	Physical Exercise Scale	Internet Addiction Scale	INTERNET
6. Koçak & Uyaroğlu (2021)	-0,715	140	Turkey	IPAQ	Internet Addiction Test	INTERNET
7. Gültekin (2025)	-0,173	792	Turkey	IPAQ_SF	Internet Addiction Scale	INTERNET
8. Dursun (2024)	-0,022	211	Turkey	IPAQ_SF	Internet Addiction Scale	INTERNET
9. Du & Zhang (2022)	-0,250	855	China	Physical Activity Level	CIAS-R	INTERNET
10. Alagöz (2022)	-0,050	409	Turkey	CBPAQ	GASFA	GAMING
11. Wong et al. (2024)	-0,090	283	China	GODIN	IGD	GAMING
12. Hazar (2017)	-0,350	330	Turkey	CBPAQ	Digital Game Addiction Scale	GAMING
13. Gültekin (2021)	-0,182	583	Turkey	CBPAQ	Digital Game Addiction Scale	GAMING
14. Havadar (2025)	-0,112	404	Turkey	FAYÖ	Digital Game Addiction Scale	GAMING
15. Cihan (2024)	-0,002	916	Turkey	IPAQ_SF	Digital Game Addiction Scale	GAMING
16. Karaaslan (2023)	-0,659	99	Turkey	IPAQ	Digital Game Addiction Scale	GAMING



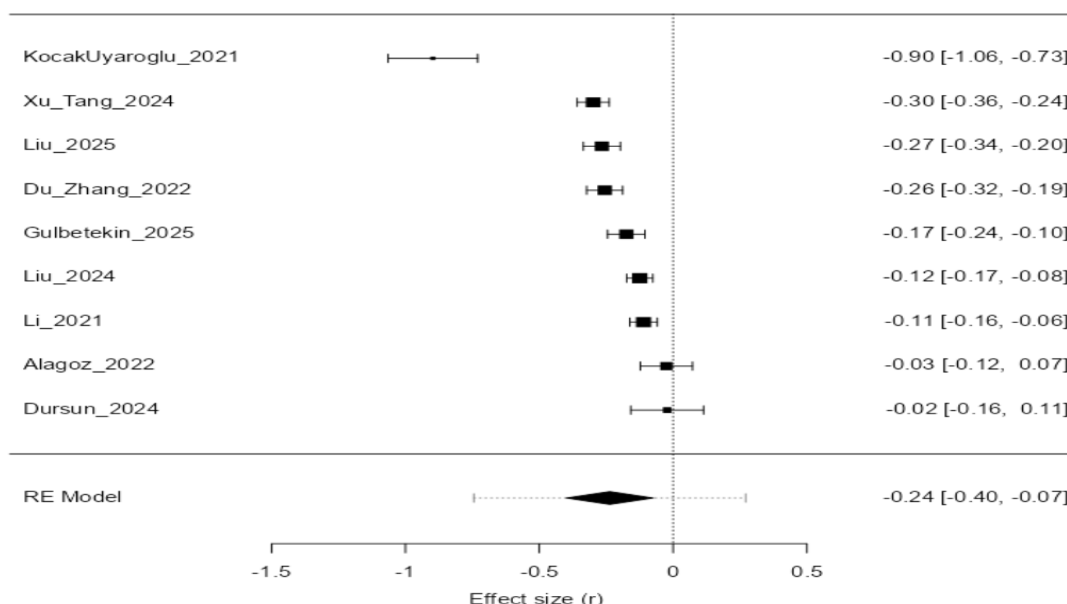
RESULTS

Table 2. Results of the random effects model in the meta-analysis of physical activity and internet addiction.

Intercept	Estimate	se	Z	p	CI Lower Bound	CI Upper Bound
	-0.237	0.0833	-2.84	0.004	-0.400	-0.073
Heterogeneity	Tau	Tau ²	I ²	H ²	df	Q
	0.245	0.0602 (SE=0.0312)	97.91%	47.869	8.000	122.693

According to the analysis results, a negative and significant relationship was found between physical activity and internet addiction ($r = -0.237$, 95% CI $[-0.400, -0.073]$, $p = .004$). In addition, a high level of heterogeneity was detected between studies in the heterogeneity analysis ($Q(8) = 122.693$, $p < .001$, $I^2 = 97.91\%$).

Figure 2. Forest plot based on the meta-analysis results of internet addiction.



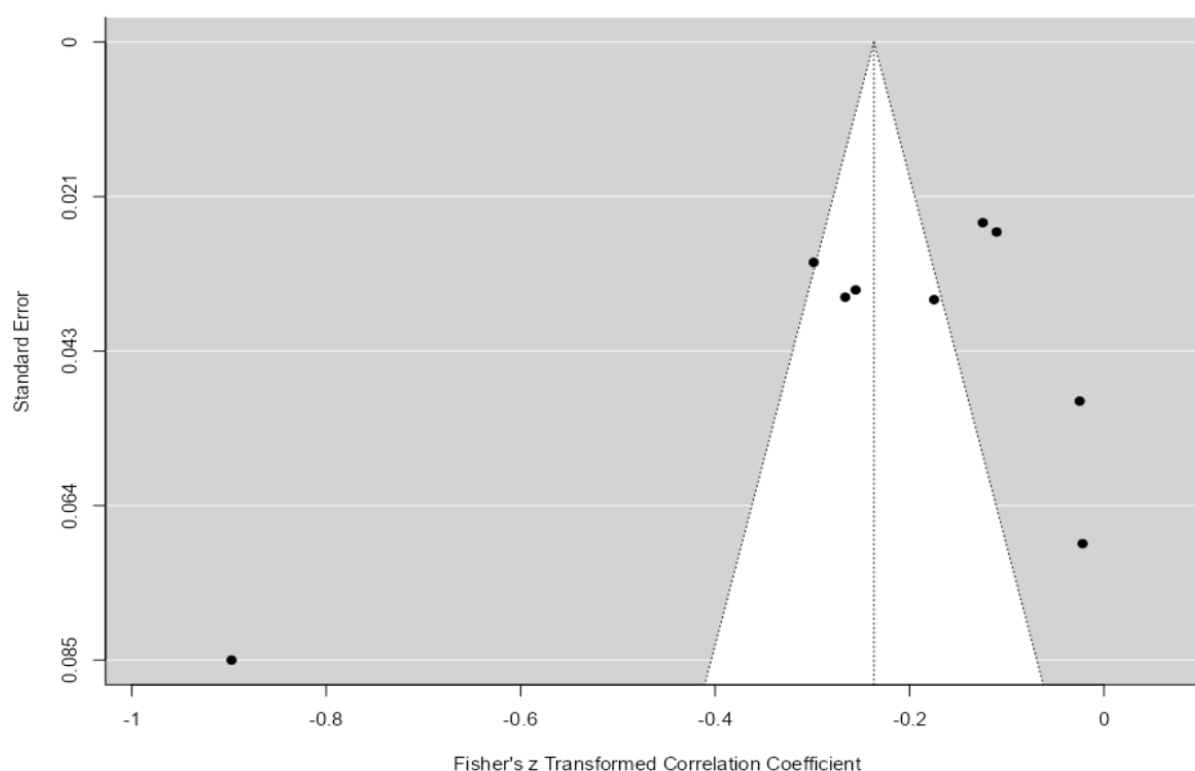
The graph in Figure 2 shows the effect size (r) and 95% confidence interval for each study. Negative correlation coefficients indicate that the tendency towards internet addiction decreases as the level of physical activity increases. The overall result of the meta-analysis shows that the mean effect size is r





= -0.24 (95% CI [-0.40, -0.07]) and the relationship is moderately negative and statistically significant ($p = .004$). The highest negative effect was observed in the study (Kocakuyaroglu, 2021) ($r = -0.90$), which is noteworthy for being a more extreme value than the others.

Figure 3. Funnel plot graph of the meta-analysis of internet addiction.



In the graph, the effect size (Fisher's z-transformed correlation coefficient) of each study is shown on the horizontal axis, and the standard error on the vertical axis. The generally symmetrical distribution of the points suggests low publication bias. Additionally, Egger's regression test ($p = 0.086$) and Begg test ($p = 0.761$) show that publication bias is not statistically significant.



Table 3. Results of the random effects model in the meta-analysis of physical activity and gaming addiction.

Intercept	Estimate	se	Z	p	CI Lower Bound	CI Upper Bound
	-0.218	0.0975	-2.24	0.025	-0.410	-0.027
Heterogeneity	Tau	Tau ²	I ²	H ²	df	Q
	-0.251	0.0631 (SE= 0.0384)	%96.25	26.660	6.000	79.885

According to the random effects model and heterogeneity statistics in table 3, a negative and significant relationship was found between physical activity and gaming addiction ($r = -0.218$, 95% CI $[-0.410, -0.027]$, $p = .025$). In the heterogeneity analysis ($Q(6) = 79.885$, $p < .001$, $I^2 = 96.25\%$), a high level of heterogeneity was detected among the studies.

Figure 4. Forest Plot according to the meta-analysis results of gaming addiction.

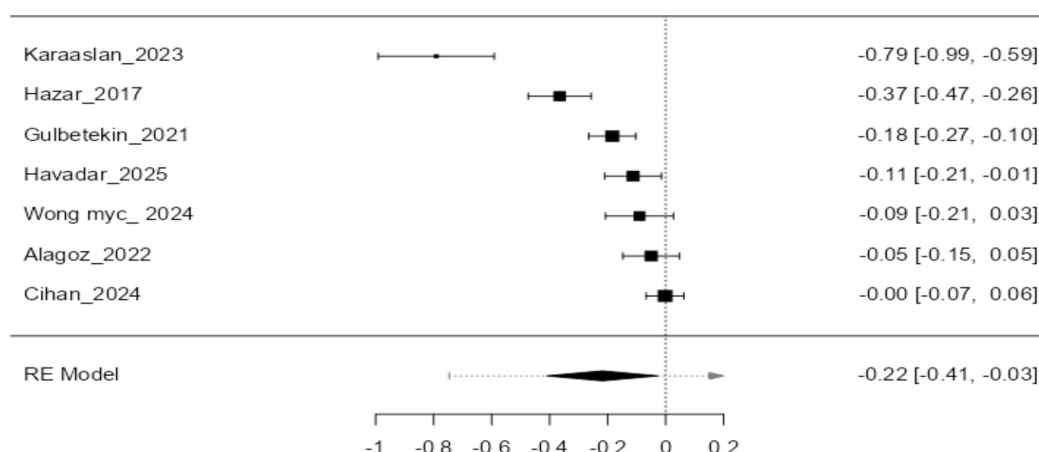
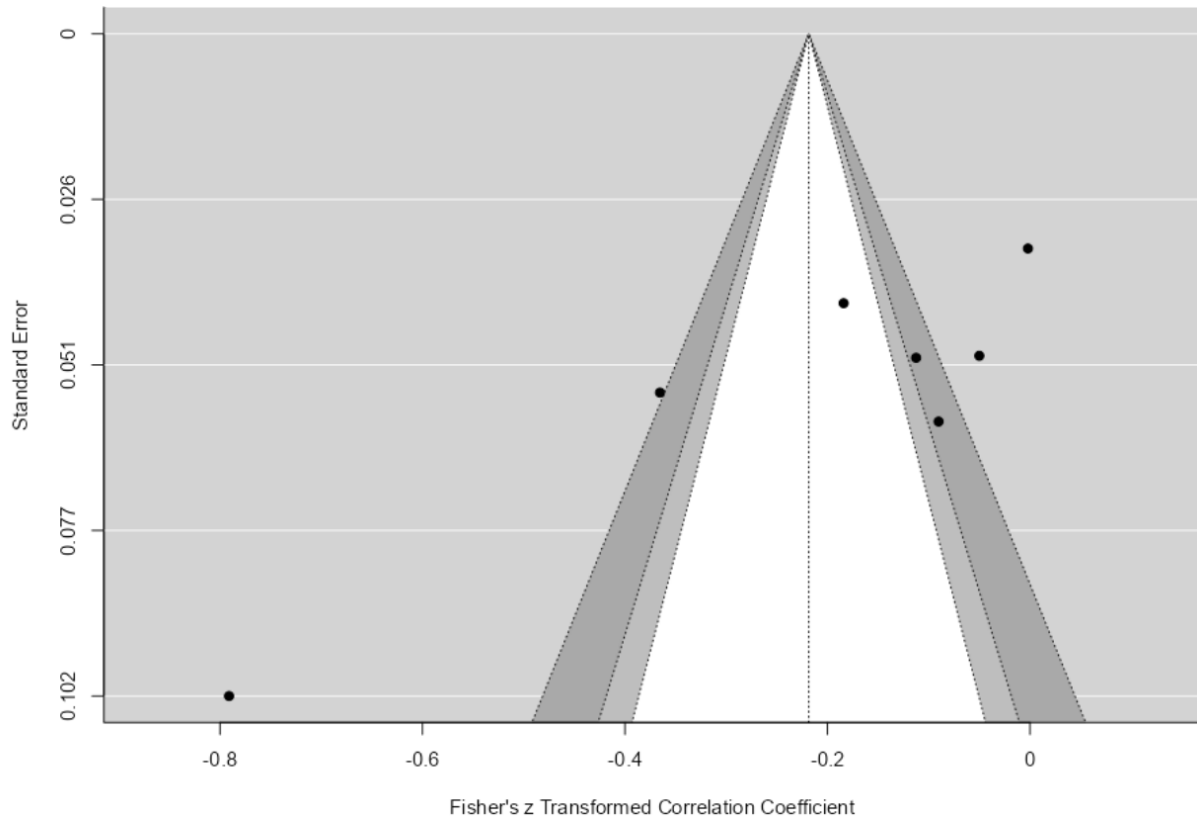


Figure 4 shows the effect size (r) and 95% confidence interval for each study. The analysis result shows an overall effect size of $r = -0.22$ (95% CI $[-0.41, -0.03]$), with a negative, low-to-moderate, and statistically significant correlation ($p = .025$). This finding indicates that increased physical activity reduces the tendency towards gaming addiction. The highest negative correlation was observed in the



study (Karaaslan_2023) ($r = -0.79$), making it one of the studies that contributed most to the heterogeneity in the model.

Figure 5. Funnel plot of the gaming addiction meta-analysis.



In the funnel plot of publication bias shown in Figure 5, the effect size (Fisher's z-transformed correlation coefficient) of each study is shown on the horizontal axis, and the standard error is shown on the vertical axis. The generally symmetrical distribution of the points indicates low publication bias in the analysis. According to the Egger test results, a significant asymmetry was observed in the funnel plot ($p < .001$), which is thought to be due to the influence of some small sample size studies. In contrast, the Begg test ($p = 0.136$) does not indicate significant publication bias. All these findings show that the meta-analysis results are generally independent of publication bias and reliable.

DISCUSSION

This study, conducted using correlational meta-analysis, evaluated the relationship between physical activity and internet and gaming addiction. The analysis results demonstrate a negative and statistically significant correlation between physical activity and both internet addiction ($r = -0.24$, $p = .004$) and gaming addiction ($r = -0.22$, $p = .025$).





Based on this data, it can be said that as individuals' physical activity levels increase, their tendency to exhibit digital addiction decreases significantly. Although the effect sizes determined in the analyses range from low to moderate, the significant and stable negative correlation indicates that physical activity has a preventive role against digital addictions. The known potential of physical activity—such as coping with stress, improving self-control, and strengthening real-life social connections—can minimize an individual's need to escape into virtual environments. Through these mechanisms, it can contribute to weakening the reward and avoidance cycles that play a role in maintaining addictive behaviors. Another important finding that stands out in the analyses is the high level of heterogeneity between studies for both types of addiction ($I^2 = 97.91\%$ for internet addiction; $I^2 = 96.25\%$ for gaming addiction). This high variation may stem from the atmosphere in which the research was conducted, the characteristics of the samples, and the diversity of measurement tools used. Furthermore, the very strong negative correlation values reported in some studies (Karaaslan, 2023) $r = -0.79$ and (Kocakuyarlıoğlu, 2021) $r = -0.90$ may have been decisive in the overall effect size calculation. Therefore, these structural differences between studies must be considered when evaluating meta-analysis results. While examinations for publication bias showed no signs of bias as a result of internet addiction, Egger test results indicated asymmetry as a result of gaming addiction. However, despite this asymmetry, the high calculated Fail-safe N values and the fact that no additional study was needed in the Trim-and-Fill analysis confirm that the overall results obtained are statistically robust and reliable. This situation demonstrates that the meta-analysis findings are not shaped solely by the influence of small sample size studies. The parallelism of the effect sizes obtained for both types of addiction is a noteworthy finding. This parallelism indicates that physical activity functions as a regulatory mechanism not only against a specific subtype but also against digital addiction in general. Additionally, the higher effect of physical activity on internet addiction compared to gaming addiction may stem from the broader range of behavioral variations encompassed by the internet, and therefore a stronger association with a lack of physical activity. One of the most fundamental contributions of this research to the literature is its quantitative synthesis of the relationship between physical activity and gaming and internet addiction in light of correlational data. In this way, data from different geographical locations, different sample characteristics, and various measurement methods have been analyzed from a holistic perspective. However, the correlational design of the studies examined prevents the establishment of a definitive causal link between the variables. The question of whether physical activity habits or the intensity of physical activity interventions are more effective in reducing gaming and internet addiction needs to be clarified more clearly through longitudinal and experimental studies. Meta-analysis studies are needed in this context.

CONCLUSION

The current meta-analysis demonstrates a statistically significant and inverse relationship between physical activity and internet and gaming addiction. These results indicate that physical activity can be considered an effective protective mechanism in minimizing and preventing the risk of digital addiction. The similar effect sizes calculated for internet and gaming addiction suggest that physical activity may have a regulatory function on the phenomenon of digital addiction in general, rather than on a specific type. However, the high degree of heterogeneity found in the analyses indicates that a cautious approach should be taken in interpreting the findings.



In this context, it is important that future studies delve deeper into potential moderating variables such as age groups, cultural dynamics, and diversity in measurement tools. The research results show that implementing policies that encourage physical activity in educational institutions and youth centers can be an effective supporting mechanism in the fight against digital addiction; however, experimental and longitudinal studies are needed in the future to definitively prove the cause-and-effect relationship between physical activity and addiction.

REFERENCES

- Alagoz, N., & Ulutas Keskinikilic, A. (2022). The relationship between internet and game addiction and the levels of physical activity of the secondary education students. *Medicine Science*, 11(1), 267–273. <https://doi.org/10.5455/medscience.2021.12.405>
- Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). Effect sizes based on correlations. In *Introduction to meta-analysis* (pp. 41–63). Wiley. <https://doi.org/10.1002/9780470743386.ch6>
- Cheng, X., Fan, Y., Li, S., Li, X., Jin, S., Zhou, C., & Feng, Y. (2025). Research landscape and trends of internet addiction disorder: A comprehensive bibliometric analysis of publications in the past 20 years. *Digital Health*, 11. <https://doi.org/10.1177/20552076251336940>
- Cihan, E., & Şahbaz Pirinççi, C. (2024). Dijital oyun bağımlılığının fiziksel aktivite, bel/boyun ağrısı ve stres düzeyi ile ilişkisi. *Spormetre: Beden Eğitimi ve Spor Bilimleri Dergisi*, 22(4), 53–62. <https://doi.org/10.33689/spormetre.1464500>
- Dursun, B., Gerçek, H., & Torlak, M. S. (2024). Üniversite öğrencilerinde fiziksel aktivite düzeyi ile nomofobi ve internet bağımlılığı arasındaki ilişki. *Başkent Üniversitesi Sağlık Bilimleri Fakültesi Dergisi*, 9(2), 223–235.
- Du, Z., & Zhang, X. (2022). Analysis of the mediating effects of self-efficacy and self-control between physical activity and internet addiction among Chinese college students. *Frontiers in Psychology*, 13, 1002830. <https://doi.org/10.3389/fpsyg.2022.1002830>
- Ginige, P. (2017). Internet addiction disorder. <https://doi.org/10.5772/66966>
- Griffiths, M. D. (2014). Internet addiction disorder and internet gaming disorder are not the same. *Journal of Addiction Research & Therapy*, 5. <https://doi.org/10.4172/2155-6105.1000e124>





- Gülbetekin, E., Güven, E., & Sökmen, Ö. (2025). The effect of internet addiction on physical activity and dietary habits in high school students. *Journal of Public Health*, 33, 925–932. <https://doi.org/10.1007/s10389-023-02083-0>
- Gülbetekin, E., Güven, E., & Tuncel, O. (2021). Adolesanların dijital oyun bağımlılığı ile fiziksel aktivite tutum ve davranışlarını etkileyen faktörler. *Bağımlılık Dergisi*, 22(2), 148–160. <https://doi.org/10.51982/bagimli.866578>
- Havadar, T., & Çınan, İ. (2025). Üniversite öğrencilerinde dijital oyun bağımlılığı ile günlük fiziksel aktivite yeterliliği arasındaki ilişkinin incelenmesi. *Spor Eğitim Dergisi*, 9(2), 223–237. <https://doi.org/10.55238/seder.1698816>
- Hazar, Z., Tekkurşun Demir, G., Namlı, S., & Türkeli, A. (2017). Investigation of the relationship between digital game addiction and physical activity levels of secondary school students. *Niğde Üniversitesi Beden Eğitimi ve Spor Bilimleri Dergisi*, 11(3), 316–330.
- Karaaslan, Y., Özyurt, F., & Karaaslan, U. (2023). Determination of physical activity level, functional capacity and depression in children with digital game addiction. *Journal of Academic Research in Medicine*, 13(1), 41–49. <https://doi.org/10.4274/jarem.galenos.2023.28942>
- Kocak Uyaroglu, A., Lok, N., & Lok, S. (2021). The relationship of internet addiction and physical activity in healthcare professionals. *Gymnasium – Scientific Journal of Education, Sports, and Health*, 22(1), 113–123. <https://doi.org/10.29081/gsjesh.2021.22.1.08>
- Li, Z.-L., Liu, R., He, F., Li, S.-Y., Zhao, Y.-J., Zhang, W.-Y., Zhang, Y., Cheung, T., Jackson, T., Tang, Y.-L., & Xiang, Y.-T. (2021). Prevalence of internet addiction disorder and its correlates among clinically stable adolescents with psychiatric disorders in China during the COVID-19 outbreak. *Frontiers in Psychiatry*, 12, 686177. <https://doi.org/10.3389/fpsy.2021.686177>
- Lin, L., Liu, J., Cao, X., Wen, S., Xu, J., Xue, Z., & Lu, J. (2020). Internet addiction mediates the association between cyber victimization and psychological and physical symptoms: Moderation by physical exercise. *BMC Psychiatry*, 20. <https://doi.org/10.1186/s12888-020-02548-6>





- Liu, Y., Jin, Y., Chen, J., Zhu, L., Xiao, Y., Xu, L., & Zhang, T. (2024). Anxiety, inhibitory control, physical activity, and internet addiction in Chinese adolescents: A moderated mediation model. *BMC Pediatrics*, 24, 663. <https://doi.org/10.1186/s12887-024-05139-6>
- Liu, Y., Xiao, T., Zhang, W., Xu, L., Wang, Y., & Zhang, T. (2025). The relationship between family support and internet addiction among adolescents in Western China: The chain mediating effect of physical exercise and depression. *BMC Pediatrics*, 25, 397. <https://doi.org/10.1186/s12887-025-05733-2>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
- The jamovi project. (2024). *jamovi* (Version 2.6) [Computer software]. <https://www.jamovi.org>
- Wallace, P. (2014). Internet addiction disorder and youth. *EMBO Reports*, 15. <https://doi.org/10.1002/embr.201338222>
- Wang, K., Li, Y., Yang, Y., Zhang, T., & Luo, J. (2023). The role of loneliness and learning burnout in the regulation of physical exercise on internet addiction in Chinese college students. *BMC Public Health*, 23. <https://doi.org/10.1186/s12889-023-16783-5>
- Welz, T., Doebler, P., & Pauly, M. (2020). Fisher transformation based confidence intervals of correlations in fixed- and random-effects meta-analysis. *British Journal of Mathematical and Statistical Psychology*. <https://doi.org/10.1111/bmsp.12242>
- Wong, M. Y. C., Yuan, G. F., Liu, C., Lam, S. K. K., & Fung, H. W. (2024). The relationship between internet gaming disorder, sleeping quality, self-compassion, physical activity participation and psychological distress: A path analysis. *Cambridge Prisms: Global Mental Health*, 11, e67. <https://doi.org/10.1017/gmh.2024.36>
- Xu, J., & Tang, L. (2024). The relationship between physical exercise and problematic internet use in college students: The chain-mediated role of self-control and loneliness. *BMC Public Health*, 24, 1719. <https://doi.org/10.1186/s12889-024-19226-X>





Zhang, Y., Li, G., Liu, C., Chen, H., Guo, J., & Shi, Z. (2023). Mixed comparison of interventions for different exercise types on students with internet addiction: A network meta-analysis. *Frontiers in Psychology, 14*.
<https://doi.org/10.3389/fpsyg.2023.1111195>



FT-11

Peak Expiratory Flow Rate Response of Female Obesity Following 12-week Aerobic Dance Circuit Training in Tertiary Institutions in Oyo State, Nigeria

¹Olusegun Adewale AJAYI, ²Oluwasogo Ruth OGUNLEYE & ³Racheal Bolanle AJALA
¹Emmanuel Alayande University of Education, Oyo State, Nigeria, ²National Open University, Abuja, Nigeria, ³Osun State College of Education, Ila-Orangun, Nigeria
segxyajayi@gmail.com

Abstract

Poor cardiorespiratory function is a major health risk associated with obesity and unhealthy lifestyle practices among young adults. Obesity contributes to reduced pulmonary efficiency, poor physical fitness, and increased vulnerability to chronic diseases. This study investigated the effects of Aerobic Dance Circuit Training Programme on Peak Expiratory Flow Rate (PEFR) among obese female university undergraduates in Oyo Town, Nigeria. The study adopted a pretest-posttest control group quasi-experimental design using a 2×2×4 factorial matrix. Seventy obese female undergraduates with Body Mass Index (BMI) ≥ 25.0 kg/m² were purposively selected and categorised into obesity classes I–IV using WHO standards. Participants were randomly assigned to experimental (35) and control (35) groups. The intervention lasted 12 weeks. Data were collected using standard PEFR assessment procedures and analysed using descriptive statistics and Analysis of Covariance at 0.05 level of significance. Participants' mean age was 21.10±2.46 years. Obesity distribution showed class I (21.4%), class II (60.0%), class III (17.1%), and class IV (1.4%). Significant improvements in PEFR were observed following participation in ADCT. The main effects of age and obesity class were not significant, nor was the treatment-age interaction ($F(1,57)=1.12$; $\eta^2=0.04$) and the three-way interaction effect was not significant ($F(2,57)=4.02$; $\eta^2=0.03$). Aerobic Dance Circuit Training significantly improved PEFR among obese female undergraduates, irrespective of age and obesity class. Regular participation in aerobic dance exercise is therefore recommended for improving respiratory health and quality of life.

Keywords: Pulmonary Function, Cardiorespiratory Fitness, Exercise Intervention and Respiratory Health



INTRODUCTION

Obesity, a skyrocketing epidemic and unbridled international spread on the global scene affecting not only developed nations but also the developing countries. It has becoming more aware among higher institutions in Nigeria. Obesity is a disorder necessitated by anomalous or disproportionate fat amassed in the adipose tissue of the human body (Ajayi, 2019). It was further stated that obesity could be seen as a medical condition that could warrant degeneration of health and increase the likelihood of early death due to excess fat in the body accumulated over a period of time. This was confirmed by Fabunmi (2011) that the consumption of food beyond the required measure needed by the body for energy and body building could be the pivot for accumulation of excess fat. It could therefore be concluded that obesity develops from surplus energy ingestion as well as underused of energy. Obesity results from a complex interaction of genetic, behavioral, environmental and socioeconomic factors causing an imbalance in energy production and expenditure (WHO, 2014).

The current medical definition establishes body mass index (BMI) which is the ratio of weight in kilograms to the square of height in meters. According to Centre for Disease and Prevention (CDC) (2017), a BMI between 25 and 29.9 is considered overweight, and BMI equal to or greater than 30 is considered obese. WHO classification of obesity, based on the BMI (Body Mass Index), ranges individuals with BMI >30 Kg/m² as obese, BMI between 25–29.9 Kg/m² as overweight and BMI >40 Kg/m² as severe/ morbid obesity. As per Asian Indian guidelines, people are categorized as underweight (<18.5 kg/m²), normal or lean BMI (18.5–22.9 kg/m²), overweight (23.0 –24.9 kg/m²) and obese (≥25 kg/m²) (Runge & Greganti, 2008).

The rise in obesity has become more concerned and the need to tackle the global obesity in an urgent manner. It was reported by World Obesity Atlas (2023) that in 2022, 1 in 8 people in the world were living with obesity. Worldwide adult obesity has more than doubled since 1990, and adolescent obesity has quadrupled. It was reported in the same year that 2.5 billion adults (18 years and older) were overweight. Of these, 890 million were living with obesity. Data for the years from 2011 to 2014 demonstrate that approximately 37% of adults and 17.2% of youth, ages 12-19, were obese (CDC, 2017). Among adults, obesity was more prevalent among middle aged (40-59) and older adults (over 60) than among young adults (age 20-39), with more women being classified as obese (38.3%) than men (34.3%) (Centers for Disease Control and Prevention 2017); among youth, the prevalence of obesity increased in children as they aged, with 2–5-year-olds demonstrating the lowest incidence of obesity and 12-19 year-olds demonstrating the highest (Centers for Disease Control and Prevention 2017).

These figures alone are concerning; however, data collected since 1999 shows that the prevalence of obesity has increased from 30.5% of adults in 1999 to 37.7% in 2014, and from 13.9% of youths in 1999 to 17.2% in 2014 (Ogden, Carroll, Kit and Flegal (2012). In 2035, an estimated 68 million children will be suffering from high blood pressure due to their high BMI, an estimated 27 million will be living with hyperglycaemia due to their high BMI, and 76 million will have low HDL cholesterol due to their high BMI. The symptoms of these precursors to serious disease are largely invisible, but the children will be entering adulthood already on track for strokes, diabetes and heart disease (WHO, 2024). This trend is particularly concerning as it demonstrates that obesity continues to rise despite efforts to combat and decrease it.



Several studies had been done on various types of obesity-induced dysfunctions, disorders and diseases. However, its impact on the pulmonary functional status is less explored. Saraswathi, Christy, Saravanan, and Sembulingam (2014) stated that obesity impairs the respiratory functions by inducing airway hyper-responsiveness in adults, which has been linked with the development of asthma. Most of the obesity and pulmonary function-related studies had been conducted in youngsters with the age group of 5 to 16 years or in older people above 50 years of age (Saraswathi, Christy, Saravanan, & Sembulingam, 2014)). From this analysis, it was discovered that the age group of 16 to 25 years, mainly in higher institutions, is the crucial adolescent age that is highly susceptible for obesity and surprisingly, this group was least targeted in several studies.

Pulmonary functions are generally determined by respiratory muscle strength, compliance of the thoracic cavity, airway resistance and elastic recoil of the lungs. Narrowing of airways is expressed in terms of various expiratory flow rates (Shanmugapriya and Vinodha, 2021). Peak Expiratory Flow Rate (PEFR) is one of the criteria in pulmonary testing for diagnosing of respiratory diseases due to airflow limitations in obesity. It is a measure of airflow in the bronchial tree and indicates bronchial tone, and is affected by age, gender, height, body weight, and other physical activity.

Several interventions have been suggested for lowering the prevalence of obesity but there is no consensus on the best way to prevent and manage it. Many of these interventions have been aimed at obese and inactive youth with a focus on improving overall lifestyles, such as nutrition and addressing physical inactivity. According to Uzoalor (2006) it was reported that most obese individual have a negative attitude towards the change in their eating habit and are lukewarm towards required exercises, and high dropout was recorded. Obese persons need activities that are exciting, interesting and fun-packed.

Aerobic dance and circuit training have been categorized as aerobic exercise. During aerobic exercise, minute ventilation increases and increased load is placed on the diaphragm, the rib cage and abdominal muscles, which are respiratory muscles, thus leading to improvement in vital capacity resulting in PEFR. This occurs as a result of regular exercise, strengthening the respiratory muscle. The combination of these two training methods is termed aerobic dance circuit training (ADCT).

Thus, ADCT in this study is a training program that consists of series of aerobic dance exercises performed to improve cardiorespiratory variables and to reduce fat. It is a form of physical exercise that combines rhythmic aerobic exercise to pre-set music with stretching and strength training routine in a circuit training (Ajayi, 2019). The ADCT can usually be completed easily by participants of all ages and fitness levels. This is one of the unique characteristics of ADCT, in that the same step can be modified by the participants to meet the needs of their individual workout. A typical ADCT workout fulfills the cardiorespiratory and body composition training principles (Frequency, Intensity, Time, and Type of activity). It is similar to any cardiorespiratory workout classes which begin with a warmup of light activity and stretching exercise for 10 minutes, progress to the 20–30-minute workout phase and then have a gradual cool-down period for 10 minutes. Thus, the present study was undertaken to find out the effects of 12 weeks of ADCT on PEFR of obese female undergraduates in Oyo State.



Research Hypotheses

The following hypotheses were tested in the study:

1. There will be no significant main effects of treatment on:
 - a. Peak Expiratory Flow Rate (PEFR),
2. There will be no significant interaction effect of:
 - a. Treatment and Age on PEFR
 - b. Treatment and Class of obesity on PEFR.
 - c. Age and Class of obesity on PEFR.
 - d. Treatment, Age and Class of obesity on PEFR.

METHODS

Research design

The research design for this study was a pretest-posttest control group quasi-experimental design using 2x2x4 factorial matrix.

Participants

The population for this study was apparently all obese female undergraduates of tertiary institutions in Oyo State, Nigeria. Seventy (70) obese female undergraduates took part in this study. Purposive sampling technique was used to select the participants for the study; because of the peculiar characteristics required BMI ≥ 25.0 as the yardstick to qualify. Purposive sampling technique was used to select two institutions in Oyo state; Emmanuel Alayande University of Education, Oyo and Ajayi Crowther University, Oyo. This restriction helped to minimize to the barest minimum the effect of nutrition on body composition variables in this study. The participants were randomly assigned into two (2) groups (35 participants per group), experimental group and control group. Experimental group went through the 12 weeks aerobic dance circuit training session while control group was placed on placebo (12 weeks lesson of lifestyle education).

Data Collection

The participants were asked to sign the informed consent form showing their interest to be part of this research work and their readiness to cooperate with the researcher. After this, the data were collected before (Pre) and after (Post) training programs.

This aerobic dance circuit training (ADCT) consisted of a series of exercises interspaced and performed at each station with a minimal 60-second rest in between. Exercises were performed at a safe level of moderate intensity between 40% (week 1) and 70% (week 12) of age-predicted MaxHR. Aerobic dance circuit training program was performed by all participants for the entire twelve (12) week period. The instructors lead the exercise at each station. The body movements were simplified and made easy to involve the use of both upper and lower extremities and the back. The participants were distributed to six stations. The frequency was 3 times/week for twelve weeks; each session consisted of 3 minutes warm up, 3 minutes cool down and 30-60 minutes of aerobic dance with brief rest periods to move from one station to the next station. The choreography exercise consisted of arm, leg, waist-hip and progressive step-aerobic movements; performed with music.





The control group participants were placed on placebo of teaching them lifestyle education which consisted of series of activities such as, nutrition and health education, concept of obesity, healthy lifestyles, importance of exercise, important of physical fitness activities and body composition. The training objectives were to identify factors influencing attitudes and practices of obese regarding diet, causes of obesity, concept of HELP (Health, Everyone, Lifetime and Personal physiology), to examine the importance of engaging in physical activities and how to measure body mass index (BMI). The lectures were done 20 minutes contact/3 times in a week lesson (Monday, Wednesday and Friday).

The instruments used for data collection were: Peak Flow Meter: Mini Wright Peak Flow Meter PFM20 was used to measure Peak Expiratory Flow Rate (PEFR) in milliliters. Sport timer alarm stop-watch used to time the rhythmic aerobic activities; Pacific DVD player used to provide the variety of aerobic dance music; plastic cones were used to demarcate each exercise station; digital metronome was used to determine increment and level of intensity on the variety of tempos of the aerobic dance; and heart rate monitors was used to monitor exercise intensity.

Data Analyses

Descriptive statistics of means, range, standard deviation, frequency, percentage, pie chart, bar chart analysis were used to for the physical characteristics of the participants and research questions. Analysis of covariance (ANCOVA) was used to analyze hypotheses obtained at 0.05 alpha levels to determine the acceptance and rejection of the stated hypotheses. Adjusted marginal means were used to show the direction of differences in variables measured.

RESULTS

The demographic variables of the participants were presented as shown below:

Demographic Variables

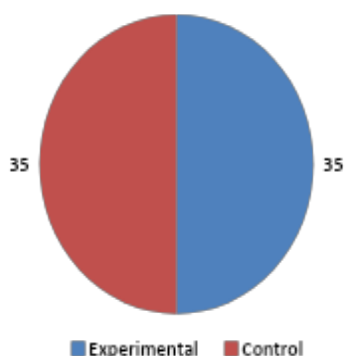


Figure 1: Pie Chart Showing the Frequency distribution of participants based on Group

Figure 1 shows the frequency distribution chart of participants with 35(50.0%) of the experimental group (ADCT) and 35(50.0%) control groups (Lifestyle Education).



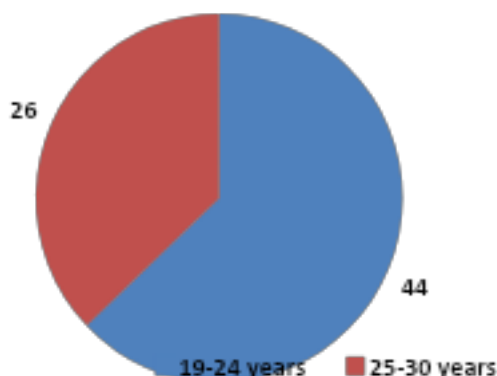


Figure 2: Pie Chart Showing the Frequency distribution of participants based on age

Figure 2 shows the descriptive statistics of the age of participants. 44(62.9%) of the participants are aged 19-24 years and 26(37.1%) are aged 25-30 years. It means that high degree of the participants was in the age range of 25-30 years.

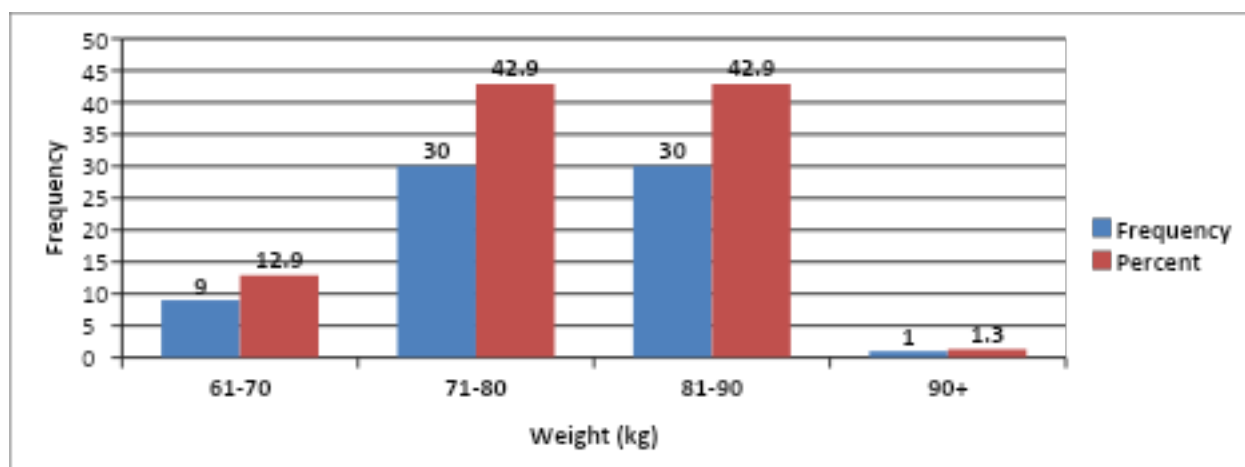


Figure 3: Bar Chart Showing the Frequency distribution of participants based on weight (kg)

Figure 3 shows that 9(12.9%) of the participants weighed 61-70Kg, 30(42.9%) weighed 71-80Kg, 30(42.9%) weighed 81-90Kg and 1(1.3%) weighed 90Kg and above. The above data was the pretreatment measurements of all the participants.



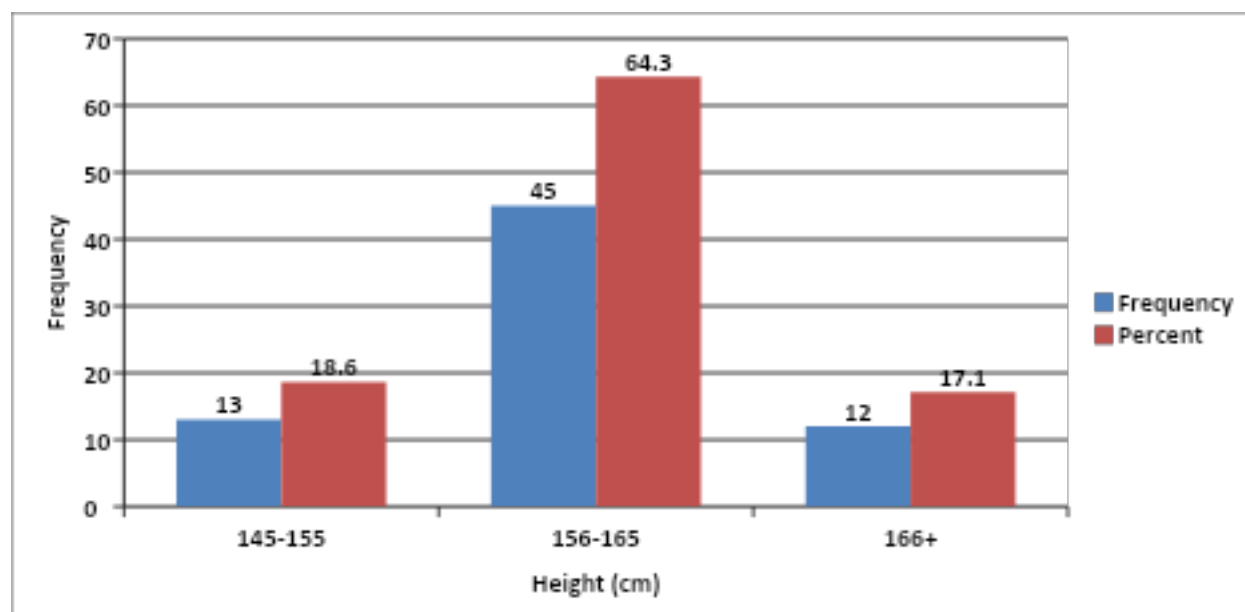


Figure 4: Bar Chart Showing the Frequency distribution of participants based on height (cm)

Figure 4 shows that 13(18.6%) of the participants had 145-155 cm, 45(64.3%) had 156-165 and 12(17.1%) had 166 cm and more.

Table 1: Distribution of the participants by Class of obesity

Class of obesity	Frequency	Percentage	Norms	Interpretations
Class 1 obesity	15	21.4	25.0-30.0	Average
Class 2 obesity	42	60.0	30.0-35.0	Fatter than average
Class 3 obesity	12	17.1	35.0-40.0	Fat
Class 4 obesity	1	1.4	40.0-above	Overfat
Total	70	100.0		

Using the classification of Japan (2013), table 5 shows that 15(21.4%) of the participants were class 1 obesity which were at average level compared to the norms, 42(60.0%) class 2 obesity were fatter than average level, 12(17.1%) class 3 obesity are fat compared to the standard norms while 1(1.4%) class 4 obesity is categorized as overfat as described above. The above table revealed that all the participants were above the recommended normal height and weight expected of their age.

Table 2: ANCOVA showing the main effect and interaction effects of Treatment, Age and Class of obesity on PEFR.



Source	Sum Squares	of df	Mean Square	F	Sig.	Eta. Sq
Corrected Model	1064212.460	13	81862.497	30.691	.000	.600
<u>Main Effect:</u>						
Treatment Group						
Age	162351.731	1	162351.731	60.867	.000	.186
Class of obesity	53042.107	1	53042.107	19.886	.000	.069
<u>2-way Interactions:</u>	12818.434	3	4272.811	1.602	.189	.018
Treatment x Age						
Treatment x Class of obesity	2985.717	1	2985.717	1.119	.291	.004
Age x Class of obesity	18174.501	3	6058.167	2.271	.081	.025
<u>3-way Interactions:</u>	4178.094	2	2089.047	.783	.458	.006
Treatment x Age x Class of obesity						
Error	13674.049	2	6837.024	2.563	.079	.019
Total	699501.825	57	12271.962			
	1773714.286	69				

The result in Table 2 shows that there is a statistically significant main effect of treatment on PEFR ($F(1,57) = 60.867$, $p < .05$, $\eta^2 = .186$). This indicates that PEFR significantly differed across the treatment groups. The effect size .186 suggests a large practical effect, meaning that approximately 18.6% of the variance in PEFR is explained by the treatment condition. Therefore, the null hypothesis is rejected.

The interaction between treatment and age is not statistically significant ($p = .291$). This suggests that the effect of treatment on PEFR does not differ significantly across different age groups. The very small effect size ($\eta^2 = .004$) confirms a negligible interaction effect. Therefore, the null hypothesis is not rejected.

The interaction between treatment and class of obesity is not statistically significant at the 0.05 level ($p = .081$), although it approaches significance. This indicates that the effect of treatment on PEFR does not significantly vary across different obesity classes, even though a weak trend may exist. The effect size ($\eta^2 = .025$) is small. Therefore, the null hypothesis is not rejected.

The interaction effect is not significant ($p = .458$), indicating that age and obesity class do not jointly influence PEFR in a meaningful way. The effect size is negligible ($\eta^2 = .006$), suggesting minimal combined influence. The null hypothesis is not rejected.

The three-way interaction is not statistically significant ($p = .079$), although it is close to the threshold for significance. This suggests that the combined effect of treatment, age, and obesity class does not significantly interactively influence PEFR. The effect size is small ($\eta^2 = .019$). Therefore, the null hypothesis is not rejected.

Table 3: The average PEFR of obese female undergraduates per week

PEFR	Baseline	week 4	week 8	week 12
Experimental	334.0000	339.1429	352.5714	358.2857
Control	225.7143	225.7143	234.5714	232.8571

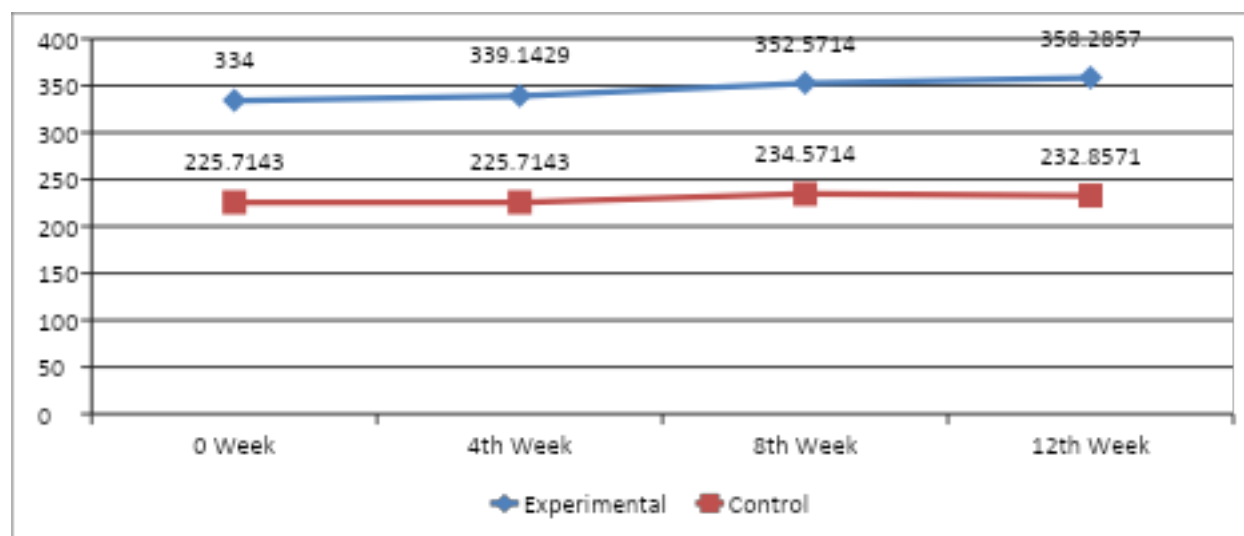


Figure 5: Line graph showing the mean scores of PEFR of the respondents in the Experimental and Control groups in the baseline, 4th week, 8th week and 12th week

Table 3 and Figure 5 show the average PEFR of experimental and control group participants taken by week. The value shows that experimental participants' PEFR increases from the Baseline to week 12 of aerobic dance circuit training

DISCUSSION

The result revealed a statistically significant main effect of treatment on PEFR indicating that participants exposed to the treatment intervention demonstrated significantly improved PEFR compared to those in the control condition. The large effect size suggests that the treatment accounted for a substantial proportion of the variance in PEFR, confirming its strong physiological impact. This finding is consistent with earlier empirical evidence on the effectiveness of structured aerobic-based interventions in improving respiratory function. For example, Fabunmi (2011) reported that aerobic exercise programmes significantly enhanced respiratory functions among obese and non-obese sedentary individuals in Ibadan, Nigeria, demonstrating that regular aerobic conditioning improves ventilatory capacity irrespective of obesity status. Similarly, Ajayi (2019) found that aerobic dance circuit training significantly improved cardiorespiratory variables among obese female college students, reinforcing the capacity of structured exercise to enhance pulmonary efficiency. In addition, Ojo (2020) observed that interval training produces significant improvements in selected physiological responses, including components related to respiratory efficiency and physical fitness. The present finding





therefore aligns with these studies and supports the physiological explanation that regular structured exercise enhances respiratory muscle strength, airway clearance, and expiratory flow dynamics, culminating in improved PEFR.

The interaction between treatment and age was not statistically significant, indicating that the effect of the treatment on PEFR was consistent across different age groups. The negligible effect size further confirms that age did not meaningfully influence the effectiveness of the intervention. This outcome aligns with Ajayi, Abayomi, and Ojo (2013), who emphasized that aerobic dance exercise can be beneficial across different population groups, including individuals with varying demographic and health characteristics. Similarly, Ojo and Ajala (2021) reported that health-related components of exercise positively influence fitness and lifestyle behaviours among sedentary youth, suggesting that physiological adaptations to exercise are relatively universal within adult populations. Thus, although age is often associated with gradual decline in pulmonary function, the present findings suggest that such decline does not significantly interfere with the responsiveness of individuals to structured exercise interventions aimed at improving PEFR.

CONCLUSIONS

It was therefore concluded that Aerobic Dance Circuit Training significantly improved PEFR among obese female undergraduates, irrespective of age and obesity class.

Funding: There was no funding

Acknowledgments: The authors sincerely appreciate all the obese female undergraduate participants from tertiary institutions in Oyo State, Nigeria, who willingly participated in this study. Special gratitude is extended to the research assistants, exercise instructors, and institutional authorities whose cooperation and support contributed immensely to the successful implementation of the 12-week Aerobic Dance Circuit Training Program.

Conflicts of Interest: The authors declare that there are no conflicts of interest regarding the publication of this study. The research was conducted solely for academic and scientific purposes, and no financial or personal relationships influenced the design, data collection, analysis, interpretation, or reporting of the findings.

Author Note: This article is based on a study conducted on the effects of a 12-week Aerobic Dance Circuit Training Program on Peak Expiratory Flow Rate among obese female university undergraduates in Oyo State, Nigeria. The authors affirm that ethical standards guiding human participation in research were strictly observed throughout the study. All procedures involving data collection, intervention administration, analysis, and interpretation were carried out solely for academic and research purposes. Correspondence concerning this article should be addressed to the lead researcher.

REFERENCES

- Ajayi, O. A. (2019). *Effect of aerobic dance circuit training programme on body composition and cardiorespiratory variables of obese female college students in Oyo town, Nigeria* (Unpublished doctoral dissertation). University of Ibadan.
- Ajayi, O. A., Abayomi, A. O., & Ojo, O. R. (2013). Promotion of aerobic dance exercise for people with mental health problems. *Journal of Nigeria Association of Sports Science and Medicine*, 14, 138–143.





Centers for Disease Control and Prevention. (2017). *National Health and Nutrition Examination Survey/National Youth Fitness Survey (NHANES/NNYFS)*. Atlanta, GA: Author.

Fabunmi, A. A. (2011). *Comparative effects of an aerobic exercise programme on respiratory functions of obese and non-obese sedentary individuals in Ibadan, Nigeria* (Unpublished doctoral dissertation). University of Ibadan.

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2012). Prevalence of obesity and trends in BMI among US children and youth, 1999–2010. *Journal of the American Medical Association*, 307(5), 483–490. [JAMA Network](#)

Ojo, O. R. (2020). Selected physiological responses to interval training in the enhancement of physical fitness. *Sapientia Foundation Journal of Education, Sciences and Gender Studies*, 2(3), 211–223.

Ojo, O. R., & Ajala, R. B. (2021). Perceived influence of health components of exercise on fitness and lifestyles of sedentary youth in tertiary institutions in Oyo State, Nigeria. *Wudil Journal of Science and Technology Education*, 3(2), 103–111.

Runge, M. S., & Greganti, M. A. (2008). *Netter's internal medicine* (2nd ed., pp. 18–28). [Elsevier](#)

Saraswathi, I., Christy, A., Saravanan, A., & Sembulingam, P. (2014). Correlation of obesity indices with peak expiratory flow rate in males and females. *IOSR Journal of Pharmacy*, 4(2), 21–27. [IOSR Journal of Pharmacy](#)

Shanmugapriya, C., & Vinodha, R. (2021). Comparison of peak expiratory flow rates (PEFR) between obese and non-obese females. *Journal of Pre-Clinical and Clinical Research*, 15(3), 111–115.

World Health Organization. (2014). *Obesity and overweight*. [World Health Organization](#)

World Obesity Federation. (2023). *World obesity atlas 2023: Skyrocketing obesity in children: Why everybody should be concerned*. [World Obesity Federation](#)

World Health Organization. (2020). *NCD global monitoring framework*. [World Health Organization](#)

World Health Organization. (2024). *Global Health Observatory: Prevalence of insufficient physical activity among adults aged 18 years and over*. World Health Organization Global Health Observatory.





FT-12

Digital Technologies for the Professional Learning of PE Teachers and Sports Coaches: A Systematic Review

Haoyue Shang, Beijing Sport University; Koh Koon Teck, Nanyang Technological University
2022240840@bsu.edu.cn

Abstract

Digital technologies are increasingly used in the professional development (PD) of physical education (PE) teachers and sports coaches, but systematic evidence on their impact remains fragmented. Guided by PRISMA 2020, this review synthesized 19 empirical studies (2021–2025) from major databases to examine the characteristics, professional outcomes, and adoption factors of digital technology interventions. Interventions ranged from AI-driven tools and video-based reflection to online communities of practice, shifting toward interactive, pedagogically scaffolded approaches. Technologies enhanced pedagogical knowledge and reflective practice, particularly when engagement was structured and embedded in authentic teaching contexts. Psychological outcomes were mixed: voluntary adoption under supportive conditions improved confidence, whereas externally mandated adoption increased stress. Informal, practice-oriented learning predicted technology acceptance, and self-regulation supported the development of AI-specific pedagogical knowledge. Barriers existed across micro, meso, and macro levels, including epistemological resistance, limited infrastructure, and policy–practice misalignment. Findings highlight the importance of sustained, collaborative, and contextually embedded PD integrating guided digital tools.

Keywords: *Digital technologies; Reflective practice*

INTRODUCTION

Digital technologies are increasingly integrated into PD for PE teachers and sports coaches, whose practice is embodied and context-dependent (Barker & Annerstedt, 2016). PE requires real-time pedagogical decisions in dynamic environments, making reflection challenging. Tools such as video-based reflection, AI systems, VR/AR (Virtual/Augmented Reality), wearable devices, and online platforms can support observation, feedback, and practice in low-stakes settings. AI tools, in particular, require active self-regulation for effective pedagogical learning. Despite this potential, PE is resistant to pedagogical change, and educators often question the relevance of digital tools (Kirk, 2010; Goodyear et al., 2018). The COVID-19 shift to online teaching highlighted disparities in infrastructure, digital literacy, and psychological impacts, while the rise of generative AI raised additional ethical and practical considerations. Existing studies are fragmented, often focusing on isolated tools without synthesizing broader patterns (Tegero & Mabini, 2025; Cocca & Cocca, 2024; Østerlie et al., 2024), and understanding of adoption barriers and facilitators remains limited. This systematic review addresses these gaps by answering three research questions: 1) What are the characteristics of





digital technology interventions for PE teachers and coaches? 2) What impacts do these technologies have on professional outcomes? 3) What barriers and facilitators influence adoption? By synthesizing studies from 2021–2025, this review provides up-to-date evidence and guidance for educators, PD providers, and policymakers.

METHODS

This systematic review followed PRISMA 2020 guidelines (Page et al., 2021) but was not pre-registered. In March 2026, Web of Science, Scopus, SPORTDiscus, and ERIC were searched for empirical studies (2021–2025) on digital technologies for professional learning of PE teachers and sports coaches. A representative Web of Science search string was: TS= ("physical education teacher*" OR "PE teacher*" OR "sports coach*" OR "physical educator*") AND ("technology" OR "digital tool*" OR "artificial intelligence" OR "video analysis" OR "virtual reality" OR "augmented reality" OR "online learning") AND ("professional development" OR "professional learning" OR "teacher training" OR "coach education" OR "reflective practice").

Included studies involved PE teachers or coaches using digital technologies (AI, VR/AR, video, wearables, online platforms) for professional learning and reporting outcomes. Peer-reviewed quantitative, qualitative, or mixed-methods articles in English were eligible; reviews, grey literature, administrative-only interventions, or non-PE populations were excluded. Screening was conducted in Rayyan (Ouzzani et al., 2016) by two independent reviewers. Extracted data included study characteristics, participants, technology type, professional outcomes, and barriers/facilitators. Methodological quality was assessed using the MMAT (2018) (Hong et al., 2018).

A pluralistic synthesis was applied: RQ1 summarized descriptively; RQ2 used narrative synthesis across cognitive, affective, and behavioral domains (Popay et al., 2006); RQ3 was analyzed thematically within a socio-ecological framework (Bronfenbrenner, 1979).

RESULTS

Study Selection

The search identified 62 records, with 24 full-text articles assessed for eligibility. Five were excluded, leaving 19 studies for extraction and synthesis. The process is shown in a PRISMA 2020 flow diagram (Figure 1) (Page et al., 2021).



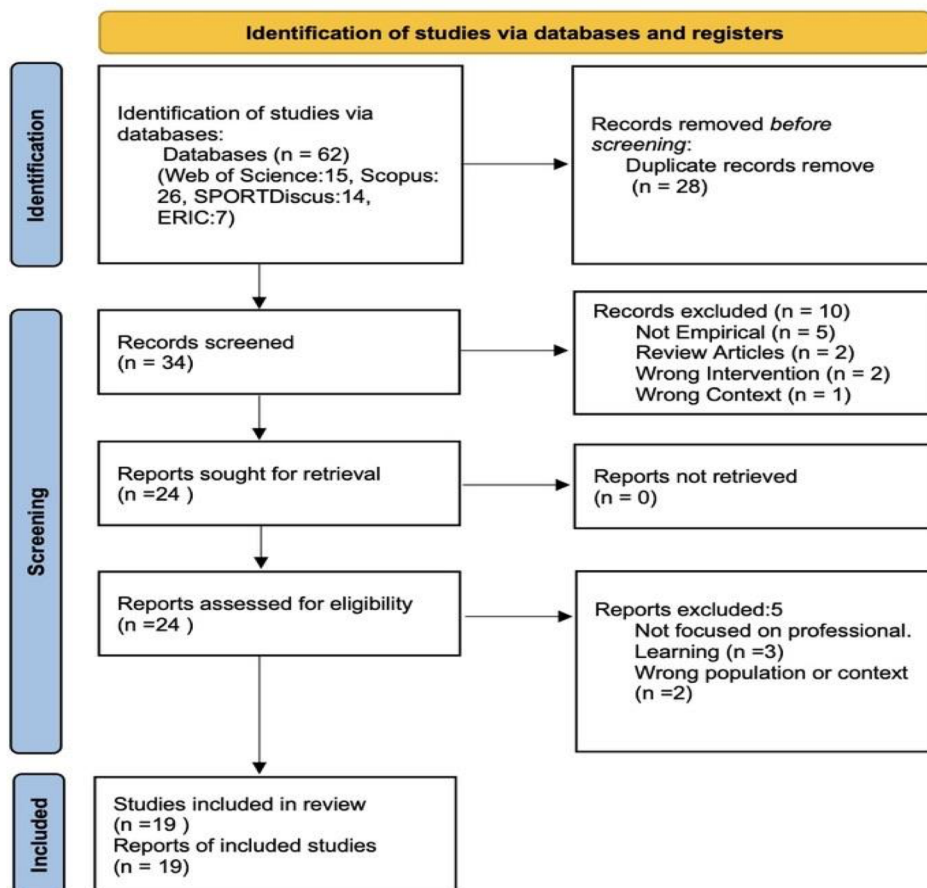


Figure 1: PRISMA 2020 flow diagram for new systematic reviews. Adapted from Page MJ, et al. (2021).

Characteristics of Included Studies

General Characteristics

The 19 included studies were published between 2021 and 2025, with most conducted in 2024–2025, across multiple countries, including Brazil, the UK, Turkey, the Philippines, Spain, Mexico, Norway, Australia, Indonesia, Germany, China, Portugal, the US, and one international study (Howley, 2022; Almusawi & Durugbo, 2024). Most studies were qualitative (n = 12), with six quantitative descriptive studies and one mixed methods study. Participants were mainly in-service PE teachers (n = 13), with five pre-service teachers and one study on sports coaches. Sample sizes ranged from 2 to 548. As shown in Figure 2, the number of published studies increased steadily over time, peaking in 2025.

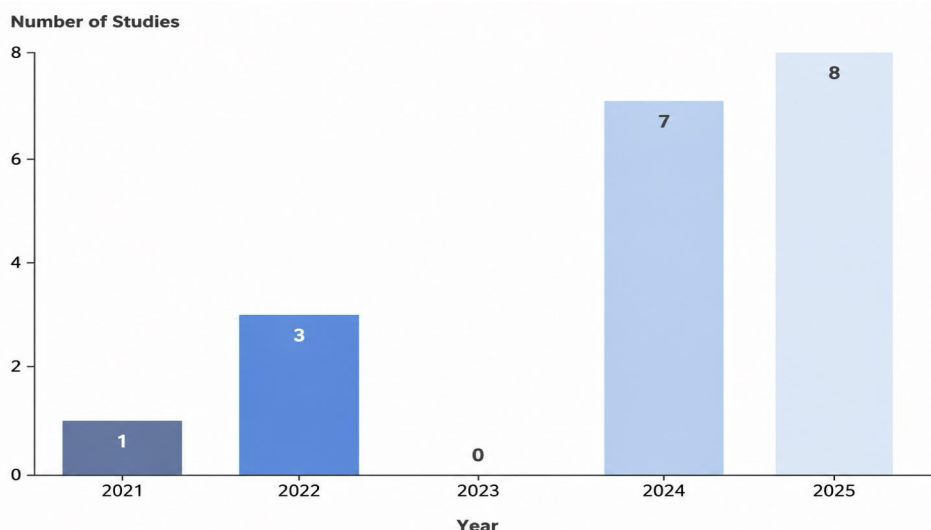


Figure 2: Number of included studies by publication year (2021–2025).

Study characteristics, including country, technology type, and participant group, are detailed in Table 1, complementing the trends shown in Figure 2 and highlighting the diversity of technologies and contexts.

Table 1: *Characteristics of included studies (N =19).*

Author (Year)	Country	Technology	Participants
Almusawi & Durugbo (2024)	Kuwait	Wearables	In-service PE teachers
Howley (2022)	International	Online CoP	PE teachers
Quarmby et al. (2024)	UK	Video / LMS	Pre-service PE teachers
Tegero & Mabini (2025)	Philippines	AI chatbot	Pre-service PE teachers
Araujo & Casey (2025)	Brazil & UK	E-portfolio / VR	In-service PE teachers
Asi & Sabbah (2025)	Palestine	Video / AI	In-service PE teachers
Bofill-Herrero et al. (2025)	Spain	Video	In-service PE teachers
Cocca & Cocca (2024)	Mexico	Video	In-service PE teachers
Østerlie et al. (2024)	Norway	VR	K-12 PE teachers
Peralta et al. (2021)	Australia	Video	Pre-service PE teachers
Setiawan et al. (2024)	Indonesia	Online LMS	In-service PE teachers
Wibowo et al. (2025)	Germany	Digital tools	In-service PE teachers
Yang et al. (2025)	China	AI / VR	Pre-service PE teachers
Ferreira et al. (2022)	Portugal	Online platform	In-service PE teachers
Killian et al. (2025)	USA	MOOC	In-service PE teachers
Rezende dos Reis et al. (2024)	Brazil	MOOC / Online	Pre-service PE teachers
Bridgeman & Giraldez-Hayes (2024)	UK	AI video	Coaches
Akyel (2025)	Turkey	Wearables	In-service PE teachers
de Souza et al. (2022)	Brazil	Digital tools	In-service PE teachers

Note. PE = physical education; AI = artificial intelligence; VR = virtual reality; LMS = learning management system; MOOC = massive open online course.



Characteristics of Digital Technology Interventions

This section summarizes the types, contexts, and target audiences of digital technology interventions across the 19 included studies. Interventions were grouped into five categories: online platforms and collaboration tools (MOOCs, LMS, digital communities; $n = 5$), AI tools (generative chatbots, AI-enhanced video feedback; $n = 4$), wearable technologies (fitness trackers, heart rate monitors; $n = 2$), video-based reflection and analysis systems ($n = 2$), and immersive VR/360° video ($n = 1$). Five studies integrated multiple tool types. Intervention duration ranged from single modules to multi-month programs, with several conducted during the COVID-19 pandemic.

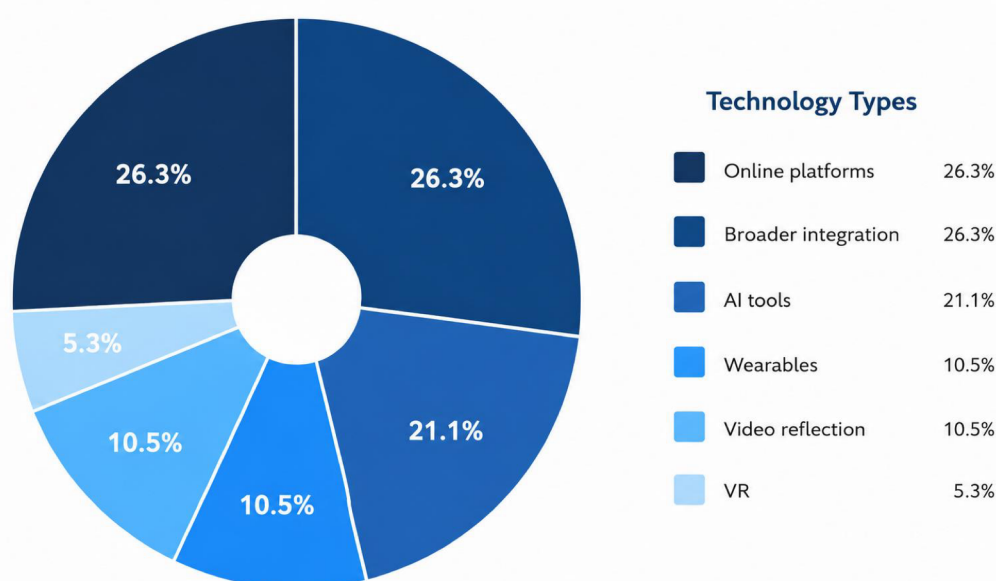


Figure 3. Distribution of Digital Technology Intervention Types Across Included Studies.

Methodological Quality of Included Studies

The methodological quality of the 19 included studies was appraised using the Mixed Methods Appraisal Tool (MMAT, 2018) (Hong et al., 2018). Overall, qualitative studies demonstrated strong methodological quality, with appropriate design, data collection, and substantiated findings, though only four explicitly reported researcher reflexivity. Quantitative descriptive studies employed rigorous analyses and validated measures but were limited by non-probability sampling and inconsistent reporting of non-response bias. The single mixed methods study effectively integrated quantitative and qualitative strands, providing complementary evidence on MOOC effectiveness, though potential divergences between strands were not fully addressed. Overall, the evidence base was adequate to strong: qualitative findings were credible where reflexivity was reported, quantitative findings were analytically rigorous but limited by sampling, and the mixed methods study illustrated effective integration of multiple data types.

Thematic Synthesis



Impacts of Digital Technologies on Professional Outcomes

The narrative synthesis identified three outcome domains: cognitive, affective/psychological, and behavioral/reflective. Cognitive outcomes included enhanced AI-specific TPACK and professional vision, with video-based reflection supporting anticipatory, student-centred reasoning (Yang et al., 2025; Cocca & Cocca, 2024; Peralta et al., 2021). Positive affective effects included self-efficacy, motivation, and confidence, while stress and fatigue occurred under rapid or mandatory adoption (Tegero & Mabini, 2025; Setiawan et al., 2024; Howley, 2022). Behavioral outcomes involved changes in instructional practice and reflection-on-action across AI, video, and online interventions (Cocca & Cocca, 2024; Peralta et al., 2021; Tegero & Mabini, 2025). These findings indicate that digital technologies support learning across knowledge, psychological, and practice dimensions.

Table 2: Synthesis of professional outcomes from digital technology interventions

Outcome Domain	Impact Direction	Key Technology	Key References	Key Findings
Cognitive: TPACK & Professional Vision	Positive	AI, Video, Online	Yang et al., 2025; Cocca & Cocca, 2024	Enhanced AI-specific pedagogical knowledge; video reflection improved professional vision
Affective & Psychological: Self-efficacy, Motivation, Well-being	Positive / Mixed	AI, Video, Online	Tegero & Mabini, 2025; Bridgeman & Giraldez-Hayes, 2024	Increased confidence and motivation; stress and fatigue observed under compulsory adoption
Behavioural & Reflective: Instructional Practice	Positive	AI, Video, Online	Cocca & Cocca, 2024; Peralta et al., 2021	Teachers applied knowledge in practice; reflection-in-action and lesson adjustments reported

Barriers and Facilitators to Digital Technology Adoption

Barriers and facilitators were analyzed using a socio-ecological framework with micro (personal), meso (institutional), and macro (systemic) levels (Figure 4). At the micro-level, low digital literacy, technophobia, stress, and resistance hindered adoption, while positive attitudes and self-regulation facilitated engagement. Meso-level barriers included ineffective one-off workshops, whereas sustained PD structured communities, and skilled facilitation promoted adoption. Macro-level barriers included policy-practice misalignment, digital inequities, and limited infrastructure, while supportive policies and accessible platforms enabled uptake. These factors interact across levels, highlighting the need for coordinated interventions.

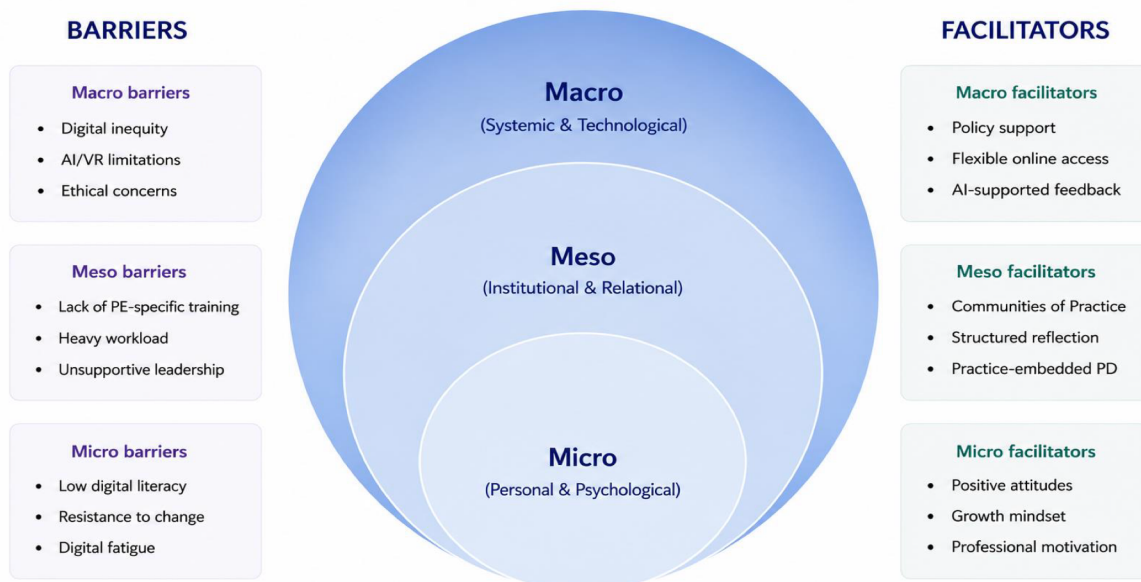


Figure 4: Socio-ecological model of barriers and facilitators to digital technology adoption in PE teachers' and coaches' professional learning.

DISCUSSION

This review synthesized 19 empirical studies examining the characteristics, outcomes, and adoption factors of digital technologies for the professional learning of PE teachers and coaches.

Characteristics of Digital Technology Interventions

The field is rapidly expanding, with most studies published in 2024–2025, reflecting post-COVID-19 digital adoption and the release of generative AI tools. AI-based technologies and online platforms dominated, whereas VR and wearables were underrepresented, likely due to costs, technical challenges, and limited infrastructure (Østerlie et al., 2024). Most studies focused on in-service teachers, with only one on coaches (Bridgeman & Giraldez-Hayes, 2024). Geographical coverage was uneven, with research concentrated in Brazil, the UK, and selected European and Middle Eastern countries, and minimal representation from Africa and South Asia (Asi & Sabbah, 2025).



Impacts on Professional Outcomes

Digital technologies consistently enhanced pedagogical knowledge and reflective practice but had mixed effects on psychological well-being. AI-specific pedagogical knowledge required active self-regulation (Yang et al., 2025), and video-based reflection promoted the shift from fragmented to anticipatory professional vision, enabling reflection-on-action to influence real-time instruction (Cocca & Cocca, 2024; Peralta et al., 2021). Voluntary adoption increased confidence and self-efficacy (Tegero & Mabini, 2025; Bridgeman & Giraldez-Hayes, 2024), while compulsory or rapid adoption induced stress and fatigue (Howley, 2022; Setiawan et al., 2024). AI-mediated feedback could motivate or trigger defensive disengagement depending on support.

Barriers and Facilitators to Technology Adoption

Barriers and facilitators were interdependent across micro, meso, and macro levels. Micro-level barriers included epistemological tensions, low digital literacy, technophobia, and stress, while positive attitudes, self-regulation, and growth mindset facilitated engagement (De Souza et al., 2022). Meso-level barriers included ineffective one-off workshops, whereas structured PD with skilled facilitation and communities of practice promoted adoption (Ferreira et al., 2022; Cocca & Cocca, 2024; Peralta et al., 2021). Macro-level barriers included policy-practice misalignment, inequities, and infrastructure limitations, while supportive policies and accessible platforms enabled uptake. These factors interact recursively, highlighting the need for coordinated interventions.

Limitations and Implications

This review is limited to English-language, peer-reviewed studies from 2021–2025, excluding earlier research on established technologies. Study heterogeneity and reliance on self-reports restrict quantitative synthesis and causal inference. Sports coaches, educators in low-resource settings, and African and South Asian populations were underrepresented (Asi & Sabbah, 2025; Bridgeman & Giraldez-Hayes, 2024).

Despite these limitations, findings suggest professional learning should be sustained, collaborative, and embedded in authentic practice, with institutional support for time, space, and facilitation. Video- and AI-based reflection require guidance to manage initial discomfort (Bridgeman & Giraldez-Hayes, 2024), and informal, practice-oriented approaches may be more effective than one-off workshops (Ferreira et al., 2022). Future research should explore longitudinal and experimental designs, compare technology types, include underrepresented populations, and examine AI ethics.



CONCLUSION

This review synthesized 19 studies on digital technologies for PE teachers' and coaches' professional learning. The field is rapidly expanding, dominated by AI tools, video analysis, and online platforms, while research on coaches, non-university pre-service teachers, and educators in low-resource contexts remains limited. Digital technologies enhance pedagogical knowledge and reflective practice, especially when engagement is structured and embedded in authentic teaching. Effects on psychological well-being depend on autonomy and support. Adoption is influenced by interactions across micro, meso, and macro levels, with barriers including infrastructure gaps, limited digital literacy, and epistemological resistance, and facilitators including informal, practice-oriented learning, structured facilitation, and combining automated feedback with human guidance. Effective professional learning requires coordinated attention to personal, institutional, and systemic factors. Policymakers and practitioners should prioritize sustainable, equitable, and contextually grounded approaches for technology integration in PE and coaching.

REFERENCES

- Akyel, Y. (2025). Personal and professional drivers of wearable technology use: A model-based analysis among physical education teachers. *Interactive Learning Environments*.
<https://doi.org/10.1080/10494820.2025.2542891>
- Almusawi, H. A., & Durugbo, C. M. (2024). Determinants of teacher attitudes and innovative use of wearable technology. *IEEE Transactions on Learning Technologies*, 17, 1402–1413. <https://doi.org/10.1109/TLT.2024.3386464>
- Asi, A., & Sabbah, S. (2025). Technological competencies of physical education teachers in the digital era. *Journal of Technical Education and Training*, 17(3), 16–24.
<https://doi.org/10.30880/jtet.2025.17.03.002>
- Barker, D., & Annerstedt, C. (2016). Physical education teacher education: Emerging issues. *European Physical Education Review*, 22(3), 271–288.
- Bofill-Herrero, A., García-Taibo, O., Ferriz-Valero, A., & Baena-Morales, S. (2025). Exploring the role and challenges of AI tools in physical education: Qualitative insights from in-service, trainee, and future teachers. *Sport, Education and Society*.
<https://doi.org/10.1080/13573322.2025.2547869>
- Celik, S. (2023). AI tools in education: Ethical and pedagogical perspectives. *Computers & Education Open*, 4, 100098.
- Cocca, M., & Cocca, A. (2024). Improving teachers' professional vision through a video-based reflection program: A case study in Mexican primary schools. *Journal on Efficiency and Responsibility in Education and Science*, 17(2), 140–150.
<https://doi.org/10.7160/ERIESJ.2024.170204>
- de Souza, A. F., de Oliveira, M. R. R., & de Araújo, A. C. (2022). The debate of digital technology in the continuing physical education teacher education: Uses and concepts for teaching and learning. *Retos*, 46, 694–704.





- Ferreira, H. J., Patton, K., & Parker, M. (2022). From isolation to collaboration: Development of a community of physical education teachers in pandemic times. *Movimento*, 28. <https://doi.org/10.22456/1982-8918.127470>
- Goodyear, V. A., Casey, A., & Kirk, D. (2018). Teachers' digital competence in physical education. *European Physical Education Review*, 24(4), 441–460.
- Kirk, D. (2010). Physical education, youth sport and lifelong participation: The importance of teacher education. *Physical Education and Sport Pedagogy*, 15(2), 121–138.
- Østerlie, O., Frantzen, H., & Portals Rioma, A. (2024). 'It's like being there, but not in the way'. Exploring the use of virtual reality tools to stimulate reflection in Norwegian physical education teacher education. *Sport, Education and Society*. <https://doi.org/10.1080/13573322.2024.2417070>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71.
- Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., ... & Duffy, S. (2006). *Guidance on the conduct of narrative synthesis in systematic reviews*. ESRC Methods Programme.
- Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan — A web and mobile app for systematic reviews. *Systematic Reviews*, 5, 210.
- Peralta, L. R., Bennie, A., Gore, J., & Lonsdale, C. (2021). An investigation of the influence of video types and external facilitation on PE inservice teachers' reflections and their perceptions of learning: Findings from the AMPED cluster controlled trial. *Journal of Teacher Education*, 72(3), 368–380. <https://doi.org/10.1177/0022487120964079>
- Setiawan, I., Kurniawan, W. R., & Wijayanti, D. G. S. (2024). Implementation of online teacher professional development programs: Physical education teacher perspectives. *Retos*, 57, 445–454. <https://doi.org/10.47197/retos.v57.105406>
- Wibowo, J., Hofmann, R., Brand, T., & Wiese, H. (2025). Predicting the power of informal learning opportunities on technology use of physical education teachers. *Frontiers in Sports and Active Living*, 7, 1653809. <https://doi.org/10.3389/fspor.2025.1653809>
- Yang, P., Liu, Y., & Li, Y. (2025). The mediating role of self-regulation in fostering Intelligent-TPACK and ethics in physical education teacher education students. *Scientific Reports*, 15(1). <https://doi.org/10.1038/s41598-025-21795-9>





FT-13

ROLE OF YOGA IN BREAKING SOCIAL AND CULTURAL BARRIERS AMONG MAHATMA GANDHI UNIVERSITY, TELANGANA, INDIA STUDENTS

Meka Vani¹, Dr. D. Devaki²

¹ Research Scholar, Department of Physical Education, Annamalai University, Annamalai Nagar, 608002, India; ² Assistant Professor, Department of Physical Education, Annamalai University, Annamalai Nagar, 608002, India
mekavani62@gmail.com

Abstract

Yoga is increasingly recognized not only as a health-promoting practice but also as a powerful social tool capable of fostering inclusion and intercultural understanding. Universities represent culturally diverse environments where social and cultural barriers may limit meaningful interaction among students. The present study examined the role of yoga in reducing perceived social and cultural barriers among students of Mahatma Gandhi University. A quantitative cross-sectional design was adopted with a sample of 200 undergraduate and postgraduate students aged 18–25 years. Participants were categorized into yoga practitioners and non-practitioners. Standardized questionnaires measuring social inclusion, perceived social and cultural barriers, and yoga participation were administered. Independent sample t-tests and Pearson's correlation analyses were employed for data analysis. Results indicated that students practicing yoga reported significantly higher levels of social inclusion and lower levels of perceived social and cultural barriers compared to non-practitioners ($p < .05$). Additionally, duration of yoga practice was positively associated with social connectedness and negatively associated with perceived barriers. The findings suggest that yoga may serve as an inclusive, non-competitive practice that promotes social harmony and cultural integration in higher education settings. Integrating yoga into university wellness and physical education programs may contribute to building inclusive campus environments.

Keywords: Yoga, Social Inclusion, Cultural Barriers, University Students, Physical Education, Cultural Integration

INTRODUCTION

Yoga is one of the oldest traditional systems of physical, mental, and spiritual practices originating in India. In contemporary society, yoga has gained worldwide recognition not only for improving physical health and psychological well-being but also for promoting emotional balance, social harmony, and intercultural understanding. Educational institutions, particularly universities, are culturally diverse environments where students from different regions, religions, languages, and socio-economic backgrounds interact. However, such diversity sometimes creates social and cultural barriers that limit meaningful communication and social integration among students.



Social and cultural barriers may emerge in the form of caste discrimination, language differences, regionalism, economic inequality, and religious diversity. These barriers can negatively influence students' interpersonal relationships, participation in academic activities, and psychological well-being. Therefore, universities require inclusive practices that encourage unity, empathy, and cooperation among students. Yoga is considered a non-competitive and universally accessible activity that promotes mindfulness, emotional regulation, mutual respect, and collective well-being.

Regular yoga practice may provide opportunities for students to engage in shared experiences that strengthen social connectedness and reduce prejudice. Through collective participation in yoga sessions, students may develop tolerance, empathy, and acceptance toward individuals from diverse backgrounds. In this context, the present study investigates the role of yoga in reducing perceived social and cultural barriers among students of Mahatma Gandhi University.

Research Questions / Problems

The present study addresses the issue of social and cultural barriers among university students and explores whether yoga can contribute to reducing these barriers. The following research questions guided the investigation:

1. Does participation in Yoga improve social inclusion among university students?
2. Does Yoga reduce perceived social and cultural barriers among students?
3. Is there a relationship between duration of Yoga practice and social connectedness?
4. Do yoga practitioners differ significantly from non-practitioners regarding social harmony and cultural acceptance?

Brief Literature Review

Previous studies have shown that yoga contributes positively to physical health, emotional stability, stress management, and psychological well-being. Researchers have also emphasized the social dimensions of yoga, including its role in improving interpersonal relationships and promoting social cohesion.

B. K. S. Iyengar explained that yoga promotes harmony between body, mind, and society. Similarly, Swami Vivekananda considered yoga a pathway toward universal brotherhood and collective well-being. Contemporary research indicates that yoga-based interventions improve emotional intelligence, empathy, communication skills, and group interaction among students.

Studies conducted in educational settings suggest that yoga creates inclusive environments where students from different cultural backgrounds can participate equally. Yoga-based group activities encourage cooperation, reduce stress, and strengthen feelings of belongingness. Research also indicates that regular yoga practice may reduce social anxiety and improve students' confidence in interpersonal interactions.

Despite these findings, limited research has specifically examined the role of yoga in reducing social and cultural barriers among university students in India. Therefore, the present study aims to contribute to the growing body of literature on yoga and social inclusion in higher education settings.



Significance of the Study

The study is significant because it highlights yoga as a potential strategy for promoting social harmony and cultural integration among university students. In culturally diverse educational institutions, social barriers can negatively affect communication, inclusion, and emotional well-being. By examining the relationship between yoga participation and social inclusion, the study contributes to understanding the broader social benefits of yoga beyond physical fitness and stress management.

The findings may assist university administrators, physical education departments, and policymakers in designing wellness programs that foster intercultural understanding and social connectedness. The study also provides practical implications for creating inclusive campus environments where students from diverse backgrounds feel accepted and respected. Furthermore, the study contributes to academic literature in physical education, psychology, and social sciences by exploring the relationship between yoga and social integration.

Purpose of the Study Including Hypotheses

The primary purpose of the study was to examine the role of Yoga in breaking social and cultural barriers among students of Mahatma Gandhi University.

Objectives of the Study

1. To compare levels of social inclusion between yoga practitioners and non-practitioners.
2. To examine the relationship between yoga participation and perceived social and cultural barriers.
3. To determine whether duration of yoga practice influences social connectedness among students.

Hypotheses

H1: Students practicing yoga will report significantly higher levels of social inclusion than non-practitioners.

H2: Students practicing yoga will report significantly lower levels of perceived social and cultural barriers than non-practitioners.

H3: Duration of yoga practice will be positively correlated with social connectedness and negatively correlated with perceived barriers.

METHODS

Research Design

The study adopted a quantitative cross-sectional research design. This design enabled the collection of data from participants at a single point in time and facilitated the comparison of yoga practitioners and non-practitioners regarding social inclusion and perceived barriers.

Data Collection

The study was conducted among undergraduate and postgraduate students of Mahatma Gandhi University. A total sample of 200 students aged between 18 and 25 years participated in the study. Participants were selected using purposive sampling technique.

The participants were categorized into two groups:

- Yoga Practitioners
- Non-Practitioners

Data were collected using standardized questionnaires measuring:



1. Social Inclusion
2. Perceived Social and Cultural Barriers
3. Yoga Participation

Prior informed consent was obtained from all participants before data collection.

Data Analyses

The collected data were analyzed using descriptive and inferential statistics. Mean and standard deviation were calculated for all variables. Independent sample t-tests were used to compare yoga practitioners and non-practitioners. Pearson's correlation analysis was conducted to determine relationships between duration of yoga practice, social connectedness, and perceived barriers. Statistical significance was set at $p < .05$.

RESULTS

The findings revealed that yoga practitioners reported significantly higher levels of social inclusion and lower levels of perceived social and cultural barriers compared to non-practitioners. The independent sample t-test showed statistically significant differences between the two groups at the 0.05 level of significance.

Pearson's correlation analysis further demonstrated that duration of yoga practice was positively associated with social connectedness and negatively associated with perceived barriers. Students who practiced yoga regularly reported greater feelings of belongingness, cooperation, and cultural acceptance.

These findings suggest that yoga participation positively contributes to interpersonal relationships and social harmony among university students.

Table 1: Demographic Characteristics of Participants (N = 200)

Variables	Categories	Frequency	Percentage (%)
Gender	Male	110	55.0
	Female	90	45.0
Age Group	18-20 Years	82	41.0
	21-23 Years	76	38.0
	24-25 Years	42	21.0
Educational Level	Undergraduate	128	64.0
	Postgraduate	72	36.0
Yoga Participation	Practitioners	100	50.0
	Non-Practitioners	100	50.0

Table 2: Mean and Standard Deviation of Study Variables

Variables	Group	Mean	SD
Social Inclusion	Yoga Practitioners	42.56	5.21

Variables	Group	Mean	SD
	Non-Practitioners	35.18	6.14
Perceived Social & Cultural Barriers	Yoga Practitioners	21.42	4.36
	Non-Practitioners	30.67	5.02

Table 3: Independent Sample t-Test Results

Variables	t-value	p-value	Interpretation
Social Inclusion	5.84	0.001	Significant
Perceived Social & Cultural Barriers	-6.27	0.001	Significant

Table 4: Correlation Between Duration of Yoga Practice and Study Variables

Variables	r-value	p-value	Interpretation
Duration of Yoga Practice & Social Connectedness	0.62	0.001	Positive Correlation
Duration of Yoga Practice & Perceived Barriers	-0.58	0.001	Negative Correlation

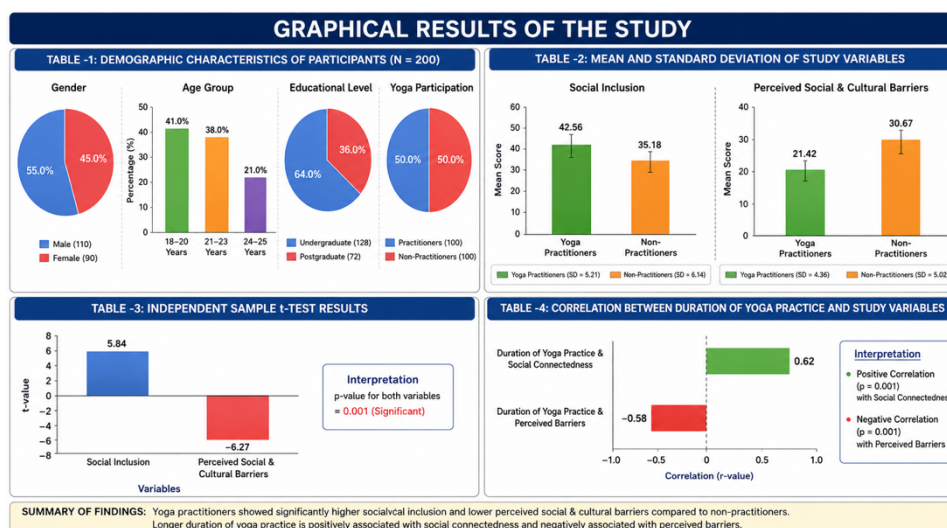


Figure 1: Graphical Representation of the Effects of Yoga Practice on Social Inclusion and Perceived Social and Cultural Barriers

The figure illustrates the demographic characteristics of participants, comparison of mean scores between yoga practitioners and non-practitioners, independent sample t-test results, and the correlation between the duration of yoga practice and study variables, highlighting the positive influence of yoga on social inclusion and the reduction of perceived social and cultural barriers.

DISCUSSION



The findings of the study support previous research indicating that yoga contributes not only to physical and psychological well-being but also to social integration and interpersonal harmony. Yoga creates opportunities for students from diverse social and cultural backgrounds to interact in a cooperative and non-competitive environment. Through collective participation in yoga activities, students may develop empathy, tolerance, and mutual respect.

The positive relationship between duration of yoga practice and social connectedness suggests that long-term engagement in yoga strengthens students' sense of belongingness and acceptance. These findings align with the philosophical principles of yoga, which emphasize unity, compassion, and collective well-being.

The study further highlights the importance of integrating yoga into university wellness and physical education programs. Such initiatives may help create inclusive campus environments and promote intercultural understanding among students.

CONCLUSIONS

The study concluded that yoga plays a significant role in reducing social and cultural barriers among university students. Students practicing yoga demonstrated greater social inclusion, stronger interpersonal relationships, and lower perceptions of social and cultural discrimination compared to non-practitioners.

The findings indicate that yoga may serve as an effective and inclusive strategy for promoting social harmony and cultural integration within higher education institutions. Universities are therefore encouraged to incorporate yoga into wellness initiatives, physical education curricula, and extracurricular activities to foster inclusive campus environments.

REFERENCES

- Field, T. (2011). Yoga clinical research review. *Complementary Therapies in Clinical Practice*, 17(1), 1-8.
- Gard, T., Noggle, J.J., Park, C.L., Vago, D.R., and Wilson, A. (2014). Potential self-regulatory mechanisms of yoga for psychological health. *Frontiers in Human Neuroscience*, 8, 770.
- Iyengar, B.K.S. (1966). *Light on yoga*. New York: Schocken Books.
- Ross, A., and Thomas, S. (2010). The health benefits of yoga and exercise. *The Journal of Alternative and Complementary Medicine*, 16(1), 3-12.
- Streeter, C.C., Gerbarg, P.L., and Saper, R.B. (2012). Effects of yoga on the autonomic nervous system and stress response. *Medical Hypotheses*, 78(5), 571-579.
- Telles, S., Sharma, S.K., and Balkrishna, A. (2014). Yoga and mental health among students. *International Journal of Yoga*, 7(2), 123-129.
- Vivekananda, S. (1896). *Raja yoga*. Kolkata: Advaita Ashrama.
- Woodyard, C. (2011). Exploring the therapeutic effects of yoga and its ability to increase quality of life. *International Journal of Yoga*, 4(2), 49-54.



3rd IAHPEDS

International Alliance for Health,
Physical Education, Dance, and Sport
World Congress

Türkiye Olympic
Committee (TMOK)
Ataköy - İSTANBUL



June 24 - 28
2026



Spor Bilimleri
Fakültesi



İstanbul
GEDİK
Üniversitesi



Global Health
Education



**National Academy
of Health and Physical Literacy**
Advancing health and physical literacy





FT-14

The Effects of Face-to-Face and Online HIFT Training on Physical Fitness in Sedentary Individuals

Serra Ayşe ÇAKAR SAKA¹, Asiye Filiz ÇAMLIGÜNEY²

¹ Dr. Istanbul Technical University, Türkiye 0000-0002-9010-5767

² Prof. Dr. Title, Marmara University, Türkiye 0000-0003-0363-3025

scakar@itu.edu.tr

Abstract

The aim of this study is to examine the effects of HIFT performed face-to-face and online training for 12 weeks in sedentary individuals on body composition, flexibility, strength, muscular endurance, aerobic capacity and some other health related physical fitness metrics. The study consisted of sedentary female participants; face-to-face training group and online training group. Participants were subjected to HIFT workout 3 days a week with 75-85% load. Physical fitness parameters of participants including body composition, flexibility, strength values were examined pre- and posttraining program. The data obtained was analyzed in the SPSS 22.0 program. A statistically significant difference was found between the pre-test and post-test values in weight, BMI, fat % and fat weight, flexibility, sit-up and aerobic capacity tests in both groups of participants who trained via face-to-face and online training ($p < 0.05$). Although there was an increase in HDL value, no statistically significant result was found. Between the groups, a significant improvement difference has been found only in the online training group for leg strength and back strength values, while no significant improvement difference has been found in other values. The HIFT training applied either face-to-face (group) or online (individual) over a period of 12 weeks has been found to result in improvement in physical fitness parameters

Keywords: Cardiovascular disease, Physical fitness parameters, Inactivity, Pandemic, Covid-19 Disease

INTRODUCTION

Cardiovascular disease (CVD) remains the leading cause of mortality worldwide, accounting for approximately 17% of all global deaths (WHO, 2019). Physical inactivity is one of the most important modifiable risk factors associated with CVD, obesity, type 2 diabetes mellitus, dyslipidemia, and premature mortality. Consequently, regular physical activity is widely recognized as an effective strategy for preventing chronic diseases and improving overall health (Boraita 2021).

The prevalence of overweight and obesity has increased markedly over recent decades due to sedentary lifestyles and an imbalance between energy intake and expenditure. According to the World Health





Organization, more than one-third of adults worldwide are overweight, and obesity continues to rise across all age groups, posing a major public health challenge (WHO, 2022). Regular exercise improves body composition, cardiovascular function, insulin sensitivity, and metabolic health, thereby reducing the risk of chronic diseases (Blair et al., 1995; Durstine et al., 2013).

The COVID-19 pandemic further reduced physical activity through lockdowns and social distancing measures, resulting in increased sedentary behavior and declines in cardiorespiratory fitness, muscular strength, and other components of health-related physical fitness across all age groups (Genin et al., 2021; Chambonniere et al., 2021; Cengiz & Ateş, 2022). These findings underscore the need for accessible exercise strategies that can be implemented regardless of environmental or social restrictions.

Health-related physical fitness comprises body composition, cardiorespiratory endurance, muscular strength, muscular endurance, and flexibility. Improving these components enhances physical performance, reduces cardiovascular risk, and promotes metabolic health. In addition, exercise-induced changes in hematological and biochemical markers provide valuable indicators of physiological adaptation and overall health status (Özer, 2016).

METHODS

This experimental study employed a quantitative research design to compare the effects of supervised face-to-face and remotely delivered High-Intensity Functional Training (HIFT) programs on health-related physical fitness and selected biochemical parameters in previously sedentary women. The study was conducted at the Istanbul Technical University Medical and Social Health Center and Healthy Living Center after obtaining ethical approval from the Marmara University Faculty of Medicine Clinical Research Ethics Committee, and all procedures complied with the Declaration of Helsinki. Written informed consent was obtained from all participants prior to data collection.

Participation

The study population consisted of sedentary female academic and administrative staff aged 24–59 years who had not participated in regular exercise during the previous six months and whose physical activity levels had further declined during the COVID-19 pandemic. Participants with recent COVID-19 infection, regular exercise habits, or conditions affecting the validity of body composition and blood measurements were excluded. Sample size was determined using G*Power (power = 0.80, α = 0.05, effect size = 0.80), indicating a minimum of 21 participants per group. Forty participants completed the intervention, including 19 participants in the face-to-face group and 21 in the online group.

Measurements

Health-related physical fitness assessments included body composition, flexibility, muscular strength, muscular endurance, and cardiorespiratory fitness. Body composition variables—including body weight, body mass index, body fat percentage, fat-free mass, total body water, and metabolic age—were measured using a Tanita BC-418MA Bioelectrical Impedance Analyzer. Flexibility was evaluated with the Sit-and-Reach Test, muscular strength using Takei back-leg and handgrip dynamometers, muscular endurance through one-minute push-up and sit-up tests, and aerobic capacity using the Queens College Step Test and the Rockport One-Mile Walk Test.





Training Method

Participants completed a 12-week HIFT intervention three times per week (Monday, Wednesday, and Friday). The first six weeks emphasized moderate training progression, followed by six weeks of higher-intensity functional training. Each session consisted of four sets of multi-joint functional exercises performed without specialized equipment. Exercise intensity was monitored using the Borg Rating of Perceived Exertion (RPE 13–16), corresponding to approximately 64–80% of maximum heart rate (Borg 1970). Rest intervals between sets were reduced from 45 seconds during the first six weeks to 30 seconds during the final six weeks to progressively increase training load.

Statistical Analysis

All measurements were repeated following completion of the intervention. Statistical analyses were performed using SPSS version 22.0. Descriptive statistics were calculated for all variables, normality was assessed using the Shapiro–Wilk test, and non-parametric within-group comparisons were conducted using the Wilcoxon signed-rank test. Statistical significance was established at $p < 0.05$.

RESULTS

Table 1: Demographic characteristics of the participants.

		N	Min.	Max.	Mean	SD
Face-to-face HIFT (n = 21)	Height (cm)	21	150	171	160,19	5,68
	Age (years)	21	27	53	41	8,48
Remote HIFT (n = 19)	Height (cm)	19	157	172	164,11	4,62
	Age (years)	19	24	52	39,8	9,4

Presents the baseline demographic characteristics of the participants. The face-to-face HIFT group consisted of 21 participants, whereas the remote access HIFT group included 19 participants. The groups were similar in terms of age and height at baseline, indicating comparable demographic characteristics before the intervention.

Table 2: Changes in body composition following the 12-week HIFT intervention in groups

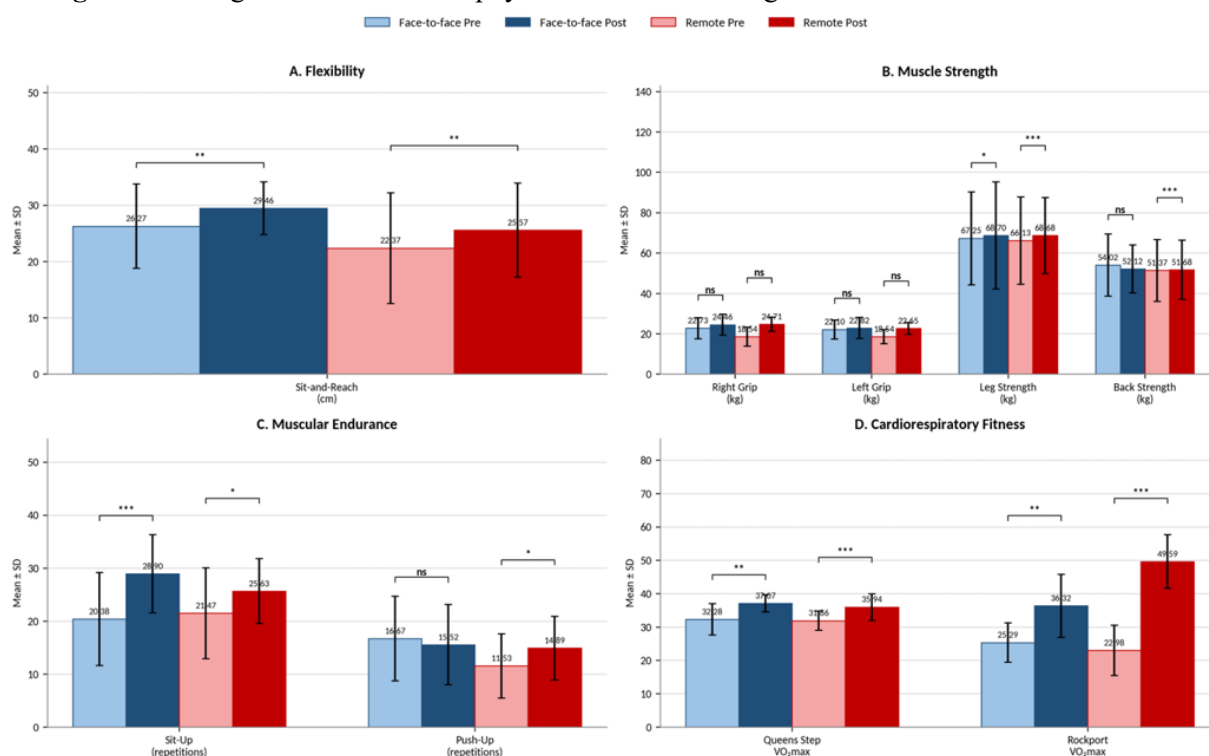
Variable	Face-to-face HIFT Pre (Mean ± SD)	Face-to-face HIFT Post (Mean ± SD)	<i>p</i>	Remote HIFT Pre (Mean ± SD)	Remote HIFT Post (Mean ± SD)	<i>p</i>
Body weight (kg)	67.7 ± 11.11	65.4 ± 10.45	<0.001*	75.47 ± 15.22	71.51 ± 13.22	0.001*
Body mass index (kg/m²)	26.4 ± 4.67	25.5 ± 4.35	<0.001*	27.51 ± 5.58	26.45 ± 5.10	<0.001*
Body fat (%)	31.61 ± 7.06	29.75 ± 7.47	<0.001*	33.28 ± 6.23	31.48 ± 6.40	0.001*



Fat mass (kg)	22.00 ± 7.99	20.40 ± 7.94	<0.001*	25.37 ± 9.31	23.52 ± 8.60	0.003*
Arm muscle mass (kg)	4.18 ± 0.47	4.05 ± 0.49	0.020*	NS	NS	>0.05*

Summarizes the significant changes in body composition after the 12-week HIFT intervention. Both the face-to-face and remotely supervised HIFT groups demonstrated significant reductions in body weight, body mass index, body fat percentage, and fat mass ($p < 0.05$). A significant reduction in arm muscle mass was observed only in the face-to-face HIFT group ($p = 0.020$), whereas no significant change was found in the remotely supervised group.

Figure 1: Changes in health-related physical fitness following the 12-week HIFT intervention.



Clustered bar charts illustrate the mean ± standard deviation values obtained before (Pre) and after (Post) the intervention in the face-to-face and remotely supervised HIFT groups. Four components of health-related physical fitness were evaluated: **(A)** flexibility (sit-and-reach test), **(B)** muscle strength (handgrip, leg, and back strength), **(C)** muscular endurance (sit-up and push-up tests), and **(D)** cardiorespiratory fitness assessed using the Queens College Step Test and the Rockport 1-Mile Walk Test (estimated $\text{VO}_2 \text{ max}$). Significant within-group differences between pre- and post-intervention measurements are indicated by brackets and asterisks ($p < 0.05$, $p \leq 0.01$, $p < 0.001$), whereas *ns* indicates no statistically significant difference. Error bars represent standard deviations.





Table 3: Between-Group Comparison of Changes in Body Composition and Physical Fitness
Following the 12-Week HIFT Intervention

	Outcome	Face-to-face HIFT	Remote HIFT	Between-group p	Interpretation
Body Composition	Body weight	↓	↓	0.675	Similar improvement
	Body mass index	↓	↓	0.882	Similar improvement
	Body fat percentage	↓	↓	0.551	Similar improvement
	Total body water	↔	↔	0.828	No difference
	Fat mass	↓	↓	0.490	Similar improvement
	Fat-free mass	↔	↔	0.882	No difference
	Muscle mass	↔	↔	0.695	No difference
	Bone mass	↔	↔	0.551	No difference
	Arm muscle mass	↔	↔	0.859	No difference
	Trunk muscle mass	↔	↔	0.745	No difference
	Leg muscle mass	↑	↑	0.903	Similar improvement
Physical Fitness	Flexibility	↑	↑	0.935	Similar improvement
	Right handgrip strength	↑	↑	0.946	Similar improvement
	Left handgrip strength	↑	↑	0.394	Similar improvement
	Leg strength	↑	↑↑	<0.001*	Greater improvement in the remote HIFT group
	Back strength	↑	↑↑	<0.001*	Greater improvement in the remote HIFT group
	Sit-up performance	↑	↑	0.208	Similar improvement
	Push-up performance	↑	↑	0.386	Similar improvement
	Queens College Step Test (VO ₂ max)	↑	↑	0.481	Similar improvement
	Rockport Walk Test (VO ₂ max)	↑	↑	0.636	Similar improvement





↑ = improvement; ↓ = reduction; ↔ = no meaningful change; HIFT = High-Intensity Functional Training. Between-group differences were analyzed using the Mann-Whitney U test. Statistically significant between-group differences * ($p < 0.05$).

DISCUSSION

The present study demonstrated that both face-to-face and remotely supervised High-Intensity Functional Training (HIFT) effectively improved health-related physical fitness in previously sedentary adults after a 12-week intervention. Significant improvements were observed in body composition, flexibility, muscular endurance, and cardiorespiratory fitness in both groups. Between-group comparisons showed comparable outcomes for most variables, with significantly greater improvements in leg and back strength in the remotely supervised group. These findings indicate that supervised remote HIFT can be as effective as conventional face-to-face training for improving health-related physical fitness.

Our findings are consistent with previous studies reporting that HIFT improves multiple components of physical fitness through functional, high-intensity, multi-joint exercises. Feito et al. (2018) demonstrated improvements in muscular fitness and aerobic capacity, while Weweg et al. (2017) reported favorable effects of high-intensity exercise on body composition and cardiovascular fitness. The present study extends these findings by showing that comparable benefits can also be achieved through remote supervision, supporting the increasing use of technology-assisted exercise programs.

Biochemical responses observed in a previous study using the same 12-week HIFT protocol further support the present findings (Çakar Saka & Çamlıgüney, 2023). Both face-to-face and remotely supervised HIFT significantly reduced LDL cholesterol, whereas HDL cholesterol showed a non-significant increase and no significant changes were observed in triglyceride or fasting glucose concentrations. These findings suggest that HIFT may improve cardiovascular health primarily through favorable changes in lipid metabolism. Together with the improvements in health-related physical fitness observed in the present study, these results support the effectiveness of supervised HIFT for reducing cardiovascular risk in previously sedentary adults.

This study has several limitations. The relatively small sample size and the 12-week intervention period may have limited the detection of long-term adaptations. In addition, dietary intake, physical activity, and motivational factors were not objectively monitored. Despite these limitations, the findings suggest that remotely supervised HIFT is a practical, accessible, and effective alternative to conventional face-to-face exercise programs, particularly for individuals with limited access to exercise facilities. Further studies involving larger samples and longer intervention periods are needed to confirm these findings.



Graphical Summary: Effects of 12-Week HIFT on Cardiovascular Biomarkers

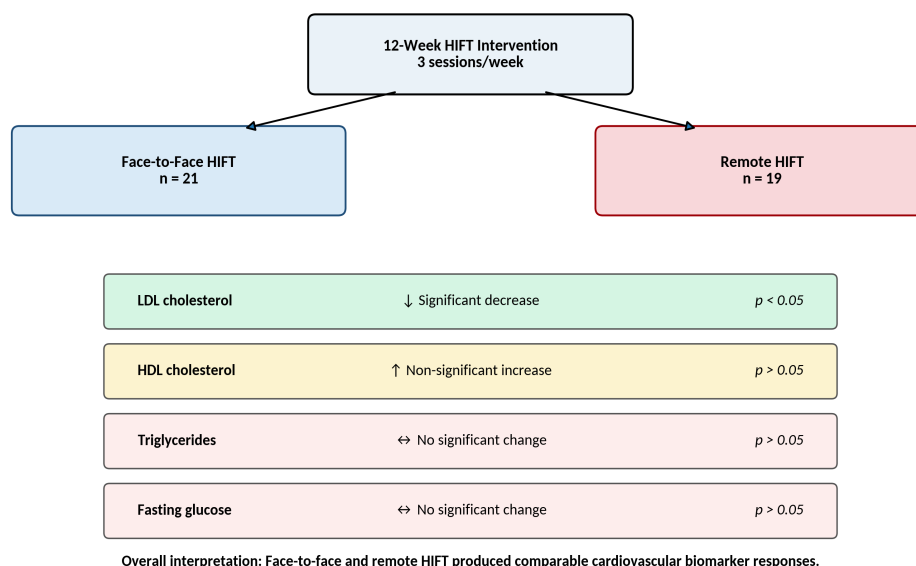


Figure 2: Effects of 12-Week Face-to-Face and Remote HIFT on Cardiovascular Biomarkers

Cakar Saka, S.A., Camliguney A.F., (2023) Graphical summary of the effects of a 12-week High-Intensity Functional Training (HIFT) program delivered face-to-face or remotely in sedentary women. Both training approaches produced a significant reduction in LDL cholesterol. HDL cholesterol increased, but the change was not statistically significant. No significant changes were observed in triglyceride or fasting glucose concentrations. Overall, the cardiovascular biomarker responses were comparable between delivery methods.

CONCLUSION

The present study demonstrated that both face-to-face and remotely supervised High-Intensity Functional Training (HIFT) effectively improved health-related physical fitness in previously sedentary adults following a 12-week intervention. Significant improvements were observed in body composition, flexibility, muscular endurance, and cardiorespiratory fitness in both groups. Between-group comparisons indicated that the overall effectiveness of the two delivery methods was comparable, with significantly greater improvements in leg and back strength observed only in the remotely supervised group.

Findings from our previous study further support these results by demonstrating favourable changes in cardiovascular biomarkers, particularly a significant reduction in LDL cholesterol following both face-to-face and remote HIFT. Collectively, these findings suggest that supervised HIFT is an effective strategy for improving both physical fitness and cardiovascular health in sedentary adults.





Given its comparable effectiveness, accessibility, and minimal equipment requirements, remotely supervised HIFT may represent a practical alternative to traditional face-to-face exercise programs. Future studies involving larger sample sizes, longer intervention periods, and diverse populations are warranted to further investigate the long-term clinical effectiveness of remotely delivered HIFT. These findings support the integration of remotely supervised HIFT into community- and home-based exercise programs as an accessible and effective strategy for improving health-related physical fitness and reducing cardiovascular risk among previously sedentary adults.

Funding: This research received no external funding

Ethics Approval The study protocol was approved by the Clinical Research Ethics Committee of Marmara University Faculty of Medicine (Approval No. 09.2021.1314; Approval Date: December 3, 2021). All participants provided written informed consent before participation, and the study was conducted in accordance with the principles of the Declaration of Helsinki.

Acknowledgments The authors would like to thank all participants for their valuable contribution and commitment throughout the study. One of the parameters of the study was published in 2023 to meet the requirements for a Ph.D. degree, as noted in the references.

Conflict of Interest This study is based on a doctoral dissertation. The author and advisor of the dissertation declare that there is no conflict of interest.

Artificial intelligence (ChatGPT, OpenAI) was used solely to assist in the preparation and graphical presentation of the figures (Figures 1 and 2). All data and statistical analyses were processed using scientific methods, and the interpretations and final content were reviewed and verified by the authors.

REFERENCES

- Blair, S. N., Kohl, H. W., 3rd, Barlow, C. E., Paffenbarger, R. S., Jr, Gibbons, L. W., & Macera, C. A. (1995). Changes in physical fitness and all-cause mortality. A prospective study of healthy and unhealthy men. *JAMA*, 273(14), 1093–1098.
- Borg G (1970). Perceived exertion as an indicator of somatic stress. *Scand J Rehabil Med* (2),92–98.
- Boraita A. Comments on the 2020 ESC guidelines on sports cardiology and exercise in patients with cardiovascular disease *Rev Esp Cardiol*. 2021;74(6):488–493. doi: 10.1016/j.rec.2021.03.002
- Cakar Saka, S.A., Camligüney A.F., (2023). The Effect of 12-Week Face-to-Face and OnlineHIFT Training on Certain Cardiovascular Biomarkers. *International Journal of Sport Exercise and Training Sciences - IJSETS*, 9(3), 91-98. DOI: 10.18826/useeabd.1339534
- Cengiz, C., & Ateş, B. (2022). COVID-19 pandemi sürecinde çocuk ve ergenlerde sağlıkla ilişkili fiziksel uygunluk. *Turkish Studies - Social*, 17(4), 647–664. <https://doi.org/10.7827/TurkishStudies.63023>
- Chambonniere C, Lambert C, Fearnbach N, TardieuA, Fillon A, Genin P, Larras B. (2021). Effect of the COVID-19 lockdown on physical activity and sedentary behaviors in French children and adolescents: New results from the ONAPS national survey. *European Journal of integrative Medicine*. 43(2). doi: 10.1016/j.eujim.2021.101308.





- Durstine, J.L., Gordon, B.T., Wang, Z., & Luo, X. (2013). Chronic disease and the link to physical activity. *Journal of Sport and Health Science*, 2, 3-11. doi: 10.1016/j.jshs.2012.07.009
- Feito, Y., Heinrich, K., Butcher, S., & Poston, W. (2018). High-Intensity Functional Training (HIFT): Definition and Research Implications for Improved Fitness. *Sports*, 6(3), 76. MDPI AG. Retrieved from <http://dx.doi.org/10.3390/sports6030076>
- Genin MP, Lambert C, Larras B, Pereira B, Toussaint JF, Baker SJ, Trembelay A, Thivel D, Duclos M. (2021). How Did the COVID-19 Confinement Period Affect Our Physical Activity Level and Sedentary Behaviors? Methodology and First Results From the French National ONAPS Survey. *J Phys Act Health*. 13: 296-303. doi: 10.1123/jpah.2020-0449
- Özer K. (2016). *Fiziksel Uygunluk*. Nobel Yayınları. 6. Basım, Ankara.
- Özer K. (2009). *Kinantropometri Sporda Morfolojik Planlama*. Nobel Yayınları. 2. Baskı, Ankara.
- Özer U. (2022). Evaluation of distance education process in sports higher education. *Problems of Education in The 21st Century* (80): 1.195-213
- Wewege, M., van den Berg, R., Ward, R. E., & Keech, A. (2017). The effects of high-intensity interval training vs. moderate-intensity continuous training on body composition in overweight and obese adults: a systematic review and meta-analysis. *Obesity reviews : an official journal of the International Association for the Study of Obesity*, 18(6), 635-646. <https://doi.org/10.1111/obr.12532>
- World Health Organization. (2016). Global Report On Diabetes. World Health Organization. <https://www.who.int/publications/i/item/who-nmh-nvi-16.3>
- World Health Organization. (2002). Projections of mortality and burden of disease to 2030. Death by Income Group, Geneva.
- World Health Organization (2020). Obesity and overweight. Secondary obesity and overweight, 2012. <http://www.who.int/mediacentre/factsheets/fs311/en/>





FT-15

Bibliometric Analysis of Parental Attitudes in Sports Using the VOSviewer Application

Melek Erol¹, Gözde Ersöz Ay²

¹ MSc Student, Marmara University, Faculty of Sport Sciences, Istanbul, Turkey,

<https://orcid.org/0009-0002-6903-7816>

² Prof. Dr., Marmara University, Faculty of Sport Sciences, Istanbul, Turkey,

<https://orcid.org/0000-0002-1261-606X>

Correspondence: melekkerl@gmail.com

Abstract

Parental attitudes and involvement play an important role in shaping children's and adolescents' experiences in sport. This study aimed to examine the authorship and thematic structure of the literature on parental attitudes and involvement in sport using bibliometric analysis. The final dataset comprised 276 unique research articles retrieved from the Web of Science and Scopus databases. Descriptive performance analysis and science-mapping techniques were applied using VOSviewer. The analyses focused on author productivity, author co-authorship networks, frequently occurring keywords, keyword co-occurrence patterns, and the temporal distribution of authors and keywords based on average publication year. The findings showed that Dorsch, T. E., Knight, C. J., and Harwood, C. G. were the most prolific authors, with six publications each. Dorsch had the highest total link strength (19), followed by Knight (13) and Harwood (12), indicating their relatively strong positions within the co-authorship network. The most frequently occurring keywords were "youth sport" (35 occurrences), "involvement" (29 occurrences), and "parents" (25 occurrences). These keywords also had high total link strengths, indicating that they occupied central positions within the keyword co-occurrence network. The overlay visualization further suggested that keywords such as "parental support," "junior," and "fit indexes" were associated with more recent average publication years. Overall, the findings indicate that the literature is primarily structured around youth sport, parental involvement, and parents' roles in athletes' experiences. The study provides an overview of author productivity, scholarly collaboration, dominant research topics, and the temporal development of research on parental attitudes and involvement in sport.

Keywords: parental attitudes, parental involvement, sport, athletes, parents

INTRODUCTION

Parents play a central role in children's development by providing care, guidance, emotional support, and opportunities for learning. Through their attitudes and behaviors, parents contribute to the development of children's values, social skills, emotional well-being, and patterns of adjustment. Consequently, parental attitudes and behaviors are considered important determinants of children's developmental experiences (Baumrind, 1971; Bandura, 1977; Demirutku, 2017).





Parenting style refers to the relatively consistent patterns through which parents interact with, guide, support, and discipline their children (Farokhzad, 2015; Karadeniz, 2020). Baumrind's (1971) framework primarily conceptualized parenting styles according to two dimensions: demandingness, which refers to the extent of parental control and expectations, and responsiveness, which refers to the degree of warmth, support, and sensitivity to children's needs. Baumrind originally identified three parenting styles—authoritative, authoritarian, and permissive—while the framework was later expanded to include the rejecting-neglecting style (Maccoby & Martin, 1983). These styles reflect distinct patterns of parental communication, discipline, emotional support, and responsiveness (Sooriya, 2017).

Authoritative parents establish clear rules, boundaries, and expectations while explaining the reasons underlying them. They combine appropriate levels of control with warmth, responsiveness, and open communication. Rather than relying solely on parental authority, they encourage children to understand rules, express their opinions, and develop autonomy within clearly defined limits (Darling & Steinberg, 1993; Joseph & John, 2008).

Authoritarian parents also establish strict rules and high expectations; however, they provide limited explanation or opportunity for discussion. Obedience and conformity are strongly emphasized, while children are generally given little autonomy or involvement in family decision-making. This parenting style is therefore characterized by high demandingness and relatively low responsiveness (Çakmak & Kaplan, 2015).

Rejecting-neglecting parents demonstrate low levels of both demandingness and responsiveness. They may provide limited supervision, emotional support, or involvement in their children's lives and may have little awareness of their children's experiences and needs. As a result, children may experience feelings of emotional neglect, inadequacy, or insecurity (Çakmak & Kaplan, 2015; Yavuzer, 2011).

Permissive parents are generally warm and accepting but impose few rules, restrictions, or behavioral expectations. Children are given considerable freedom, often without consistent guidance or consequences. Although these parents may be emotionally responsive, the lack of clear boundaries and supervision may make it difficult for children to develop self-regulation and a sense of responsibility (Steinberg, 2017).

Regarding parental attitudes toward sport, Mandic et al. (2025) examined 570 parents, including 238 fathers and 332 mothers. The findings indicated that mothers placed greater importance than fathers on maintaining a balance between sport and academic life. Mothers also attributed greater importance to their children's psychological well-being. Cross-national differences were observed in performance-oriented attitudes: Serbian parents placed greater emphasis on performance than Ukrainian and Spanish parents, whereas Ukrainian parents expressed the lowest level of concern about balancing sport and academic life. These findings suggest that parental attitudes toward sport may vary according to both parental gender and cultural context.

Gönener and Dülger (2026) examined the attitudes of 529 parents of children aged 9–12 toward physical education classes. The findings showed that higher parental education levels were associated with more positive attitudes toward physical education. This result suggests that parents' educational backgrounds may be an important factor in shaping their perceptions of physical education.





Kovács et al. (2022) investigated stress factors and sport participation among 1,260 parents. Higher levels of parental support for self-efficacy were associated with greater sport participation, whereas a history of sport-related injury among children was associated with increased parental stress and more restrictive attitudes. In addition, parents with higher educational levels were more likely to perceive communication with sport clubs and coaches as stressful.

Focusing on parental involvement in sport, Kovács et al. (2024) examined 118 adolescents and classified them into three groups based on their perceptions of their parents: those whose parents valued both sport and academic achievement, those whose parents prioritized academic achievement, and those whose parents prioritized neither sport nor academic achievement. Adolescents whose parents valued both sport and academics demonstrated higher levels of athletic achievement and stronger motivation to continue participating in sport than those in the other groups. In contrast, adolescents whose parents focused primarily on academics demonstrated higher levels of academic achievement. Adolescents whose parents valued neither domain exhibited higher levels of excessive attachment to sport and passion than those in the other groups.

In a qualitative study of parental involvement in sport, Felber Charbonneau and Camiré (2020) interviewed eight parents and eight athletes. Parallel questions were used to explore both groups' experiences. For example, parents were asked how frequently they attended their children's competitions, while athletes were asked whether they had a say in their parents' attendance and how they felt when their parents attended. The findings indicated that parents and athletes generally responded to each other's needs. However, when their expectations and needs were not aligned, communication difficulties emerged.

Overall, the existing literature has predominantly focused on young athletes and has examined how parental attitudes and involvement influence athletes' experiences, participation, development, and well-being. Against this background, the present study uses bibliometric analysis to visualize the major research themes, changes in thematic emphasis over time, influential authors, and patterns of scholarly collaboration in the literature on parental attitudes and involvement in sport.

Aim

This study aimed to examine the authorship and thematic structure of the literature on parental attitudes and involvement in sport through bibliometric analysis. Specifically, it sought to identify the most prolific authors based on their publication output, examine the strength and temporal distribution of author collaboration networks, determine the most frequently occurring keywords, and map keyword co-occurrence patterns and their development over time using VOSviewer.

METHOD

This study employed bibliometric analysis by combining descriptive performance analysis with science-mapping techniques. Bibliometric analysis enables the quantitative examination of publication characteristics, authorship patterns, collaborative relationships, and major research themes within a particular field (Pritchard, 1969; Nicholas & Ritchie, 1978).

The final bibliographic dataset consisted of 276 unique research articles retrieved from the Web of Science and Scopus databases. Descriptive performance analysis was used to identify the most prolific





authors according to their number of publications and the most frequently occurring keywords according to their occurrence counts. Total link strength was used to assess the overall strength of each author's co-authorship connections and each keyword's co-occurrence relationships within the respective networks.

Science-mapping analyses were conducted using VOSviewer. Author co-authorship analysis was used to examine collaboration patterns among researchers, whereas keyword co-occurrence analysis was used to identify the principal topics and conceptual relationships within the literature. Network visualizations represented the relationships among authors and keywords, while overlay visualizations illustrated their temporal distribution based on average publication year. In the visual maps, larger nodes represented authors with more publications or keywords with higher occurrence counts, whereas thicker links indicated stronger relationships between the nodes. Together, these analyses provided an overview of author productivity, scholarly collaboration, dominant research topics, and the temporal development of the literature on parental attitudes and involvement in sport.

Data Collection and Analysis Process

The identification and selection of studies were reported in accordance with the PRISMA 2020 guidelines (Page et al., 2021). The literature search was conducted in the Web of Science Core Collection and Scopus databases on February 18, 2026.

The search strategy combined terms related to sport and athletes with terms related to parental attitudes and involvement. The following combination of keywords was used: ("athlete" OR "sport") AND ("parent involvement" OR "parental experience" OR "parental attitudes"). The search terms were determined jointly by the researcher and the academic advisor following a preliminary review of the relevant literature.

Studies were included if they:

- were indexed in Web of Science or Scopus;
- were published between January 1, 2016, and February 18, 2026;
- were conducted within the fields of sport sciences or sport and exercise psychology;
- focused directly on parental attitudes, involvement, or experiences in sport;
- were original research articles published in English; and
- were available in full text.

Studies were excluded if they:

- were published before January 1, 2016;
- were not original research articles, such as reviews, book chapters, conference abstracts, or editorials;
- were conducted outside the fields of sport sciences and sport and exercise psychology;
- did not focus on parental attitudes, involvement, or experiences in sport;
- were published in a language other than English;
- were available only as abstracts; or
- were duplicate records.

The database searches yielded 316 records, including 104 from Web of Science and 212 from Scopus. All records were exported to EndNote for reference management and duplicate detection. After 40 duplicate records had been removed, 276 unique records remained for screening.





The titles and abstracts of these records were screened according to the predefined eligibility criteria. The full texts of potentially eligible articles were subsequently retrieved and assessed. No additional articles were excluded during the screening or full-text eligibility assessment. Therefore, all 276 articles were included in the final bibliometric analysis.

The bibliographic data of the included articles were imported into VOSviewer version 1.6.20. Descriptive performance analysis was used to identify the most prolific authors based on their publication counts and the most frequently occurring keywords based on their occurrence frequencies. Author co-authorship analysis was conducted to examine collaboration patterns among researchers, whereas keyword co-occurrence analysis was performed to identify prominent research topics and conceptual relationships within the literature.

Total link strength was used to indicate the overall strength of each author's co-authorship relationships and each keyword's co-occurrence relationships. Network visualizations represented the relationships among authors and keywords, while overlay visualizations illustrated their temporal distribution based on average publication year.

The study identification and selection process is presented in Figure 1.

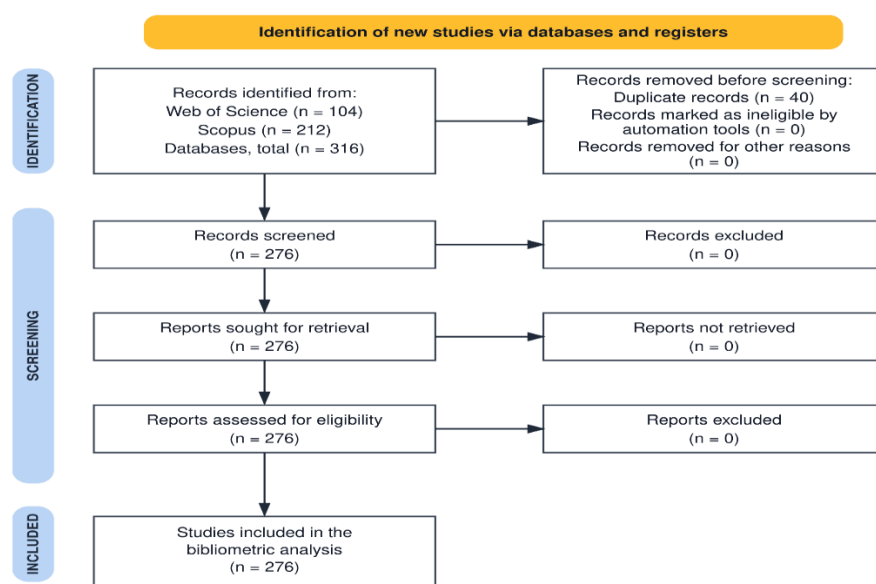


Figure 1: PRISMA 2020 Flow Diagram of the Study Identification and Selection Process





RESULTS

Table 1: Most Prolific Authors in the Dataset

Author	Document	Total link strength
Dorsch, t. e.	6	19
Knight, c. j.	6	13
Harwood, c. g.	6	12

Author	Number of publications	Total link strength
Dorsch, T. E.	6	19
Knight, C. J.	6	13
Harwood, C. G.	6	12

As shown in Table 1, Dorsch, T. E., Knight, C. J., and Harwood, C. G. were the most prolific authors in the dataset, with six publications each. Among these authors, Dorsch had the highest total link strength (19), followed by Knight (13) and Harwood (12). These findings indicate that Dorsch had the strongest overall co-authorship connections within the analyzed author network.

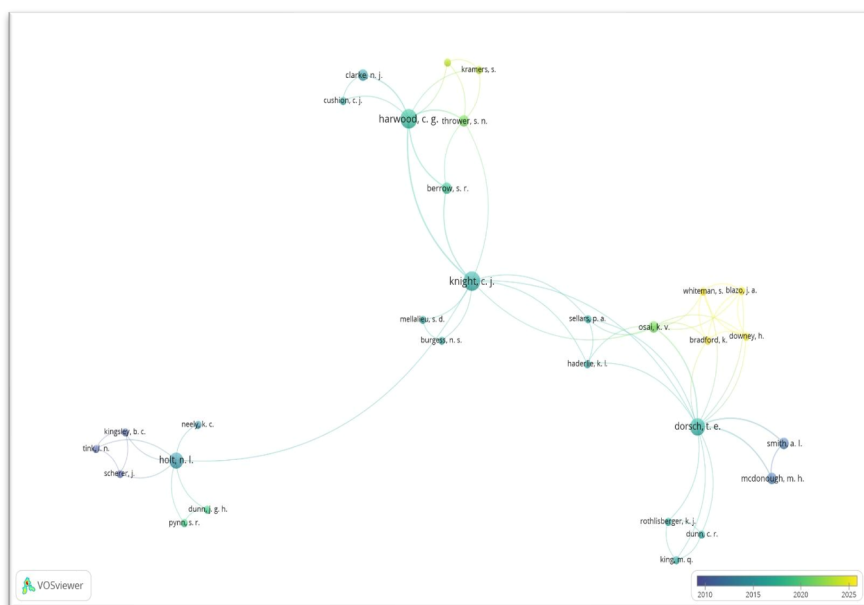


Figure 2: Overlay Visualization of the Author Co-authorship Network





Figure 2 presents an overlay visualization of the author co-authorship network in the analyzed literature. Each node represents an author, while the links between nodes indicate co-authorship relationships. Larger nodes represent authors with higher publication output, and thicker links indicate stronger collaborative relationships. The colors represent the authors' average publication years, ranging from earlier years in blue to more recent years in yellow.

Dorsch, T. E., Knight, C. J., and Harwood, C. G. occupy relatively central positions in the network and connect with several other authors. Authors such as Bradford, R., Downey, H., Whiteman, S., Blazo, J. A., and Kramers, S. are shown in yellow or yellow-green, indicating that their publications have more recent average publication years. However, these colors do not necessarily indicate greater productivity or influence; they reflect the temporal distribution of publications within the co-authorship network.

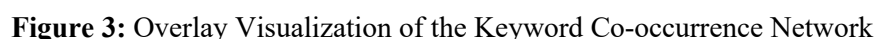
Table 2: Most Frequently Occurring Keywords

Keyword	Occurences	Total link strength
Youth sport	35	381
Involvement	29	296
Parents	26	233

Keyword	Occurrences	Total Link Strength
Youth sport	35	381
Involvement	29	296
Parents	25	233

As shown in Table 2, "youth sport" was the most frequently occurring keyword in the analyzed literature, with 35 occurrences, followed by "involvement" with 29 occurrences and "parents" with 25 occurrences. "Youth sport" also had the highest total link strength (381), followed by "involvement" (296) and "parents" (233). These findings indicate that "youth sport" occupied the most central position among these keywords and had the strongest overall co-occurrence relationships with other terms in the keyword network.





The keywords “youth sport,” “involvement,” “parents,” “physical activity,” and “sport” occupy relatively central positions in the network and are strongly connected with other terms. Keywords such as “parental support,” “junior,” and “fit indexes” are displayed in yellow or yellow-green, indicating that they are associated with more recent average publication years. However, this color distribution does not necessarily indicate an increase in popularity; it reflects the temporal distribution of the keywords within the analyzed literature.

This study examined the authorship and thematic structure of the literature on parental attitudes and involvement in sport by analyzing 276 articles indexed in the Web of Science and Scopus databases. The findings indicate that the field is primarily centered on youth sport and addresses parental involvement in relation to athletes' participation, experiences, behavior, motivation, and physical activity. The results also reveal a relatively concentrated structure in terms of author productivity, together with a conceptually interconnected keyword network.

Dorsch, T. E., Knight, C. J., and Harwood, C. G. were the most prolific authors, with six publications each. Among these authors, Dorsch had the highest total link strength, followed by Knight and Harwood. This suggests that these researchers occupy important positions within the co-authorship structure of the field.

However, publication counts and total link strength should not be interpreted as direct indicators of research quality or scientific impact. Publication count reflects productivity, whereas total link strength represents the overall strength of an author's collaborative relationships within the analyzed dataset. The temporal overlay map also showed that authors such as Bradford, Downey, Whiteman, Blazo, and Kramers had more recent average publication years. This finding indicates their relatively recent participation in the network but does not necessarily mean that they are more productive or influential than authors represented by earlier colors.

The keyword analysis further demonstrated that "youth sport," "involvement," and "parents" were the most frequently occurring terms and had the highest total link strengths. The prominence of these terms confirms that the literature is predominantly concerned with the role of parents in young athletes' sporting experiences. Their strong co-occurrence relationships with terms such as "physical activity," "sport," "motivational climate," and "behaviors" suggest that parental involvement is studied not as an isolated construct but as part of a broader system involving participation, motivation, behavior, and development. In particular, the central position of "youth sport" indicates that parental attitudes are most frequently examined during childhood and adolescence, when parents continue to influence access to sport, motivation, emotional experiences, and decisions about continued participation.

The temporal overlay analysis showed that terms such as "parental support" and "junior" had more recent average publication years. This may indicate growing scholarly attention to supportive parental behaviors and younger sport participants. Nevertheless, overlay colors represent the average publication year of the documents in which a keyword occurred and should not be interpreted as direct evidence of an increase in its frequency or popularity. Similarly, the relatively recent appearance of "fit indexes" should be interpreted cautiously because it is primarily a methodological term and may reflect the increased use of statistical modeling rather than the emergence of a substantive research topic.

Thematic Synthesis and Future Research Directions

The studies synthesized in Table 3 demonstrate that parental involvement cannot be classified as inherently positive or negative. Its consequences appear to depend on the form, intensity, timing, and context of the involvement, as well as on how it is perceived by the athlete. Encouragement, emotional support, constructive communication, and appropriate guidance can contribute to children's enjoyment, motivation, competence, and continued participation. In contrast, excessive expectations, controlling behavior, negative sideline conduct, comparisons with other athletes, and interference with coaches may create pressure, undermine autonomy, and contribute to burnout or withdrawal from sport (Burke et al., 2023; Nunomura & Oliveira, 2013; Strandbu et al., 2019).

These findings can also be interpreted through Baumrind's (1971) dimensions of demandingness and responsiveness. Parental behaviors that combine appropriate expectations with warmth, explanation, and autonomy support resemble an authoritative pattern. By contrast, high levels of control and performance pressure combined with limited responsiveness may resemble an authoritarian pattern, whereas parental disengagement may reflect low responsiveness and low involvement. However, these connections should be regarded as conceptual interpretations rather than direct classifications of individual parents. Parental behavior in sport may vary according to the competitive situation, the child's age, the sporting environment, and the parent's own emotional experiences.

The thematic findings are also consistent with the basic psychological needs perspective presented by Felber Charbonneau and Camiré (2020). Parental involvement may support athletes' autonomy, competence, and relatedness when parents respect their children's choices, provide constructive

feedback, and offer appropriate postcompetition support. Conversely, excessive training attendance, sideline interference, or controlling communication may frustrate these needs. Therefore, the effectiveness of parental involvement depends not only on how frequently parents participate in their children's sporting lives but also on whether their behavior corresponds to the athlete's preferences and developmental needs.

The findings further indicate that parental involvement is shaped by socioeconomic, cultural, and organizational conditions. Financial investment may provide children with greater access to training, equipment, and competition; however, it may also increase parents' expectations and athletes' perceptions of pressure (Dunn et al., 2016). Similarly, Knoester and Bjork (2025) emphasized that parental investment and commitment may differ according to socioeconomic status and the structure of sport participation. These observations are consistent with previous findings showing that parental attitudes toward sport may vary according to gender, cultural context, and educational background (Gönener & Dülger, 2026; Mandic et al., 2025). Consequently, parental involvement should be examined within the broader family and sporting environment rather than solely as an individual parental characteristic.

The studies on unsupportive parental behavior and club culture also highlight the importance of safeguarding. Emotional pressure, negative body language, coach interference, and overinvolvement may adversely affect young athletes' sporting experiences (Burke et al., 2023). At the organizational level, performance-oriented cultures and inconsistent support from clubs may intensify parental expectations or contribute to behaviors ranging from excessive intervention to disengagement (McGlynn et al., 2026). These findings suggest that responsibility for improving parental behavior should not be placed solely on individual parents. Sport clubs, coaches, and governing organizations should establish clear role boundaries, communication procedures, and standards of acceptable conduct.

Parent education interventions may be useful in addressing these concerns. The reflective practice intervention examined by Azimi and Tamminen (2022) encouraged parents to evaluate their behavior, improve their listening skills, and adopt more autonomy-supportive communication. However, the absence of statistically significant quantitative changes, despite positive qualitative findings, suggests that intervention effectiveness requires further examination using larger samples, comparison groups, validated outcome measures, and longer follow-up periods. Future programs should also involve athletes and coaches so that parental behavior can be evaluated from multiple perspectives.

The findings concerning parasport provide an additional contextual consideration. Parents of athletes with disabilities may assume greater logistical, financial, or organizational responsibilities because of difficulties in finding suitable clubs, trained coaches, and inclusive sporting environments (Coates & Howe, 2023). In such contexts, a high degree of parental involvement may represent a response to structural barriers rather than excessive parental control. Therefore, assessments of parental involvement should consider disability, accessibility, available institutional support, and the specific demands placed on families.

From a practical perspective, sport organizations should provide parent education covering autonomy-supportive communication, emotional regulation, appropriate sideline behavior, postcompetition communication, safeguarding, and parent-coach role boundaries. Such programs should be adapted to athletes' developmental stages and should consider differences associated with gender, sport type, competitive level, socioeconomic background, culture, and disability. Creating formal communication

channels among parents, athletes, and coaches may also help prevent misunderstandings and align expectations.

Future studies should employ longitudinal and multi-informant designs that include athletes, parents, and coaches. Observational and mixed-method research may provide a more accurate understanding of the differences between parents' intended support and athletes' perceptions of that support. Further research should also investigate the mechanisms connecting parental behavior with enjoyment, motivation, psychological need satisfaction, perceived pressure, burnout, and sport continuation. Greater attention should be given to underrepresented cultures, lower-income families, parasport settings, and different family structures.

Finally, Table 3 represents a thematic synthesis of selected studies rather than a formal content analysis of all 276 articles. Its findings should therefore be interpreted as illustrative of important themes and research gaps rather than as an exhaustive representation of the entire dataset. Similarly, the bibliometric maps demonstrate patterns of productivity, collaboration, and conceptual association but do not establish causality or determine the effectiveness of particular parental behaviors.

Table 3: Thematic Synthesis of Selected Studies on Parental Involvement in Youth Sport and Proposed Research Questions

Primary thematic focus	Study	Aim	Key findings	Proposed research questions
Unsupportive parental behaviours	Burke et al. (2023)	To examine competitive female youth golfers' perceptions of unsupportive parental behaviours.	Participants reported emotional and physical ill-treatment, performance pressure, negative body language, comparisons with other athletes, and parental interference with coaches. These behaviours were perceived as unsupportive and emotionally harmful.	- How do parents understand and explain their own unsupportive behaviours? - What situational and emotional triggers contribute to these behaviours? - How effective are parent-focused emotion-regulation and safeguarding interventions?
Parental investment and sport commitment	Knoester and Bjork (2025)	To examine historical changes in parental involvement in youth sport and how involvement varies across generational, socioeconomic, and sport-related contexts.	Parental involvement and investment in youth sport increased over time and were greater among families with higher socioeconomic status. Participation in school-based sport teams was associated with stronger youth sport commitment.	- How does intensive parental investment affect family and parental well-being? - How do parent and child gender, sport type, sibling structure, and disability or special educational needs shape parental involvement?
Parental support in gymnastics	Nunomura and Oliveira (2013)	To examine young gymnasts' perceptions of parental attitudes and the role of parental support in their sporting careers.	Gymnasts generally valued parental encouragement, emotional support, and financial assistance. However, excessive achievement expectations and concerns about education or injury	How effective are parent education programmes in improving young gymnasts' motivation and



Primary thematic focus	Study	Aim	Key findings	Proposed research questions
			could be perceived as pressure and were associated with burnout or sport withdrawal.	- reducing stress and dropout? - How do perceptions of parental support vary across socioeconomic and cultural contexts? - Under what conditions are parental expectations perceived as support rather than pressure?
Parental involvement and basic psychological needs	Felber Charbonneau and Camiré (2020)	To examine parent-child perspectives on how parental involvement in sport influences athletes' basic psychological needs.	Parental involvement could both support and frustrate athletes' autonomy, competence, and relatedness. Guidance during difficult situations and post-competition support were perceived positively, whereas sideline interference and excessive attendance at training sessions were viewed negatively.	- How do athlete gender and sport type shape perceptions of parental involvement? - Which forms and levels of parental involvement predict psychological need satisfaction or frustration?
Financial investment, pressure, and enjoyment	Dunn et al. (2016)	To examine the relationships among family financial investment, perceived parental pressure, and children's enjoyment and commitment in organised youth sport.	Greater family financial investment was indirectly associated with lower sport enjoyment through increased perceived parental pressure. Perceived pressure was negatively associated with children's enjoyment of sport.	- How do financial investment, perceived pressure, enjoyment, and commitment change over time? - How do financial stress and non-financial costs, such as time away from work and home, influence children's perceptions of parental pressure?
Autonomy and boundaries in parental involvement	Strandbu et al. (2019)	To explore how young athletes experience and negotiate intensified parental involvement in organised youth sport.	Participants valued parental support and guidance but wanted greater control over sport-related decisions and clearer boundaries around peer contexts. Sideline shouting and interference were viewed negatively, while having a parent as a coach was described as both challenging and potentially beneficial for family communication.	- How closely do athletes' and parents' perceptions of parental involvement correspond? - What are the experiences of athletes receiving limited parental support? - How can parents provide support while respecting athletes' autonomy and social boundaries?
Reflective practice and parent-athlete communication	Azimi and Tamminen (2022)	To examine whether a six-week reflective-practice intervention increased parents' awareness of their communication and influenced parent-	Qualitative findings suggested that reflective practice encouraged parental self-evaluation, listening, and autonomy-supportive communication. However, quantitative measures showed no statistically significant pre-post	Which components of reflective-practice interventions are most effective?





Primary thematic focus	Study	Aim	Key findings	Proposed research questions
		athlete communication behaviours.	changes in parental support, pressure, parenting style, or communication quality.	- Are these programmes effective in larger and more diverse samples? - What are the effects of involving athletes, coaches, and both parents in the intervention?
Parental experiences in parasport	Coates and Howe (2023)	To explore parents' experiences of facilitating their disabled children's engagement in competitive parasport.	Parents encountered structural barriers when seeking suitable clubs, coaches, and inclusive sporting environments. Some reduced or left employment or became coaches themselves, while sport participation and social support were perceived as beneficial for both children and parents.	- How do barriers to sport participation vary across disability groups and sociocultural contexts? - How can clubs, coaches, governing bodies, and other stakeholders better support athletes and their families? - Which environmental factors facilitate or restrict participation in parasport?
Parental expectations in fee-paying sport clubs	McGlynn et al. (2026)	To examine negative parental attitudes and behaviours in fee-paying youth sport clubs.	The findings highlighted excessive emphasis on winning, immediate success, and playing time. High performance expectations were sometimes accompanied by inconsistent practical support, while parental behaviour ranged from excessive intervention to complete disengagement.	- How do cultural and socioeconomic backgrounds shape parent-coach relationships and role expectations? - How do athletes, parents, and coaches differ in their perceptions of parental behaviour? - Which organisational practices can reduce unrealistic expectations and inappropriate parental involvement?

LIMITATIONS

This study has several limitations. First, the data were retrieved on February 18, 2026, and therefore represent a snapshot of the literature available on that date. Subsequent publications and changes to database records were not included in the analysis.

Second, the dataset was obtained exclusively from the Web of Science Core Collection and Scopus. Consequently, relevant publications indexed in other bibliographic databases, scholarly search engines, or national and local indexes may not have been captured. This limitation may have affected the comprehensiveness of the dataset and the resulting bibliometric networks.

Third, the analysis was restricted to original research articles published in English and available in full text. Therefore, studies published in other languages, other publication types, and articles without



accessible full texts were not included. These eligibility criteria may have introduced language, publication-type, and accessibility biases.

Finally, bibliometric maps depend on the accuracy and consistency of the metadata provided by the selected databases. Variations in author names, spelling differences, synonymous keywords, and inconsistencies in indexing may have influenced the structure of the co-authorship and keyword co-occurrence networks. Moreover, publication counts and total link strength reflect productivity and network connectivity rather than the methodological quality or scientific impact of individual studies.

REFERENCES

- Azimi, S., & Tamminen, K. A. (2022). Parental communication and reflective practice among youth sport parents. *Journal of Applied Sport Psychology*, 34(1), 109–132. DOI: <https://doi.org/10.1080/10413200.2019.1705433>
- Bandura, A. (1977). Social Learning Theory. Englewood Cliffs, NJ: Prentice-Hall.
- Baumrind, D. (1971). Current patterns of parental authority. *Developmental Psychology*, 4(1, Pt.2), 1–103. <https://doi.org/10.1037/h0030372>
- Burke, S., Sharp, L.-A., Woods, D., & Paradis, K. (2023). Athletes' Perceptions of Unsupportive Parental Behaviours in Competitive Female Youth Golf. *Journal of Applied Sport Psychology*, 35(6), 960-982. Advance online publication. DOI: <https://doi.org/10.1080/10413200.2023.2166155>
- Çakmak, K. ve Kaplan, N. (2015). *Çocuk yetiştirme tarzları, anne-baba tutumları*. Aydın: Aydın İl Emniyet Müdürlüğü Rehberlik ve Psikolojik Danışma Büro Amirliği.
- Coates, J., & Howe, P. D. (2023). Parents in the parasport pathway: parental experiences of facilitating their child's engagement in competitive disability sport. *Journal of Applied Sport Psychology*, 35(6), 1050-1071. <https://doi.org/10.1080/10413200.2023.2181464>
- Darling, N., & Steinberg, L. (1993). Parenting style as context: An integrative model. *Psychological Bulletin*, 113(3), 487-496. 10.1037/0033-2909.113.3.487
- Demirutku, K. (2017). *Değerlerin edinilmesinde ailenin rolü*. T.C. Aile ve Sosyal Politikalar Bakanlığı Aile ve Toplum Hizmetleri Genel Müdürlüğü.
- Dunn, R. C., Dorsch, T. E., King, M. Q., & Rothlisberger, K. J. (2016). The impact of family financial investment on perceived parent pressure and child enjoyment and commitment in organized youth sport. *Family Relations*, 65(2), 287-299. DOI: <https://doi.org/10.1111/fare.12193>
- Farokhzad, P. (2015). Childrearing styles and family communication patterns among university students. *International Journal of Psychological and Behavioral Sciences*, 9(5), 1711-1716.
- Felber Charbonneau, E., & Camiré, M. (2020). Parental involvement in sport and the satisfaction of basic psychological needs: Perspectives from parent-child dyads. *International Journal of Sport and Exercise Psychology*, 18(5), 655-671. <https://doi.org/10.1080/1612197X.2019.1570533>
- Gönener, U., & Dülğar, M. (2026). Parents' Attitudes Toward Physical Education and Sports Lessons: A Descriptive Study. *Eurasian Journal of Sport Sciences and Education*, 8(1), 195-202. <https://doi.org/10.47778/ejsse.110>



- Joseph, M. V., & John, J. (2008). Impact of parenting styles on child development. *Global Academic Society Journal: Social Science Insight*, 1(5), 16-25.
- Karadeniz, G. (2020). Kendini seven çocuk yetiştirmek. İstanbul: Maltepe Üniversitesi Kitapları.
- Kovács, K., Földi, R. F., Géczi, G., & Gyömbér, N. (2022). Parental stressors in sports influenced by attributes of parents and their children. *International journal of environmental research and public health*, 19(13), 8015. <https://doi.org/10.3390/ijerph19138015>
- Kovács, K., Oláh, Á. J., & Pusztai, G. (2024). The role of parental involvement in academic and sports achievement. *Heliyon*, 10(2). <https://doi.org/10.1016/j.heliyon.2024.e24290>
- Knoester, C., & Bjork, C. (2025). Parental involvement in youth sports: historical trends and links to generational, socioeconomic status, sport culture, and youth sport commitment contexts. *Leisure/Loisir*, 1-37. DOI: <https://doi.org/10.1080/14927713.2025.2503183>
- Maccoby, E. E., & Martin, J. A. (1983). Socialization in the context of the family: Parent-child interaction. In E. M. Hetherington (Ed.) & P. H. Mussen (Series Ed.), *Handbook of child psychology: Vol. 4. Socialization, personality, and social development* (4th ed., pp. 1–101). John Wiley & Sons.
- Mandic, R., Veskovic, A., Jakovljevic, S., Majstorovic, N., Ranisavljev, I., & Mrdakovic, V. (2025). Parental perspectives on mental skill development and sport-school balance in youth athletes: A cross-cultural study. *Journal of Physical Education and Sport*, 25(8), 1683-1690. 10.7752/jpes.2025.08188
- McGlynn, J., Bell, T. R., & Milford, M. (2026). 'Just be the parent': Problematic parent behavior from the perspective of fee-based youth sport coaches. *Sport in Society*, 29(4), 868–885. <https://doi.org/10.1080/17430437.2025.2537646>
- Nicholas, D., & Ritchie, M. (1978). Literature and Bibliometrics London: Clive Bingley.
- Nunomura, M., & Oliveira, M. S. (2013). Parents' support in the sports career of young gymnasts. *Science of Gymnastics Journal*, 5(1), 5–17
- Page, M. J., Moher, D., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., . . . McKenzie, J. E. (2021). PRISMA 2020 explanation and elaboration: Updated guidance and exemplars for reporting systematic reviews. *BMJ*, 372, Article n160. <https://doi.org/10.1136/bmj.n160>
- Pritchard, A. (1969). Statistical bibliography or bibliometrics. *Journal of documentation*, 25, 348.
- Steinberg, L. (2017). *Ergenlik* (F. Çok, Çev. Ed.; 3. bsk.). Ankara: İmge Kitabevi Yayınları.
- Sooriya, P. (2017). Parenting Styles. Printed by Laxmi Publication, Solapur. ISBN- 978-387-36166-3. Published by Lulu Publication.3101 Hillborough St. Raliegh, NC 27607, United States.
- Strandbu, Å., Stefansen, K., Smette, I., & Sandvik, M. R. (2019). Young people's experiences of parental involvement in youth sport. *Sport, Education and Society*, 24(1), 66–77. <https://doi.org/10.1080/13573322.2017.1323200>



Yavuzer, H. (Ed.). (2011). *Çocuk ve ergen eğitiminde anne baba tutumları* (2. bsk.). İstanbul: Timaş Yayınları.



FT-16

AI-Supported Curriculum Design for Game-Based Approaches in Physical Education: A Qualitative Study of Teachers' Curriculum Decision-Making

Naoki Suzuki, Tokyo Gakugei University, Japan
nsuzuki@u-gakugei.ac.jp

Abstract

Background: Generative AI is often promoted to automate lesson planning, yet such automation can bypass the professional judgment needed for situated and embodied learning. **Purpose:** This study examined how physical education teachers calibrated AI-generated curriculum suggestions in game-based units. **Methods:** Three Japanese teachers from elementary, lower secondary, and upper secondary settings were purposefully selected because they used Manabi for PE in different game forms: T-ball, basketball, and badminton. Data included semi-structured interviews, the curriculum-development prompt artifact, and interview-elicited design traces. Reflexive thematic analysis was used with attention to researcher positionality, negative cases, and audit-trail transparency. **Results:** The analysis developed the concept of pedagogical calibration: teachers' situated work of verifying, modifying, rejecting, or recontextualizing AI suggestions in relation to student learning histories, embodied game realities, institutional constraints, and pedagogical intentions. AI functioned as an epistemic scaffold by rapidly aggregating fragmented learning histories, but teachers retained authority over whether and how suggestions entered curriculum design. Calibration also revealed risks, including mixed learning logs, misalignment with physical skill prerequisites, and representational demands that could create new participation thresholds. **Conclusions:** The study contributes a delayed-suggestion architecture, a recursive calibration model, and design principles for AI-supported curriculum work in embodied learning domains. It theorizes teacher authority over AI output as structured professional practice and identifies embodied game realities as a domain-specific limit of text-based AI.

Keywords: *pedagogical calibration; embodied learning; epistemic scaffolding; professional noticing; teacher judgment*

INTRODUCTION

Game-based approaches (GBAs) in physical education position games as sites of inquiry rather than as final applications of isolated skill drills. Teachers must modify game forms so that learners encounter meaningful tactical problems, participate in developmentally appropriate ways, and notice relationships among movement, decision-making, and collective play. This work is demanding because teachers must interpret student histories, anticipate how game constraints will shape embodied action, and adapt activities under everyday constraints of time, space, equipment, and continuity.

Generative AI appears to offer relief from this burden. Teachers can ask AI systems to propose modified games, lesson sequences, rubrics, and reflection prompts. However, if AI is positioned as an automatic lesson-plan generator, the most professionally important work of



curriculum design - interpreting learners and judging what should happen next - may be hidden or displaced. This concern is especially acute in physical education because central learning objects include pace, fear of the ball, fatigue, perceptual timing, tactical anticipation, bodily confidence, and participation that may never be fully captured in text-based logs.

This study examines an alternative design: AI as a dialogic support for teacher curriculum reasoning. Manabi for PE was developed to help teachers work from accumulated student learning logs toward game-based curriculum decisions. The tool was not prompted to produce a lesson plan immediately. Instead, it was instructed to synthesize learning histories as tentative hypotheses, ask the teacher to verify those interpretations, and only then elicit the intended judgment and game situation before offering options.

Research Questions/Problems

The research question was: How did teachers pedagogically calibrate AI suggestions when using Manabi for PE to design or improve game-based physical education units? Pedagogical calibration is defined as teachers' situated work of verifying, modifying, rejecting, or recontextualizing AI-generated curriculum suggestions in relation to student learning histories, embodied game realities, institutional constraints, and pedagogical intentions. The study contributes a delayed-suggestion prompt architecture, a recursive model of teacher calibration practices, and design principles for human-AI curriculum work in embodied learning domains. Across these contributions, the analytic focus shifts from what AI generates to how teachers exercise authority over AI output.

Brief Literature Review

Game-based approaches and curriculum design work

Teaching Games for Understanding, Game Sense, and tactical games approaches share a concern with making game structures pedagogically meaningful (Bunker & Thorpe, 1982; Light, 2013; Mitchell et al., 2021). Representation, exaggeration, simplification, and small-sided design are often key principles (Griffin et al., 1997; Kirk & MacPhail, 2002). Yet GBA implementation is not a recipe: teachers must decide which problem to foreground, how much complexity to retain, and how to design for diverse learners without reducing activity to decontextualized drills (Harvey & Jarrett, 2014; Morales-Belando et al., 2018).

Teacher judgment and human-AI curriculum work

This study is grounded in teacher judgment research. Shulman's (1987) pedagogical content knowledge emphasizes transforming content for particular learners. Schön (1983) frames professional practice as judgment under uncertainty. Professional noticing research explains how teachers attend to, interpret, and respond to student activity (Mason, 2002; van Es & Sherin, 2002; Jacobs et al., 2010). Remillard's (2005) curriculum design capacity shows that teachers interpret and adapt curriculum resources. AI-supported curriculum design brings these traditions into a new configuration because teachers respond not only to students and materials but also to dynamically generated AI interpretations and options.

Human-AI complementarity research argues that AI should augment rather than replace human expertise (Holstein et al., 2022; Luckin et al., 2016). Learning analytics can process



large volumes of student traces, but their meaning remains pedagogically underdetermined until interpreted by teachers. This division of work is consistent with distributed cognition: interpretation is distributed across records, tools, teachers, and classroom situations rather than residing in AI alone (Hutchins, 1995). In this study, AI's value is analyzed as epistemic scaffolding: it creates provisional objects for teacher judgment.

Embodied learning and the limits of text-based AI

Physical education sharpens the limits of text-based AI. A student may write that they understood spacing, while the enacted reality involves hesitation, timing errors, fear, fatigue, or inability to perceive off-ball relationships. Embodied and enactive perspectives emphasize that knowing is inseparable from perception, action, and the lived body (Merleau-Ponty, 2012; Varela et al., 1991). Constraint-led and ecological approaches also stress that action emerges through task, environment, and performer constraints (Araújo et al., 2006; Chow et al., 2016; Renshaw & Chow, 2019). Thus, teacher calibration is not a secondary implementation step; it is the point where AI-generated interpretations meet embodied game realities.

Table 1. Conceptual positioning of pedagogical calibration

Concept	Primary focus	What calibration adds
PCK	Transforming subject matter for particular learners.	Focuses on teacher response to external AI-generated interpretations and options.
Professional noticing	Attending to and interpreting student thinking or activity.	Includes teacher verification and dispute of AI-synthesized interpretations.
Curriculum design capacity	Using and adapting curriculum resources.	Addresses real-time adjustment of dynamic AI outputs, not only static materials.
Pedagogical calibration	Aligning AI suggestions with histories, embodied realities, constraints, and intentions.	Names teacher authority to verify, modify, reject, or recontextualize AI curriculum possibilities.

This positioning matters because the study does not treat AI output as a neutral resource. AI suggestions enter curriculum design as provisional claims that must be made accountable to students, materials, time, space, and teacher intention. Pedagogical calibration therefore describes a form of professional authority: teachers do not simply use AI; they test the fit between AI-generated possibilities and the lived conditions of instruction.

Significance of the Study

This study is significant because it shifts attention from whether AI can generate lesson plans to how teachers exercise professional judgment over AI-generated suggestions in embodied learning domains. It contributes the concept of pedagogical calibration as a way to understand teacher authority, AI use, and curriculum decision-making in physical education.

Purposes of the Study

The purpose of this study was to examine how physical education teachers verified, modified, rejected, or recontextualized AI-generated curriculum suggestions when designing or improving game-based physical education units.

Delayed-Suggestion Architecture of Manabi for PE

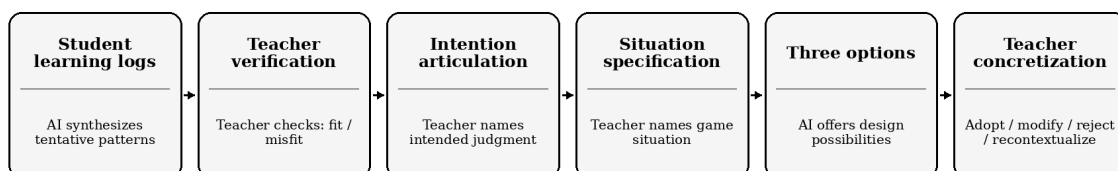


Figure 1. Dialogic prompt architecture of Manabi for PE. The design delays solution-giving until teachers verify AI interpretations and articulate the desired game situation.

METHODS

Research Design and Measures for Qualitative Study

This exploratory qualitative study is positioned as theory-building rather than effects measurement. Data sources included three semi-structured interviews, the curriculum-development prompt artifact, and interview-elicited traces of AI-teacher design episodes. The design deliberately distinguishes primary evidence from illustrative reconstruction so that the claims remain proportionate to the data. Original AI chat logs and student logs were not fully exported at the time of this proceedings manuscript; therefore, reconstructed traces are clearly labeled as illustrative and are not treated as independent log data.

Table 2. Data sources and analytic status

Data source	Included	Analytic use	Limitation
Semi-structured interviews	Yes	Primary evidence for calibration practices, perceived affordances, and limits.	Retrospective accounts; subject to recall and interviewer effects.
Prompt artifact	Yes	Evidence of the delayed-suggestion architecture and constraints placed on AI.	Design intention, not proof of AI behavior in every episode.
AI-teacher chat logs	Not yet fully incorporated	Future evidence of exact AI output and teacher response sequence.	Current trace is reconstructed from interview, not raw log.
Student logs / classroom artifacts	Not yet fully incorporated	Future evidence of what the AI synthesized and how participation changed.	Current study does not measure student learning gains.

Participants

Participants were three Japanese physical education teachers who had experience using AI-supported reflection tools and Manabi for PE. They were purposefully selected through maximum-variation logic because they represented different school levels and game forms: elementary/baseball-type, lower secondary/goal-type, and upper secondary/net-type. The aim was analytic replication across heterogeneous contexts, not statistical representation. The sample was judged sufficient for the proceedings study because the same mechanism - teacher verification and adjustment of AI output - appeared across highly varied contexts, while also



revealing different boundary conditions. Gender, ethnicity, and age are not reported because they were not analytic variables and were withheld to protect anonymity.

Table 3. Anonymized participant and curriculum design contexts

Case	Context	Game form and design problem	Use of Manabi for PE
Teacher A	Elementary teacher; more than 15 years of experience; upper-grade classroom teacher with PE coordination and ICT-related roles.	Grade 6 T-ball / baseball-type game. Problem: involving all students in fielding when skilled students tend to dominate.	Used before the unit to clarify the situation that should occur and consider cooperative fielding-oriented options.
Teacher B	Upper secondary PE teacher; more than 20 years of experience; involved in sport-course management and ICT-supported PE development.	Badminton / net-type game. Problem: supporting doubles positioning based on accumulated learning cards.	Used after several lessons to compare AI interpretations of student status with teacher judgment and consider next-lesson ideas.
Teacher C	Lower secondary PE teacher; approximately eight years of experience; roles in PE coordination, student guidance, school health, and AI use.	Basketball / goal-type game. Problem: making non-scorers' contributions visible when scorers became the most recognized participants.	Used during a Grade 2 unit to select and adapt a relationship-map activity from three AI-proposed options.

Data Collection

Interviews were conducted online in Japanese, audio-recorded with consent, and transcribed. The guide asked teachers to describe the unit context, how they used Manabi for PE, what suggestions they adopted or rejected, how they adjusted the suggestions, what happened in class, and what limits they noticed. English quotations were translated by the author for analytic reporting, prioritizing semantic equivalence over literal form. Participants gave informed consent for recording, transcription, translation, and anonymized research use. The procedures followed institutional requirements for anonymized interview research and excluded identifiable student data.

Data Analyses

Analysis followed reflexive thematic analysis (Braun & Clarke, 2006, 2019) and was reported with attention to COREQ-informed transparency (Tong et al., 2007). The author read each transcript to identify episodes connecting AI suggestions, teacher judgments, and classroom implementation. Initial codes included log verification, intention clarification, adoption, modification, rejection, recontextualization, embodied mismatch, institutional constraint, invisible participation, and AI-specific synthesis. Codes were compared across cases to develop the construct of pedagogical calibration. Trustworthiness was supported through an audit trail of excerpts and memos, attention to negative cases, and explicit researcher positionality (Lincoln & Guba, 1985). The author was involved in tool development; therefore, analysis did not treat usefulness as the outcome and instead foregrounded moments of mismatch, uncertainty, rejection, and miscalibration.



RESULTS

AI synthesized fragmented learning histories as hypotheses for teacher verification

Teachers valued AI not primarily because it generated activities, but because it rapidly aggregated dispersed learning histories into provisional patterns that could be inspected. Teacher B reported that the AI read learning cards and asked whether its interpretation of student status matched the teacher's view. This functioned as an epistemic scaffold for professional noticing rather than as an authoritative diagnosis.

Teacher B: "The AI read various learning cards and said, 'I think the students are in this kind of state; does that match the teacher's view?' When we read it, it was quite accurate."

Delayed prompts clarified pedagogical intentions before activities were proposed

The delayed-suggestion architecture required teachers to articulate what judgment or situation they wanted the game to generate before the AI offered design options. Teacher A recalled the question about what must occur in the game as difficult but productive because it moved T-ball design toward the intention to involve all students in fielding. Teacher C similarly used the basketball prompt to name the desired realization that scoring is produced through connected movements, not only by the final shooter.

Teacher C: "I told the AI that I wanted students to understand that everyone's movements were connected and led to scoring. Then it asked what situation must happen in the game."

Teachers calibrated AI suggestions through adoption, modification, rejection, and recontextualization

The three cases showed four calibration patterns. Teacher B approximated adoption when an option matched the badminton teacher's instructional intention. Teacher A modified AI-generated fielding ideas to fit students' limited baseball-type experience and fear of the ball. Teacher C rejected a two-court linked game because it did not fit the school's space, then recontextualized relationship mapping into a one-play, video-supported representational task.

Table 4. Cross-case calibration patterns

Pattern	Case example	Calibration criterion	Risk revealed
Adoption	Teacher B selected an option that matched the badminton teacher's intention.	Expertise fit: the teacher recognized a useful option quickly.	Smooth adoption may depend on prior expertise.
Modification	Teacher A combined AI suggestions with class reality.	Class fit: suggestions had to fit skill, fear, and participation.	Hidden assumptions can miscalibrate design.
Rejection	Teacher C rejected the two-court game because the school had only two courts.	Institutional fit: space, time, and lesson flow mattered.	Plausible options may be infeasible.
Recontextualization	Teacher C turned relationship mapping into a one-play analysis task.	Representational fit: the option made participation visible.	Representation can create new access demands.

Interview-elicited design trace

The following trace is reconstructed from Teacher C's interview and the prompt architecture. It is not a raw AI chat log and is included to illustrate how calibration patterns emerged within a design sequence, rather than to evaluate AI output quality.

Table 5. Interview-elicited calibration trace from Teacher C

Moment	Trace
Teacher intention	Students should understand that everyone's movements are connected and lead to scoring, not only the final shooter.
AI prompt	What situation must occur in the game for that judgment to emerge?
AI options	Pass-chain scoring; two-court linked play; relationship mapping.
Teacher calibration	The two-court option was rejected due to space and setup constraints. Relationship mapping was selected because it connected with prior experience and could be localized.
Classroom recontextualization	The teacher cut play into one-possession sequences and used worksheets and later video-supported team analysis to make contributing movements visible.

Teacher C's case is especially important because the AI option did not remain a game modification. Through teacher calibration, it became a representational activity that made invisible participation visible while also exposing a new access problem: students with weaker tactical perception found the map difficult to create. This is the theoretical hinge of the paper. AI-supported design did not simply modify a game; it changed what counted as visible participation and revealed who could or could not access that representation.

Calibration was recursive and did not guarantee success

Pedagogical calibration did not guarantee success. Teacher A's T-ball unit was designed around the assumption that offense was already guaranteed because every student would have a batting turn. After implementation, batting itself proved more difficult than expected, weakening the design premise.

Teacher A: "I designed it with a focus on defense, but when the students tried it, they really could not hit the ball. My outlook was too optimistic there."

This episode shows that calibration is recursive. Once AI-supported design meets the embodied reality of the class, new information emerges and should become input for the next cycle. Figure 2 models this recursive process.

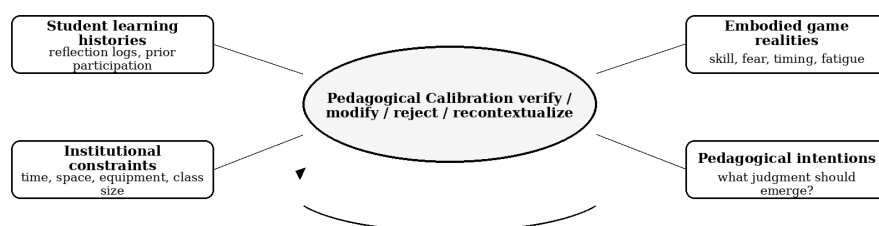




Figure 2. Recursive model of pedagogical calibration. Implementation generates new embodied realities and learning traces, which become input for the next calibration cycle.

DISCUSSION

What pedagogical calibration adds

The study shifts the question from whether AI can support teachers to how teachers act upon AI and make AI output accountable to professional judgment. Pedagogical calibration differs from PCK because the object of judgment is not only content transformation but externally generated AI output. It differs from professional noticing because teachers notice, verify, and sometimes dispute AI's interpretation of students. It differs from curriculum design capacity because the resource is not static; it is dynamically generated and locally incomplete. Adoption, modification, rejection, and recontextualization should therefore be treated as legitimate teacher actions. Disagreement with AI is not a breakdown of the tool; it is part of human-AI curriculum work.

Embodied limits, inclusion, and generalizability

The findings identify an uncomfortable truth for AI in embodied education. AI can help make participation visible, but representational tools may create new thresholds. Teacher C's relationship map allowed non-scorers to recognize their contributions, yet students with weak tactical perception struggled to map relationships. Teacher A's case showed that text-based AI may not detect physical prerequisites such as batting success. These are not peripheral implementation issues; they show that in PE the gap between verbalized reflection and bodily action is a central design problem. Importantly, misalignment was not only a technical problem. When teachers detected that AI summaries mixed domains or that a suggestion ignored bodily difficulty, the error became an occasion for professional verification and sharper judgment. Pedagogical calibration may transfer to domains where professional judgment is indispensable, AI output is useful but contextually incomplete, and important knowledge cannot be fully reduced to text-based records, such as music, art, laboratory work, clinical simulation, and teacher education.

Design principles

The limits identified above generate practical principles for AI-supported curriculum systems in embodied learning domains. By contextual purity, this study means keeping logs scoped to the relevant unit, game form, class, and time period unless teachers deliberately request cross-unit synthesis.

Table 6. Design principles for AI-supported curriculum design

Design principle	Implication
Preserve contextual purity while allowing deliberate cross-domain synthesis.	Let teachers scope logs by unit, game form, class, and time period unless they intentionally request cross-unit synthesis.



Design principle	Implication
Build delayed suggestion into the architecture.	Require teacher verification of AI interpretations and teacher articulation of intended judgment before offering activities.
Treat all four calibration patterns as legitimate.	Support adoption, modification, rejection, and recontextualization; do not treat rejection as tool failure.
Scaffold representational access, not only game access.	When systems suggest maps, videos, or diagrams, provide graduated tasks so that students with weaker tactical perception are not excluded.

LIMITATIONS

The study is limited by its small, purposive sample and its reliance on retrospective teacher accounts. The current dataset includes interviews and the prompt artifact but not a systematically analyzed corpus of raw AI-teacher chat logs, student logs, lesson plans, or classroom observation data. Therefore, the findings should be read as theory-building evidence about teacher calibration practices, not as evidence that AI improved student learning or curriculum quality. A journal version should incorporate anonymized AI logs, student learning-log excerpts, before-and-after design artifacts, classroom observations, and participant review of translated quotations.

CONCLUSIONS

This study argues that the future of AI-supported curriculum design should not be framed as a question of whether AI can generate better lesson plans. The more important question is how teachers verify, modify, reject, and recontextualize AI suggestions in relation to situated practice. Manabi for PE supported teachers when it delayed suggestions, aggregated fragmented learning histories, and prompted teachers to articulate the game situation they wanted to create. Yet calibration is not a guarantee of success. It is a recursive professional practice through which AI output is made accountable to the embodied realities of teaching and learning. Pedagogical calibration therefore defines a crucial dimension of AI-era teacher education: AI literacy for professional judgment.

Funding:

This work was supported by JSPS KAKENHI Grant Number JP24K05906. This study was conducted as part of the broader research project supported by this grant.

Acknowledgments: The author thanks the participating teachers for sharing their experiences and reflections.

Conflicts of Interest: The author was involved in the development and dissemination of Manabi for PE. This positionality is disclosed and addressed in the Methods section.



REFERENCES

- Araújo, D., Davids, K., & Hristovski, R. (2006). The ecological dynamics of decision making in sport. *Psychology of Sport and Exercise*, 7(6), 653-676.
<https://doi.org/10.1016/j.psychsport.2006.07.002>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. <https://doi.org/10.1191/1478088706qp063oa>
- Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, 11(4), 589-597. <https://doi.org/10.1080/2159676X.2019.1628806>
- Bunker, D., & Thorpe, R. (1982). A model for the teaching of games in secondary schools. *Bulletin of Physical Education*, 18(1), 5-8.
- Chow, J. Y., Davids, K., Button, C., & Renshaw, I. (2016). *Nonlinear pedagogy in skill acquisition: An introduction*. Routledge.
- Griffin, L. L., Mitchell, S. A., & Oslin, J. L. (1997). Teaching sport concepts and skills: A tactical games approach. *Human Kinetics*.
- Harvey, S., & Jarrett, K. (2014). A review of the game-centred approaches to teaching and coaching literature since 2006. *Physical Education and Sport Pedagogy*, 19(3), 278-300.
<https://doi.org/10.1080/17408989.2012.754005>
- Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial intelligence in education: Promises and implications for teaching and learning. *Center for Curriculum Redesign*.
- Holstein, K., Aleven, V., & Rummel, N. (2022). Designing for human-AI complementarity in K-12 education. *AI Magazine*, 43(2), 239-248. <https://doi.org/10.1002/aaai.12058>
- Hutchins, E. (1995). *Cognition in the wild*. MIT Press.
- Jacobs, V. R., Lamb, L. L. C., & Philipp, R. A. (2010). Professional noticing of children's mathematical thinking. *Journal for Research in Mathematics Education*, 41(2), 169-202.
- Kirk, D., & MacPhail, A. (2002). Teaching games for understanding and situated learning. *Journal of Teaching in Physical Education*, 21(2), 177-192.
- Light, R. (2013). *Game sense: Pedagogy for performance, participation and enjoyment*. Routledge.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage.
- Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson.
- Mason, J. (2002). *Researching your own practice: The discipline of noticing*. RoutledgeFalmer.
- Merleau-Ponty, M. (2012). *Phenomenology of perception* (D. A. Landes, Trans.). Routledge. (Original work published 1945)
- Mitchell, S. A., Oslin, J. L., & Griffin, L. L. (2021). Teaching sport concepts and skills: A tactical games approach (4th ed.). *Human Kinetics*.
- Morales-Belando, M. T., Calderón, A., & Arias-Estero, J. L. (2018). Improvement in game performance and adherence after an aligned TGfU floorball unit in physical education. *Physical Education and Sport Pedagogy*, 23(6), 657-671. <https://doi.org/10.1080/17408989.2018.1530747>
- Remillard, J. T. (2005). Examining key concepts in research on teachers' use of mathematics curricula. *Review of Educational Research*, 75(2), 211-246.
- Renshaw, I., & Chow, J. Y. (2019). A constraint-led approach to sport and physical education pedagogy. *Physical Education and Sport Pedagogy*, 24(2), 103-116.
<https://doi.org/10.1080/17408989.2018.1552676>
- Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books.





- Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. Harvard Educational Review, 57(1), 1-22. <https://doi.org/10.17763/haer.57.1.j463w79r56455411>
- Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist. International Journal for Quality in Health Care, 19(6), 349-357. <https://doi.org/10.1093/intqhc/mzm042>
- van Es, E. A., & Sherin, M. G. (2002). Learning to notice. Journal of Technology and Teacher Education, 10(4), 571-596.
- Varela, F. J., Thompson, E., & Rosch, E. (1991). The embodied mind: Cognitive science and human experience. MIT Press.





FT-17

From Data to Movement: How AI Empowers Educators and Athletes to Overcome Barriers

Shawn Cradit, Wake Technical Community College, Raleigh, NC, USA

ORCID: [0000-0002-2458-3998](https://orcid.org/0000-0002-2458-3998)

Abstract

The landscape of sports science, kinesiology, and physical education is undergoing a fundamental transformation driven by the integration of artificial intelligence (AI). Traditionally, the study of human movement relied on manual observation and standardized prescriptions; however, the emergence of AI allows for high-precision biomechanical analysis, predictive injury modelling, and personalized exercise prescriptions (Seo, 2024). Despite this potential, the rapid adoption of these tools has often outpaced the development of institutional policies and ethical frameworks, creating what researchers call an "AI implementation gap" (Westover, 2026).

INTRODUCTION

In 2026, educational conversation has shifted from whether AI should be used to how to use this tool. AI in education refers to technologies that enhance teaching, learning, and administrative processes, including adaptive systems that personalize content to individual needs (Achieving the Dream AI for All Task Force, 2025). For athletes and physical educators, this shift offers a "force multiplier" to accelerate success and completion. Educators and coaches now face a dual imperative: adopting AI to enhance performance while ensuring they possess the AI literacy, the foundational skills to evaluate and use AI effectively, to do so ethically (Daniels, 2025). The integration of artificial intelligence into higher education is characterized by a significant "implementation gap," where rapid tool adoption is often accompanied by overpowering psychological and ethical fears (Westover, 2026). Faculty concerns are prominent, with 95% of college faculty reporting a fear of student overreliance on AI and the subsequent erosion of critical thinking skills (American Association of Colleges and Universities, 2026). This anxiety is closely tied to academic integrity; 73% of faculty have personally handled misconduct issues related to AI, and many fear a "nightmare scenario" where students use AI to write papers while instructors use the tool to grade them, effectively removing the human purpose from education (Seril, 2026; Gaines, 2025). Beyond the classroom, educators express increasing apprehension regarding job security, with the number of professionals worried about AI-driven role elimination doubling year-over-year (Ellucian, 2026).





Students experience a different but equally potent set of fears, most notably the stress of being falsely accused of cheating when they have done nothing wrong (45%) and deep-seated concerns regarding the privacy and security of their personal data (40%) (American Council on Education & Studiosity, 2026). These individual anxieties are mirrored at the institutional level, where leaders struggle with the risks of "Shadow AI", the use of unvetted, unsanctioned tools that bypass governance structures and expose the institution to data leaks and cybersecurity vulnerabilities (Westover, 2026). There is also a widespread fear of "AI FOMO" (fear of missing out), which can drive a false sense of urgency and lead to a rush toward implementation without the deliberate frameworks needed to address algorithmic bias, misinformation, and "confidently incorrect" AI hallucinations (Ellucian, 2026; Li et al., 2026; SHRM, 2026). These collective fears emphasize that successful AI integration is not merely a technical challenge but a "leadership challenge" requiring a delicate balance between human judgment and automated efficiency (Caneva, 2025). This article examines how AI empowers stakeholders in movement-based fields and elsewhere to overcome traditional barriers of workload, personalization, and diagnostic accuracy.

METHODS

To evaluate the impact of AI on movement-based education and performance, current research utilizes diverse methodologies. One prominent approach involves an eight-week pilot implementation using a "hybrid intelligence" framework, where AI functions as a parametric feedback mechanism that dynamically adjusts support levels based on learner competence (Jafarli et al., 2026). Longitudinal qualitative case studies have also been employed, involving over 200 hours of participant observation to analyze "co-performance" between human instructors and generative AI tools like GPT-4 (Huang & Wang, 2025). Teacher preparation programs have integrated Kolb's Experiential Learning Cycle into AI literacy projects, guiding preservice teachers through phases of concrete experience, reflective observation, abstract conceptualization, and active experimentation with AI tools (Johnson, 2026; Row Lazzarini, 2026).

Assessing the strategic use of specialized AI tools can significantly diminish the psychological burdens of higher education and professional environments by reducing administrative burnout, cognitive load, and the anxiety associated with complex research tasks. This is also applicable to students who are assigned research tasks. Tools like Rewind AI and Otter.AI serve to alleviate the "tedious and routine" stress of manual notetaking and transcription, providing searchable archives that overcome the "blank-page" problem when drafting reports (Row Lazzarini, 2026; Westover, 2026). These tools can assist students when attending seminars, conferences and workshops when information is difficult to process due to the environment in which the information is being given. A reduction in administrative burden is repeated by using





Notion AI, which functions as a centralized knowledge management system to prevent "siloed implementation" and the feelings of being pressed for capacity that often result in staff burnout (Daniels, 2025; Evelyn Learning, 2026). Canva Magic Studio and SlideSpeak reduce the time-related anxiety of lengthy production cycles by allowing for the rapid creation of professional-quality visual materials, effectively bridging the technical skill gap for educators and students alike (Achieving the Dream AI for All Task Force, 2025; Row Lazzarini, 2026).

In academic and research contexts, tools like SciSpace, Consensus, and Elicit directly address the universal fear of misinformation and AI "hallucinations" by grounding their synthesis in verified academic databases (Row Lazzarini, 2026). This grounding technique helps users overcome information overload and the stress of verifying contradictory claims (Row Lazzarini, 2026; Westover, 2026). NotebookLM complements this by enabling students to deconstruct complex technical language and query their own sources for a "big picture" view, which builds confidence and reduces the cognitive load associated with initial literature analysis (Jafarli et al., 2026; Row Lazzarini, 2026). Notebook LM is dependent upon what is uploaded into the tool and has fewer hallucinations due to not having other information to draw upon. Finally, adaptive feedback tools like Formative overcome the stressors of grading fatigue and feedback delay by providing instantaneous, parametric feedback (Jafarli et al., 2026). By automating routine feedback, these systems reduce faculty workload by up to 28% while helping students manage their learning trajectories with higher confidence and reduced frustration (Jafarli et al., 2026; Seril, 2026).

RESULTS

Research indicates that AI integration significantly diminishes operational and instructional barriers:

- **Workload Efficiency:** AI tools have been shown to reduce faculty workload by 26% to 28% by automating routine feedback and grading tasks (Jafarli et al., 2026). In fitness education settings, instructors using AI for lesson planning reported cutting their preparation time by approximately 31% (Baxter, 2024, as cited in Huang & Wang, 2025).
- **Enhanced Learning Outcomes:** Students in AI-powered environments achieve 54% higher test scores and 10x more engagement compared to traditional methods (Seril, 2026). In kinesiology, project quality improved by an average of 12 points on standardized rubrics when supported by AI feedback (Jafarli et al., 2026).
- **Precision Diagnostics:** AI excels at information-intensive tasks such as identifying subtle movement anomalies. For example, AI can analyze visual data to pinpoint weight distribution issues in a "toe-tuck" or suggest lateral breathing modifications that a human instructor might not immediately identify (Huang & Wang, 2025).





- **Human-AI Synergy:** Findings consistently show that AI functions best as a "teammate" rather than a replacement (Huang & Wang, 2025). While AI provides technical analysis and rapid exercise suggestions, human instructors remain superior in providing embodied demonstration, emotional support, and "soul" to the instructional environment (Huang & Wang, 2025; Seo, 2024).

The following comparison evaluates several AI tools based on their practical applications in education and the workplace, highlighting the specific barriers they help stakeholders overcome.

Table 1. Comparison of AI Tools: Use Cases and Barriers Overcome

Tool(s)	Primary Use Cases	Barriers Overcome
Rewind AI or Otter.AI	Administrative Automation & Memory Support: These tools are used for transcribing and summarizing meetings, lectures, and long documents. They can generate meeting minutes, record action items, and create searchable archives of verbal interactions. Student Support: Record and transcribe lectures, meetings, or coaching sessions automatically.	High Administrative Workload: They reduce the "tedious and routine" burden of manual note taking. They also mitigate the "blank-page" problem by providing a drafted summary to serve as a starting point for reports. Student Barrier Broken: Enhances accessibility for students with hearing or processing difficulties.
Formative	Adaptive Assessment & Real-Time Feedback: AI systems in this category provide parametric feedback, which dynamically adjusts scaffolding based on a student's demonstrated competence. They allow for instantaneous formative feedback on assignments.	Feedback Delay & Grading Fatigue: These tools overcome the barrier of "high faculty workload" by automating routine feedback. They ensure students receive timely, micro-level input that is otherwise difficult for human instructors to provide at scale. Teachers can instantly track understanding and mastery, eliminating the need to wait for end-of-unit assessments to identify learning gaps. Barrier broken- Limited Student Engagement: Interactive questions, multimedia, and live responses make



		lessons more participatory compared to passive lectures or static worksheets. Data & Progress Visibility: Teachers can instantly track understanding and mastery, eliminating the need to wait for end-of-unit assessments to identify learning gaps.
SciSpace, Consensus, Elicit	Research Synthesis & Grounding: These are AI-powered research tools designed to scan and synthesize academic literature. They help users identify claims, evaluate evidence-based arguments, and locate sources that generative AI cannot access via standard web searches.	Misinformation & "Hallucinations": By using Retrieval-Augmented Generation (RAG) to ground answers in verified academic databases, these tools overcome the risk of AI-generated fabrications. They also help users overcome information overload by prioritizing sources for close reading. Makes research more accessible to students and educators by simplifying complex journal articles and supporting evidence-based teaching and practice.
Notion AI	Knowledge Management & Workflow Integration: This tool functions as an organizational assistant, used for document formatting, editing, and centralizing institutional documentation into a Knowledge Management System (KMS). It supports task delegation and strategic alignment.	Siloed Information & Fragmented Adoption: Notion AI helps overcome "siloed implementation" where departments lack a shared space for training and documentation. It also addresses "institutional security risks" by providing a structured, vetted environment for drafting non-confidential materials. Improves efficiency and accessibility of academic content organization
Canva Magic Studio or SlideSpeak	Rapid Content & Visual Creation: These are AI-powered presentation tools used to generate educational materials, lesson plans, and editable visual depictions of text (such as flow charts or mind maps).	Resource & Time Constraints: They overcome the barrier of lengthy production cycles, allowing educators and students to create interactive learning modules in minutes rather than hours. They also reduce the technical skill gap for creating professional-quality visual aids.



	Converts PowerPoint or PDF slides into interactive presentations and generates spoken explanations, quizzes, and summaries.	
NotebookLM	Big-Picture Synthesis & Technical Deconstruction: Users load specific source collections into NotebookLM to deconstruct technical language, query sources for a "big picture" view, and generate mind maps that link back to specific passages with citations.	Metacognitive Laziness & Skill Erosion: Unlike general chatbots, NotebookLM encourages "human-in-the-loop" engagement, requiring users to provide the context (their own sources). This overcomes the risk of cognitive offloading by forcing a closer, evidence-based interaction with the material. This also reduces hallucinations that can occur when using AI. Supports auditory and visual learners who struggle with traditional text-heavy materials.

The implementation of specialized AI tools produces measurable improvements in instructional efficiency, student performance, and collaborative equity. The use of adaptive feedback systems like Formative, alongside transcription tools such as Otter.AI, significantly mitigates faculty burnout by reducing administrative burdens; research indicates that AI-powered administrative tools can lower educator workload by 45%, with automated essay scoring alone saving up to 80% of traditional grading time (Evelyn Learning, 2026). Pilot studies of "parametric feedback" systems demonstrate a 28% reduction in the time faculty spend providing project feedback while simultaneously increasing individual student contributions by 23.7% and improving final project quality scores by an average of 12 points (Jafarli et al., 2026).

Research-oriented tools, including NotebookLM, SciSpace, and Elicit, enable higher-order cognitive gains by supporting structured inquiry and literature synthesis. NotebookLM allows students to query specific source collections to analyze complex technical language and generate "big picture" mind maps that link directly back to source passages with citations (Row Lazzarini, 2026). This grounding in verified academic databases via retrieval-augmented generation (RAG) effectively reduces the risk of AI "hallucinations" and helps students prioritize sources (Row Lazzarini, 2026). These processes encourage human engagement, where students learn to use AI as a "thinking partner" to overcome the blank-page problem, while building the metacognitive skills necessary to add unique value beyond the AI's output





(Jafarli et al., 2026; Row Lazzarini, 2026). Every outcome produced from AI requires editing, proofreading, correcting, and reworking the output into what the user is attempting to produce. Creative and organizational tools such as Canva Magic Studio, SlideSpeak, and Notion AI empower students, educators and staff to bridge technical skill gaps and streamline institutional knowledge management. These platforms are frequently used to automate "tedious and routine" tasks, such as document formatting, drafting emails, and creating interactive simulations, allowing 57% of surveyed faculty to focus more on curriculum development (Gaines, 2025; Westover, 2026). In movement-based fields like physical education, these tools enable the rapid generation of standards-aligned rubrics and personalized instructional materials that would otherwise be cost-prohibitive or too time-intensive to produce manually (PhyshednHealth, 2025). This approach ensures that while AI handles analytical speed and content curation, human instructors remain the primary providers of embodied demonstration and emotional support (Achieving the Dream AI for All Task Force, 2025; Huang & Wang, 2025).

DISCUSSION

The strategic deployment of these specialized AI tools creates a comprehensive support ecosystem that addresses the distinct needs of educators, students, and professionals while maintaining human agency. Tools such as Rewind AI and Otter.AI are instrumental in reducing the "tedious and routine" administrative workload by automating the summarization of long documents and transcribing meetings, which allows stakeholders to focus on higher-order decision-making. In instructional settings, adaptive feedback systems like Formative provide parametric feedback that dynamically adjusts to a learner's level of competence, ensuring that students receive timely, micro-level input that is conceptually relevant rather than just superficial correction. For research-intensive tasks, SciSpace, Consensus, and Elicit overcome the barrier of information overload by using retrieval-augmented generation (RAG) to ground their summaries in verified academic databases, thereby mitigating the risk of AI-generated "hallucinations".

Centralizing institutional intelligence through Notion AI as a Knowledge Management System (KMS) prevents fragmented adoption and "siloed implementation" by providing an internal chatbot aware of all official policies and documentation. Creative tools like Canva Magic Studio and SlideSpeak empower educators to rapidly generate standards-aligned rubrics and personalized instructional materials, bridging the technical skill gap and allowing for the implementation of Universal Design principles for accessible learning. NotebookLM serves as a unique "thinking partner" in the project development process, enabling users to deconstruct technical language, generate big-picture mind maps, and prioritize sources for close reading with direct citation links back to the original text. This approach ensures that while AI handles



analytical speed and content curation, the human instructor, student, stakeholder or athlete remains the ultimate pilot responsible for embodied demonstration, emotional support, and professional judgment.

AI empowers educators and athletes by increasing access to high-quality coaching and personalized data that were previously cost-prohibitive. However, several limitations and ethical considerations must be addressed.

- **Limitations:** Current AI systems are often limited by a lack of true multimodal integration; while they process text well, movement-based fields require better integration of live video and kinesthetic feedback (Huang & Wang, 2025). Additionally, technical barriers such as inconsistent Wi-Fi or lack of broadband quality can halt AI-driven engagement in physical spaces like gymnasiums (Jafarli et al., 2026).
- **Ethical Risks:** The collection of physiological and location data from athletes introduces significant privacy risks (Li et al., 2026). Furthermore, "data bias" remains a concern, as algorithms trained on limited demographic datasets may produce suboptimal or unsafe recommendations for diverse groups (Li et al., 2026).
- **Future Considerations:** Institutional leadership must prioritize AI literacy for all stakeholders, including staff and students, to ensure equitable access (Westover, 2026). Future research should focus on longitudinal studies to determine if sustained AI uses independent metacognitive thought or leads to "cognitive offloading" and skill erosion over time (Alubthane, 2026).

The deployment of AI tools is inhibited by significant technical and cognitive limitations, most notably the tendency for models to produce "hallucinations" or confidently incorrect information. This unreliability necessitates a human approach where professional judgment is applied to verify all AI-generated claims against trusted databases. There is a risk of cognitive offloading or "metacognitive laziness," where users outsource critical analysis to AI, leading to the erosion of independent problem-solving skills. This lack of engagement can result in "idea standardization," where reliance on AI-generated suggestions leads to a convergence in solution approaches and a decrease in genuinely original thought. Finally, the effectiveness of these tools is often limited by external factors such as broadband quality and Wi-Fi consistency, which can create significant barriers for rural institutions, homes, or movement-based learning in physical spaces like gymnasiums.

Ethical and governance risks also present considerable hurdles to successful AI integration. Institutional security is frequently compromised by "Shadow AI," the use of unvetted tools that bypass organizational protocols and expose sensitive data to cybersecurity vulnerabilities. These systems also carry intrinsic algorithms and data biases, often trained on demographic datasets that may hinder specific groups or produce unsafe recommendations in coaching and fitness contexts. The collection of physiological and location data poses extreme privacy risks, requiring users to proactively anonymize student and client work before inputting it into generative models. Additionally, the continued reliance on AI detection software remains

problematic, as these tools are fundamentally unreliable and often penalize neurodivergent students and non-native English speakers.

Looking toward future implementation, stakeholders must prioritize several strategic considerations to ensure sustainable growth. There is an urgent need for longitudinal research to track the long-term impact of AI on cognitive development and professional expertise, as current studies are largely short-term. Institutions must also move beyond initial experimentation to develop rigorous frameworks for measuring the Return on Investment (ROI), evaluating tools for their impact on learning quality and staff well-being rather than just speed. Environmental sustainability is another growing concern, with nearly a quarter of institutional leaders now citing the significant carbon footprint of large AI models as a top concern. Ultimately, future frameworks must emphasize that AI serves as a "co-pilot" rather than a replacement; human instructors remain essential for providing empathy, motivational leadership, and embodied demonstrations that AI cannot duplicate. To bridge the "implementation gap," institutions are encouraged to establish dedicated AI leadership roles to coordinate these efforts across governance, operations, and pedagogy.

Conclusion

AI offers an unprecedented opportunity to transform the move from "data to movement" by amplifying human expertise rather than replacing it. By strategically integrating AI into governance, operations, and pedagogy, institutions can foster "AI agility", the ability to grow alongside the technology. The successful integration of AI in movement-based fields depends on maintaining the "human touch", leadership, empathy, and professional judgment, while leveraging AI's analytical speed to break down traditional barriers to athletic and academic achievement.

REFERENCES

- Achieving the Dream AI for All Task Force. (2025). Creating the AI-enabled community college: A road map for using generative AI to accelerate student success. Achieving the Dream. <https://achievingthedream.org/creating-the-ai-enabled-community-college>
- Alubthane, F. O. (2026). Amplifier or substitute? A systematic review of generative AI's impact on higher-order cognitive skills among university students. *Frontiers in Psychology*, 17, Article 1863931. <https://doi.org/10.3389/fpsyg.2026.1863931>
- American Association of Colleges and Universities. (2026). National survey: 95% of college faculty fear student overreliance on AI and diminished critical thinking.
- American Council on Education & Studiosity. (2026). AI in higher education: Where leaders and students stand.
- Baxter, D. (2024). Teachers using ChatGPT – alongside a guide to support them to use it effectively – can cut lesson planning time by over 30 per cent. Education Endowment Foundation. <https://educationendowmentfoundation.org.uk/news/teachers-using->





- chatgpt- alongside-a-guide-to-support-them-to-use-it-effectively-can-cut-lesson-
planning-time-by- over-30-per-cent
- Caneva, C. (2025). Assessing in the Age of AI: The Paradox of Dual Anchoring. *Revue internationale sur le numérique en éducation et communication*, 22. <https://doi.org/10.52358/mm.vi22.495>
- Daniels, C. P. (2025). Exploring artificial intelligence literacy and engagement in higher education stakeholders. *Issues in Information Systems*, 26(1), 201-216. https://doi.org/10.48009/1_iis_116
- Ellucian. (2026). Artificial intelligence in higher education: From widespread adoption to strategic integration. <https://www.ellucian.com/blog/ai-higher-education-2025-survey-findings-move-strategic-integration>
- Evelyn Learning. (2026). The teacher burnout exodus: How AI-powered administrative tools are reducing educator workload by 45% and reversing the Great Resignation. <https://www.evelynlearning.com/blog/the-teacher-burnout-epidemic-how-ai-powered-administrative-automation-is-reducing-educator-workload-by-40-and-revitalizing-the-teaching-profession>
- Gaines, L. V. (2025). Research, curriculum and grading: New data sheds light on how professors are using AI. KQED/MindShift. <https://www.kqed.org/mindshift/62534/how-professors-are-using-ai>
- Huang, Q., & Wang, P. K. (2025). Human-AI co-performance in fitness education: A longitudinal study with a Pilates instructor. <https://doi.org/10.48550/arXiv.2501.00000>
- Jafarli, R., Jafarli, G. F., Özperçin, A., & Adıgüzel, E. (2026). Scaling project-based learning with artificial intelligence-powered parametric feedback - A model for Nakhchivan State University. *Electrica*, 26, Article 0054. <https://doi.org/10.5152/electrica.2026.26054>
- Johnson, R. (2026). Building AI literacy through assessment practices in physical education teacher education. *Educational Practices in Kinesiology*, 6(2), Article 1.
- Li, W., Bian, L., & Wu, W. (2026). Ethical examination of AI coaches: privacy, bias, and responsibility. *Frontiers in Digital Health*, 8, Article 1781352. <https://doi.org/10.3389/fdgth.2026.1781352>
- PhysednHealth. (2025). A comprehensive guide to AI for physical education teachers: Enhancing instruction and efficiency. De Monfort LLC. <https://www.physednhealth.com/ai-in-physical-education/>
- Row Lazzarini, B. (2026). Building critical thinking and AI literacy through the topic development process in kinesiology. *Educational Practices in Kinesiology*, 6(2), Article 2.





- Saunders, M. A. (2026). Artificial intelligence adoption among community college faculty: A comparative analysis of rural and urban institutions (Doctoral dissertation). East Tennessee State University. <https://dc.etsu.edu/etd/4698>
- Seo, J.-H. (2024). The evolving role of kinesiologists in the era of artificial intelligence. *The Asian Journal of Kinesiology*, 26(1), 1-2. <https://doi.org/10.15758/ajk.2024.26.1.1>
- Seril, L. (2026). 25 AI in education statistics to guide your learning strategy in 2026. Engageli. <https://www.engageli.com/blog/ai-in-education-statistics>
- SHRM. (2026). The state of AI in HR 2026 report. <https://www.shrm.org/topics-tools/research/state-of-ai-hr-2026>
- Westover, J. H. (2026). The AI implementation gap in higher education: Navigating the disconnect between technology adoption, policy awareness, and institutional governance. Preprints.org. <https://doi.org/10.20944/preprints202603.2295.v1>





FT-18

The Effects of an Inclusive Sports Project on the Attitudes of Sports High School Students Toward Individuals With Special Needs

Uğur Karakaş^{1*}, Yusuf Dumlu², Tuna Uslu³

¹ Ministry of National Education, Türkiye (Corresponding Author)

² Atatürk University, Türkiye

³ Istanbul University-Cerrahpaşa, Türkiye

* Correspondence: ugurkarakas321@gmail.com

Abstract

To foster positive attitudes towards individuals with special needs and raise the awareness of future professionals, it is necessary to disseminate inclusive practices (such as the inclusive education approach) within vocational education. This study was conducted within the scope of a project to examine the development of attitudes and awareness among sports high school students toward individuals with special needs. The research, designed with a quantitative research methodology, comprises a sample of 150 sports high school students participating in the project, which was carried out in collaboration with the Turkish Down Syndrome Association and the Istanbul Provincial Directorate of National Education during the 2023–2024 academic year. During the implementation, participants were engaged in inclusive sports activities and social interaction–based training programs with monthly rotating themes. The results indicated a statistically significant improvement in the cognitive and behavioral attitude scores toward individuals with special needs; furthermore, positive developments were observed in the social skills and group integration processes of the individuals with special needs involved in the interactions. Consequently, the findings demonstrate that incorporating such inclusive projects into high school curricula strengthens the professional competencies and social awareness levels of future sports educators. Scaling up these models is of critical importance for sustainable inclusivity in special education. In conclusion, it has been determined that such inclusive projects and practices integrated into the sports high school curriculum strengthen the professional competencies and social awareness of future professionals; consequently, expanding these practices is of critical importance for sustainable inclusivity in special education.

Keywords: intellectual disability, integrated sports, social skills, physical education, awareness

INTRODUCTION



Inclusive education can be defined as a process that aims to ensure that all children receive an education in line with their developmental, sociocultural, and individual characteristics and needs (UNESCO, 2005). Ensuring children's access to a quality education, increasing their participation, and reducing potential forms of discrimination are among the fundamental goals of inclusive education.

In inclusive education environments, the educational program, setting, methods, and materials are adapted to the children by taking into account the individual characteristics, needs, interests, and preferences of all children. This is important for ensuring equality of opportunity and fairness in education. Another important feature of inclusive education is the value it places on family participation and community involvement (Ministry of National Education, n.d.). Inclusive education ensures equality of opportunity by adapting educational content, materials, and environments to the individual needs of all children, while also placing family and community participation at the heart of this process.

Over the past thirty years, inclusion has been one of the frequently debated topics within society, politics, and educational theory. This concept stands out particularly in discussions concerning the process by which individuals and groups living at the margins of society are embraced by that society (Terzi, 2014). The reflection of the concept of inclusion in education has become intensely debated in recent years. The understanding of inclusivity in education focuses on offering equivalent learning opportunities to all children and young people, taking into account their different cultural, social, and learning backgrounds. The core areas on which inclusive education focuses are stated by the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2009) as follows:

Inclusiveness of the system: respect for cultural, social, and individual diversity by education systems, schools, and teachers, and responding to students' expectations and needs accordingly;

Inclusiveness of access to education: providing equal access to a quality education for everyone;

Social inclusiveness: maintaining close coordination that encompasses other social policies and the expectations of social actors and stakeholders.

Inclusive education has a socially unifying function. One important benefit of inclusive education concerns the improvement of students' academic performance. Because schools that strive to provide a quality education together to students with cultural differences must develop different teaching methods in order to respond to individual needs, positive progress is expected in the learning of all students. This is presented as the educational rationale for inclusive education. In countries that achieve high success on international assessments such as PISA, it is observed that inequality between schools is minimal and that individuals are given the opportunity to benefit from equal learning environments regardless of their socioeconomic status (Organisation for Economic Co-operation and Development [OECD], 2010). On the other hand, in addition to serving the culture of integration and coexistence in society, inclusive education also has the function of evoking feelings oriented toward accepting differences as a source of richness. Indeed, Article 2 of the Salamanca Statement and Framework for Action (1994) states that schools with an inclusive education orientation are the most effective means of combating discriminatory attitudes, creating welcoming communities, building an inclusive society, and ensuring that everyone can access the right to education. UNESCO (2001) explains this as the social rationale for inclusive education. Inclusive schools, in which everyone is educated in the same environment and under the same conditions, help develop positive attitudes toward the differences among students. By contributing to the formation of a more just and inclusive society, inclusive education has an important function in preventing social divisions and contributing to social integration. Inclusive education rests not only on an educational rationale—enhancing the academic

success of all students through teaching methods tailored to diverse individual needs—but also on a social rationale: fostering a fair and integrated society by preventing discrimination and cultivating positive attitudes through the education system.

In a sense, inclusion is the act of understanding and recognizing the “other.” All individuals who are characterized as the “other” and who occupy a disadvantaged position are the target population of inclusive education. Multiculturalism constitutes an important sub-dimension of inclusive education. Multiculturalism refers to the culture of the “others” among students. Knowing and understanding different cultures can be achieved only through multicultural education (Shaw, 1988). While the inclusive education approach targets disadvantaged individuals viewed as “the other” in society, multicultural education—a fundamental component of this approach—aims to foster mutual acceptance through the interactive recognition and understanding of diverse cultures.

The measurement and evaluation within the support education program for individuals with intellectual disabilities consists of a phased process that begins with the identification of individual needs, continues with pre- and post-instruction measurements, and encompasses monitoring and end-of-year assessment. The practices of the Support Education Program for Individuals With Intellectual Disabilities consist of the following stages: determining the individual’s needs, pre-instruction (preliminary) assessment, post-instruction (final) assessment, monitoring of development, and end-of-year evaluation (Ministry of National Education, General Directorate of Special Education and Guidance Services, n.d.).

For all individuals in need of special education, an Individualized Education Program (IEP) should be prepared and implemented on the basis of support education programs, in line with their individual characteristics, performance, and needs. In determining the objectives to be included in the IEP, in organizing the teaching–learning process, and in evaluating achievement, the individual’s readiness as well as cognitive, social, and physical characteristics may differ. For this reason, when the teaching–learning process is planned, individuals’ individual differences (their current performance, readiness levels, learning styles and needs, sociocultural differences, etc.) should be taken into account. In line with these explanations, an inclusive sports practices project was implemented with individuals with intellectual disabilities.

The Benefits of Inclusive Education Environments for Students Without Disabilities

- Effects on students without disabilities that are neutral or positive (Kalambouka et al., 2005).
- A positive effect on the progress of students without disabilities in mathematics (Cole et al., 2004).
- As a result of teachers’ inclusive attitudes toward supporting students with diverse learning needs, other teachers, school educators, parents, and students come to hold more inclusive attitudes (Carlson et al., 2012).
- Because the inclusion of students with disabilities can serve as a catalyst for schoolwide improvement, it provides benefits for students without disabilities as well (Giangreco et al., 1993; Hehir & Katzman, 2012).
- The skills that educators develop in order to support students with disabilities help them better meet the unique needs of all of their students.
- Inclusive education makes both teachers and students more creative.
- Students in inclusive settings perform better on standardized tests than students in segregated settings (National Center for Education Statistics, n.d.).





The Contribution of Inclusive Education to the School and the Education System

Inclusive education aims to enhance academic success, foster social skills and respect for diversity, and create a positive school climate by reducing bullying while offering all students equal access to the curriculum, a safe environment, and social interactions based on empathy.

Inclusive education ensures equal access to the general education curriculum for all students, regardless of their abilities or disabilities (TeacherPH, n.d.). This approach helps all students reach their full potential by providing the necessary support they need in order to succeed.

It fosters a sense of community and understanding among all members of the school ecosystem. The presence of all students in the same classroom, regardless of their abilities, gives classmates the opportunity to get to know one another better. They can learn from one another, share their experiences, and make friends.

Inclusive education also helps students learn to work together and to respect others' differences. This is an important life skill that will help them succeed in their personal and professional lives.

When all students are included in the classroom, it helps break down social barriers and fosters a sense of community. Inclusive education also enables all students to learn something from one another and helps develop empathy and compassion. By including all students in the learning process, it teaches them to respect one another and to accept each other as they are.

By providing a welcoming and supportive learning environment, inclusive education helps all students—regardless of their abilities or differences—feel seen and valued. In this way, it supports all students in feeling safe and valued both inside and outside the classroom. Inclusive education develops social skills among students.

This educational approach helps create the more positive and inclusive school climate that is necessary in order to promote social justice and to ensure that all students have the opportunity to reach their full potential.

Inclusive environments provide students with a more diverse learning experience, allowing them to learn from and interact with classmates who have different strengths and weaknesses. Inclusive education improves academic outcomes among all students. By providing students with a safe place where they can ask for help, inclusive education can help reduce the negative effects of bullying and harassment on students' lives.

METHOD

This study examines the development of attitudes and awareness regarding individuals with special needs among sports high school students, employing a quantitative general survey model that aims to describe past and present situations as they exist. The fact that the study was limited to volunteer 12th-grade sports high school students in Istanbul, the absence of a control group, and its reliance on self-reporting and a single measurement limit the study's generalizability as well as the causal and longitudinal inferences that can be drawn from it.

Research Model

The research, which aims to examine the development of attitudes and awareness of sports high school students toward individuals with special needs within the scope of the "Sporda +1'İz" project, was conducted using the general survey model based on quantitative data. Survey research consists of studies that aim to collect data in order to determine certain characteristics of a group (Büyüköztürk,



2002). According to Karasar (2024), survey models are research approaches that aim to describe a situation that existed in the past or that exists at present, as it is. In other words, they aim to explain the interaction among situations by taking into account the relationships of current events with prior events and conditions (Kaptan, 1998).

Study Group

This study was conducted to examine the development of attitudes and awareness of sports high school students toward individuals with special needs within the scope of the "Sporda +1'İz" project. The sample of this quantitative study consisted of 150 sports high school students (90 male, 60 female) participating in the project, which was carried out in collaboration with the Turkish Down Syndrome Association and the Istanbul Provincial Directorate of National Education during the 2023–2024 academic year. Only 12th-grade students participated in the study, and the participating students' willingness and the principle of voluntary participation were taken into consideration.

Data Collection Tools

For data collection, an Interview Form prepared by the researcher was administered online via Google Forms; during the implementation process, participants were offered inclusive sports activities and social interaction-based training programs whose theme changed each month. To determine the participants' attitudes, the Multidimensional Attitudes Scale Toward Persons With Disabilities (MAS) was administered. The MAS, developed by Findler et al. (2007) and adapted into Turkish—with validity and reliability studies—by Yelpaze and Türküm (2018), consists of 16 items in the "Affect" dimension, 10 items in the "Cognition" dimension, and 8 items in the "Behavior" dimension, for a total of 34 items across 3 subscales. The scale contains a total of 17 reverse-scored items. It is of the 5-point Likert type. The Cronbach's alpha (internal reliability) coefficient of the scale was calculated as .90. The Cronbach's alpha coefficient was calculated as .88 for the "Affect" subscale, .89 for the "Cognition" subscale, and .84 for the "Behavior" subscale. In the present study, the overall internal reliability coefficient of the MAS was calculated as .89. After reverse coding was carried out, the maximum score that can be obtained from the scale is 170 and the minimum score is 34, with higher scores indicating a more positive attitude.

Research Ethics

The legal permissions for the students participating in the research were obtained from the Sultanbeyli District Directorate of National Education and from the participants' families.

Data Analysis

The obtained data were entered into the SPSS 22.0 program, and frequency distributions and percentages were examined according to the participants' socio-demographic characteristics, while skewness and kurtosis values were examined for conformity to a normal distribution. The skewness values were found to range between -0.76 and 0.135 , and the kurtosis values between -1.11 and 1.38 . As the values were found to fall within the -2 to $+2$ range, it was determined that the data displayed a distribution consistent with a normal distribution (George & Mallery, 2010). Because the data conformed to a normal distribution, the t-test, a parametric test, was used. The tests were conducted at a significance level of $p < .05$.

RESULTS

In this study, where male students constituted the majority of participants, it was found that most of the students had not previously had a relative with special needs and had not participated in sports activities with such individuals (Table 1).

Table 1: Selected Demographic Characteristics of the Research Sample

Variable	Group	<i>n</i>	%
Gender	Female	60	40.0
	Male	90	60.0
Having a Relative With Special Needs (Prior)	Yes	50	33.3
	No	100	66.7
Prior Sports Activity With Individuals With Special Needs	Yes	40	26.7
	No	110	73.3
Total		150	100.0

n = 150.

When Table 1 is examined, 40% of the participants are female (*n* = 60) and 60% are male (*n* = 90). This indicates that male students participated in the study at a higher level than female students. Regarding the variable of having previously had a relative with special needs, it is seen that 100 participants answered "No" and 50 answered "Yes." In response to the question "Have you previously taken part in sports activities with individuals with special needs?", it is seen that 40 participants answered "Yes" and 110 answered "No."

The analyses indicate that the gender variable results in a statistically significant difference regarding the scale's total score and the emotion and cognition sub-dimensions, but does not create a significant difference in the behavior sub-dimension (Table 2).

Table 2: Results of the t-Test of Participants' Attitude Scores by Gender

Scale and Subscales	Gender	<i>n</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Affect	Female	60	2.540	0.80	3.375	.001*
	Male	90	2.090	0.80		
Cognition	Female	60	2.477	0.84	2.407	.017*
	Male	90	2.140	0.84		
Behavior	Female	60	2.692	0.90	1.680	.095
	Male	90	2.440	0.90		
Scale Total	Female	60	2.534	0.72	3.950	<.001**
	Male	90	2.060	0.72		

M = mean; *SD* = standard deviation. **p* < .05. ***p* < .001.

When Table 2 is examined, according to the findings obtained from the data analysis, a statistically significant difference was found by the female-male variable in the Affect subscale ($p = .001$). A statistically significant difference was found by the female-male variable in the Cognition subscale ($p = .017$). A statistically significant difference was found by the female-male variable in the scale total score ($p < .001$). In the Behavior subscale, however, no statistically significant difference was found ($p = .095$).

Having a relative with special needs resulted in a statistically significant difference regarding the total scale score and the emotion and behavior sub-dimensions, whereas it did not create a significant difference in the cognition sub-dimension (Table 3).

Table 3: Results of the t-Test of Participants' Attitude Scores by Prior Status of Having a Relative With Special Needs

Scale and Subscales	Status	<i>n</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Affect	Yes	50	2.904	0.62	3.017	.003*
	No	100	2.580	0.62		
Cognition	Yes	50	2.862	0.76	1.307	.193
	No	100	2.690	0.76		
Behavior	Yes	50	2.911	0.60	3.377	.001*
	No	100	2.560	0.60		
Scale Total	Yes	50	2.987	0.58	3.952	<.001**
	No	100	2.590	0.58		

M = mean; *SD* = standard deviation. "Yes" = has a relative with special needs; "No" = does not. * $p < .05$. ** $p < .001$.

When Table 3 is examined, according to the findings obtained from the data analysis, a statistically significant difference was found by the variable of previously having a relative with special needs in the Affect subscale ($p = .003$). A statistically significant difference was found by the same variable in the Behavior subscale ($p = .001$). A statistically significant difference was found by this variable in the scale total score ($p < .001$). In the Cognition subscale, however, no statistically significant difference was found ($p = .193$).

It is observed that prior participation in sports activities with individuals with special needs leads to a statistically significant difference not only in the total scale score but also in all of the emotion, behavior, and cognition sub-dimensions (Table 4).

Table 4: Results of the t-Test of Participants' Attitude Scores by Prior Status of Engaging in Sports Activities With Individuals With Special Needs

Scale and Subscales	Activity	<i>N</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Affect	Yes	40	2.816	0.58	3.138	.002*
	No	110	2.480	0.58		
Cognition	Yes	40	2.747	0.55	2.925	.004*
	No	110	2.450	0.55		

Scale and Subscales	Activity	N	M	SD	t	p
Behavior	Yes	40	2.828	0.57	3.022	.003*
	No	110	2.510	0.57		
Scale Total	Yes	40	2.869	0.52	3.947	<.001**
	No	110	2.490	0.52		

M = mean; SD = standard deviation. "Yes" = has previously engaged in sports activities with individuals with special needs; "No" = has not. * $p < .05$. ** $p < .001$.

When Table 4 is examined, according to the findings obtained from the data analysis, a statistically significant difference was found by the variable of previously engaging in sports activities with individuals with special needs in the Affect subscale ($p = .002$). A statistically significant difference was found by the same variable in the Behavior subscale ($p = .003$). A statistically significant difference was likewise found in the Cognition subscale ($p = .004$). A statistically significant difference was found by this variable in the scale total score ($p < .001$).

DISCUSSION AND CONCLUSION

This research was conducted to examine the effect of the inclusive sports practices carried out within the scope of the "Sporda +1'İz" project on the attitudes of sports high school students toward individuals with special needs. The findings obtained from the research reveal that students' attitudes toward individuals with disabilities were generally positive and that their attitude scores differed significantly according to the variables examined.

While the study found that female students held more positive emotional and cognitive attitudes toward individuals with disabilities compared to their male counterparts, the participation of all students in the same inclusive activities resulted in both genders exhibiting similarly positive behavioral attitudes. When the participants' attitude scores were examined by gender, statistically significant differences were found in the "Affect" ($p = .001$) and "Cognition" ($p = .017$) subscales as well as in the scale total score ($p < .001$), whereas no significant difference was found in the "Behavior" subscale ($p = .095$). This result indicates that the emotional and cognitive attitudes of female students toward individuals with disabilities were shaped more markedly than those of male students, but that there was no clear divergence between the two groups at the behavioral level. Studies in the literature showing that women's attitudes toward individuals with disabilities are more positive than men's support this finding. The fact that the difference in the behavior dimension was nonsignificant can be explained by the fact that, throughout the project, all participants—regardless of gender—took part in the same shared activities, training programs, and direct interaction experiences; a shared and structured experience may have balanced behavioral tendencies in a similarly positive direction in both groups.

The direct contact resulting from having a relative with special needs has strengthened positive behavioral attitudes by reducing individuals' emotional distance toward disability, in line with contact theory. When the attitude scores of students who had previously had a relative with special needs and those who had not were compared, significant differences were determined in the "Affect" ($p = .003$) and "Behavior" ($p = .001$) subscales and in the total score ($p < .001$), whereas no significant difference was observed in the "Cognition" subscale ($p = .193$). This finding shows that a relationship established beforehand with an individual with a disability at the family or close-circle level is effective particularly in shaping emotional and behavioral attitudes. The firsthand experience acquired through close contact reduces an individual's emotional distance toward disability and strengthens positive behavioral



tendencies in everyday life. This is consistent with the predictions of contact theory: high-quality, direct interaction established with disadvantaged groups contributes to the reduction of prejudice and to the development of positive attitudes.

The experience of engaging in sports with individuals with special needs during the implementation process brought about significant positive changes across the students' emotional, cognitive, and behavioral dimensions, thereby demonstrating the powerful role of sports in fostering inclusive and holistic attitudinal transformation. One of the most striking results of the research is that, according to the variable of having previously engaged in sports activities with individuals with special needs, statistically significant differences emerged in all subscales ["Affect" ($p = .002$), "Cognition" ($p = .004$), and "Behavior" ($p = .003$)] and in the scale total score ($p < .001$). This finding clearly demonstrates the strong potential that sport possesses, as an inclusive tool, in attitude change. Sporting interaction carried out around a common goal, on an equal footing, and on a cooperative basis breaks down the social barriers between individuals and develops feelings of empathy and acceptance. This result is consistent with studies revealing that inclusive education environments provide positive contributions not only to individuals with disabilities but also to students without disabilities (Kalambouka et al., 2005; Carlson et al., 2012). Indeed, inclusive practices create environments in which students learn to respect differences, to work together, and to accept one another as they are (Hehir & Katzman, 2012), thereby laying the groundwork for a holistic attitudinal transformation at the cognitive, emotional, and behavioral levels.

When the findings are evaluated as a whole, it is seen that the direct and high-quality contact established beforehand with individuals with disabilities—whether within the family circle or through sporting activities—plays a determining role in attitude development. In particular, the fact that shared sporting experience produced a significant difference in all attitude dimensions suggests that inclusive sports projects are more effective in changing attitudes than mere theoretical information transmission. Within this framework, the research empirically supports the social rationale of inclusive education (UNESCO, 2001) and the goal of combating discrimination and building an inclusive society emphasized in the Salamanca Statement (1994). Research findings empirically validate the inclusive society goals set out in high-level international policies by demonstrating that direct and sports-based contact with individuals with disabilities fosters a shift in attitudes far more effectively than theoretical information alone.

In conclusion, the attitudes of sports high school students toward individuals with special needs are generally positive, and this positive attitude is significantly strengthened through direct interaction experience. It was determined that including such inclusive projects in sports high school curricula increases the professional competencies and social awareness levels of future sports educators. The widespread adoption of these models is of critical importance for ensuring sustainable inclusivity in education. This study, which reinforces the positive attitudes of vocational high school students toward individuals with special needs through direct interaction, demonstrates that integrating inclusive projects into the curriculum is essential for empowering future sports professionals through experiential learning and ensuring sustainability in special education.

Limitations

This research has certain limitations. First, the study group is limited to 12th-grade sports high school students studying only in the province of Istanbul who participated on a voluntary basis; this restricts the generalizability of the findings. Second, the data were collected through an attitude scale based on the participants' self-reports. In addition, no control group was included in the research, and



measurements were obtained through a single administration; therefore, causal and longitudinal inferences are limited.

Recommendations

It is necessary to consistently integrate inclusive sports practices into school curricula, expand opportunities for collaborative interaction, and deepen findings in future research by employing larger samples, longitudinal tracking, and mixed methods. Inclusive sports practices should be integrated into the curricula of sports high schools as a component characterized by continuity, rather than remaining merely project-based and temporary activities. Program designs based on equal status and cooperation, in which students can engage in direct and regular sporting interaction with individuals with special needs, should be expanded. Replicating similar studies in different regions and with larger samples covering different grade levels will increase the generalizability of the findings. In order to evaluate the permanence of the change in attitudes, it is recommended that longitudinal research based on a pretest–posttest design and follow-up measurements be conducted. In future research, using mixed-methods designs in which quantitative data are supported by qualitative data that reveal participants' experiences in depth will contribute to a more holistic understanding of the process.

Acknowledgment: We would like to thank the Turkish Down Syndrome Association and the Istanbul Provincial Directorate of National Education for their support and contributions to the execution of the project.

Conflict of Interest: The authors declare that there is no conflict of interest regarding this study.

Funding: This research did not receive any specific funding/grant from public, commercial, or not-for-profit organizations.

REFERENCES

- Büyüköztürk, Ş. (2002). Faktör analizi: Temel kavramlar ve ölçek geliştirmede kullanımı [Factor analysis: Basic concepts and its use in scale development]. *Kuram ve Uygulamada Eğitim Yönetimi Dergisi*, 8(32).
- Carlson, L., Hemmings, B., Wurf, G., & Reupert, A. (2012). The instructional strategies and attitudes of effective inclusive teachers. *Special Education Perspectives*, 21(1), 7–20.
- Cole, C. M., Waldron, N., & Majd, M. (2004). Academic progress of students across inclusive and traditional settings. *Mental Retardation*, 42(2), 136–144.
- Findler, L., Vilchinsky, N., & Werner, S. (2007). The Multidimensional Attitudes Scale Toward Persons With Disabilities (MAS): Construction and validation. *Rehabilitation Counseling Bulletin*, 50(3), 166–176.
- George, D., & Mallery, P. (2010). *SPSS for Windows step by step: A simple guide and reference*, 17.0 update (10th ed.). Pearson.
- Giangreco, M. F., Dennis, R., Cloninger, C., Edelman, S., & Schattman, R. (1993). "I've counted Jon": Transformational experiences of teachers educating students with disabilities. *Exceptional Children*, 59(4), 359–372.
- Hehir, T., & Katzman, L. I. (2012). *Effective inclusive schools: Designing successful schoolwide programs*. Jossey-Bass.

- Kalambouka, A., Farrell, P., Dyson, A., & Kaplan, I. (2005). *The impact of population inclusivity in schools on student outcomes*. Institute of Education, University of London, EPPI-Centre.
- Kaptan, S. (1998). *Bilimsel araştırma ve istatistik teknikleri* [Scientific research and statistical techniques]. Rehber Yayıncılık.
- Karasar, N. (2024). *Bilimsel araştırma yöntemi* [Scientific research method] (39th ed.). Nobel Yayıncılık.
- Ministry of National Education. (n.d.). *Kapsayıcı eğitim* [Inclusive education]. Retrieved May 15, 2026, from <https://egitimdebirlikteyiz.meb.gov.tr/ContentPage/KapsayiciEgitim>
- Ministry of National Education, General Directorate of Special Education and Guidance Services. (n.d.). *Zihinsel yetersizliği olan bireyler için destek eğitim programı* [Support education program for individuals with intellectual disabilities]. Retrieved May 15, 2026, from https://orgm.meb.gov.tr/meb_iys_dosyalar/2026_01/12171059_zihinsel.pdf
- National Center for Education Statistics. (n.d.). *Home*. Retrieved May 15, 2026, from <https://nces.ed.gov/>
- Organisation for Economic Co-operation and Development. (2010). *PISA 2009 results: Overcoming social background – Equity in learning opportunities and outcomes* (Vol. 2). OECD Publishing. <https://doi.org/10.1787/9789264091504-en>
- Shaw, B. (1988). The incoherence of multicultural education. *British Journal of Educational Studies*, 36(3), 250–259.
- TeacherPH. (n.d.). *Benefits of inclusive education*. Retrieved May 15, 2026, from <https://www.teacherph.com/benefits-inclusive-education/>
- Terzi, A. (2014). Kapsayıcı eğitim [Inclusive education]. In Z. T. Aktürk & A. A. Dönmez (Eds.), *Eğitimde yeni yönelimler* [New trends in education] (pp. 125–145). Anı Yayıncılık.
- United Nations Educational, Scientific and Cultural Organization. (1994). *The Salamanca statement and framework for action on special needs education*. UNESCO.
- United Nations Educational, Scientific and Cultural Organization. (2001). *Understanding and responding to children's needs in inclusive classrooms*. UNESCO.
- United Nations Educational, Scientific and Cultural Organization. (2005). *Guidelines for inclusion: Ensuring access to education for all*. UNESCO.
- United Nations Educational, Scientific and Cultural Organization. (2009). *Defining an inclusive education agenda: Reflections around the 48th session of the International Conference on Education*. UNESCO International Bureau of Education.
- Yelpaze, İ., & Türküm, A. S. (2018). Adaptation and validation of the Turkish version of the Multidimensional Attitudes Toward Persons With Disabilities Scale. *OPUS International Journal of Society Researches*, 8(14), 167–187.