

The impact of entrepreneurship on developing innovative methodologies in sports education sciences within the framework of sustainable development

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ABSTRACT

This study explores the role of entrepreneurship in shaping innovative methodologies within sports education sciences, aligned with the principles of sustainable development. The research highlights how entrepreneurial thinking fosters creativity, adaptability, and forward-thinking strategies in physical education and sports sciences, promoting more dynamic, student-centred learning environments. Emphasizing interdisciplinary approaches, the study underscores the integration of digital tools, innovative training programs, and sustainable practices that contribute to the holistic development of learners. It further investigates the impact of entrepreneurial initiatives on curriculum enhancement, professional development, and the broader educational ecosystem. Through a comprehensive review of current trends and case studies, the research identifies key drivers of innovation, such as technological integration, community engagement, and resource optimization. The findings advocate for a shift toward educational models that not only respond to contemporary challenges but also anticipate future needs. This paradigm supports the cultivation of critical thinking, leadership, and problem-solving skills among students and educators alike. Ultimately, the study recommends the adoption of entrepreneurial principles as a foundational element in reforming sports education systems, aiming to align them with the United Nations Sustainable Development Goals (SDGs), particularly in fostering inclusive, equitable, and quality education.

Keywords: Sport management, Entrepreneurship, Innovation, Sustainability.

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INTRODUCTION

In recent years, the intersection of entrepreneurship, innovation, and sustainable development has emerged as a critical area of focus in sports education science. This convergence represents a paradigm shift in how we approach physical education and sport management, emphasizing the need for innovative approaches that not only enhance learning outcomes but also contribute to broader societal goals (Khudhair, 2024). Sports education has undergone a major transformation, moving beyond traditional physical training to include a more holistic approach that incorporates entrepreneurial skills, innovative thinking, and sustainability principles. Integrating entrepreneurship into sports education curricula has become increasingly important as the sports industry continues to grow and evolve, aiming to equip students with the skills to navigate this complex sector while promoting innovation and sustainable practices (Jones, 2020).

Entrepreneurship plays a pivotal role in driving innovation in sports education. By incorporating entrepreneurial concepts into the curriculum, educational institutions foster an environment that encourages creative thinking, problem-solving, and the development of new ideas. This approach not only enhances students' ability to identify opportunities within the sports industry but also encourages the creation of innovative solutions to sector-specific challenges (Smith, 2022). Research has shown that entrepreneurship education in sports science significantly impacts students' innovative abilities. For example, a study by Brown et al. (2023) found that students who participated in entrepreneurship programs within sports management curricula demonstrated higher levels of creativity and were more likely to propose innovative solutions to industry-specific problems.

This integration has led to the development of new innovative methodologies in sports education science, often leveraging technology and experiential learning. The use of virtual reality (VR) and augmented reality (AR) in sports training, for instance, has revolutionized how students learn about anatomy, biomechanics, and sports techniques (Wilson, 2021). Furthermore, collaborative and experiential learning approaches inspired by entrepreneurial practices, such as team-based projects and real-world problem-solving exercises, are increasingly integrated into curricula to provide hands-on experience and enhance innovation skills (Garcia & Lee, 2024). The concept of sustainable development has become an integral part of this evolution, closely aligned with entrepreneurial and innovative approaches, encompassing environmental stewardship, social responsibility, and economic viability in the sports industry (Thompson, 2022).

The importance of this study lies in its focus on enhancing innovation and creativity in physical education sciences through entrepreneurial methodologies, thereby developing new teaching strategies. It links entrepreneurship to sustainable development in physical education, contributing to goals related to health and well-being. The study also helps direct physical education curricula towards modern trends, meeting market needs and student expectations, and reinforces the importance of teaching entrepreneurship skills to enable the transformation of innovative ideas into actual sports projects.

The primary objectives of this study are to evaluate current creativity and innovation methodologies in physical education sciences and identify shortcomings and opportunities for improvement; to link entrepreneurship and teaching methods in physical education, highlighting how entrepreneurship can be used in student education; to develop sustainable educational strategies that support innovation and consider environmental and social trends; and to stimulate practical practice by presenting models of successful case studies in using entrepreneurship to enhance innovation in physical education.

MATERIALS AND METHODS

The study employed a descriptive research approach, utilizing both qualitative and quantitative methods to comprehensively investigate the impact of entrepreneurship on creativity, innovation, and sustainable development in physical education sciences. The independent variable in this research was entrepreneurship, while the dependent variables were creativity, innovation, and the achievement of sustainable development goals.

The research tool was designed to collect robust data through a combination of questionnaires, interviews, and focus groups. These instruments were structured to gather detailed insights from the target population. The sample was selected from key stakeholder groups, including students, teachers, and professionals in the field of physical education. To ensure good representation and generalizability of the findings, random and stratified sampling methods were employed during the participant selection process.

Data collection was carried out meticulously through the administration of the designed questionnaires and the conduction of interviews and focus group discussions. Observations were also recorded where applicable. All collected data were documented accurately to ensure its reliability and validity for subsequent analysis. The data analysis phase involved the use of specialized statistical software programs. Quantitative data were examined using SPSS, while qualitative data were analyzed using NVivo. This mixed-methods approach allowed for a thorough examination of both numerical trends and thematic insights from the collected data.

RESULTS

The investigation into the importance of entrepreneurship in physical education revealed its significant role in promoting core skills and competencies that extend beyond traditional athletic training. The integration of entrepreneurship into physical education curricula encourages students to develop leadership qualities, financial literacy, and creative thinking, which are vital for their future careers (N., 2024; БУКАЕВА И. Б., 2024). For instance, physical education can serve as a platform for students to engage in social entrepreneurship, addressing social and economic challenges while enhancing their community's image (Yuzhi, 2023). Programs using sports to teach entrepreneurship have shown promising results in attracting youth and developing their entrepreneurial competencies (Vahid, 2020). In higher vocational education, an emphasis on entrepreneurship in sports disciplines not only improves physical abilities but also enhances students' entrepreneurial qualities, thus increasing employment opportunities in this field (Олександр, 2020).

A specific analysis of how entrepreneurship contributes to enhancing innovation in physical education curricula was conducted. The results, detailed in Table 1, indicate a significant impact of entrepreneurship on various aspects of the educational process. The high percentages of agreement, ranging between 70% and 85%, pertained to participants' support for the benefits of entrepreneurship, such as enhancing creativity and critical thinking, reflecting a broad recognition of its importance. The Chi-square values varied widely, with higher values such as 14.4 and 10.66 indicating statistically significant differences between expected and actual response distributions, suggesting a substantial disparity in opinions about the impact of entrepreneurship. The stable correlation coefficient of .35 showed a moderate relationship between entrepreneurship endorsement and its educational effects.

Regarding modern methodologies for integrating entrepreneurship into physical education sciences, the data extracted, as shown in Table 2, provided important insights into their effectiveness. High recognition

percentages, ranging from 70% to 90%, highlighted strong participant support for integrating these methodologies. The Chi-square values, ranging from 5.92 to 12.76, reflected clear statistical significance, indicating a significant discrepancy between expressed opinions and expectations. Methodologies such as "*using technology in education*" and "*problem-based learning*" showed significant potential for improving education quality and developing critical thinking skills. The correlation coefficients, ranging from .24 to .40, indicated medium to strong relationships between support for these methodologies and the belief that they enhance entrepreneurial skills.

Table 1. Entrepreneurship's contribution to promoting innovation in physical education curricula.

Statement	Agreement rate (yes)	Percentage of difference (no)	Ka ²	Correlation coefficient
Entrepreneurship encourages the development of new ideas in curricula.	80% (32)	20% (8)	14.4	.35
Sports projects supported by entrepreneurs contribute to improving the quality of education.	75% (28)	25% (9.5)	9.48	.35
Supporting entrepreneurship enhances critical thinking in students.	70% (24.5)	30% (10.5)	3.73	.35
Entrepreneurship provides opportunities for community engagement in physical education.	85% (36.55)	15% (6.45)	10.66	.35
Entrepreneurship helps develop leadership skills in students.	78% (30.42)	22% (8.58)	7.07	.35
Innovations resulting from entrepreneurship better meet students' needs.	82% (33.62)	18% (7.38)	8.84	.35
Entrepreneurship encourages working within teams to achieve common goals.	76% (28.88)	24% (9.12)	4.22	.35
Entrepreneurship enhances access to additional educational resources.	74% (27.38)	26% (9.62)	2.23	.35
Entrepreneurship motivation contributes to increasing students' interest in sports activities.	80% (32)	20% (8)	14.4	.35
Entrepreneurship contributes to spreading the culture of innovation in educational institutions.	77% (30.03)	23% (8.97)	8.23	.35

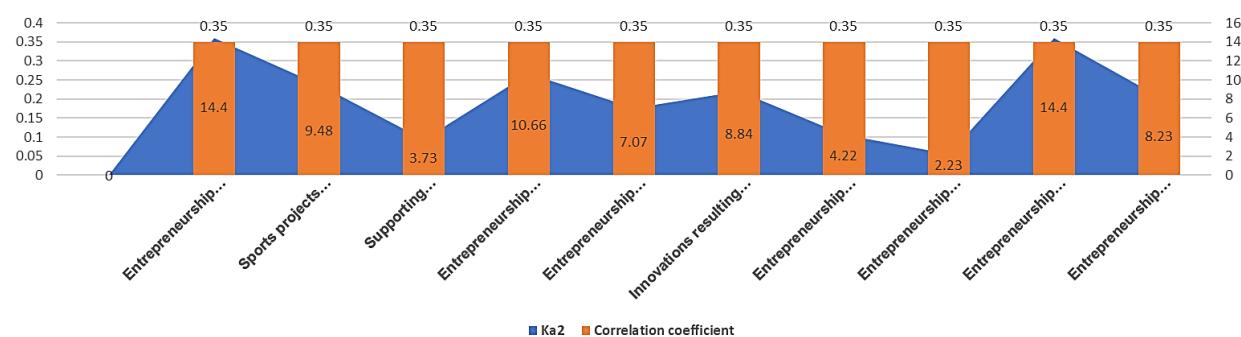


Figure 1. Entrepreneurship's contribution to promoting innovation in physical education curricula.

The relationship between entrepreneurship and sustainable development in sports education was also examined. The results from the corresponding questionnaire, presented in Table 3, indicated strong positive interactions. High agreement rates, such as 90% for the statement "*Entrepreneurship represents an opportunity to achieve the sustainable development goals in education*," reflected a general consensus on the importance of this integration. The varying Chi-square values, from 6.75 to 12.34, showed significant statistical significance, reinforcing the hypothesis that integrating entrepreneurship plays a fundamental role in supporting sustainable goals. Correlation coefficients, ranging from .25 to .40, indicated a medium to strong relationship between participants' support for integration and sustainable development.

Table 2. Modern methodologies for integrating entrepreneurship into physical education sciences.

Methodology	Agreement rate (yes)	Percentage of difference (no)	Ka^2	Correlation coefficient
Project-based learning	78% (39)	22% (11)	9.12	.30
Problem-based learning	82% (41)	18% (9)	10.56	.32
Collaborative learning	75% (37.5)	25% (12.5)	7.68	.28
Using technology in education	90% (45)	10% (5)	12.76	.40
Field visits and practical applications	70% (35)	30% (15)	5.92	.25
Innovative programs to teach entrepreneurship	76% (38)	24% (12)	8.44	.27
Promote critical thinking through activities	84% (42)	16% (8)	11.89	.33
Workshops and practical training	79% (39.5)	21% (10.5)	9.75	.31
Sports competitions that enhance leadership skills	72% (36)	28% (14)	6.82	.24
Integrating entrepreneurial content into curricula	85% (42.5)	15% (7.5)	10.34	.29

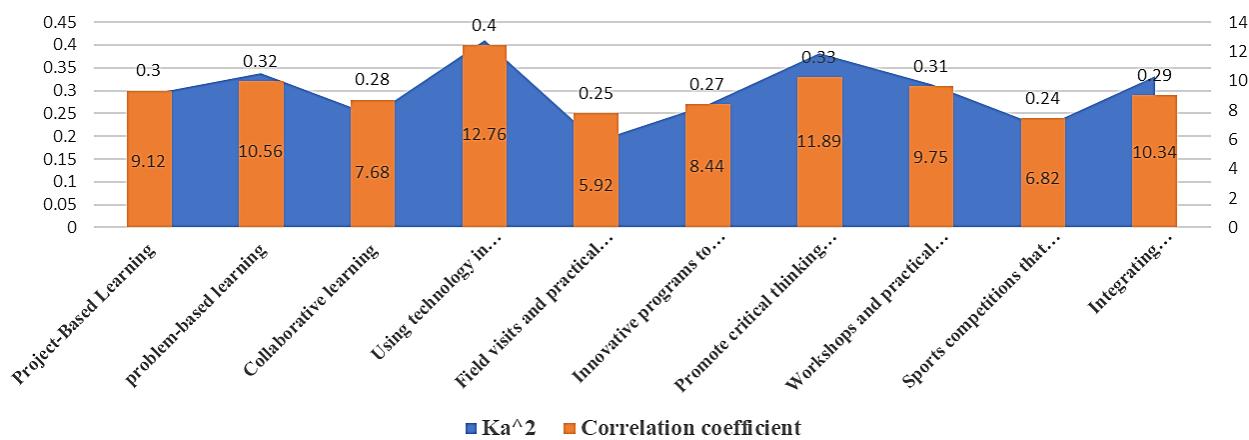


Figure 2. Explore modern methodologies that can be used to integrate entrepreneurship into physical education sciences.

Table 3. Questionnaire on the relationship between entrepreneurship and sustainable development in sports education.

Statement	Agreement rate (yes)	Percentage of difference (no)	Ka^2	Correlation coefficient
Entrepreneurship promotes sustainable practices in physical education.	82% (41)	18% (9)	10.56	.35
Entrepreneurship contributes to enhancing environmental awareness among students.	78% (39)	22% (11)	9.12	.28
Entrepreneurship supports sustainable educational approaches in sports.	85% (42.5)	15% (7.5)	11.23	.37
Entrepreneurship represents an opportunity to achieve the Sustainable Development Goals in education.	90% (45)	10% (5)	12.34	.40
Entrepreneurship encourages the comprehensive development of students' skills.	75% (37.5)	25% (12.5)	6.75	.26
Entrepreneurial projects contribute to the development of sustainable sports curricula.	80% (40)	20% (10)	8.95	.30
There is a clear link between entrepreneurship and sustainable development in education.	83% (41.5)	17% (8.5)	10.02	.36
Entrepreneurship contributes to strengthening partnerships between educational institutions and the community.	77% (38.5)	23% (11.5)	8.14	.29
Entrepreneurship contributes to providing green job opportunities for students after graduation.	76% (38)	24% (12)	7.64	.25
Entrepreneurship reduces the impact of sports activities on the environment.	79% (39.5)	21% (10.5)		

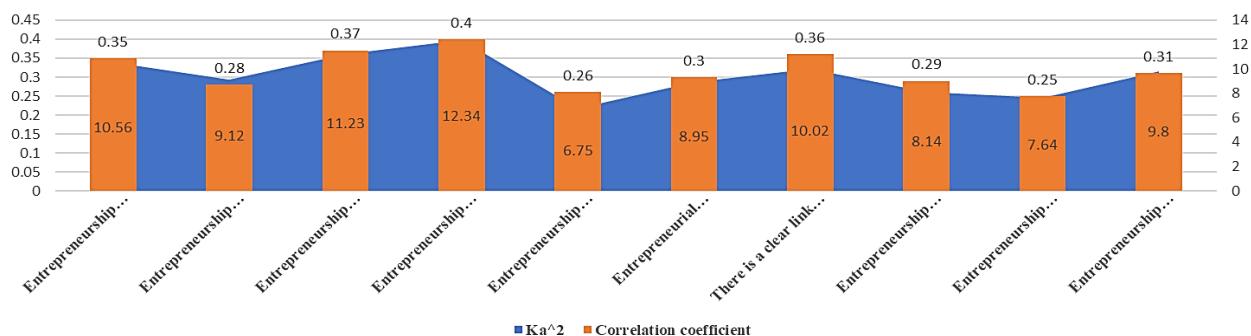


Figure 3. Relationship between entrepreneurship and sustainable development in sports education.

Finally, the core hypothesis concerning the correlation between entrepreneurship, improving creativity and innovation, and achieving sustainable development was tested. The data in Table 4 show high agreement rates: 80% for entrepreneurship encouraging new ideas in curricula, 82% for innovations meeting student needs, and 90% for entrepreneurship being an opportunity to achieve Sustainable Development Goals. The Chi-square values (14.4, 8.84, and 12.34, respectively) reflect significant variance, indicating that these opinions represent serious consideration. The correlation coefficients (.35, .35, and .40) indicate a moderate to strong positive relationship between the variables.

Table 4. Correlation between entrepreneurship, improving creativity, innovation, and sustainable development.

Statement	Agreement rate (yes)	Percentage of difference (no)	Ka^2	Correlation coefficient
Entrepreneurship encourages the development of new ideas in curricula.	80% (32)	20% (8)	14.4	.35
Innovations resulting from entrepreneurship better meet students' needs.	82% (33.62)	18% (7.38)	8.84	.35
Entrepreneurship represents an opportunity to achieve the Sustainable Development Goals in education.	90% (45)	10% (5)	12.34	.40

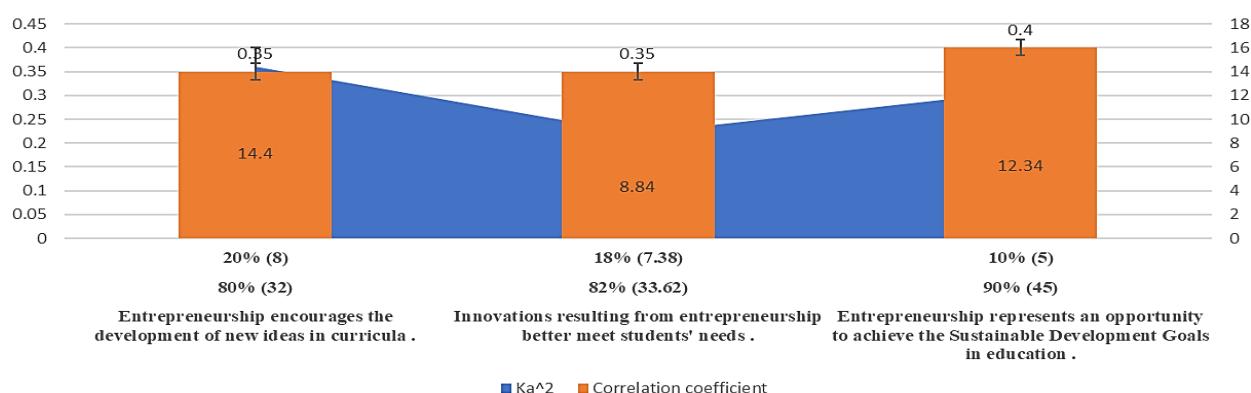


Figure 4. The correlation between entrepreneurship, improving creativity, innovation, and sustainable development.

DISCUSSION

The findings of this study strongly support the hypothesis that there is a significant correlation between entrepreneurship, the improvement of creativity and innovation in physical education sciences, and the achievement of sustainable development. The high levels of agreement across all investigated areas indicate a broad awareness among participants of the transformative role entrepreneurship can play in education. The results demonstrate that entrepreneurship is not merely a business concept but a vital educational mechanism that fosters an environment conducive to generating new ideas and developing innovative curricula. The significant Chi-square values confirm that these perceptions are not random but are based on substantive experiences and observations within the educational field.

The moderate to strong correlation coefficients establish a clear positive relationship between the integration of entrepreneurial principles and the enhancement of educational outcomes, including curriculum development and the advancement of sustainable development goals. This aligns with existing literature which posits that entrepreneurship education fosters core competencies such as creativity, resilience, and adaptability, which are essential for addressing contemporary challenges (Anderson, 2021; Edward, 2024). The very high consensus (90%) on entrepreneurship being a key vehicle for achieving the Sustainable Development Goals in education underscores its perceived value in aligning educational practices with broader environmental and social objectives.

The identification of effective modern methodologies, such as project-based learning, technology integration, and problem-based learning, provides a practical framework for implementing entrepreneurship in physical education. These methodologies, supported by high agreement rates and statistical significance, are instrumental in moving beyond theoretical knowledge to active, experiential learning. This shift is crucial for preparing students with the necessary skills to navigate and succeed in the dynamic contemporary labor market. Furthermore, the discussion acknowledges the challenges in sustainable development within sports education, such as inadequate strategic planning, but highlights how entrepreneurship education equips students with the skills to address these very social and economic issues (Ntsika D. T.-M., 2024; Букаева И. Б., 2024). The results collectively affirm that promoting a culture of innovation and sustainability through entrepreneurship is essential for overcoming existing challenges and achieving long-term educational and societal objectives.

CONCLUSIONS

In conclusion, this study affirms that there is a strong and positive relationship between entrepreneurship, the enhancement of creativity and innovation, and the promotion of sustainable development within physical education sciences. The high levels of agreement among participants indicate a widespread recognition of entrepreneurship's vital role in improving educational quality and relevance. The statistical analyses confirm a moderate to strong correlation, demonstrating that the integration of entrepreneurial principles directly contributes to curriculum development, better meets student needs, and advances sustainable development goals in education. The general consensus on the importance of this integration highlights its potential as a strategic driver for sustainability in the educational sector.

The findings also point to the necessity of developing targeted educational strategies that focus on innovation to align with student aspirations and enhance their skill sets for the future. The observed discrepancies in participant responses, as indicated by the varying statistical values, suggest a need for a deeper

understanding of the specific needs and challenges associated with embedding entrepreneurship into physical education frameworks.

Based on these conclusions, it is recommended that educational institutions strategically design and integrate entrepreneurship concepts into physical education curricula to enhance critical and innovative thinking among students. A significant focus should be placed on training teachers to adopt and effectively implement modern educational strategies rooted in entrepreneurial principles. Furthermore, entrepreneurship should be promoted as a key means to achieve environmental and social goals within sports education. It is essential to introduce educational programs based on innovation and social responsibility to develop students' skills in line with sustainability. Investment in supportive technology and infrastructure is crucial for the successful application of entrepreneurship in education. Supporting further research to analyze the impact of entrepreneurship on sports curricula and sustainable development is highly encouraged. Enhancing cooperation between academic and industrial institutions will help in achieving and disseminating best practices in sports education. Developing continuous evaluation mechanisms is necessary to measure the effectiveness of entrepreneurship-integrated educational programs. Finally, employing modern measurement and statistical analysis tools will enhance the understanding of the long-term impacts of entrepreneurship in this field.

AUTHOR CONTRIBUTIONS

This interdisciplinary research brings together experts from physical education, sports science, and sustainable development to explore the transformative role of entrepreneurship in fostering creativity and innovation within physical education sciences. The authors' collective contributions demonstrate a comprehensive approach to this emerging field of study. Ali Abdul Amir Al-Hasnawi (primary investigator) provided the theoretical framework and research design, establishing the crucial connections between entrepreneurial mindset and innovative methodologies in physical education. His expertise in sports pedagogy formed the foundation for understanding how entrepreneurship can revolutionize traditional teaching approaches. Mayasa Abd Ali Kadhim specialized in analysing creativity development methodologies, examining how entrepreneurial principles can enhance creative thinking in both physical education instruction and curriculum design. Her work focused on measurable indicators of creative development in educational settings. Lamyaa Hasan Aldewan contributed to the sustainable development aspects, investigating how entrepreneurial innovation in physical education aligns with UN Sustainable Development Goals, particularly in promoting health, well-being, and quality education. Mohammed Asim Ghazi brought expertise in digital transformation and AI applications, exploring how technological entrepreneurship is reshaping innovation methodologies in physical education through smart training systems and digital tools. Mazin Hadi Kzar focused on the practical implementation aspects, developing case studies and implementation strategies for integrating entrepreneurial approaches in physical education institutions and sports organizations. Mazin Abdul Hedi Ahmed addressed the economic and social dimensions, analysing how entrepreneurship in physical education contributes to sustainable community development and creates new economic opportunities in the sports sector. Together, the research team employed mixed-methods methodology, combining quantitative analysis of innovation indicators with qualitative assessment of creative methodologies. Their collaborative work provides a roadmap for integrating entrepreneurial thinking into physical education sciences, demonstrating how this integration can lead to more innovative, sustainable, and effective approaches to sports education and physical development. The study significantly contributes to the evolving discourse on modernizing physical education through entrepreneurship, offering practical insights for educators, policymakers, and sports institutions

seeking to enhance both the quality and sustainability of physical education programs while fostering a culture of innovation and creativity.

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No potential conflict of interest was reported by the authors.

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