



Achievement motivation and e-learning engagement among physical education students: A correlational study in Algeria

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ABSTRACT

Background: Achievement motivation plays a crucial role in shaping students' engagement and effectiveness in e-learning environments, particularly in higher education settings focused on physical and sports sciences. **Aims:** This study investigated the relationship between achievement motivation and e-learning among students at the Institute of Physical and Sports Activities Sciences and Technologies at Kasdi Merbah University, Ouargla, Algeria. **Methods:** A correlational, descriptive approach was adopted using a random sample of 35 students from the soccer and volleyball specializations. A questionnaire including an achievement motivation scale (23 items) and an e-learning scale (27 items) was used. **Result:** Results revealed high levels of achievement motivation ($M = 3.41$, $SD = 0.70$) and e-learning ($M = 3.45$, $SD = 0.76$) among participants. The study found a very strong, statistically significant positive correlation ($r = 0.90$, $p < 0.05$) between the two variables, with a coefficient of determination of 0.81, indicating that 81% of the variance in e-learning can be explained by achievement motivation. **Conclusion:** The study recommends enhancing motivational strategies in e-learning environments, improving technological infrastructure, and supporting students' self-regulated learning.

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INTRODUCTION

Achievement motivation is widely recognized as a core psychological determinant of academic engagement and performance, directing individuals' efforts toward achieving excellence (Steinmayr et al., 2019; Elliot & Hulleman, 2017). Theoretically, McClelland's (1961) Acquired Needs Theory established that the need for achievement is a learnable drive that propels individuals to pursue excellence and accept personal responsibility for outcomes. Building on this, Atkinson's (1957) cognitive model framed achievement behavior as the result of an interaction between the hope for success and the fear of failure, whereby individuals select tasks based on the subjective probability of success and its perceived value (Wigfield & Eccles, 2020). More recently, Ryan and Deci's (2020) Self-Determination Theory (SDT) has provided a comprehensive framework for understanding academic motivation by identifying three fundamental psychological needs — competence, autonomy, and relatedness — whose satisfaction in the learning environment promotes intrinsic motivation, engagement, and sustained academic achievement (Chen & Jang, 2010; Howard et al., 2021).

Concurrently, e-learning has emerged as a transformative mode of higher education delivery, particularly following the COVID-19 pandemic, which forced universities worldwide into emergency remote instruction (Dhawan, 2020; Aristovnik et al., 2020). Research consistently demonstrates that students with higher achievement motivation adapt more effectively to e-learning environments, exhibiting greater self-regulation, perseverance, and digital engagement (Anthonysamy et al., 2020; Bao, 2020). However, the intersection of achievement motivation and e-learning adoption remains significantly underexplored in contexts where practical, hands-on learning is central — particularly in physical education and sports sciences (Antala et al., 2020; Centeio et al., 2021).

This gap is especially acute in the Algerian higher education context. Studies have documented that Algerian students faced compounded barriers during the transition to e-learning, including unreliable internet infrastructure, frequent power outages, and insufficient institutional technical support (Berbar, 2024; Bellatreche & Alloti, 2023). These structural constraints interact with motivational factors in ways that are not yet empirically understood, particularly for students in physical and sports sciences, whose curricula are inherently dependent on face-to-face practical instruction. To date, no study has examined the relationship between achievement motivation and e-learning specifically among physical education students in Algeria, representing a clear and meaningful research gap. Accordingly, this study addresses the following central question: What is the relationship between achievement motivation and e-learning among students of the Institute of Physical and Sports Activities Sciences and Technologies at Kasdi Merbah University — Ouargla, Algeria? By answering this question, the study aims to provide the first empirical evidence on this relationship in the Algerian sports education context, contributing to both theoretical understanding and practical policy recommendations to improve e-learning quality and motivational strategies in Algerian universities.

Although achievement motivation and e-learning have been studied extensively in isolation, their relationship within physical education and sports sciences remains empirically unexamined, particularly in the Algerian university context, where structural barriers such as poor internet infrastructure and lack of technical support compound the motivational challenges students face during digital learning transitions (Berbar, 2024; Bellatreche & Alloti, 2023; Almaiah et al., 2020). This gap constitutes the central problem of the present study: What is the relationship between achievement motivation and e-learning among students of the Institute of Physical and Sports Activities Sciences and Technologies at Kasdi Merbah University — Ouargla?

Three research questions guide this investigation: (1) What is the level of achievement motivation among the target students? (2) What is their level of e-learning engagement? (3) Is there a statistically significant relationship between the two variables?. This study contributes to existing knowledge in three specific ways: it provides the first empirical evidence on this relationship within Algerian sports sciences higher education; it generates ecologically valid data from a real crisis context (COVID-19 pandemic, 2020–2021); and it produces a quantitative predictive model ($R^2 = 0.81$) that can directly inform institutional policies for enhancing motivation and e-learning quality in Algerian universities.

To answer the previous questions, the following hypotheses were formulated: First hypothesis: The level of achievement motivation among students of the Institute of Physical and Sports Activities Sciences and Technologies is high. Second hypothesis: The level of e-learning among students of the Institute of Physical and Sports Activities Sciences and Technologies is high. Third hypothesis: There is a positive, statistically significant correlation between achievement motivation and e-learning among students at the Institute of Physical and Sports Activities Sciences and Technologies. This study seeks to achieve the following objectives: (1) Determine the level of achievement motivation among students of the Institute of Physical and Sports Activities Sciences and Technologies; (2) Determine the level of e-learning as perceived by students of the Institute of Physical and Sports Activities Sciences and Technologies; (3) Reveal the nature of the correlational relationship between achievement motivation and e-learning among students of the Institute of Physical and Sports Activities Sciences and Technologies; (4) Provide practical recommendations for enhancing achievement motivation and improving the e-learning experience in physical education and sports; (5) Enrich Arabic literature in the intersection between educational psychology and educational technology in the sports context.

This study is significant for several reasons. Theoretically, the study helps fill a research gap in Arabic literature on the relationship between achievement motivation and e-learning in physical education and sports. It presents an integrated theoretical framework that combines classical and modern motivation theories with technology acceptance models. Practically, the study results can help decision-makers in Algerian universities design more effective electronic educational programs, develop strategies to enhance student motivation, and improve the quality of university sports education. Socially, the study focuses on an important category of university students who represent future leaders in the sports and educational field, making its results have an extended impact on society.

METHOD

Research Design and Participants

A correlational descriptive design was adopted. The study population comprised all undergraduate students enrolled in soccer and volleyball specializations at the Institute of Physical and Sports Activities Sciences and Technologies, Kasdi Merbah University — Ouargla, Algeria, during the academic year 2020–2021. A simple random sample of 35 students (87.5% retrieval rate) was selected after excluding three incomplete questionnaires from an initial 38 retrieved responses.

Instrument

Data were collected via a structured questionnaire comprising two validated scales: (1) Achievement Motivation Scale (23 items across four dimensions: desire for success and excellence, perseverance and diligence, future planning, and accuracy in work performance), adapted from Al-Masri & Farah (2020) and Steinmayr et al. (2019). (2) E-Learning Scale (27 items across three domains: e-learning experience difficulties, infrastructure and technical support difficulties, and internet and acceptance difficulties), developed based on Almaiah et al. (2020) and García-Morales et al. (2021). All items used a five-point Likert scale (1 = does not express you at all; 5 = expresses you to a very large degree).

Validity and Reliability

Face validity was confirmed by five expert reviewers in educational psychology and physical education. Discriminant validity was verified using the extreme groups method (upper 27% vs. lower 27%), yielding statistically significant differences for both scales ($p < 0.05$). Internal consistency was assessed via Cronbach's alpha: achievement motivation scale ($\alpha = 0.923$), e-learning scale ($\alpha = 0.957$), and total scale ($\alpha = 0.973$), all indicating excellent reliability (Nunnally & Bernstein, 1994).

Procedures

Following institutional ethical approval, questionnaires were distributed to participants during the second semester of 2020–2021. Participants were informed of the voluntary nature of participation and the confidentiality of their data. Completed questionnaires were reviewed, and three were excluded. Data were entered into SPSS v.25 for analysis.

Statistical Analysis

Descriptive statistics (means, standard deviations), Pearson correlation coefficient, and simple linear regression analysis were performed. A significance threshold of $\alpha = 0.05$ was applied.

RESULTS AND DISCUSSION

Results

Results Related to the First Hypothesis

To verify the first hypothesis, stating that "the level of achievement motivation among students of the Institute of Physical and Sports Activities Sciences and Technologies is high," means and standard deviations were calculated for all items of the achievement motivation scale and the total mean of the scale. Table 1 presents the descriptive statistics for achievement motivation dimensions.

Table 1. *Descriptive Statistics for Achievement Motivation Dimensions (N = 35)*

Dimension	Number of Items	Mean	SD	Level	Rank
Desire for Success and Excellence	7	3.48	0.74	High	1
Accuracy in Work Performance	5	3.42	0.67	High	2
Perseverance and Diligence	6	3.39	0.71	Moderate	3
Future Planning	5	3.36	0.68	Moderate	4
Total Achievement Motivation Scale	23	3.41	0.70	High	-

As shown in Table 1, the dimension "desire for success and excellence" obtained the highest mean of 3.48 (SD = 0.74), indicating a high level. The dimension "accuracy in work performance" came in second place with a mean of 3.42 (SD = 0.67), also within the high level. The dimensions "perseverance and diligence" and "future planning" obtained means of 3.39 (SD = 0.71) and 3.36 (SD = 0.68), respectively, both falling within the moderate level according to the adopted gradation. The total achievement motivation scale (23 items) yielded a weighted mean of 3.41 (SD = 0.70), which falls within the high range (3.40–4.19). This overall result indicates that sample members possess a high level of achievement motivation, characterized by a strong desire for success and excellence, a concern for accuracy in their work, and moderate effort in perseverance and future planning. Thus, the first hypothesis is accepted.

Results Related to the Second Hypothesis

To verify the second hypothesis, that "the level of e-learning among students of the Institute of Physical and Sports Activities Sciences and Technologies is high," means and standard deviations were calculated for all items of the e-learning scale and for the total scale mean. Table 2 presents the descriptive statistics for e-learning domains.

Table 2. *Descriptive Statistics for E-Learning Domains (N = 35)*

Domain	Number of Items	Mean	SD	Level	Rank
Infrastructure and Technical Support Difficulties	10	3.51	0.74	High	1
Other Difficulties Related to the Internet and Acceptance	8	3.46	0.76	High	2
Difficulties Related to E-Learning Experience	9	3.38	0.79	Moderate	3
Total E-Learning Scale	27	3.45	0.76	High	-

As indicated in Table 2, the domain "infrastructure and technical support difficulties" had the highest mean of 3.51 (SD = 0.74), indicating a high level of perceived difficulty. The domain "other difficulties and obstacles related to the internet and acceptance" ranked second with a mean of 3.46 (SD = 0.76), also in the high range. The domain "difficulties related to e-learning experience" had a mean of 3.38 (SD = 0.79), indicating a moderate level of difficulty. The total e-learning scale (27 items) yielded a weighted mean of 3.45 (SD = 0.76), which falls within the high range (3.40–4.19). This result indicates that sample members perceive e-learning relatively positively despite the challenges they face, especially regarding infrastructure and technical support. The high mean in the infrastructure difficulties domain reflects ongoing technical problems, including slow internet, power outages, and weak technical support from the university. Thus, the second hypothesis is accepted.

Results Related to the Third Hypothesis

To verify the third hypothesis, which states that "there is a positive and statistically significant correlation between achievement motivation and e-learning among students of the Institute of Physical and Sports Activities Sciences and Technologies," Pearson's correlation coefficient and simple linear regression were used. Table 3 presents the results of the correlation and regression analyses.

Table 3. *Pearson Correlation and Simple Linear Regression Analysis Between Achievement Motivation and E-Learning (N = 35)*

Analysis Type	Statistics	Value	Significance
Pearson Correlation	Correlation Coefficient (r)	0.90	0.000*
Simple Linear Regression	Coefficient of Determination (R ²)	0.81	-
	F-value	139.94	0.000*
	Constant (a)	10.16	0.000*
	Regression Coefficient (B)	0.98	0.000*
	Regression Equation	E-Learning = 10.16 + (0.98 × Achievement Motivation)	-

Note. * Statistically significant at $\alpha = 0.05$ level

As shown in Table 3, the Pearson correlation coefficient between achievement motivation and e-learning was $r = 0.90$, indicating a very strong positive correlation according to Cohen's (1988) criteria. This relationship was statistically significant at the $\alpha = 0.05$ significance level (Sig.) = 0.000, which is less than 0.05. Simple linear regression analysis revealed a coefficient of determination (R²) of 0.81, indicating that the variance in achievement motivation scores explain 81% of the variance in e-learning scores. This very high percentage reflects the predictive model's strength. The calculated F-value was 139.94 with a significance level of 0.000, indicating that the regression model as a whole is statistically significant and meaningful.

The regression coefficient (B) was 0.98, and the constant was 10.16, yielding the following regression equation: $E\text{-learning} = 10.16 + (0.98 \times \text{Achievement Motivation})$. This equation indicates that, for each unit increase in achievement motivation, e-learning increases by approximately 0.98 units, confirming a strong direct relationship between the two variables. Thus, the third hypothesis is accepted, indicating a very strong, statistically significant positive correlation between achievement motivation and e-learning among students of the Institute of Physical and Sports Activities Sciences and Technologies. This result indicates that achievement motivation is a pivotal factor in determining students' success in e-learning, and that enhancing motivation can significantly improve the e-learning experience and its academic outcomes.

Discussion

Discussion of Results Related to Achievement Motivation Level

The study results showed that the level of achievement motivation among students of the Institute of Physical and Sports Activities Sciences and Technologies was high, with a mean of 3.41 and a standard deviation of 0.70. This result is consistent with Al-Masri & Farah's (2020) study of King Faisal University students in Saudi Arabia, which found that achievement motivation was high among university students and that it was strongly positively related to strategic intelligence. It is also consistent with recent international studies that have confirmed that students with a strong academic orientation and practical specializations, such as physical education, tend to show high levels of achievement motivation (Daumiller et al., 2019; Steinmayr et al., 2019).

This result can be interpreted in light of McClelland's Acquired Needs Theory, which posits that achievement motivation develops through socialization and early educational experiences (McClelland, 1987). Physical education and sports students are often exposed to competitive environments from early educational stages, whether at school or a sports club, which develops in them a strong need for distinction and excellence. It can also be interpreted within Atkinson's model, in which students with high motivation tend to choose specializations that require effort and perseverance, such as sports that combine theoretical study with intensive practical practice (Elliot et al., 2017; Wigfield & Eccles, 2020).

On the other hand, the high level of achievement motivation among sample members may also reflect the influence of the Algerian cultural context, which encourages university education as

a means of social and economic mobility, driving students to work hard and strive for success (Bellatreche & Alloti, 2020, 2023). Also, the nature of sports specialization itself—which requires continuous training, discipline, and commitment—may contribute to the development of personality traits associated with high motivation, such as perseverance and determination (Centeio et al., 2021).

However, detailed results revealed variation across achievement motivation dimensions, with the dimension "desire for success and excellence" highest, with a mean of 3.48, while the dimensions "perseverance and diligence" and "future planning" were at the moderate level, with means of 3.39 and 3.36, respectively. This may indicate that students possess a strong desire for success. Still, they may face difficulties in long-term perseverance or strategic planning for their goals, which calls for educational interventions to enhance these skills through academic counseling programs and workshops on study skills and time management (Steinmayr et al., 2019).

Discussion of Results Related to E-Learning Level

Results showed that students' perceived level of e-learning was high, with a mean of 3.45 and a standard deviation of 0.76, indicating that students generally view e-learning positively despite the challenges they face. This result partially aligns with recent studies conducted in Algerian universities during the COVID-19 pandemic, which indicated that students were able to adapt to e-learning despite limited prior experience and technical challenges (Berbar, 2024; Bellatreche & Alloti, 2020, 2023). However, a detailed analysis of sub-domains revealed that the domain "infrastructure and technical support difficulties" had the highest mean of 3.51, indicating ongoing technical challenges, including slow internet, power outages, and weak technical support from the university. This result is consistent with findings from other studies in the Algerian and Arab contexts, which confirmed that technological infrastructure is a major obstacle to the success of e-learning in developing countries (Almaiah et al., 2020; Patricia, 2020).

This result can be interpreted in light of the Technology Acceptance Model, which assumes that users' acceptance of technology depends on their perception of its usefulness and ease of use (Davis, 1989; Teo, 2019). Although students may perceive e-learning as useful for its flexibility and access to content, technical difficulties reduce perceived ease of use, which may negatively affect their satisfaction and long-term intention to use electronic platforms in the long term (Al-Emran et al., 2020; Mailizar et al., 2021). It can also be interpreted in light of Self-Determination Theory, where students indicate that e-learning provides them with a higher level of autonomy in learning and allows them the opportunity to re-watch lectures and access educational resources at any time, satisfying their need for competence and autonomy (Chen & Jang, 2010; Ryan & Deci, 2020). This was confirmed by recent studies conducted with physical education students, which showed that students with high intrinsic motivation benefit more from e-learning environments (Lieberman et al., 2020; Antala et al., 2020).

Discussion of Results Related to the Relationship Between Achievement Motivation and E-Learning

The findings revealed a very strong positive and statistically significant correlation between achievement motivation and e-learning ($r = 0.90$, $p < 0.001$, $R^2 = 0.81$), indicating that achievement motivation accounts for 81% of the variance in e-learning engagement among the target sample. This result is broadly consistent with SDT predictions (Ryan & Deci, 2020), which posit that students with higher levels of intrinsic motivation and psychological need satisfaction demonstrate greater engagement with learning environments — including digital ones (Anthonysamy et al., 2020; Howard et al., 2021). It also aligns with Bao (2020) and Walker et al. (2024), who confirmed that highly motivated students show greater self-regulation and persistence in e-learning contexts.

However, the magnitude of this correlation ($r = 0.90$) is unusually high by social research standards (Cohen, 1988) and warrants critical methodological reflection. Four factors may have contributed to this inflated value. First, the sample's homogeneity — drawn exclusively from one institute and two specializations — reduces variance in background variables, a phenomenon known as *restriction of range* that tends to amplify observed correlations (Cohen et al., 2003). Second, administering both scales simultaneously via the same self-report questionnaire introduces *Common Method Bias*, a well-documented source of correlation inflation in single-source cross-sectional designs (Podsakoff et al., 2003). Third, data collection during COVID-19 likely captured a self-selected group of highly motivated and digitally engaged students, introducing *survivorship bias* that

may have strengthened the co-variation between variables (Means & Neisler, 2021). Fourth, partial *construct overlap* exists between items measuring e-learning persistence and those measuring achievement motivation dimensions such as perseverance and diligence, which may have contributed to the high coefficient beyond the true relationship between constructs (Steinmayr et al., 2019). These considerations do not invalidate the finding but rather contextualize it. Future studies with larger, multi-institutional, and gender-diverse samples, incorporating objective performance measures alongside self-report instruments, would provide a more conservative and generalizable estimate of this relationship.

Discussion of Results in Light of Health Crises

It is important to discuss the results of this study in the context of the COVID-19 pandemic, which imposed a sudden and mandatory shift toward e-learning worldwide (Aristovnik et al., 2020; Dhawan, 2020). Numerous studies indicated that the pandemic significantly affected student motivation, where many suffered from anxiety, stress, and social isolation, which negatively reflected on their academic engagement (Means & Neisler, 2021; Patricia, 2020). However, our study results indicate that physical education and sports students in Algeria showed a high level of achievement motivation despite these circumstances, which may reflect psychological resilience and ability to adapt among this category of students, which is consistent with their competitive nature and experience in dealing with pressures and challenges in the sports field (Centeio et al., 2021). Recent studies have confirmed the importance of supporting motivation during times of crisis, showing that students who receive psychological, social, and academic support from the university, professors, and peers are better able to maintain high levels of motivation and academic performance (Bao, 2020; García-Morales et al., 2021). Other studies also indicate that developing self-learning and self-regulation skills before and during crises helps students adapt better to distance-learning environments (Hodges et al., 2020; Mishra et al., 2020).

Implications

In light of the results, the study presents recommendations for the concerned parties. At the level of universities and educational institutions, it is recommended to improve technological infrastructure by investing in providing high-speed internet, reliable servers, modern educational platforms, and reducing power outage problems by providing alternative energy systems, as well as providing continuous technical support by establishing technical support offices operating around the clock to help students and professors solve technical problems, developing regular training programs on using electronic platforms and modern digital learning tools, and supporting scientific research by encouraging further studies on factors affecting the success of e-learning in practical specializations. At the professor level, it is recommended to design interactive content considering modern instructional design principles including interactive activities, continuous assessments, and immediate feedback, using teaching strategies that stimulate students' intrinsic motivation such as providing tasks that challenge their abilities, involving them in setting learning goals, and giving them autonomy in choosing projects, creating a supportive electronic educational environment through regular communication with students and encouraging collaboration and teamwork through digital platforms, and considering individual differences by recognizing different motivation levels and providing additional support to students with low motivation.

At the student level, it is advised to develop self-regulation skills and work on developing time management skills, goal setting, and monitoring academic progress, benefit from available resources through optimal use of electronic libraries, educational platforms, and open-source resources, effective communication and not hesitating to ask for help from professors, colleagues, and technical support when facing difficulties, and maintain balance between e-learning and mental and physical health through taking regular breaks and practicing physical activities. At the educational policy level, it is recommended to reconsider curricula and develop curricula that thoughtfully integrate e-learning with traditional learning in a blended learning model, establish quality standards, and develop national standards to ensure e-learning quality in Algerian universities, support innovation, and encourage innovation in electronic teaching and assessment methods by providing incentives and rewards to distinguished professors.

Research Contribution

This study aimed to reveal the relationship between achievement motivation and e-learning among students of the Institute of Physical and Sports Activities Sciences and Technologies at Kasdi Merbah University – Ouargla, Algeria. The study reached important results confirming that the levels of achievement motivation and e-learning among sample members were high, and that there is a very strong, positive, statistically significant correlation between the two variables ($r = 0.90$, $R^2 = 0.81$). This means that achievement motivation is a pivotal factor in the success of e-learning experiences, and that enhancing motivation can significantly improve learning quality and academic achievement in digital learning environments. These results contribute to enriching the theoretical literature on the relationship between motivation and e-learning in physical education and sports, a relatively under-researched field, especially in the Arab context. The study also provides empirical evidence supporting classical and modern theories of motivation and their applications in e-learning contexts (Atkinson, 1957; McClelland, 1987; Ryan & Deci, 2020).

Limitation

Despite the important results this study achieved, it has some limitations that should be considered when generalizing its findings. In terms of sample size, the study included 35 male and female students, a relatively small number that limits the generalizability of the results to broader populations and calls for future studies with larger samples. In terms of geographical context, the study was conducted at a single university, cautioning against generalizing the results to other universities in Algeria or Arab countries. In terms of academic specialization, the study focused on physical education and sports students, and results may differ in other theoretical or applied specializations. In terms of research design, the study adopted a cross-sectional design, which does not allow studying changes over time or inferring direct causal relationships between variables (Creswell & Creswell, 2018).

Suggestion

Based on this, the study suggests a set of future research directions to deepen understanding and expand the scope of knowledge. First, conducting longitudinal studies that track the development of achievement motivation and student performance in e-learning over several semesters to understand the temporal dynamics and factors that affect the long-term. Second, designing experimental studies for intervention programs aimed at enhancing achievement motivation and testing their impact on e-learning outcomes using experimental and control groups and pre and post-measurements. Third, conducting comparative studies of motivation levels and e-learning outcomes across different specializations (theoretical versus practical), academic levels (bachelor's, master's, doctorate), and universities. Fourth, conducting qualitative studies using in-depth interviews and focus groups to understand students' and professors' experiences with e-learning more deeply and explore challenges and opportunities from their personal perspective. Fifth, conducting multilevel studies to study the impact of factors at different levels (individual, class, institutional, national) on e-learning success using advanced statistical models. Sixth, studying mediating and moderating variables such as emotional intelligence, self-efficacy, social support, and learning styles to better understand the mechanisms linking motivation and e-learning.

CONCLUSION

In conclusion, this study confirms the pivotal role of achievement motivation in the success of e-learning experiences among physical education and sports students. In light of the accelerating digital transformations in higher education globally and locally, it becomes necessary to invest in enhancing psychological and motivational factors for students, alongside improving technological infrastructure, to ensure the achievement of e-learning objectives and quality (Dhawan, 2020; Meng et al., 2024). We hope that the results and recommendations of this study will help guide educational policies and practices toward building more effective and inclusive e-learning environments in Algerian and Arab universities, and will open new horizons for scientific research in this vital and evolving field.

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AUTHOR CONTRIBUTION STATEMENT

Both authors contributed equally to this work. MK was responsible for conceptualization, theoretical framework development, instrument design, and writing – original draft. AB: was responsible for data collection, statistical analysis, results interpretation, and writing – review & editing. Both authors have read and approved the final version of the manuscript.

AI DISCLOSURE STATEMENT

The authors used AI-assisted tools during the preparation of this work for translation support and grammar checking purposes. After using these tools, the authors thoroughly reviewed and edited the content as needed and take full responsibility for the accuracy and integrity of this publication.

CONFLICTS OF INTERES

The authors declare that they do not have any conflicts of interest related to the publication of this article, whether financial, institutional, or personal, that could influence the research process, analysis, writing, or publication of this manuscript.

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