

Exploratory Factor Analysis for Measuring Instrument of Sports Involvement on Psychological Resilience among Boarding School Students in Malaysia

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ABSTRACT

This study focuses on the development and validation of an instrument to measure sports involvement as a contributing factor to psychological resilience among Malaysian boarding school students. A survey-based quantitative approach was employed, with data collected from 150 respondents through simple random sampling. The instrument, initially comprising 15 items, was refined through expert validation and exploratory factor analysis (EFA), resulting in a final version with nine items. These items were adapted and modified to align with the study context, utilizing an interval scale ranging from 1 to 10 for precise measurement. The Kaiser-Meyer-Olkin (KMO) test demonstrated excellent sampling adequacy (0.909), and Bartlett's Test of Sphericity was significant ($p < 0.05$), validating the factorability of the correlation matrix. The analysis identified a single component with an eigenvalue greater than 1 (5.548), accounting for 61.645% of the total variance explained, surpassing the minimum threshold ($> 60\%$). EFA findings indicated that all nine retained items had factor loadings exceeding the cutoff point of 0.60, confirming their suitability for measuring sports involvement. The final instrument exhibited strong internal consistency, with Cronbach's Alpha value surpassing the acceptable threshold. The study highlights the rigorous validation process undertaken to ensure the instrument's reliability and relevance for future research. This validated tool provides a solid foundation for exploring the relationship between sports involvement and psychological resilience among boarding school students in Malaysia.

Keywords: Sports Involvement, Psychological Resilience, Boarding School Students, Exploratory Factor Analysis (EFA)

INTRODUCTION

Sports involvement, as a co-curricular activity, has a significant impact on individual development, particularly in the psychological context (Indroasyoko et al., 2020; Shaharuddin et al., 2018). Numerous studies have demonstrated that frequent participation in physical activities can substantially enhance psychological resilience and contribute to improved overall well-being (Lancaster & Callaghan, 2022; Y. Li & Guo, 2023; Lok et al., 2020). Physical endurance developed through regular engagement in sports strengthens an individual's ability to face challenges, thereby fostering greater psychological resilience (Husain et al., 2024). According to Li et al., (2024), the psychological energy accumulated through physical training enhances individuals' capacity to cope with stress and setbacks. In challenging and stressful situations, such training mitigates physiological stress responses while fortifying psychological resilience.

Research conducted among university students further highlights a positive correlation between physical activity and psychological resilience (Seçer & Çakmak Yıldızhan, 2020). Sports and physical activity create opportunities and conditions conducive to resilience development, providing participants with experiences that

promote growth (Bai et al., 2022; Xu et al., 2021). Yang et al., (2024) argue that sports training and participation in competitions offer temporary mental and emotional benefits, allowing individuals to face challenges, endure setbacks, and ultimately cultivate a resilient mindset. Successfully navigating these experiences equips students to adapt positively and effectively to life's demands (Kocatürk & Çiçek, 2023). Additionally, individuals with higher psychological resilience tend to employ diverse problem-solving strategies and report lower levels of anxiety and depression (Mesman et al., 2021; Morales Rodríguez et al., 2020). Li and Guo, (2023) emphasize that the enjoyable, open, and competitive environment of sports serves as an ideal platform for fostering psychological resilience among students.

In addition to promoting resilience, physical activity has been shown to alleviate negative emotions. Research by Cui and Zhang, (2022) found that consistent participation in exercise positively influences emotional control, confidence, communication skills, empathy, and personal development. As individuals enhance their activity levels, develop sports-related skills, and achieve personal goals, they experience a sense of accomplishment that boosts self-efficacy. Furthermore, the enjoyment and satisfaction derived from such activities lead to positive changes in psychological functioning (Li et al., 2024; Nyquist et al., 2020). Regular physical exercise also strengthens individuals' adaptability, enabling them to overcome challenges more effectively (Kim et al., 2023).

To encourage such development, the Ministry of Education Malaysia (MOE) introduced the "1 Student 1 Sport" policy, which ensures that every student participates in sports activities as part of their educational experience. Initiatives such as intra-school competitions, club activities, and sports games not only foster social engagement but also equip students with essential skills that enhance their overall well-being (Mohamad et al., 2022).

Through sports participation, students gain valuable opportunities to navigate complex life challenges, thus enhancing their psychological resilience (Gonzalez-Hernandez et al., 2019; O'Connor & Penney, 2021). Despite the abundance of instruments designed to measure sports involvement, the specific elements of sports participation that contribute to psychological resilience among boarding school students remain underexplored. This study aims to address this research gap by focusing on the exploratory validation of a measuring instrument to assess the impact of sports involvement on psychological resilience in this population. Employing EFA, the study seeks to confirm the key components essential for evaluating this relationship. The findings are expected to enrich the existing literature and provide a robust foundation for developing effective, sports-based interventions to support the mental well-being of boarding school students.

MATERIALS AND METHODS

Sample

The study population consists of 8,943 Form Four students from boarding schools in Malaysia, based on the 2022 Secondary School Enrollment data. A total of 170 respondents were randomly selected from four states in Malaysia: Kedah, Kelantan, Johor, and Sabah. The sampling method used was simple random sampling to ensure that the selected sample represents the characteristics of the overall population. All responses received underwent a screening process, and 20 incomplete responses were excluded, resulting in a total of 150 complete questionnaires. According to Awang et al., (2018) and Hair et al., (2018), a pilot study requires a minimum of 100 or more samples to assess the significance of factor loadings accurately, examine components formed from a combination of developed items, and evaluate the internal reliability of the instrument. Therefore, the sample size of 150 is sufficient and exceeds the minimum recommended size for a pilot study.

Instrument

The primary data collection tool was a survey questionnaire administered directly by the researcher. The instrument was developed based on an extensive literature review and adapted from previous studies exploring the relationship between sports involvement and psychological resilience. Relevant theoretical frameworks and models informed the design of the questionnaire items to ensure alignment with the research objectives.

The questionnaire comprised 15 items that required respondents to assess their level of sports involvement, based on their perceptions during their secondary school experience. Responses were recorded using a 10-point interval

scale, ranging from 1 (strongly disagree) to 10 (strongly agree), to facilitate precise data measurement and meet the assumptions required for parametric statistical analysis (Awang et al., 2023; Piaw, 2014a). Table 1 presents the details of the items included in the questionnaire to construct the construct of sports involvement.

Table 1: Items for the construct of sports involvement

No.	Items
1	Sports activities are enjoyable for me.
2	I feel a sense of belonging through sports activities.
3	Sports involvement benefits me by teaching valuable life lessons.
4	Sports involvement helps boost my self-confidence.
5	Sports present challenges for me.
6	I participate in sports because my friends are inclined towards sports.
7	I make many friends through sports involvement.
8	My parents encourage me to be actively involved in sports.
9	Experiences in sports teach me the value of perseverance.
10	Sports provide opportunities for my personal development.
11	Sports help me develop new skills through the activities I participate in.
12	Sports teach me how to handle challenging situations.
13	Sports involvement is a healthy outlet for managing stress.
14	I learn to set goals through sports involvement.
15	Sports involvement helps me develop a positive outlook on life.

Expert Validation

Prior to the main study, five experts were consulted to review the suitability and accuracy of the instrument. Expert validation was employed to determine whether the instrument was valid and aligned with the research objectives (Mills & Gay, 2019; Nikmohamed et al., 2023). Their evaluation focused on content validity, face validity, and the appropriateness of the measurement scale. Additionally, the experts recommended revising or eliminating items with unclear meanings, overlapping content, or those deemed unsuitable for the study's context.

As a result of the expert review process, six items were excluded for failing to contribute significantly to the component structure. These items were identified as redundant, overlapping, unclear, or irrelevant to the study constructs. Adjustments were made to improve the remaining items, incorporating expert feedback to enhance clarity, relevance, and alignment with the study objectives. Each retained item was carefully refined in terms of language and content to ensure suitability for the study context. This rigorous process reduced the total number of items from the initial 15 to 9, as detailed in Table 2, and ensured that the instrument was well-prepared for the pilot study.

Table 2. Items retained and removed

	Item	Number of items
Item retained	Sports activities are enjoyable for me (PS1).	9
	I feel a sense of belonging through sports activities (PS2).	
	Experience in sports teaches me how to face challenges (PS3).	
	Sports involvement helps me build my self-confidence (PS4).	
	Sports activities are a healthy way to help reduce my stress levels (PS5).	
	Sports involvement helps me develop my thinking skills (PS6).	

	Item	Number of items
	Experiences in sports teach me the value of perseverance (PS7).	
	Sports teaches me how to set goals (PS8).	
	Sports involvement helps me develop decision-making skills (PS9).	
Item removed	Sports involvement benefits me by teaching valuable life lessons.	6
	I participate in sports because my friends are inclined towards sports.	
	I make many friends through sports involvement.	
	My parents encourage me to be actively involved in sports.	
	Sports provide opportunities for my personal development.	
	Sports involvement helps me develop a positive outlook on life.	

Pilot Study

Following adjustments based on expert validation, a pilot study was conducted to evaluate the feasibility, clarity, and quality of the research instrument before proceeding with the actual data collection (Cohen et al., 2018; Piaw, 2014b). The pilot study serves as an initial assessment conducted on respondents drawn from the target population. The data collected from the pilot study will be used to conduct an EFA, which plays a crucial role in refining the research instrument.

FINDING

Exploratory Factor Analysis (EFA)

The Exploratory Factor Analysis (EFA) was conducted to validate the construct of sports involvement and to determine the underlying factor structure. Several key criteria were considered to ensure the appropriateness and adequacy of the analysis, as outlined in Table 3.

Table 3. The key criteria of EFA

Indicators	Cut-off value	Source
Kaiser-Meyer-Olkin (KMO)	KMO > 0.7	Hair et al., (2018) and Awang et al., (2023)
Bartlett’s Test of Sphericity	P < .05	Cohen et al., (2018), Hair et al., (2018), Piaw (2014a) and Tabachnick & Fidell (2019)
Total Variance Explained (TVE)	TVE > 60%	Awang et al., (2023), Cohen et al., (2018) and Hair et al., (2018)
Eigenvalue	Eigenvalue > 1	Cohen et al., (2018), DeVellies (2021) and Hair et al., (2018)
Factor loading	Factor loading > 0.6	Awang et al., (2023) and Hair et al., (2018)

The suitability of the data for EFA was assessed using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett’s Test of Sphericity. As presented in Table 4, the KMO value was 0.909, indicating an excellent level of sampling adequacy. Additionally, Bartlett’s Test was significant (p < 0.05), confirming the factorability of the correlation matrix and the appropriateness of proceeding with factor analysis for the sports involvement construct.

Table 4. KMO measurement values and Bartlett’s test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.909
Bartlett's Test of Sphericity	Approx. Chi-Square	826.515
	Df	36
	Sig.	.001

Principal component analysis (PCA) was conducted to extract factors for the nine items measuring sports involvement, as shown in Table 5. The analysis identified a single component with an eigenvalue greater than 1 (5.548), accounting for 61.645% of the total variance explained. This result exceeds the minimum threshold of 60%, further supporting the unidimensionality of the construct .

Table 5. TVE for component

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.548	61.645	61.645	5.548	51.645	61.645

The component matrix, presented in Table 6, reveals that all nine items loaded strongly onto the single factor, with factor loadings ranging from 0.677 to 0.837. These loadings meet the standard criterion of exceeding 0.6, indicating strong correlations between the items and the underlying construct.

Table 6. Number of components and items of sports involvement

Item code	Component 1
PS9	.837
PS3	.823
PS4	.814
PS8	.811
PS5	.796
PS1	.781
PS6	.769
PS7	.746
PS2	.677

After the EFA procedure, a Cronbach Alpha reliability test was conducted to measure the internal consistency of the instrument. Reliability refers to the consistency and stability of a measure or research tool in measuring what it is supposed to measure (Cohen et al., 2018; Creswell, 2024). The nine items for the sports involvement construct achieved a Cronbach’s Alpha value of 0.922, which exceeds the recommended minimum threshold of 0.7 (Cohen et al., 2018; Creswell, 2024). This high-reliability score reflects excellent internal consistency, affirming the robustness and suitability of the construct for use in further research (DeVellies, 2017; Hair et al., 2018).

CONCLUSION

This study successfully developed and validated an instrument to measure sports involvement concerning psychological resilience among boarding school students in Malaysia. The researcher administered the instrument, drawing from a thorough review of the literature and adaptation of previous studies examining the influence of sports involvement on psychological resilience. The exploratory factor analysis (EFA) demonstrated

a robust construct structure, consistent with the study's context. The final instrument comprises nine items, showing excellent reliability with a high Cronbach's Alpha value.

Expert evaluations established content, face, and criterion validity. The pilot study further affirmed the instrument's adequacy, with sufficient sampling adequacy confirmed by the KMO index and Bartlett's Test of Sphericity, as well as internal consistency, meeting the recommended standards. These findings underscore the instrument's suitability for measuring the relationship between sports involvement and psychological resilience among boarding school students.

However, some limitations should be noted. The focus was exclusively on boarding school students in Malaysia, which may limit the generalizability of the findings to other populations. Future studies should broaden the scope by including students from diverse ethnic backgrounds and varying school types to enhance the instrument's applicability across different contexts.

Overall, this research provides significant contributions to understanding the role of sports involvement in fostering psychological resilience among students. It reinforces the theoretical and methodological underpinnings of the field and offers a validated, reliable instrument for future studies. By doing so, this study lays a foundation for further exploration into the relationship between sports involvement and psychological resilience, both in Malaysia and in broader educational settings worldwide.

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