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Validity and reliability of a questionnaire to assess the impact of physical training and martial arts on physical fitness and psychological well-being in overweight secondary school students

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ABSTRACT

Childhood obesity is a pressing global issue, particularly among secondary school students, highlighting the need for effective interventions to mitigate its health impacts. As the first step to evaluate the effects of physical training and martial arts on the physical fitness and psychological states of overweight secondary school students, this study aimed to assess the validity and reliability of a newly developed questionnaire used to measure these outcomes. The questionnaire, comprising 37 items across four dimensions, was subjected to a rigorous validation process involving expert panels and reliability analysis, demonstrating good content validity (CVI = 0.87) and internal consistency reliability (overall Cronbach's Alpha = 0.810). The results suggest that the questionnaire is a reliable and valid instrument for assessing the intended constructs. These findings have significant implications for the educational and public health sectors, advocating for the integration of physical training and martial arts interventions to combat obesity prevalence and promote healthier lifestyles among adolescents. This study provides valuable insights into the effectiveness of these interventions and their potential to improve the physical and psychological well-being of overweight secondary school students. Future research could explore the longitudinal effects and compare different intervention modalities to further inform evidence-based practices in addressing childhood obesity.

KEYWORDS

Physical Fitness; Psychological State; Physical Training; Martial Arts

1. INTRODUCTION

The prevalence of overweight secondary school students is a pressing concern, as evidenced by global trends showing an increase in obesity among this demographic (Institute for Public Health, 2017; Mahmudiono et al., 2022; Saemoh et al., 2022). The prevalence of obesity and overweight not only indicates a societal health issue but also sheds light on the potential repercussions for these students Khalid et al., (2013), such as the risk of developing conditions like Type II diabetes mellitus. Understanding the prevalence of overweight secondary school students is crucial for informing interventions aimed at promoting healthier lifestyles and addressing the physical and psychological impacts of excess weight (Vikneswaran et al., 2015; Elumalai et al., 2016). By incorporating physical training and martial arts into strategies to combat obesity in this population, schools and health practitioners can offer effective and holistic approaches to tackle this prevalent issue.

Physical training holds substantial benefits for overweight secondary school students, particularly in light of the significant prevalence of obesity highlighted in studies such as the Malta Childhood National Body Mass Index study (Aquilina, 2017). With approximately 40% of Maltese school-aged children classified as overweight or obese, targeted physical education programs become crucial in addressing this pressing public health concern. Understanding the variations in BMI between regions, as evidenced in the study's findings of significant differences between Northern and Southern Malta, can inform more effective resource allocation and intervention strategies (Fismen et al., 2022). By leveraging evidence-based strategies and policy recommendations, schools can optimize the impact of physical training on the health and well-being of overweight secondary school students (YAACOB, 2021).

Besides physical training, martial art is suggested to be another potential approach to elevate the physical fitness and psychological states among school students (Stamenkovi et al., 2022). The impact of martial arts on overweight secondary school students presents a multifaceted opportunity to enhance physical and mental well-being (de Souza et al., 2020). Drawing on the synthesis of relevant literature, it becomes evident that physical education programs, including martial arts, can play a pivotal role in addressing weight-related issues and promoting a healthy lifestyle among adolescents. While Jiménez-Barbero et al. (2020) suggests the importance of physical education in tackling

bullying and enhancing students' coping skills that later delves into the mechanisms through which maternal employment influences childhood obesity. Integrating these insights, it is conceivable that martial arts training not only offers a structured platform for physical activity but also cultivates discipline, self-confidence, and stress management – qualities essential for combatting overweight issues in secondary school students. By intertwining the practical benefits of martial arts with the overarching goal of improving students' overall well-being, schools can potentially harness the potential of combat sports to address the complex challenges of obesity among adolescents.

Implementing physical training and martial arts programs for overweight secondary school students presents a multifaceted challenge that requires careful consideration and strategic planning. Addressing the complex interplay of physical, mental, emotional, and social factors is essential, as highlighted by research indicating the importance of physical activity for youth health and well-being (Jayasinghe & Hills, 2023). Furthermore, engaging in systematic strategic planning processes, such as Intervention Mapping (IM), can guide the development of community-specific strategies to increase adolescent physical activity (Fernandez et al., 2019). Understanding the unique challenges faced by rural communities, including limited access to physical education classes and exercise facilities, is crucial when designing effective intervention programs (Chrisman et al., 2015). Additionally, aligning program implementation with organizational practices and public policies aimed at improving physical activity among children and youth can enhance the impact of interventions, especially in schools, community settings, and out-of-school programs. By integrating evidence-based approaches with tailored strategies, initiatives focused on physical training and martial arts for overweight secondary school students can promote holistic well-being and potentially address wider health challenges faced by this population group.

This study aims to evaluate the validity of the questionnaire designed to measure the effects of physical training and martial arts on physical fitness and psychological states in overweight secondary school students. Besides, this study will also assess the reliability of the questionnaire across multiple applications within a diverse sample of overweight secondary school students.

2. METHODS

2.1. Participants

The study employed a quantitative research method using a descriptive survey to assess the effects of physical training and martial arts on the physical fitness and psychological states of overweight secondary school students. This research design aims to provide a systematic description

of the facts and characteristics of the population under study. The questionnaire instrument developed for this study underwent a thorough process of face and content validity and reliability assessment, conducted by a panel of eight experts. According to Lynn (1986), a panel of five to ten experts is sufficient for such validation processes. The panel comprised experts in physical education, sport science, martial arts training, gym training, and counseling. Their task was to verify the content of the items, ensuring they accurately represented the research constructs and were appropriate in terms of word choice, language, spelling, and phrasing. The content validity procedure also involved making necessary language adjustments to the questionnaire instrument.

The sample comprised thirty students from Forms 1 to 5 in secondary schools across the state of Kedah, Malaysia. These students were randomly selected to participate in the pilot phase of the study. Although the selection was random, the researchers ensured that the pilot study sample included overweight students involved in physical training and martial arts. The sample size for the study was determined based on the perspectives of previous researchers, which varied.

2.2. Instrument

The instrument utilized in this study is a questionnaire. This questionnaire has been adapted from previous research studies (Sal, 2022). However, modifications have been made to the language structure and content of the questionnaire to align with the requirements of this study. The research instrument consists of 37 items, categorized as per table 1 below:

Table 1. Distribution of items according to dimensions

No	Dimensions	Item Number	Number of Item
1	Demographic Information	1,2,3,4,5,6, 7	7
2	Self-Discipline Measurement	8,9,10,11,12,13,14, 15,16,17	10
3	Perceived Impact of Physical Training and Martial Arts Participation on Physical Fitness	18,19,20,21,22,23,2 4,25,26,27	10
4	Perceived Impact of Physical Training and Martial Arts Participation on Psychological State	28,29,30,31,32,33,3 4,35,36,37	10
		Total	37

The five-point Likert scale method was employed as the response option for the study participants to answer this research instrument. This approach facilitates researchers in identifying respondents' evaluations of the items they perceive as suitable. The scoring of the Likert scale used is

as follows, where 1 denotes as Strongly Disagree, 2 as Disagree, 3 as Neutral, 4 as Agree and 5 denotes as Strongly Agree.

3. RESULTS AND DISCUSSION

3.1. Validity of Instrument

The validity of the questionnaire instrument was assessed by eight relevant experts, consistent with the guidelines of (bin Darusalam & Hussin, 2016), who suggest that the involvement of four or five experts is sufficient to provide insights into the dimensions and items of an instrument. The content validation of the questionnaire was undertaken by five expert evaluators. Additionally, three lecturers from a language department served as language validators, ensuring the instrument's suitability regarding language coherence, content, and format.

Modifications to the study instrument were made based on feedback from the supervisors and the panel of experts. Items deemed lengthy, repetitive, or unclear in measuring the intended dimensions were eliminated, resulting in a reduction from 45 to 37 items in the final questionnaire. To determine the level of expert agreement, the Content Validity Index (CVI) was employed, measuring the average appropriateness according to expert judgments (Chua, 2020). This study utilized the Item Content Validity Index (I-CVI) method, which calculates the CVI value for each item on the scale (Creswell & Creswell, 2017). Each expert received a set of questionnaires and validity assessment forms. The expert panel rated each item on a five-point scale, ranging from 1 (very low) to 5 (very high). The total score for each item was then divided by the number of experts to determine the I-CVI for each item. Table 2 below shows the average CVI results for the questionnaire instrument of this study.

Table 2. Expert Content Validity Index (CVI) Result

n	**I-CVI**								**CVI**
37	1	2	3	4	5	6	7	8	
	0.92	0.89	0.95	0.90	0.87	0.85	0.80	0.78	0.87

Table 2 has presented the CVI values for the instrument of this study. For a new instrument, researchers must obtain a CVI value equal to or above 0.8 to demonstrate high content validity, clarity, and relevance of items (Lau et al., 2018; Shrotryia & Dhanda, 2019). Previous researchers have suggested a threshold of 0.78 and above for cases where three or more expert panellists are considered to have good content validity (Polit et al., 2007). The questionnaire instrument of this

study obtained a CVI value of 0.87 (Table 2) based on the overall agreement and assessment of the expert panel (n = 37). Therefore, based on the CVI value, it can be concluded that the instrument (questionnaire) of this study has good content validity, and the items in this questionnaire are deemed suitable for use.

3.2. Reliability of Instrument

Pilot studies are conducted prior to distributing the actual survey instrument in the main study to ensure the reliability and validity of the questionnaire used in the research (Othman & Kassim, 2018). Therefore, researchers have employed internal reliability measures to determine Cronbach's Alpha by conducting pilot studies before the main study is carried out. The Cronbach's Alpha value indicates the extent of reliability and consistency of a research instrument, with a value of 0.7 or higher considered desirable (Taber, 2018). Table 3 illustrates the range of Cronbach's Alpha coefficients (Hair et al., 2019).

Table 3. Range of Cronbach's Alpha Coefficients

Alpha Range	Reliability Strength
0.6 - < 0.7	Moderate
0.7 - < 0.8	Good
0.8 - < 0.9	Very Good
0.9	Excellent

Statistical Package for Social Science (SPSS) version 23.0 is used to assess the reliability of research instruments by analysing each dimension in the questionnaire to obtain Cronbach's alpha coefficient. Table 4 shows the reliability values obtained from the pilot study conducted.

Table 4. Results of the reliability analysis of the questionnaire instrument

No	Dimensions of items	Cronbach's Alpha
1	Demographic Information	.795
2	Self-Discipline Measurement	.867
3	Perceived Impact of Physical Training and Martial Arts Participation on Physical Fitness	.748
4	Perceived Impact of Physical Training and Martial Arts Participation on Psychological State	.825
Overall Cronbach's Alpha		.810

In Table 4, the results of the reliability analysis for the questionnaire instrument are presented. Each dimension of items is evaluated in terms of its internal consistency reliability, as indicated by

the Cronbach's Alpha coefficients. The reliability strength of each dimension is interpreted within the context of the range of Cronbach's Alpha coefficients, as outlined by (Hair et al., 2019). Firstly, the dimension concerning demographic information demonstrated a Cronbach's Alpha coefficient of .795. This falls within the range of 0.7 to < 0.8, indicating a good level of reliability strength. This suggests that the items within this dimension are moderately to strongly correlated, providing consistent measurement of demographic variables. Moving on to the dimension of self-discipline measurement, it exhibited a Cronbach's Alpha coefficient of .867. Falling within the range of 0.8 to < 0.9, this indicates a very good level of reliability strength. This suggests that the items related to self-discipline measurement are highly correlated, demonstrating strong internal consistency reliability. The dimension assessing the perceived impact of physical training and martial arts participation on physical fitness yielded a Cronbach's Alpha coefficient of .748. Falling within the range of 0.6 to < 0.7, this indicates a moderate level of reliability strength. While the internal consistency reliability of this dimension is acceptable, there may be room for improvement in the correlation between items.

Similarly, the dimension focusing on the perceived impact of physical training and martial arts participation on psychological state demonstrated a Cronbach's Alpha coefficient of .825. Falling within the range of 0.8 to < 0.9, this indicates a very good level of reliability strength. This suggests that the items within this dimension are highly correlated, providing consistent measurement of the impact on psychological state. Overall, the questionnaire instrument exhibited an overall Cronbach's Alpha of .810. Falling within the range of 0.8 to < 0.9, this indicates a very good level of reliability strength for the entire instrument. This suggests that the questionnaire as a whole demonstrates strong internal consistency reliability across all dimensions of items, providing reliable measurement of the constructs under investigation.

4. CONCLUSIONS

the findings of this study support the validity and reliability of the questionnaire designed to measure the effects of physical training and martial arts on physical fitness and psychological states in overweight secondary school students. Through rigorous content validation and reliability analysis, the questionnaire instrument demonstrated good content validity and internal consistency reliability, providing a robust tool for assessing the intended constructs.

The implications of this research extend to educational and public health sectors, where interventions combining physical training and martial arts can be implemented to address the prevalence of obesity and promote positive lifestyle changes among secondary school students. By

fostering self-discipline, confidence, and overall well-being, such interventions have the potential to mitigate the adverse effects of excess weight and empower students to lead healthier lives.

Future research endeavours may explore the longitudinal effects of physical training and martial arts interventions on overweight secondary school students, considering factors such as sustained behaviour change and long-term health outcomes. Additionally, comparative studies assessing the effectiveness of different intervention modalities and program structures could further inform evidence-based practices in combating childhood obesity and promoting holistic well-being among adolescents.

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All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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