

Validity and reliability of resilience measurement model for student-athletes in Yogyakarta, Indonesia

Validez y confiabilidad del modelo de medición de la resiliencia para deportistas estudiantes en Yogyakarta, Indonesia

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Abstract. The purpose of this study is to develop a valid and reliable resilience questionnaire model for student-athletes at the university level in Indonesia. It is an analytical survey with a correlational approach. The research analysis was done through Confirmatory Factor Analysis (CFA) with the help of LISREL 8.71. The questionnaire was developed through several stages: the first stage was the study of previous research, the second stage was the focus group discussion (FGD) involving lecturers from sports coaching and sports psychology, as well as coaches from several types of sports, the third stage was data collection, the fourth stage was the report of research results. The sample participating in this study was 245 athletes (147 male and 98 female), with several characteristics (mean \pm SD): maximum age was 21.7 \pm 8.9, minimum age was 18.4 \pm 3.3, average age was 20.5 \pm 2.8 years, training experience was 8.3 \pm 2.1 years, experience as an athlete was 4.8 \pm 7.7 years, and experience participating in competition was 2 – 4 times a year. The results of this study produced the questionnaire that features three aspects: 1) self-regulation, 2) personal competence, and 3) acceptance of one's self and life. The loading factor value of each item in aspect >0.5 and T-value >1.96 , and the fit model criteria showed Chi Square 1811.53, RMSEA 0.06, NFI 0.92, NNFI 0.93, CFI 0.91, PGFI 0.93, AGFI 0.92 which was fit. It can be concluded that the resilience questionnaire developed for student-athletes in Indonesia proved to be valid and reliable. Thus, this questionnaire can be an effective measuring tool as well as a guide for intervention programs aimed at increasing resilience and supporting optimal student-athletes achievement in Indonesia.

Keywords: Sport-Resilience, Student-Athlete, Sport Psychology

Resumen. El propósito de este estudio es desarrollar un modelo de cuestionario de resiliencia válido y confiable para estudiantes-atletas a nivel universitario en Indonesia. Es una encuesta analítica con un enfoque correlacional. El análisis de la investigación se realizó a través del Análisis Factorial Confirmatorio (AFC) con la ayuda de LISREL 8.71. El cuestionario se desarrolló a través de varias etapas: la primera etapa fue el estudio de investigaciones previas, la segunda etapa fue la discusión en grupo focal (FGD) en la que participaron profesores de entrenamiento deportivo y psicología deportiva, así como entrenadores de varios tipos de deportes, la tercera etapa fue la recopilación de datos, la cuarta etapa fue el informe de los resultados de la investigación. La muestra que participó en este estudio fue de 245 deportistas (147 hombres y 98 mujeres), con varias características (media \pm DE): edad máxima de 21,7 \pm 8,9, edad mínima de 18,4 \pm 3,3, edad media de 20,5 \pm 2,8 años, experiencia en entrenamiento de 8,3 \pm 2,1 años, experiencia como deportista de 4,8 \pm 7,7 años y experiencia participando en competición de 2 a 4 veces al año. Los resultados de este estudio produjeron el cuestionario que presenta tres aspectos: 1) autorregulación, 2) competencia personal y 3) aceptación de uno mismo y de la vida. El valor del factor de carga de cada ítem en el aspecto $>0,5$ y el valor T $>1,96$, y los criterios del modelo de ajuste mostraron Chi Square 1811,53, RMSEA 0,06, NFI 0,92, NNFI 0,93, CFI 0,91, PGFI 0,93, AGFI 0,92 que se ajustó. Se puede concluir que el cuestionario de resiliencia desarrollado para estudiantes-atletas en Indonesia demostró ser válido y confiable. Por lo tanto, este cuestionario puede ser una herramienta de medición eficaz, así como una guía para programas de intervención destinados a aumentar la resiliencia y apoyar el rendimiento óptimo de los estudiantes-atletas en Indonesia.

Palabras clave: Resiliencia deportiva, Estudiante-atleta, Psicología del deporte

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Introduction

Resilience is an individual's ability to adapt and persevere in facing the pressure, challenge, or difficult situation. In other terms, resilience is often associated with strong mental traits, including perseverance, optimism, and the ability to learn from negative experience (Brozovich-Neyra et al., 2024). In the context of sports, resilience is an important aspect for athletes, especially for student-athletes who must balance between academic demands and sports activities (Zazueta-Beltrán et al., 2022). Student-athletes in Indonesia face various pressures, both in terms of academic and sports achievement demands. Therefore, resilience ability is an important key in maintaining this balance as well as in achieving optimal achievement (Leão et al., 2023).

Student-athletes who have difficulty adapting and coping in facing the pressure, challenges, or difficult situations can experience a variety of significant negative impacts. Poorly managed stress can lead to decreased sporting

achievement, where they may lose concentration, coordination, and the ability to make the right decisions when competing (Trigueros et al., 2020; Hussain et al., 2023). In addition, this difficulty also has the potential to disrupt the balance between academic demands and sports, which in turn can have an impact on decreasing academic achievement and the risk of dropping out of school (Heikura et al., 2023). Thus, the problem of resilience not only affects sports performance but also the mental well-being of student-athletes (Kuok et al., 2022; Imtihansyah et al., 2024), with the possibility of anxiety, depression, or burnout that can worsen the situation.

In addition, negative impacts can also be seen in athletes' social relationships, where they may have difficulty communicating or establishing good relationships with peers, coaches, and family. The findings of previous studies show that excessive pressure without good resilience also increases the risk of physical injury because stress can affect focus and muscle tension during high-intensity exercise

(León-Guereño et al., 2020; Etayo-Urtasun et al., 2022). In long term, athletes who are unable to develop resilience cause a loss of motivation and interest in sports (Efek & Eryigit, 2022), which can hinder their progression to higher levels in sports careers. Then, the results of other studies explain the positive impact on athletes who have high resilience to manage stress related to sports and academics (Sullivan et al., 2023; Abdhi et al., 2024). Cultivating insights into resilience is also beneficial for reducing fear of failure and burnout (Yıldırım et al., 2023). Thus, the ability to adapt and persevere in facing challenges is an important key to the well-being and success of student-athletes, both in sports and in their personal lives.

Currently, the measurement of resilience in student-athletes is still rarely carried out systematically in Indonesia. A valid and reliable measuring instrument to identify the level of resilience in student-athletes is indispensable, especially to improve a more comprehensive coaching and training program. However, no resilience measurement model is specifically developed and adapted to the cultural context and characteristics of student-athletes in Indonesia. The development of a resilience measurement model in the form

of a valid and reliable questionnaire is an important step to fill this void. Therefore, the purpose of this study is to develop a valid and reliable resilience questionnaire model for student athletes in Indonesia. Thus, the development of this measurement model will not only enrich the scientific literature in the field of sports but also make a real contribution to improving the quality of student-athletes coaching in Indonesia.

Methods

Study Organizations

This study is an analytical survey with a correlational approach. The first stage in this study was literature review and observation through examination and unstructured interview. The literature review included analyzing articles based on the results of limited research covering aspects of resilience in athletes. The purpose of the first stage was to identify research problems and collect questionnaire evidence on resilience variables.

Table 1.

Results of Previous Sport-Resiliensi Research

Title	Aspects
An adaptation study of measurement properties for the characteristics of resilience in sports team inventory (Gorgulu et al., 2018)	1) Demonstrating resilience characteristics, 2) Vulnerabilities shown under pressure
Validity and reliability of the Connor-Davidson Resilience Scale (CD-RISC) in competitive sport (Gonzalez et al., 2016)	1) Positive affect, 2) Negative affect, 3) Worry, 4) Concentration disruption, 5) Somatic anxiety
Development and validation evidence for the Resilience Scale for Sport (RS-Sp) (Fonseca Bicalho et al., 2021)	1) Competition experiences, 2) Training experiences, 3) Individual psychological characteristics, 4) Coaches/teammates support, 5) Family/friends support
Development, validation, and reliability of athletes' resilience index (Khalid et al., 2022)	1) performance issues, 2) change issues, 3) behavioral issues, 4) psychological issues, 5) interpersonal issues

The second stage was conducting a focus group discussion (FGD) involving lecturers with a minimum of Doctoral qualification from sport coaching and sport psychology, as well as coaches from several types of sports who have national license. The purpose of this FGD was to determine the form of the questionnaire to match the condition of student-athletes in Indonesia. The third stage was data collection, which was carried out by distributing questionnaires directly without intermediaries such as online data collection. When the student athletes filled out the questionnaire, the researcher also showed a research letter with the number B/1330/UN.34.16/PT.01.04/2023 that this research was official from the university. The purpose of direct data collection was so that researchers could interact with student-athletes and the answers to the research problems could be explained in more detail and in-depth. The data collection procedure was carried out when the athlete was off training and the coach was present to assist the athlete in filling out the questionnaire. The fourth stage was reporting the results of this study in the form of scientific papers.

Study Participant

The research population was athletes from Yogyakarta Province who were university students. The sample selection of this study used purposive sampling so that the sample

had certain characteristics. This characteristic concluded several criteria which were aged 18 – 21, won at least the regional level, and were undergoing a period of competition. Based on the predetermined characteristics, the study sample that had been identified was 245 athletes (mean±SD) with 147 male athletes and 98 female athletes, maximum age was 21.7±8.9 years, minimum age was 18.4±3.3 years, average age was 20.5±2.8 years, had 8.3±2.1 years of training experience, been an athlete for 4.8±7.7 years, and has participated in competitions twice to four times a year. Athletes also filled out a consent form to participate in this study after receiving the official research letter from the university.

Instrument

The preparation of this questionnaire resulted from the first stage of collecting evidence of the previous studies' results. Then, the results of the studies were developed and modified so that the questionnaire was appropriate to the problem and condition of student-athletes in Indonesia. After the questionnaire had been developed and modified, the questionnaire proceeded to the second stage, the focus group discussion (FGD). Thus, the results of the second and third stages produced the resilience questionnaire for student-athletes in Indonesia which was based on three aspects,

namely self-regulation (eight items), personal competence (eight items), and acceptance of one’s self and life (eight items). The following was the form of resilience questionnaire for student-athletes in Indonesia.

Table 2. Resilience Questionnaire Grid for Student-Athletes

Aspects	Statement
Self-regulation	I often disregard collaboration in team work.
	I can identify my own strengths and weaknesses during training and competition.
	I have difficulty adapting strategies or tactics quickly when faced with unexpected situations.
	My motivation increases when I work together with fellow athletes to face new challenges and problems.
	I feel anxious when facing new opponents in a match.
	I have a specific plan for dealing with new situations.
	I doubt my ability to achieve personal goals.
	I am confident that I can achieve goal faster than it is planned.
Personal competence	I tend to be afraid to take risks in competitions.
	I actively seek help from professionals to develop skills in controlling and managing emotions, behaviors, and thoughts.
	I have difficulty recognizing body language and other people’s emotions when interacting.
	I am able to resolve conflicts in a mature manner.
	I feel threatened when my weaknesses are exposed by someone.
	I easily adapt to strict routines and schedules.
	I am reluctant to admit mistakes I have made in the past.
	I am able to understand the risks of past mistakes and can maintain focus better.
Acceptance of one’s self and life	I feel anxious, hurt, and threatened by criticism I receive as an athlete, and respond impulsively.
	I quickly and effectively respond to any criticism that might affect my performance.
	I often ignore or avoid responsibility for the mistakes I make as an athlete.
	I feel satisfied when I am fully responsible for my actions in the sports arena.
	I feel frustrated when my sports goals are not achieved.
	I see failure as an opportunity to learn and grow as an athlete.
	I rarely engage in relaxation techniques or breathing exercises to reduce stress or improve my mental well-being.
	I feel free to express my feelings and emotions related to the sport I play.

Statistical Analysis

Data analysis in this study utilized Structural Equation Modeling (SEM) through LISREL software version 8.71. This SEM analysis employed the Confirmatory Factor Analysis (CFA) method. In this study, SEM was used to integrate latent variables into the analysis. CFA was selected to assess the construct’s validity by comparing the observed data with the proposed model structure, using several conformity criteria as indicators. According to (Ondé & Alvarado, 2018; Dash & Paul, 2021) the following criteria indicate a good fit model: Chi-square value is low and $p > 0.05$, RMSES < 0.05 indicates a good fit, and $0.05 < RMSEA < 0.08$ indicates good fit. Standardized Root Mean Square Residual (RMR) < 0.05 , GFI > 0.90 indicates good fit, NFI > 0.90 indicates reasonable fit, NNFI > 0.90 indicates good fit, CFI > 0.90 indicates good fit, IFI > 0.90 indicates good fit, and RFI > 0.90 indicates marginal fit. A comprehensive analysis of the model concluded that it met these recommended criteria.

Results

Based on the results of the Confirmatory Factor Analysis (CFA) analysis using LISREL by analyzing the factor load value (> 0.50) and the t count value (> 1.96), the results can be seen in the following figure:

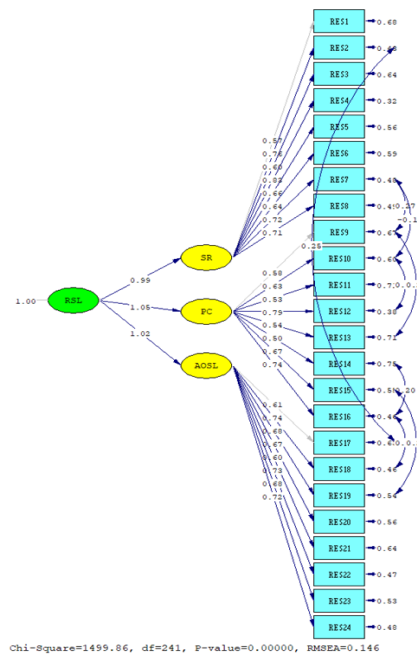


Figure 1. Loading Factor Value in Confirmatory Factor Analysis for Student-Athletes Resilience

The first level of analysis was to look at the value of the latent construct of the aspect to the indicators. Based on the results of the analysis of Figure 1 above, it showed that the lowest factor loading value was 0.50, meaning that the factor loading value was greater than 0.50.

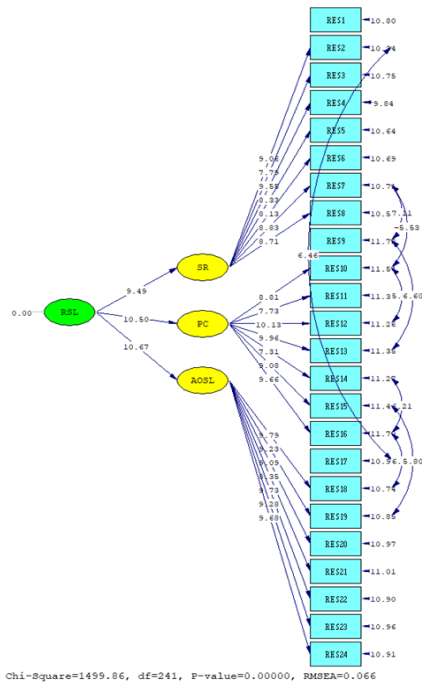


Figure 2. T-Value in Confirmatory Factor Analysis for Student-Athletes Resilience

Then the t-count value needed to test the significance of the loading factor value showed that all items were greater than 1.96 (Figure 2). This condition means that of the 24 items that measure resilience, all are valid and significant items. The summary of the results of the analysis can be seen in Table 3.

Table 3. T-Value in Confirmatory Factor Analysis for Student-Athletes Resilience

No.	Item	Factor Load	T-Value	Note
1	RES1	0.57		
2	RES2	0.76	9.06	Sig
3	RES3	0.60	7.79	Sig
4	RES4	0.83	9.59	Sig
5	RES5	0.66	8.33	Sig
6	RES6	0.64	8.13	Sig
7	RES7	0.72	8.83	Sig
8	RES8	0.71	8.71	Sig
9	RES9	0.58		
10	RES10	0.63	8.81	Sig
11	RES11	0.53	7.73	Sig
12	RES12	0.79	10.13	Sig
13	RES13	0.54	9.96	Sig
14	RES14	0.5	7.31	Sig
15	RES15	0.67	9.08	Sig
16	RES16	0.74	9.66	Sig
17	RES17	0.61		
18	RES18	0.74	9.79	Sig
19	RES19	0.68	9.23	Sig
20	RES20	0.67	9.09	Sig
21	RES21	0.60	8.35	Sig
22	RES22	0.73	9.73	Sig
23	RES23	0.68	9.28	Sig
24	RES24	0.72	9.68	Sig

The second level of analysis was carried out from the latent construct to the aspect construct. Based on the results of testing Table 3 above, shows that the loading factor values were all greater than 0.50.

Then, based on Table 4, all the T-value values needed to test the significance of the loading factor value were

greater than 1.96. The self-regulation (SR) aspect obtained a factor charge of 0.99 with a T-Value of 9.49, the personal competence (PC) aspect had a factor charge of 1.05 with a T-Value of 10.50 and the acceptance of one's self and life (AOSL) aspect had a factor charge of 1.02 with a T-Value of 10.67. These results indicate that the three aspects of resilience consisting of self-regulation, personal competence, and acceptance of one's self and life are said to be valid and significant to measure the latent variable of resilience. The next analysis is to test the fit model.

Table 4. Construct Validity Value of Latent Aspects

No.	Aspect	Factor Load	T-Value	Note
1	Self-regulation	0.99	9.49	Sig
2	Personal competence	1.05	10.50	Sig
3	Acceptance of one's self and life	1.02	10.67	Sig

Table 5. Model Fit Criteria

No	Fit Index	Value	Note
1	Chi Square p	1811.53	Fit
2	RMSEA	0.06	Fit
3	RMR	0.051	Not Fit
4	GFI	0.86	Not Fit
5	NFI	0.92	Fit
6	NNFI	0.93	Fit
7	CFI	0.91	Fit
8	IFI	0.89	Not Fit
9	RMSR	0.051	Not Fit
10	PGFI	0.93	Fit
11	AGFI	0.92	Fit

Notes: RMSEA - Root Mean Square Error of Approximation; GFI - Goodness of Fit Index; CFI - Comparative Fit Index; RMSR - Standardized Root Mean Square Residual; NFIs - Normed Fit Indexes; IFI - Incremental Fit Index; NNFI - Non-Normed Fit Index; ECVI - Expected Cross-Validation Index; CAIC - Consistent Akaike Information Criterion; PNFI - Parsimonious Normed Fit Index; RFI Relative Fit Index; NPCs - Noncentrality Parameters; AGFI - Adjusted Goodness-of-Fit Index

The results of the analysis in Table 5 showed that as many as 7 of the 11 fit indices state that the model is fit, so the next analysis can be continued. These results indicate that the empirical model of resilience variables is in accordance (fit) with the theoretical model.

Discussion

This research indicates that the resilience questionnaire developed for student-athletes in Indonesia has successfully identified three primary aspects underlying resilience: self-regulation, personal competence, and acceptance of one's self and life. These three aspects are considered crucial in measuring an athlete's level of resilience, given the importance of mental and emotional adaptation in a high-pressure sports environment. Previous research has developed resilience questionnaires for team sports, identifying two aspects: the team's ability to exhibit responsible characteristics and the vulnerability of performance under pressure (Decroos et al., 2017). Subsequently, this questionnaire was also validated for Chinese athletes (Yang et al., 2020). The model fit results also show adequacy in Chi-Square, RMSEA, NFI, CFI, and AGFI,

which align with previous studies such as the Athletes Resilience Index (ARI-37) for Malaysian athletes (Khalid et al., 2022). However, in this study, indices like NNFI and PGFI further support the model fit of this questionnaire.

The first aspect in this questionnaire is Self-regulation, which reflects an individual's ability to control their emotions, thoughts, and behaviors in challenging situations. In the context of student-athletes, this ability is crucial for maintaining focus and performance during training and competition. Research studies have shown that self-regulation training methods also impact the resilience of student-athletes, such as motivation, self-confidence, emotional control, and optimism for winning (Park, 2023; García et al., 2023; Prabowo et al., 2024). The validity of this aspect of the questionnaire indicates that the developed instrument can accurately measure the level of self-regulation possessed by student-athletes, making it a valuable component in assessing resilience. These findings on self-regulation are supported by the research of Alexe et al (2022) which states that self-regulation can predict the level of resilience in an athlete. Therefore, the self-regulation aspect is crucial for measuring the resilience of student-athletes in Indonesia.

The second aspect of this questionnaire is Personal competence, which refers to an individual's belief in their own ability to overcome challenges and achieve goals. Previous research has indicated that athletes tend to exert more effort in athletic competitions compared to academic pursuits (Van Yperen et al., 2021). An athlete's self-belief is also influenced by factors such as their coach's ability to deliver training materials, the closeness between coaches and athletes, and their shared commitment to achieving success (José et al., 2023; Sridana et al., 2024; Wijayanti et al., 2024; Juita et al., 2024; Latief et al., 2024). In a sports environment, self-confidence can significantly impact athletic performance, decision-making, and competitive spirit. The validity of this aspect indicates that the questionnaire can accurately measure the extent to which athletes feel competent in facing various challenging situations, both in training and competition. The validity results of the self-competence aspect in this questionnaire are also supported by the findings of Tutte-Vallarino et al (2022), which suggest that athletes with high competence should be measured for resilience, as both variables can indirectly predict athlete fatigue.

The third aspect is Acceptance of one's self and life, which describes the extent to which an individual accepts themselves and their situation positively, even in facing failure or obstacles. Previous studies have shown that student-athletes who possess a high level of acceptance of themselves and their life are better able to manage emotions, alleviate stress in both athletic and academic environments, and accept criticism constructively (Schnell et al., 2014; González-Hernández et al., 2020; Özbek & Nalbant, 2021; Wibowo et al., 2024). It is because they accept their shortcomings and always strive to improve by continuing to train, being open with their peers, coaches, and parents,

and not dwelling on failures. As a result, this positively affects their performance. This performance improvement can be evidenced on athletes by maintaining focus, increasing training perseverance, taking risks, and remaining calm in crisis situations during training or competition, so it supports optimal performance (Mohebi et al., 2022; Wang et al., 2023; Reinebo et al., 2024; Mandan et al., 2024). The validity results demonstrate that the third aspect of this questionnaire is effective in measuring athletes' ability to accept and adapt to non-ideal situations, which is a crucial component of resilience.

To increase resilience in student-athletes, various simple methods are recommended, such as mental and psychological training, emotional and social education programs, growth mindset-based approaches, strengthening social support, and mentoring athletes regularly (Ali Rasti et al., 2015; Ong & Griva, 2017; Grasdalsmoen et al., 2022; Hidayat et al., 2023). Coaches can also play a vital role by building strong networks, such as communicating intensively with athlete parents, intervening with school teachers to provide support, and proposing long-term programs to sports organizations to ensure ongoing attention for student-athletes. Additionally, indirect factors can support student-athlete resilience. A supportive training environment and athlete satisfaction with training can enhance motivation and resilience (Ningrum et al., 2024; Prabowo, 2024). Moreover, High self-efficacy allows athletes to believe in their ability to face challenges (Widyastuti et al., 2024; Saniah et al., 2024). Intrinsic and extrinsic motivation must also be continuously improved. These are fundamental for novice athletes aspiring to become professional athletes (Imtihansyah et al., 2024; Djaba et al., 2024). Motivation is crucial for strengthening mental endurance, athlete commitment to achieving goals, and self-confidence when facing tough opponents, ultimately shaping more resilient and enduring athletes.

Based on this discussion, the validity and reliability of the three aspects measured in this questionnaire demonstrate that it is an effective and reliable instrument for assessing the resilience of student-athletes in Indonesia. In the future, it is recommended to conduct further research by increasing the sample size and employing measurement methods such as combining factor analysis and Structural Equation Modeling to develop questionnaires with even higher levels of validity and reliability. Additionally, more accurate analyses could be conducted based on gender and type of sport, such as team sports, individual sports, or combat sports. Therefore, this questionnaire is not only a valuable measurement tool but can also serve as a foundation for developing intervention programs aimed at enhancing athlete resilience, ultimately supporting the achievement of optimal performance in various sports.

Conclusion

In conclusion, the developed resilience questionnaire for Indonesian student-athletes successfully identified three

primary aspects underlying resilience: self-regulation, personal competence, and acceptance of one's self and life. These aspects were found to be valid and reliable for measuring athlete resilience. Self-regulation reflects an athlete's ability to control emotions, thoughts, and behavior in challenging situations, which is crucial for maintaining focus and performance during training and competition. Personal competence measures an athlete's confidence in their ability to overcome challenges and achieve goals, influencing athletic performance and decision-making. Acceptance of one's self and life describes the extent to which athletes positively embrace their identity and circumstances, which helps manage stress and positively impacts overall performance. The questionnaire demonstrated a strong model fit, satisfying 7 out of 11 model compatibility indices. Therefore, it can be an effective tool for measuring resilience and guiding intervention programs aimed at enhancing resilience and supporting optimal student-athlete achievement in Indonesia. Further studies with larger sample sizes and additional measurement methods, such as factor analysis and Structural Equation Modeling, are necessary to strengthen the questionnaire's validity and reliability, including analyses based on sex and exercise type.

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