



Adaptation, validation, and reliability of the Revised Athletic Hardiness Scale (RAHS): testing in the context of Indonesian sports students

Adaptación, validación y fiabilidad de la Escala de Resistencia Atlético Revisada (RAHS): pruebas en el contexto de estudiantes deportivos de Indonesia

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Abstract

Introduction: Hardiness is a frequently studied psychological concept, but in the context of sports, there have been few studies, particularly on testing instruments that encapsulate this construct.

Objective: To adapt the language and test the validity and reliability of the Revised Athletic Hardiness Scale (RAHS) in the context of Indonesian sports students.

Methodology: A total of 189 sports students participated in this study: 135 (71.43%) were male and 54 (28.57%) were female. The sports students ranged in age from 18 to 22, with an average age of 19.48 (± 0.879). In addition to the RAHS, two other standardized instruments, MTI and SWLS, were used to test validity.

Results: The CFA test results showed a good fit with the data, with a chi-square (χ^2) value of 89.910 ($p < 0.001$), CFI = 0.936, TLI = 0.914, RMSEA = 0.080, and SRMR = 0.048. RAHSid correlated significantly with MTI ($p < 0.001$) and did not correlate significantly with SWLS ($p > 0.05$). RAHSid had high reliability, both in McDonald's omega (α) and Cronbach's alpha (α), with reliability values ranging from 0.723 to 0.840 for each dimension.

Discussion: The Indonesian version of RAHSid consists of 11 items, differing from the original version, which had 12. However, psychometrically, RAHSid is a three-factor model consisting of commitment, control, and challenge, confirming the original version.

Conclusions: RAHSid is a valid and reliable instrument in revealing hardiness, so that the instrument can be used to reveal hardiness in the Indonesian context, especially for sports students.

Keywords

Language adaptation; RAHS; reliability; sports students; validity.

Resumen

Introducción: La resistencia es un concepto psicológico frecuentemente estudiado, pero en el contexto de los deportes ha habido pocos estudios, particularmente sobre instrumentos de prueba que encapsulen este concepto.

Objetivo: Adaptar el lenguaje y probar la validez y confiabilidad de la Escala Revisada de Resistencia Atlético (RAHS) en el contexto de los estudiantes deportivos de Indonesia. **Metodología:** Un total de 189 estudiantes de deportes participaron en este estudio: 135 (71,43%) eran hombres y 54 (28,57%) eran mujeres. La edad de los estudiantes de deportes oscilaba entre los 18 y los 22 años, con una edad promedio de 19,48 años ($\pm 0,879$). Además del RAHS, se utilizaron otros dos instrumentos estandarizados, el MTI y el SWLS, para evaluar la validez.

Resultados: Los resultados de la prueba CFA mostraron un buen ajuste con los datos, con un valor de chi-cuadrado (χ^2) de 89,910 ($p < 0,001$), CFI = 0,936, TLI = 0,914, RMSEA = 0,080 y SRMR = 0,048. RAHSid correlacionó significativamente con MTI ($p < 0,001$) y no con SWLS ($p > 0,05$). RAHSid presentó una alta fiabilidad, tanto en el omega de McDonald (α) como en el alfa de Cronbach (α), con valores de fiabilidad que oscilaron entre 0,723 y 0,840 para cada dimensión.

Discusión: La versión indonesia de RAHSid consta de 11 ítems, a diferencia de la versión original, que tenía 12. Sin embargo, psicométricamente, RAHSid es un modelo de tres factores que consiste en compromiso, control y desafío, lo que confirma la versión original.

Conclusiones: RAHSid es un instrumento válido y confiable para revelar la resistencia, por lo que puede usarse para revelar la resistencia en el contexto de Indonesia, especialmente para estudiantes de deportes.

Palabras clave

Adaptación lingüística; RAHS; fiabilidad; estudiantes deportistas; validez.

Introduction

Hardiness can be understood as a psychological concept that describes a person's personality strength to persist, adapt, and remain motivated in the face of pressure, stress, or challenging situations (Maddi, 2013). This concept was first proposed by Kobasa, who observed that individuals with high levels of hardiness are less prone to stress and view difficulties as manageable challenges (Maddi, 2002; Maddi, 2006). Recently, studies on hardiness have shown a significant upward trend (Mund & Mishra, 2025). This increase occurs because the construct of "hardiness" is seen as a personality trait needed in stressful life situations (Nia et al., 2022). Therefore, research investigating the relationship between hardiness and other constructs is widespread (Chuning et al., 2024). However, this increase in studies on hardiness has not yet reached the world of sports. Based on data from internationally reputable scientific article search engines, there appears to be a disparity between the number of publications on hardiness in sports and in the general context. We found the same thing in scientific publications in Indonesia.

A search for the keywords "hardiness" or "athlete hardiness" or "hardiness in sports" in our government's scientific publication search engine, Garba Rujukan Digital (Garuda), conducted on March 17-19, 2025, showed data with the same pattern as international publications. Our review found only four publications (Annimar & Jannah, 2023; Wisudawati et al., 2017; Kinanthi & Jannah, 2016; Dawenan et al., 2016). When we analyzed these publications more deeply, we found that some had developed their own hardiness instruments, but the development process was unclear (Dawenan et al., 2016; Annimar & Jannah, 2023). Another study measured "hardiness" by interviewing athletes (Kinanthi & Jannah, 2016). Some studies provide hardiness training to athletes, but this construct is not measured (Wisudawati et al., 2017). What about publications on the topic of "hardiness" in general? A search on Garuda Indonesia for the keyword "hardiness" from 2004 to 2024 found 399 publications. This number is significantly higher than publications on athlete/sports hardiness. The question is what causes this.

We argue that the lack of standardized instruments to uncover the dimensions of hardiness in the athlete/sports context has led to this topic's lack of research. Unlike the general theme of hardiness, standardized instruments are readily available and tested in Indonesian (Erica & Pudjiati, 2024). Therefore, it is not surprising that studies on "athlete hardiness" or "hardiness in sport" have faced publication issues, particularly related to the instruments used. Therefore, we believe a standardized instrument in Indonesian is needed for researchers, coaches, and the public to use in assessing the dimensions of hardiness in the sports context. Having a standardized measurement tool will significantly improve studies on athlete/sports hardiness and minimize bias, thus making coaching, training, and interventions for athletes more appropriate, as any policies or actions related to psychological well-being are based on credible data (research). The question then becomes: which instrument will be adapted and tested?

Several hardiness instruments have been created by scientists (see, for example, Soheili et al., 2021; Hosseini et al., 2022; Bartone, 2007), but the instrument specifically developed to reveal in the context of sports/athletes is the Athletic Hardiness Scale (AHS). Given that the AHS was deemed by its developers to have psychometric weaknesses, it was revised and became the Revised Athletic Hardiness Scale (RAHS) (Yamaguchi et al., 2020). Nia and colleagues, who conducted a Systematic Review of the psychometric properties of hardiness measurement tools, found that the RAHS is the best measurement tool for measuring hardiness in the context of sports/athletes (Nia et al., 2022). However, the RAHS has not been tested in other contexts and cultures, such as Indonesia. Therefore, we believe that broader testing of the RAHS's psychometric properties is necessary to determine its reliability.

Given the conditions outlined above, the urgency of conducting RAHS research is twofold. First, studies in Indonesia on athlete hardiness have left behind issues related to the instruments used. Second, the RAHS has never been tested outside of its native language, so its reliability, as expressed by other researchers, still needs to be verified. Given these facts, this research is highly urgent, not only for research needs in Indonesia but also internationally to confirm the reliability of the RAHS. Therefore, the purpose of this study is to adapt the language and test the validity and reliability of the Revised Athletic Hardiness Scale (RAHS) in the context of Indonesian sports students.

Method

Participants

Respondent recruitment was conducted both offline and online using convenience sampling techniques. For the offline method, the research team distributed a set of questionnaires to sports students at Cenderawasih University. For the online method, the research team uploaded the research instrument into a Google Form. Then it distributed the instrument link to colleagues in several sports study programs to be forwarded to the sports students. The inclusion criteria for this study were active participation in sports, willingness to participate as research respondents, and completion of all research instruments. Exclusion criteria were non-sports students and incomplete instrument completion. This resulted in 189 sports students participating in this study. Based on student gender, 135 (71.43%) were male students and 54 (28.57%) were female students. The sports students' ages ranged from 18 to 22 years, with an average age of 19.48 years and a standard deviation of 0.879.

Instrument

The instrument adapted and validated was the Revised Athletic Hardiness Scale (RAHS) created by Icalho and colleagues (Yamaguchi et al., 2020). RAHS has three subscales: commitment (e.g., I can adapt myself to the team), control (e.g., I can carry out my own role in the team), and challenge (e.g., Even when practice is difficult, I will try my best). These three subscales are broken down into twelve items with four alternative answers in the form of a Likert scale ranging from "I do not agree at all" to "I agree very much." The results of the RAHS test with CFA showed a good model fit, namely the CFI value = 0.91, GFI = 0.93, AGFI = 0.90, RMSE .08 (Yamaguchi et al., 2020). The original RAHS has excellent factor loading ($\lambda = 0.55 - 0.90$) and relatively high internal consistency ($\alpha = 0.75 - 0.80$) (Yamaguchi et al., 2020). Convergent validity testing was conducted using the Mental Toughness Index (MTI) (Gucciardi et al., 2014). The MTI has seven components, namely self-belief, attention regulation, emotion regulation, success mindset, context knowledge, buoyancy, and optimism, which are described into eight items with alternative answers in the form of a continuum ranging from 1 (False, 100% of the time) to 7 (True, 100% of the time). The MTI has been adapted into an Indonesian version in a previous study (Putra et al., 2024) and found that the Indonesian version of the MTI has an excellent factor loading value ($\lambda = 0.563$ to 0.759) and excellent internal consistency reliability (CR = 0.864; $\alpha = 0.862$) (Putra et al., 2024). In addition, the Satisfaction with Life Scale (SWLS) (Pavot & Diener, 1993) was also used to determine the relationship between hardiness and life happiness. The SWLS consists of five items that measure general life satisfaction and has been adapted into an Indonesian version, with a validity value of 0.55 to 0.69 and a reliability value of 0.83 (Afiatin et al., 2016). Furthermore, the SWLS has been used in several previous studies, both for students and athletes (Wandik et al., 2024; Guntoro & Putra, 2022).

Procedure

In summary, the procedure was as follows: After the proposer received permission to adapt and test the questionnaire in the Indonesian context, there were six steps in the study process. First, two English language experts were involved to translate from English into Indonesian. Second, the translation results were sent to three sports psychologists with doctoral degrees to check the suitability of the meaning/substance between the original and Indonesian versions. Third, the results from the sports psychologists were then submitted to an Indonesian language expert to check the readability of the items in the RAHS. Fourth, the results of the third stage were then tested for readability on three sports students. After all this was completed, the proposer then conducted a psychometric structure test in the field, namely by distributing the Indonesian version of the RAHS to sports students (athletes and non-athletes) in Indonesia. The rigorous adaptation and testing process undertaken by this study indicates that it used accurate methods in its process.

Data analysis

In the initial stage, the research data were analyzed using descriptive analysis, such as mean value, standard deviation, minimum value, maximum value, and percentage. This analysis will illustrate how emotional regulation, mental toughness, spirituality, and academic achievement of students are related. The next step is Confirmatory Factor Analysis (CFA) to test whether the model fits the data. We used weigh-

ted least squares means and variance adjusted (WLSMV) estimation in the analysis because the literature suggests that this estimator is more appropriate for ordinal data (Beauducel & Herzberg, 2006). To assess the accuracy of the tested model (RAHSid), parameters such as chi-square (χ^2), the comparative fit index (CFI), the Tucker-Lewis index (TLI), the standardized root mean square residual (SRMR), and the root mean squared error of approximation (RMSEA) were used. The following are the cut-off values used to assess model fit: CFI and TLI values > 0.90 (Browne & Cudeck, 1992), SRMR values ≤ 0.07 (Bagozzi, 2010), and RMSEA scores $\leq .08$ (Browne & Cudeck, 1992). After the model fit, the analysis continued to examine the factor loadings of each item in the RAHS. The factor loading criteria refer to the recommendations given by Comrey & Lee (1992) (i.e., > 0.71 = excellent; > 0.63 = very good; > 0.55 = good; > 0.45 = fair; < 0.32 = poor). In addition, a convergent analysis was also conducted by analyzing the correlation between the RAHS and the MTI. It was hypothesized that all subscales in the RAHS would show a positive correlation with the MTI. For divergent validity, we used the SWLS as a comparative measurement tool. We hypothesized that there was no significant correlation between the RAHS and the SWLS. Next, a reliability analysis was conducted to assess the internal consistency of the Indonesian version of the RAHS, using McDonald's Omega and Cronbach's Alpha. The acceptable reliability value was > 0.70 (Nunnally & Bernstein, 1994; Taber, 2018). All analyses in this study were conducted using JASP software version 0.19.3.

Results

Descriptive statistics

The description of the results of the descriptive analysis is presented in Table 1. Based on the descriptive analysis, it can be seen how each dimension in the RAHS instrument, the total RAHS score, mental toughness, and happiness in the lives of sports students are depicted.

Table 1. Descriptive Analysis Result (n = 189)

	Control	Challenge	Commitment	Hardiness	Mental toughness	Happiness
Mean	12.471	13.450	11.571	37.492	47.889	13.730
Std. Deviation	1.674	1.715	2.124	4.184	6.592	2.080
Minimum	7.000	10.000	7.000	30.000	15.000	7.000
Maximum	16.000	16.000	16.000	48.000	56.000	20.000

Confirmatory Factor Analysis

The results of the goodness-of-fit analysis of the RAHSid instrument showed unsatisfactory results. The model fit test found a chi-square (χ^2) value of 185.156 ($p < 0.001$), CFI = 0.846, TLI = 0.801, RMSEA = 0.119, and SRMR = 0.127. These results indicate that the model does not fit the data. Therefore, we revised it by removing the item in RAHSid that had a lower factor loading value than the other items, namely commitment item 4 ($\lambda = 0.347$; Z-value = 4.905; $p < 0.001$). By removing one item (com4), the results of this study found that the model was better, namely the chi-square value (χ^2) = 89.910 ($p < 0.001$), CFI = 0.936, TLI = 0.914, RMSEA = 0.080, SRMR = 0.048.

Validity and reliability of the RAHSid

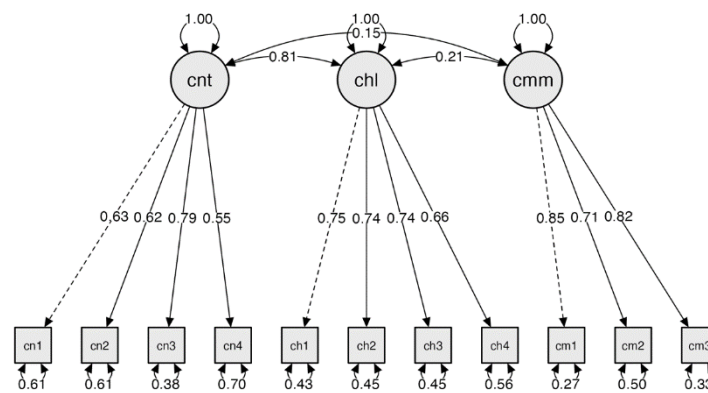
The eleven items in RAHSid have loading factors above 0.50 ($\lambda \geq 0.50$) and are statistically significant ($p < 0.001$) (Table 2). These results indicate that all eleven items in RAHSid have the required loading factors, namely $\lambda \geq 0.50$. Furthermore, upon closer inspection, it appears that the indicators or items com1, com3, con3, chal1, chal2, and chal3 fall into the excellent category. Items com2 and chal4 fall into the excellent category. Items con1 and con2 fall into the good category, while con4 falls into the fair category.

Table 2. Factor loading values and significance of each item in RAHSid

Factor	Indicator	Std. estimate	Std. Error	z-value	p	95% Confidence Interval	
						Lower	Upper
Control	con1	0.435	0.054	11.578	< .001	0.361	0.508
	con2	0.434	0.054	11.528	< .001	0.360	0.508
	con3	0.549	0.042	18.933	< .001	0.492	0.606
	con4	0.381	0.060	9.106	< .001	0.299	0.462
Challenge	chal1	0.522	0.041	18.476	< .001	0.467	0.578
	chal2	0.517	0.041	17.942	< .001	0.460	0.573
	chal3	0.516	0.042	17.853	< .001	0.459	0.572
	chal4	0.460	0.049	13.605	< .001	0.394	0.527
Commitment	com1	0.593	0.037	22.976	< .001	0.542	0.644
	com2	0.492	0.045	15.737	< .001	0.431	0.553
	com3	0.568	0.039	21.109	< .001	0.515	0.620

The RAHSid model is shown in Figure 1. From this model, it appears that RAHSid is a three-factor model.

Figure 1. Indonesian version of the RAHS model (RAHSid)



In addition, convergent validity testing found that all dimensions in RAHSid had a significant positive correlation with MTI ($p < 0.001$), with a correlation coefficient ranging from 0.312 to 0.388 (Table 3). The correlation coefficients between dimensions in RAHSid showed a correlation coefficient value of $r = 0.247$ to 0.775 . All of these correlation coefficient values were positive and statistically significant ($p \leq 0.01$). Divergent validity testing showed no significant relationship between the three dimensions in RAHS and the total RAHS score with SWLS. These results indicate that RAHSid is valid in measuring the hardiness aspect in Indonesian sports students.

Table 3. Results of validity and correlation tests between factors of the Indonesian version of RAHS

Variable		Control	Challenge	Commitment	Hardiness	Mental toughness	Happiness
Control	Pearson's r	—					
	p-value	—					
Challenge	Pearson's r	0.422	—				
	p-value	< .001	—				
Commitment	Pearson's r	0.172	0.191	—			
	p-value	< .001	< .001	—			
Hardiness	Pearson's r	0.538	0.551	0.499	—		
	p-value	< .001	< .001	< .001	—		
Mental toughness	Pearson's r	0.269	0.258	0.217	0.324	—	
	p-value	< .001	< .001	< .001	< .001	—	
Happiness	Pearson's r	0.084	-0.070	0.090	0.051	0.021	—
	p-value	0.174	0.234	0.150	0.339	0.540	—

For reliability testing, it appears that the three factors in RAHS have relatively high reliability values (Table 4). In McDonald's Omega, it appears that the three dimensions in RAHSid have high reliability values, ranging from 0.723 to 0.840. The same thing was found in reliability testing with Cronbach's



Alpha, namely an α value between 0.736 and 0.835. The same results were found in the total RAHSid score, namely, a high value was obtained both in McDonald's Omega ($\alpha = 0.802$) and in Cronbach's Alpha ($\alpha = 0.873$).

Table 4. Results of reliability tests with McDonald's omega and Cronbach's Alpha

	Coefficient ω	Coefficient α
Commitment	0.502	0.511
Control	0.565	0.567
Challenge	0.583	0.580
RAHSid	0.606	0.557

Discussion

The purpose of this study was to adapt the language and test the validity and reliability of the Revised Athletic Hardiness Scale (RAHS) in the context of Indonesian sports students. The RAHS has three subscales: commitment, control, and challenge (Yamaguchi et al., 2020). Testing results in the Indonesian context showed that all three dimensions were valid in measuring hardiness. However, one item was discarded due to its low factor loading and unsatisfactory model fit. Therefore, this item was removed from the psychometric properties of the Indonesian version of the RAHS, known as RAHSid.

The results of testing in the Indonesian context were nearly identical to those of the original RAHS, where the original RAHS demonstrated good model fit, with CFI = 0.91, GFI = 0.93, AGFI = 0.90, and RMSE = 0.08 (Yamaguchi et al., 2020). In the Indonesian version, after revision (reducing items that have low factor loading values), the chi-square (χ^2) value was obtained = 89.910 ($p < 0.001$), CFI = 0.936, TLI = 0.914, RMSEA = 0.080. SRMR = 0.048.

The original RAHS has excellent factor loadings ($\lambda = 0.55 - 0.90$) and relatively high internal consistency ($\alpha = 0.75 - 0.80$) (Yamaguchi et al., 2020). This is consistent with findings in the Indonesian context, where factor loadings ranged from 0.548 to 0.854. These values fall within the threshold required for an instrument item (Comrey & Lee, 1992). Specifically, Com1, com3, con3, chal1, chal2, and chal3 fall within the excellent criteria. Then com2 and chal4 fall within the excellent criteria. Con1 and con2 fall within the good criteria, while con4 falls within the fair criteria (Comrey & Lee, 1992). Thus, all eleven items in the RAHSid instrument can be declared valid in measuring hardiness in the context of Indonesian sports students.

Furthermore, convergent validity testing showed that all dimensions in RAHSid (Control, Challenge, and Commitment) were significantly correlated with the mental toughness score measured using MTI (coefficient value $r = 0.312$ to 0.388 ; $p < 0.001$). The same was found in the total RAHSid score, with a coefficient value of 0.466 ($p < 0.001$). This indicates that RAHSid is valid in measuring the construct of hardiness in Indonesian sports students. If the Japanese version was tested using the self-rating depression scale (SDS) and found a significant negative correlation (Yamaguchi et al., 2020), this study showed that RAHSid was positively correlated with the mental toughness construct. The difference in correlation direction is due to the MTI instrument (Gucciardi et al., 2014) used in this study measuring the construct of mental toughness which tends to be positive, while the Japanese test used the SDS which measures the construct of depression and this tends to be negative, so it is natural to find a difference in the direction of the relationship in the two studies. MTI, when used to test convergent validity with an instrument measuring the construct of psychological strain, showed a significant negative relationship (Putra et al., 2025). However, when used to test with a construct similar to hardiness, namely mental toughness, a significant and positive correlation was found (see Sutoro et al., 2025; Guntoro et al., 2025). Mental toughness is a construct that is very similar to hardiness, so the significant and positive correlation between RAHSid and MTI shows that RAHSid is valid in measuring the construct of hardiness in the Indonesian context.

Furthermore, this study also showed that in divergent validity testing, the RAHSid did not have a significant relationship with the Happiness construct as measured by the SWLS (Pavot & Diener, 1993). As is known, the SWLS is an instrument that measures a person's general happiness in life (Diener et al., 1985). This is very different from the RAHS, which measures the construct of hardiness, a construct about a person's personality strength to survive, adapt, and stay motivated in the face of pressure, stress,



or challenging situations (Maddi, 2013). Thus, the two instruments appear to be very different in their functions. Therefore, it is very reasonable to find no significant difference between the RAHSid and the SWLS.

The results of the reliability test show that the three dimensions in the RAHSid have high McDonald's omega values, namely commitment = 0.723, control = 0.814, and challenge = 0.840. Overall, the McDonald's omega reliability value was obtained at 0.802. The same thing was found in the reliability test with Cronbach's Alpha, namely in the commitment dimension = 0.736, control = 0.816, and challenge = 0.835. Overall, with Cronbach's Alpha, the value of $\alpha = 0.873$ was obtained. The reliability value of the RAHSid is included in the relatively high category (Nunnally & Bernstein, 1994; Taber, 2018). These results confirm the findings in the Japanese version, namely the reliability value of commitment = 0.75, control = 0.80, and challenge = 0.77 (Yamaguchi et al., 2020). Thus, the findings of this study strengthen previous studies that stated that the RHAS has high internal consistency in measuring the hardiness dimension.

The practical implication of this study's results is that the RAHSid can be used to measure the construct of hardiness, especially in Indonesia, across universities and schools. Using the RAHSid minimizes bias caused by the measurement instrument, as it is valid and reliable among Indonesian sports students. Furthermore, this study has theoretical implications: although it generally supports previous research that found the RAHS to be a reliable measure of hardiness in a sport context, it identified one item missing from the RAHS. That is why broader testing, across different contexts and cultures, is needed to assess the accuracy of the RAHS model. Thus, this study contributes positively to the field of sport psychology.

Although this study attempted to rigorously test the RAHS in the context of Indonesian sports students, it has several limitations. First, although the study used students in a sports study program, it did not identify respondents who were athletes. This information is crucial, given that the RAHS was designed to measure hardiness in the context of athletes or sport situations. Second, the number of research subjects involved in this study was relatively small. Furthermore, there was a significant difference between male and female respondents. Therefore, further analysis, such as an analysis of invariance, was not conducted, even though this information is crucial for determining whether the RAHS consistently measures the same constructs across male and female respondents. Therefore, a recommendation for future studies is to identify the difference between athlete and non-athlete sports students. This identification will allow for more detailed and in-depth research, allowing for comparisons between the two groups. In addition, the distribution of male and female respondents also needs to be considered in a relatively balanced manner so that, in addition to conducting invariance analysis based on athlete vs. non-athlete status, invariance analysis of men vs. women can also be conducted. Thus, RAHS testing can be more comprehensive.

Conclusions

RAHS testing in the context of Indonesian sports students showed that there was one item that failed in the test, so that in the Indonesian version, RAHS consisted of 11 statements. The results of the CFA test showed that the model fit the data, namely the chi-square value (χ^2) = 89.910 ($p < 0.001$), CFI = 0.936, TLI = 0.914, RMSEA = 0.080, SRMR = 0.048. The Indonesian version of RAHS is a three-factor model consisting of commitment, control, and challenge. The RAHSid loading factor value ranged from .548 to .854, which indicated quite a high value. In addition, RAHSid correlated significantly with MTI ($p < 0.001$) and did not correlate significantly with SWLS ($p > 0.05$), which indicated RHAS is a valid instrument in measuring the construct of hardiness in the context of Indonesian sports students. The reliability test results showed high reliability values, both in McDonald's Omega and Cronbach's Alpha, thus strengthening the evidence that RHASid is reliable in measuring hardiness. Thus, RHASid can be used to reveal hardiness in the Indonesian context, especially for sports students.

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