

Cross-cultural adaptation of the psychological performance inventory-alternative (PPI-A) for the Indonesian context

Adaptación transcultural del inventario alternativo de desempeño psicológico (PPI-A) para el contexto indonesio

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Abstract. In Indonesia, studies on the theme of sports psychology, especially mental toughness, are experiencing an increasing trend. However, there are problems with the measuring instruments used. Therefore, this research aims to adapt and test the psychometric properties of the PPI-A in the Indonesian context. There were 331 young athletes ($M = 218$, $F = 113$) with a mean age of 17.9 years and a standard deviation of 2.09. Apart from the psychological performance inventory-alternative (PPI-A), the mental toughness index (MTI) was also used to collect data in this study. The data obtained were analyzed using confirmatory factor analysis (CFA) to test the three models (single-factor model, four-factor model, and second-order model) proposed. The research results show that the second-order model is the best compared to the unidimensional model and four-factor model, as evidenced by the chi-square value = 47.934; $df = 32$; $p = .002$; CFI = .961; GFI = .969; TLI = .938; SRMR = .038; RMSEA = .057. Of the fourteen items in the PPI-A, nine items had very good loading factor ($\lambda = .563$ to $.759$; $p < 0.001$). The internal consistency reliability of the PPI-Aid is moderate ($\alpha = .74$ to $.77$) while the reliability with convergent validity is in the small to moderate category ($r = .16$ to $.35$; $p \leq .01$). Even though the reliability value is not high, it can be stated that PPI-Aid is a valid and reliable measuring tool in measuring aspects of mental toughness.

Keywords: mental toughness, psychometric, validation, PPI-A, athlete.

Resumen. En Indonesia, los estudios sobre el tema de la psicología deportiva, especialmente la fortaleza mental, están experimentando una tendencia creciente. Sin embargo, existen problemas con los instrumentos de medición utilizados. Por tanto, esta investigación tiene como objetivo adaptar y probar las propiedades psicométricas del PPI-A en el contexto de Indonesia. Había 331 atletas jóvenes ($M = 218$, $F = 113$) con una edad media de 17,9 años y una desviación estándar de 2,09. Además del inventario alternativo de rendimiento psicológico (PPI-A), también se utilizó el índice de fortaleza mental (MTI) para recopilar datos en este estudio. Los datos obtenidos se analizaron mediante análisis factorial confirmatorio (AFC) para probar los tres modelos (modelo de un solo factor, modelo de cuatro factores y modelo de segundo orden) propuestos. Los resultados de la investigación muestran que el modelo de segundo orden es el mejor en comparación con el modelo unidimensional y el modelo de cuatro factores, como lo demuestra el valor de chi-cuadrado = 47,934; $gl = 32$; $p = 0,002$; CFI = .961; GFI = 0,969; ILI = 0,938; SRMR = 0,038; RMSEA = .057. De los catorce ítems del PPI-A, nueve ítems tenían muy buen factor de carga ($\lambda = 0,563$ a $0,759$; $p < 0,001$). La confiabilidad de la consistencia interna del PPI-Aid es moderada ($\alpha = 0,74$ a $0,77$) mientras que la confiabilidad con validez convergente está en la categoría de pequeña a moderada ($r = 0,16$ a $0,35$; $p \leq 0,01$). Aunque el valor de confiabilidad no es alto, se puede afirmar que PPI-Aid es una herramienta de medición válida y confiable para medir aspectos de la fortaleza mental.

Palabras clave: fortaleza mental, psicometría, validación, PPI-A, deportista.

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Introduction

In competitive sports, there are four aspects which has dominant effect on athlete's performance, namely physical, technical, tactical, and mental aspects (Weinberg & Gould, 2015; Akbar et al., 2024; Guntoro et al., 2023). The four aspects above form a unity that must be forged in the training process so that optimal performance can be achieved. However, several studies show that in the training process, coaches tend to pay attention to physical, technical, and tactical aspects (Said & Jannah, 2018) while mental aspects are often left aside (Adisasmito, 2007). The subside of mental aspects also seemingly shown in Indonesian sport context, as shown by Nasution (2009), which conducted at the Student Sports Education and Training Center (PPLP) the results showed that the mental aspects of athletes were not studied seriously.

This phenomenon occurs because not all coaches realize

how important the mental aspect of athletes is to their achievements on the field. This opinion was confirmed when there was a national discussion held by the Indonesian Sports Mental Trainers Association (APMOI) after the National Sports Week (PON) event. PON is the largest multi-sport event in Indonesia which is held every four years (Kogoya, Guntoro, & Putra, 2022). During the discussion, it was revealed that there was still poor knowledge among coaches and sports administrators regarding the importance of the mental aspects of athletes. This is contrast with the fact when athletes experience defeat, the mental aspect is often scapegoated as the cause of the athlete's failure (Guntoro, Kurdi, & Putra, 2020; Sutoro, Guntoro, & Putra, 2023).

Under these conditions, it is not surprising that the study of athletes' mentality in Indonesia is not very clear because matters related to the substantive aspects of athletes'

mental aspects have not been discussed in depth and comprehensively. The results of a review of scientific articles published in Indonesia related to "athlete mentality" found that: (1) there was an increase in the number of scientific publications with the theme "athlete mentality," (2) most of the articles did not clearly state what instruments were used to reveal athlete mentality, (3) others developed their instruments but the development process was not stated in detail (see for example: Giandra & Setyawan, 2014; Budiman, 2015; Periyadi, 2016; Masrun, 2016; Raynadi et al., 2017; Setiawan et al., 2020) so we think there are still weaknesses in the development procedures that has been carried out in the process of investigating mental toughness.

In scientific research, the instruments used are a very important aspect (Kerlinger, 2006). When the instrument used to collect data has unclear validity and reliability, the data produced by the measuring instrument likely has a high error content (Azwar, 2013). The problem in Indonesia related to assessing the mental aspects of athletes is the instruments used (Putra, Sutoro, & Sinaga, 2023). When the instrument was developed, it turned out that the development process carried out was not explained in detail. Likewise, when external instruments were used, the language adaptation and testing process was not carried out in an internationally recognized way (see for example ITC, 2017; Hambleton & de Jong, 2003; Ohrbach et al., 2013). With these facts, studies related to athletes' mental health are questionable due to the limitation of information about the psychometric quality of the available instruments. With the facts above, we consider that there needs to be a standard instrument in Indonesian that can be used by researchers, trainers, and the public. Having reliable measuring instruments will make studies related to athletes' mental health much better and minimize the occurrence of bias caused by the instruments used.

Gucciardi et al. (2009) state that the pioneer of inventories that measure aspects of mental toughness in the world is Loehr, who developed the Psychological Performance Inventory (PPI; Loehr, 1986). According to Mack & Ragan (2008), PPI is a measuring tool that is very often used to reveal mental aspects. Even though the PPI is an instrument that is often used to investigate aspects of mental toughness, the PPI presents a problem related to its construct validity (Middleton et al., 2004). That is why, the PPI was later revised by Golby et al. (2007) and is called the Psychological Performance Inventory-Alternative (PPI-A). Based on this, we chose PPI-A to be adapted and tested in the Indonesian context. We consider the PPI-A to be quite representative because this measuring tool is often used to reveal the mental aspects of athletes in the world. Apart from that, what we are doing is in line with the consensus of scientists in the world of sports psychology who recommend evaluating the construct validity of existing instruments in the field (Middleton et al., 2004). Unfortunately, there have been no studies that have adapted and tested the PPI-A in the Indonesian context to date.

Therefore, this study aims to adapt and test the psychometric properties of the PPI-A in the Indonesian context. Thus, this study will serve a solid fundamental basis regarding mental measurement tools for athletes in Indonesia, because there have been a large void of studies that have adapted and evaluated the PPI-A in the Indonesian context.

Material and methods

Participants

This research was carried out involving young Indonesian athletes. 331 young athletes participated in this study with diverse sports backgrounds, such as weightlifting, athletics, bicycle racing, volleyball, rowing, wrestling, judo, karate, archery, rock climbing, pencak silat, swimming, gymnastics, football, taekwondo, tennis, and boxing. There were 218 male athletes, and 113 female athletes, with an average age of 17.9 years and a standard deviation of 2.09.

Instruments

The instrument adapted and tested in this study is the Psychological Performance Inventory-Alternative (PPI-A; Golby et al., 2007). PPI-A consists of four sub-scales, namely determination (e.g., The goals I've set for myself as a player keep me working hard.), self-belief (e.g., I lost my confidence very quickly), positive cognition (e.g., I can clear interfering emotions quickly and regain my focus), and visualization (e.g., I visualize working through tough situations before competition). PPI-A consists of 14 statements with alternative answers in the form of a Likert scale, from almost always to almost never (1 to 5).

To ensure the convergent validity of the adapted PPI-A, we also used the mental toughness index (MTI) to test the convergent validity. MTI was developed by Gucciardi et al. (2014) and has been adapted and tested in the Indonesian context (Putra et al., 2024). MTI has seven dimensions, namely self-belief (Item example: 'I believe in my ability to achieve my goals'), attention regulation ('I can regulate my focus when performing tasks'), emotion regulation ('I can use my emotions to perform the way I want to'), success mindset ('I strive for continued success'), context knowledge ('I execute my knowledge of what is required to achieve my goals'), buoyancy (e.g., 'I consistently overcome adversity'), and optimism ('I can find a positive in most situations'). These seven dimensions are translated 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). In the Indonesian version, the MTI has a very good loading factor value ($\lambda = .563$ to $.759$). Meanwhile, the internal consistency reliability of MTI is excellent ($CR = .864$; $\alpha = .862$) (Putra et al., 2024).

Procedure

This research procedure was approved by the Health Research Ethics Committee of Cenderawasih University with number 266/KEPK/EC. All respondents were asked to provide informed consent before participating in this

study. Thus, the data we received and analyzed are data that have been approved by the respondents. We began this research by applying for permission from the developer of the PPI-A instrument. After receiving permission to carry out language adaptation and testing in the Indonesian context, we then handed over the English version of the PPI-A to two English language experts to translate into Indonesian. The results of the synthesis stage were then submitted to two sports psychology experts and one sports coaching expert, all of whom have doctoral-level education. The three experts assessed the suitability of the substance of each item in the Indonesian version of the PPI-A with the original version. The results from the three experts were then synthesized and submitted to an Indonesian language expert to check the readability level of the Indonesian version of the PPI-A. After that, we tested the readability level on three athletes at the junior high school level and three athletes at the high school level. We then submitted the final results of the Indonesian version of the PPI-A instrument (PPI-Aid) to a different English language expert from the initial stage to be translated back into the original language. After we received the PPI-Aid and PPI-A translations, the next step

was to send the two instruments to the PPI-A developer to be checked and we received input regarding the results of the language adaptation that we had carried out. After receiving input and being declared "Okay" by the original developer, we collected data in the field on the athletes. The Indonesian version of the final PPI-A instrument can be seen in the appendix.

Statistical analysis

The data analysis used confirmatory factor analysis (CFA) with the maximum likelihood (ML) estimation with bootstrapping, which tested three models (single-factor model, four-factor model, and second-order model) (figure 1). The single-factor model is intended to test whether the PPI-A instrument is unidimensional. Meanwhile, four-factor and second-order models are used to test the multidimensional PPI-A instrument. This test is in accordance with previous research which found that the PPI-A was a multidimensional mental toughness measuring tool (Golby et al., 2007).

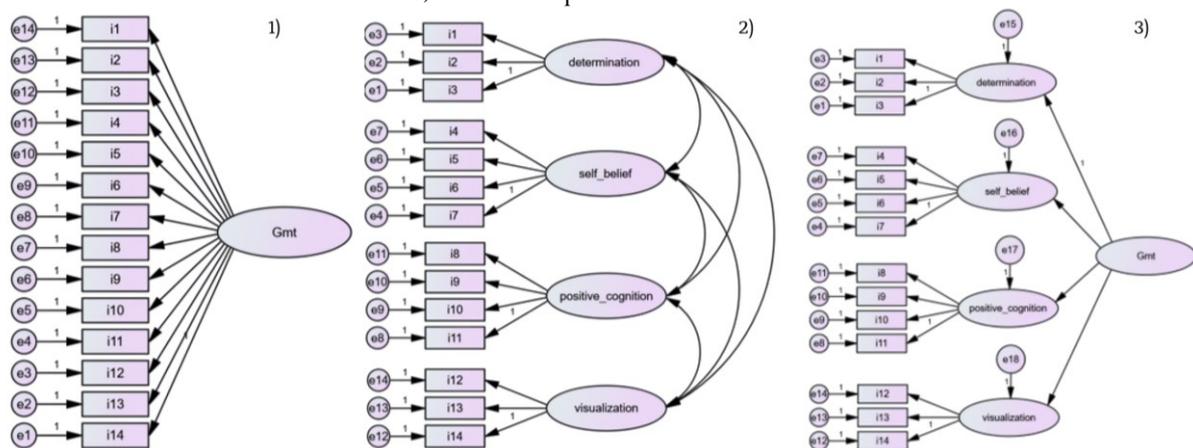


Figure 1. Three CFA models for the Indonesian version of PPI-A. 1) unidimensional model 2) correlated four-factor model 3) second-order model.

In this test, we are guided by several fit indexes to test the accuracy of the model. The fit indexes used as parameters are (1) Chi-square (χ^2) and p-value, (2) Comparative Fit Index (CFI), (3) Tucker-Lewis Index (TLI), (4) Standardized Root Mean Square Residual (SRMR) and (5) Root Mean Square Error of Approximation (RMSEA). The following are the cut-off values used to assess model fit: CFI and TLI values $> .90$ (Browne & Cudeck, 1992), GFI values $\geq .93$ (Cho, Hwang, Sarstedt, & Ringle, 2020), SRMR values $\leq .07$ (Bagozzi, 2010), and RMSEA scores $\leq .08$ (Browne & Cudeck, 1992). After the model was fit, the analysis continued to see the factor loadings of each item in the PPI-Aid. The factor loading criteria referred to the recommendations given by Comrey & Lee (1992) (i.e., $> .71$ = excellent; $> .63$ = very good; $> .55$ = good; $> .45$ = fair; $< .32$ = poor). Next, reliability analysis was carried out with Cronbach's alpha (α) to assess the internal consistency of PPI-Aid. The accepted reliability value was $> .70$ (Nunnally & Bernstein, 1994; Taber, 2018). Apart

from that, the reliability value of PPI-Aid could also be seen by correlating with similar instruments (convergent validity) that measured mental toughness. All analyses in this research were carried out with the help of the IBM SPSS v.26 and IBM Amos v. programs. 22.

Results

The results of the model suitability analysis (goodness-of-fit) on the PPI-Aid instrument found that the second-order model and four-factor model showed better results than the unidimensional model (Table 1). However, the two models (the second-order model and the four-factor) are still in the marginal fit category. These results show that several items have loading factor values of less than $.50$, namely items number 2, 4, 7, 9, and 14. Therefore, we removed these items from the model and recalculated them.

Table 1.
Model fit of three CFA models for the Indonesian version of PPI-A (n = 331)

Model	χ^2	df	p	CFI	TLI	GFI	SRMR	RMSEA [90%CI]
1-factor model	269.762	77	.000	.755	.892	.711	.073	.087 [.076, .099]
4-factor model	146.521	71	.000	.904	.877	.940	.056	.057 [.044, .070]
2-order factor	146.706	73	.000	.906	.883	.940	.056	.055 [.042, .068]

Note. χ^2 = chi-square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; GFI = Goodness Fit Index; SRMR = standardized root mean residual; RMSEA = root mean square error of approximation.

After the five items that had a loading factor value $< .50$ were removed, the model appeared to be better, especially the second-order model, with the chi-square value = 47.934, $df = 32$, $p = .002$, CFI = .961, GFI = .969, TLI = .938, SRMR = .038, RMSEA = .057 while the four-factor model obtained a chi-square value = 47.256, $df = 21$, $p = .001$, CFI = .959, GFI = .969, TLI = .929, SRMR = .038, RMSEA = .062. Even though the p-value is $< .05$, the other parameters show that the model is a fit. In other words, there is no difference between the sample data covariance matrix compared to the estimated population covariance matrix, thereby confirming the suitability of the model being tested. With these results, it appears that the second-order model is the best model of the three. Therefore, the next analysis was carried out based on the second-order model.

After the model was fit, we then carried out an analysis of the validity of each item in the PPI-Aid. The nine items or indicators in the PPI-Aid showed statistical significance with a p-value $< .001$ and a convergent validity value or loading factor value on the nine PPI-Aid indicators $> .50$ (Figure 2). With these results, it can be stated that the nine items in the PPI-Aid have the required loading factor, namely $\geq .50$. Apart from that, if you look closely it appears that indicators or items number 13, 3, and 8 are in the excellent category, items number 10 and 11 are in the very good category, items number 12, 1, 5 and 6 are in the good category (Figure 2). This indicates that the nine items in the PPI-Aid are valid indicators in measuring the latent construct of general mental toughness and are multidimensional, consisting of four dimensions: determination, self-belief, positive cognition, and visualization.

After the model testing and factor loading analysis, a reliability test was then carried out. In general, reliability can be expressed as the internal consistency of an instrument which can be measured based on the level of item homogeneity. The results of reliability testing using the internal consistency method as measured by Cronbach's alpha (α) showed that the PPI-Aid reliability value ranged from .74 to .77 and the overall PPI-Aid reliability value was .79 (Table 2). In addition, convergent validity testing found that all dimensions in the PPI-Aid were significantly correlated with the MTI ($p \leq .01$) with a correlation coefficient ranging from .16 to .34 while the correlation coefficient between the total score of the PPI-Aid with MTIid was .35 ($p \leq .01$) (Table 2). The correlation coefficient between dimensions in the PPI-Aid appears to have an r-value ranging from .26 to .46, while the correlation coefficient with the

total PPI-Aid score ranged from .66 to .82. All these correlation coefficient values were positive and statistically significant ($p \leq .01$). These results indicate that PPI-Aid is reliable in measuring aspects of mental toughness.

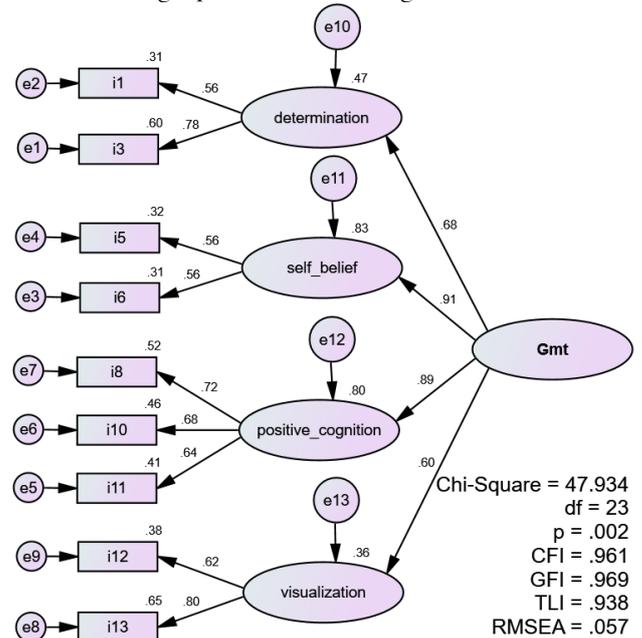


Figure 2. Final Model of PPI-Aid

Table 2.

Loading factor (λ) and reliability of the Indonesian version of PPI-A (PPI-Aid)

Factor	Indicator	λ	α	Factor				PPI-Aid	MTIid
				DT	SB	PC	VL		
DT	Dt1	.56	.79						
	Dt3	.78							
SB	SB5	.56		.36**					
	SB6	.56							
PC	PC8	.72							
	PC10	.68		.41**	.46**				
VL	PC11	.64							
	Vz12	.62		.26**	.33**	.36**			
PPI-Aid	Vz13	.80							
				.66**	.72**	.82**	.67**		
MTIid				.26**	.24**	.34**	.16**	.35**	

Note: DT = determinant; SB = self-belief; PC = positive cognition; VL = visualization; α = Cronbach's alpha; PPI-Aid = PPI-A Indonesian version; MTIid = MTI Indonesian version. ** $\leq .01$

Discussion

This study aims to adapt and test the psychometric properties of the PPI-A in the Indonesian context. The results of this research showed that the model fit after improvements were made by removing the five items in the PPI-A because they had a loading factor value of $\leq .50$. The goodness-fit results show that the second-order model is a model that has a better model accuracy value compared to the four-factor model and the unidimensional model. The second-order model has a chi-square value = 47.934, $df = 32$, $p = .002$, CFI = .961, GFI = .969, TLI = .938, SRMR = .038, RMSEA = .057. According to Browne & Cudeck (1992) the CFI and TLI values accepted are $> .90$. For the GFI value, according to Cho et al. (2020) the accepted value is $\geq .93$. For the SRMR parameter, the accepted value is $\leq .07$ (Bagozzi, 2010) while for RMSEA it is $\leq .08$ (Browne &

Cudeck, 1992). With reference to these criteria, the second-order PPI-Aid model is declared fit (Figure 2).

The results of testing the validity of PPI-Aid items showed that five items had to be excluded because they had loading factor values below .50. This means, this study found that there were nine items in the Indonesian version of the PPI-A (PPI-Aid) that met the requirements as valid items ($\lambda \geq .50$). By using the criteria from Comrey & Lee (1992), it appears that there are three items that are in the excellent category (item numbers 13, 3 and 8), two items are in the very good category (item numbers 10 and 11), and four items are in a good category (item numbers 12, 1, 5, and 6). Thus, the findings in this study are different from the results of previous research which found that the fourteen items in the PPI-A items had high factor loading values (Golby et al., 2007). Even though this study eliminated five items in the PPI-A, the four dimensions in the PPI-A (e.g. determination, self-belief, positive cognition, and visualization) remain part of the PPI-A and are believed to be dimensions that contribute to measuring mental toughness. This is proven by obtaining standardized coefficient values of .68, .91, .89, and .60 respectively. For the Indonesian version of PPI-A, the determination dimension contains two items, self-belief contains two items, positive cognition contains three items, and visualization contains two items. This makes the Indonesian version of the PPI-A more concise compared to the PPI which contains 42 items (Loehr, 1986; Middleton et al., 2004), and the original PPI-A which contains fourteen items (Golby et al., 2007).

The results of reliability testing show that a relatively sufficient internal consistency value was obtained ($\alpha = .74$ to $.77$) and this is in line with previous research (Golby et al., 2007). According to Nunnally & Bernstein (1994) and Taber (2018), the accepted internal consistency reliability value is $> .70$. However, in reliability testing using the parallel-form method, it was found that the range of correlation coefficient values was not large in the four dimensions of PPI-Aid and MTIid ($r = .16$ to $.34$; $p \leq .01$) and the correlation coefficient for the total score of PPI-Aid and MTIid was equal to $.35$ ($p \leq .01$). Using the criteria proposed by Cohen, (1988) (i.e., small = $< .30$; moderate = $< .50$; large = $> .50$), we found that the reliability of PPI-Aid with MTIid was in the small to moderate category. Although this indicates that the reliability of PPI-Aid is acceptable, the value is not high. These results are in line with findings in previous research that tested the PPI with the PPI-A and found the reliability of the PPI-A to be inadequate (Gucciardi, 2012).

The results of this research, in particular, have succeeded in presenting a set of instruments that can be used to reveal aspects of mental toughness, especially in the context of athletes in Indonesia. Thus, this instrument will add and become a new alternative that can be used to uncover aspects of mental toughness other than the mental toughness index (MTI) (Gucciardi et al., 2014) which has been tested by Putra et al., (2024) in the Indonesian context. In

other words, studies in Indonesia that examine the dimensions of mental toughness in athletes are expected to be better because the data are taken using valid and reliable instruments. The use of instruments that are not valid and reliable will create the opportunity for the data taken to be wrong so that they do not reflect actual conditions (Kerlinger, 2006; Azwar, 2013).

Limitations and future research directions

Even though this study has attempted to carry out in-depth investigations involving a relatively large sample size and become the leading research in the adaptation and testing of PPI-A in Indonesia, we see limitations, especially in the context of the participants involved. This study does not classify the type of level of athletes involved and generally only refers to young athletes. The facts show that there are various levels of athletes, from regional, national, to international level athletes; amateur, sub-elite, and elite athletes. Athletes on each stages would experience different demands and pressures, which lead to different results if PPI-A were administered. We assess that these levels will provide influence and differences in responding to the instruments being tested. Apart from that, this study also did not use non-athlete participants even though this issue is important so that there can be generalization in a wider context.

With the limitations above, future studies should be carried out involving a variety of research subjects, for example, athletes and non-athletes, and classifying the athlete level in more detail. In addition, we provide recommendations for future research to add other variables by using similar instruments or instruments that measure other psychological constructs such as anxiety (Putra et al., 2021; Putra & Guntoro, 2022), resilience (Wagnild & Young, 1993), religiosity and happiness (Guntoro & Putra, 2022; Wandik et al., 2024) as well as performance in sports and non-sport contexts.

Conclusions

From this research, it can be concluded that the second-order model is better compared to the unidimensional model and four-factor model in the Indonesian version of PPI-A (PPI-Aid). Testing the accuracy of the model (goodness of fit) shows that the model fits the data. The four dimensions in the PPI-A (determination, self-belief, positive cognition, and visualization) are all statistically significant in measuring mental toughness. Of the 14 items in the PPI-A, nine items have very good loading factors. The internal consistency reliability of PPI-Aid is considered sufficient ($\alpha = .74$ to $.77$) while in convergent validity testing a range of weak to moderate correlation coefficient values was found between the four dimensions of PPI-Aid and MTIid. Meanwhile, the correlation coefficient for the total PPI-Aid score with MTIid is $.35$. Thus, it can be stated that PPI-Aid is a valid and reliable measuring tool for

measuring aspects of mental toughness.

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Conflicts of interest

All authors declare that they have no conflicts of interest with any person, company, or institution.

References

- Adisasmito, L. S. (2007). *Mental juara: modal atlet berprestasi*. Jakarta: PT RajaGrafindo Persada.
- Akbar, A., Karim, Z. A., Zakaria, J., Suryanef, Cahyani, F. I., Rahman, M. A., ... Mohamad, S. K. B. (2024). Understanding Mental Toughness in Student-Athletes: Insights from Sport Psychology. *Retos*, *54*, 1–9. <https://doi.org/10.47197/retos.v54.102230>
- Azwar, S. (2013). *Reliabilitas dan validitas*. Yogyakarta: Pustaka Pelajar.
- Bagozzi, R. P. (2010). Structural equation models are modelling tools with many ambiguities: Comments acknowledging the need for caution and humility in their use. *Journal of Consumer Psychology*, *20*(2), 208–214. <https://doi.org/10.1016/j.jcps.2010.03.001>
- Browne, M. W., & Cudeck, R. (1992). Alternative Ways of Assessing Model Fit. *Sociological Methods & Research*, *21*(2), 230–258. <https://doi.org/10.1177/0049124192021002005>
- Budiman, I. A. (2015). Penerapan latihan relaksasi latihan konsentrasi dan latihan visualisasi terhadap peningkatan mental atlet sepak bola Universitas Majalengka. *Jurnal Educatio*, *1*(1), 40–62.
- Cho, G., Hwang, H., Sarstedt, M., & Ringle, C. M. (2020). Cutoff criteria for overall model fit indexes in generalized structured component analysis. *Journal of Marketing Analytics*, *8*(4), 189–202. <https://doi.org/10.1057/s41270-020-00089-1>
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Comrey, A. L., & Lee, H. B. (1992). *A First Course in Factor Analysis*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Giandra, S. N., & Setyawan, I. (2014). Hubungan antara efektivitas komunikasi interpersonal pelatih dengan ketangguhan mental atlet. *Empati*, *3*(4), 558–569.
- Golby, J., Sheard, M., & van Wersch, A. (2007). Evaluating the Factor Structure of the Psychological Performance Inventory. *Perceptual and Motor Skills*, *105*(1), 309–325. <https://doi.org/10.2466/pms.105.1.309-325>
- Gucciardi, D. F. (2012). Measuring mental toughness in sport: A psychometric examination of the psychological performance inventory-A and its predecessor. *Journal of Personality Assessment*, *94*(4), 393–403. <https://doi.org/10.1080/00223891.2012.660292>
- Gucciardi, D. F., Gordon, S., & Dimmock, J. A. (2009). Development and preliminary validation of a mental toughness inventory for Australian football. *Psychology of Sport and Exercise*, *10*(1), 201–209. <https://doi.org/10.1016/j.psychsport.2008.07.011>
- Gucciardi, D. F., Hanton, S., Gordon, S., Mallett, C. J., & Temby, P. (2014). The Concept of Mental Toughness: Tests of Dimensionality, Nomological Network, and Traitness. *Journal of Personality*, *83*(1), 26–44. <https://doi.org/10.1111/jopy.12079>
- Guntoro, T. S., Kurdi, & Putra, M. F. P. (2020). Karakter kepribadian atlet Papua: kajian menuju POPNAS ke-XV. *Jurnal Sportif: Jurnal Penelitian Pembelajaran*, *6*(1), 40–58. https://doi.org/https://doi.org/10.29407/js_unpgri.v6i1.13638
- Guntoro, T. S., & Putra, M. F. P. (2022). Athletes' religiosity: How it plays a role in athletes' anxiety and life satisfaction. *HTS Teologiese Studies/Theological Studies*, *78*(1), a7802. <https://doi.org/10.4102/hts.v78i1.7802>
- Guntoro, T. S., Sutoro, Putra, M. F. P., Kurdi, Németh, Z., & Setiawan, E. (2023). The role of anthropometry, physical, psychological and personality for elite athletes in competitive sports. *Pedagogy of Physical Culture and Sports*, *27*(4), 331–339. <https://doi.org/10.15561/26649837.2023.0409>
- Hambleton, R. K., & de Jong, J. H. A. L. (2003). Advances in translating and adapting educational and psychological tests. *Language Testing*, *20*(2), 127–134. <https://doi.org/10.1191/0265532203lt247xx>
- ITC. (2017). ITC Guidelines for Translating and Adapting Tests (Second Edition). *International Journal of Testing*, 15305058. <https://doi.org/10.1080/15305058.2017.1398166>
- Kerlinger, F. N. (2006). *Asas-asas penelitian behavioral*. Yogyakarta: Gadjah Mada Univeristy Press.
- Kogoya, K., Guntoro, T. S., & Putra, M. F. P. (2022). Sports Event Image, Satisfaction, Motivation, Stadium Atmosphere, Environment, and Perception: A Study on the Biggest Multi-Sport Event in Indonesia during the Pandemic. *Social Sciences*, *11*(6), 1–13. <https://doi.org/10.3390/socsci11060241>
- Loehr, J. E. (1986). *Mental Toughness Training For Sport*. New York: Stephen Greene Press.
- Mack, M. G., & Ragan, B. G. (2008). Development of the mental, emotional, and bodily toughness inventory in collegiate athletes and nonathletes. *Journal of Athletic Training*, *43*(2), 125–132. <https://doi.org/10.4085/1062-6050-43.2.125>
- Masrun. (2016). Pengaruh Mental Toughness dan Motivasi Berprestasi Terhadap Prestasi Olahraga Atlet PPLP Sumbar. *Jurnal Performa Olahraga*, *1*(1), 1–11.
- Middleton, S. C., Marsh, H. W., Martin, A. J., Richards,

- G. E., Savis, J., Perry, C., & Brown, R. (2004). The psychological performance inventory: Is the mental toughness test tough enough? *International Journal of Sport Psychology*, 35(2), 91–108.
- Nasution, Y. (2009). *Laithan mental bagi atlet pelajar*. Jakarta: Pusat Pengembangan Kualitas Jasmani, Sekjen, Depdiknas.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric Theory*. New York: McGraw-Hill.
- Periyadi, A. (2016). Hubungan Motivasi, Agresivitas, Dan Mental Terhadap Prestasi Olahraga Beladiri Taekwondo Pada Atlet Kyoreugi. *Revolusi Mental Mewujudkan Tenaga Pendidikan Yang Profesional Dalam Menyiapkan Generasi Emas Indonesia*, 2050–2064. Palembang: Universitas PGRI Palembang.
- Putra, M. F. P., & Guntoro, T. S. (2022). Competitive State Anxiety Inventory–2R (CSAI-2R): Adapting and Validating Its Indonesian Version. *International Journal of Human Movement and Sports Sciences*, 10(3), 396–403. <https://doi.org/10.13189/saj.2022.100305>
- Putra, M. F. P., Guntoro, T. S., Wandik, Y., Ita, S., Sinaga, E., Hidayat, R. R., ... Rahayu, A. S. (2021). Psychometric properties at Indonesian version of the Sport Anxiety Scale-2: Testing on elite athletes of Papua, Indonesian. *International Journal of Human Movement and Sports Sciences*, 9(6), 1477–1485. <https://doi.org/10.13189/saj.2021.090645>
- Putra, M. F. P., Kurdi, Syahrudin, S., Hasibuan, S., Sinulingga, A., Kamaruddin, I., ... Ridwan, M. (2024). An Indonesian Version of Mental Toughness Index: Testing Psychometric Properties in Athletes and Non-athletes. *Retos*, 55, 816–824. <https://doi.org/10.47197/retos.v55.106086>
- Putra, M. F. P., Sutoro, & Sinaga, E. (2023). Mental atlet: Konstruksi, pengukuran, dan arah penelitian ke depan. *MULTILATERAL: Jurnal Pendidikan Jasmani Dan Olahraga*, 22(1), 63–79. <https://doi.org/10.20527/multilateral.v22i1.14785>
- Raynadi, F. B., Rachmah, D. N., & Akbar, S. N. (2017). Hubungan ketangguhan mental dengan kecemasan bertanding pada atlet pencak silat di Banjarbaru. *Jurnal Ecopsy*, 3(3), 149–154. <https://doi.org/10.20527/ecopsy.v3i3.2665>
- Said, H., & Jannah, M. (2018). *Penentu Kemenangan: Problematika dan solusi mental dalam olahraga*. Surabaya: Unesa University Press.
- Setiawan, E., Patah, I. A., Baptista, C., Winarno, M. ., Sabino, B., & Amalia, E. F. (2020). Self-efficacy dan mental toughness: Apakah faktor psikologis berkorelasi dengan performa atlet? *Jurnal Keolahragaan*, 8(2), 158–165. <https://doi.org/10.21831/jk.v8i2.33551>
- Sutoro, Guntoro, T. S., & Putra, M. F. P. (2023). Development and validation mental training model: Mental Toughness Training Circle (MTTC). *F1000Research*, 12(169), 1–36. <https://doi.org/10.12688/f1000research.129010.1>
- Taber, K. S. (2018). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education*, 48(6), 1273–1296. <https://doi.org/10.1007/s11165-016-9602-2>
- Wagnild, G. M., & Young, H. M. (1993). Development and psychometric evaluation of the Resilience Scale. *Journal of Nursing Measurement*, 1(2), 165–178.
- Wandik, Y., Dina, Guntoro, T. S., Sutoro, Wambrauw, O. O. O., Abidjulu, C. F., ... Putra, M. F. P. (2024). Interrelation of mental toughness, religiosity, and happiness of elite adolescent athletes based on gender, type of sport, and level of education. *Retos*, 57, 1–12.
- Weinberg, R. S., & Gould, D. (2015). *Foundations of Sport and Exercise Psychology* (6th ed.). Champaign, IL 61825: Human Kinetics Publisher, Inc.

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Appendix:

Psychological Performance Inventory-Alternative Versi Indonesia (PPI-Aid) The Indonesian version of Psychological Performance Inventory-Alternative (PPI-Aid)

Petunjuk Pengisian:

Ini merupakan *Psychological Performance Inventory-Alternative (PPI-A)* versi Indonesia yang terdiri dari 9 item pernyataan. Anda diminta untuk memberi tanggapan terhadap setiap pernyataan yang ada berdasarkan kesesuaian dalam berpikir, merasa, dan berperilaku. Semua jawaban adalah betul sejauh memang benar-benar sesuai dengan diri Anda. Oleh sebab itu, jawablah sejujurnya! Pilihan jawaban yang tersedia adalah: TIDAK PERNAH (TP), JARANG (JR), KADANG-KADANG (KK), SERING (SR), dan SELALU (SL). Berikut adalah contohnya:

Saya mampu menjaga emosi positif selama kompetisi berlangsung.

Tidak Pernah	Jarang	Kadang-kadang	Sering	Selalu
TP	JR	KK	SR	SL

Anda hanya perlu memilih salah satu alternatif jawaban yang sesuai dengan kondisi Anda.

No	Pernyataan	Tidak Pernah	Jarang	Kadang-kadang	Sering	Selalu
1	Target yang telah Saya tetapkan untuk diri Saya sebagai pemain/atlet membuat Saya terus berlatih keras.	TP	JR	KK	SR	SL
2	Saya bersedia melakukan apa saja untuk mencapai potensi optimal yang Saya miliki sebagai pemain/atlet.	TP	JR	KK	SR	SL
3	Saya mampu menjaga emosi positif selama kompetisi berlangsung.	TP	JR	KK	SR	SL
4	Saya memikirkan hal-hal positif selama kompetisi berlangsung.	TP	JR	KK	SR	SL
5	Saya mampu mengendalikan emosi, kemudian fokus kembali pada pertandingan.	TP	JR	KK	SR	SL
6	Saya mampu mengendalikan pikiran untuk mengubah suasana hati yang negatif menjadi positif.	TP	JR	KK	SR	SL
7	Saya mampu mengubah situasi sulit menjadi peluang.	TP	JR	KK	SR	SL
8	Saya membayangkan gerakan-gerakan Saya.	TP	JR	KK	SR	SL
9	Saya mampu memvisualisasi penampilan atau gerakan Saya dengan mudah.	TP	JR	KK	SR	SL

Terima Kasih.

Note. Items 1-2 measure Determination, 3-4 measure Self-belief, 5-7 measure Positive cognition, 8-9 measure Visualization