MENTAL TOUGHNESS MEASUREMENT FOR PSYCHOLOGICAL SKILLS TRAINING INTERVENTION: TRANSLATION AND ADAPTATION

JAMATUL SHAHIDAH SHAARI[1], LIM BOON HOOI[2], JAMILAH AHMAD RADZI[3], SİSWANTOYO[4], SRI SUMARTININGGSIH[5] & NOR EEZA ZAINAL ABIDIN[6]

[1]Faculy of Sports Science and Recreation, Universiti Teknologi MARA, Shah Alam

[2,6] Centre for Sport and Exercise Sciences, University of Malaya, Malaysia

[3]Fculty of Sports Science and Recreation, Universiti Teknologi MARA, Perlis

[4]Sport Science Faculty, Yogyakarta State University, Indonesia

[5]Faculty of Sport Science, Universitas Negeri Semarang, Indonesia

ABSTRACT

The purpose of this study was to assess the validity and reliability of mental toughness measurement among netball youth athletes on shooting skill performance who underwent for Psychological Skills Training intervention. Cultural adaptation of the English version of the Psychological Performance Inventory was performed, and a Malay version was developed following standard forward-backward translation by independent native speaker. Psychometric properties of both versions were determined by assessing the internal consistency and test-retest reliability. The instrument's validity and reliability were analyzed in two phases: Phase 1 involved the translation of the questionnaire to Malay, establishing content validity and pilot study; and Phase 2 involved psychometric assessment. As for individual scales, this study's values were slightly higher from.66 -.84, compares those found in the original version of.42 -.82. Subscale–total score correlations for pre-intervention ranged.65 -.85 and for post intervention ranged.67 -.79. The test-retest analysis showed reliability with correlation coefficient of.82, thus indicating that the score is better and the stability of the measure across time are ensured. The PPI of Malay version are reliable and valid instruments for assessing mental toughness on the target population.

KEYWORDS: *Mental Toughness, Translation, Internal Consistency, Test-Retest Reliability & Netball Youth Athletes*

Original Article

INTRODUCTION

According to Bull, Shambrook, James, and Brooks (2005) and Cowden (2017), one of the most important psychological attributes that guarantee performance excellence is mental toughness. Loehr (1986) added that individuals who are mentally tough are able to increase their flow of positive energy during crisis and adversity through disciplined thinking, which, in turn, enable them to remain relaxed, energized, and calm when responding to pressure. Not only that, when faced with mistakes, competition, or problems, these individuals bounce back with the right attitude. The specific attributes of mental toughness are: a) confidence in oneself (having the knowledge that one is capable of success and excellent performance); b) control of negative energy (one is capable of handling negative emotions such as frustration, fear, or anger, and can cope with events that are out of one's control); c) control of attention (one is able to focus); d) visualization and imagery control (one is able to remain optimistic by picturing oneself as such); e) motivation (one is willing to persevere); f) positive energy (one still enjoys and has fun); and g) control of attitude (one does not yield). Coulter, Mallett, and Gucciardi (2010) listed quality preparation,

a winning mindset, and enjoying and handling pressure as the other key qualities associated with mental toughness. Mental toughness, as posited by Crust and Azadi (2010), is akin to psychological skills, as both share similar structures of multidimensional constructs, and serve to enhance the performance of an athlete.

Past researchers have gained insights on mental toughness by focusing on athletes from various sporting disciplines. For example, Bastug (2018) investigated racket sports athletes while Zeiger and Zeiger (2018) studied endurance athletes. Studies like these have enabled researchers to determine the attributes of a great athlete compared to a mediocre one, and how psychological strength feeds into it. Truelove (2014) claimed that an athlete could be trained to become mentally tough; hence, resulting in the development of specific mental toughness training programs for athletes. Mental toughness is characterized by specific psychological skills, which have been proven to benefit athletes. These include relaxation, mental imagery, goal setting, and self-talk. The training programs or interventions did not clearly show a positive impact on the performance of athletes. Nevertheless, athletes admitted having better self-confidence, better control of anxiety during competitions, and better performance, as a result of the interventions (Truelove, 2014). To assess 'mental strengths and weaknesses', Loehr (1986) developed an inventory, which, according to Kuan and Roy (2007), could enhance an athlete's understanding and awareness of his mental skills. One mechanism for developing the mental toughness of athletes is to incorporate Psychological Skills Training (PST) as part of athlete training (Omar-Fauzee et al., 2013).

Most of the definition and attribution of characteristics of mental strength and weakness have been projected several instruments to measure personality construct which related to general Most of the definition and attribution of characteristics of mental strength and weakness have been documented in several instruments to measure personality constructs related to general sport-related behaviors (Hardy, Roberts, Thomas, & Murphy, 2010) and specific psychological skills (Abdelbaky, 2012). Psychological factors that contribute to the successful performance of an athlete can be determined via a psychological assessment. However, Beckmann and Kellmann (2003) added that these assessments must adhere to methodological standards. For instance, the instruments used in the assessment should have established construct validity and reliability. Although past quantitative researches have provided numerous measurements for mental toughness components, it is still important to conduct integrative measurements to obtain more efficient psychometric measurements. One example is to design questionnaires that are shorter with a focus on only the essential components of mental toughness to lessen the burden when it comes to repeating the measurements. In turn, the effects of training can be tracked more effectively. Another example is to use only universal, robust components that could also be used across multiple sports disciplines in time-limited or resource-scarce scenarios, during group assessments, or at the early stages of mental training. Based on the above, the Psychological Performance Inventory (PPI) has been found to fulfill these example criteria; it has huge potential as a tool for assessing and developing mental toughness and has been employed in many studies. Nevertheless, Golby, Sheard, and Van Wersch (2007) and Middleton et al. (2004) claimed that to date, very limited studies that have assessed the reliability and validity of PPI.

In addition, Gucciardi and Gordon (2011) pointed out that most mental toughness studies have been done in Western countries, and hence contextualized to Western culture. Despite the prevalence of Western studies in this area, some studies have been conducted in Asian countries such as Malaysia (Kuan & Roy, 2007; Nizam, Omar-Fauzee, & Abu Samah, 2009), India (Patel, Pandey, & Saxena, 2011), and the Philippines (Juan & Lopez, 2015). However, there are some exceptions to these studies, depending on how target groups and local researchers perceived the concept of mental toughness. In spite of the prevalent use of PPI around the world, to date, no study has yet attempted to translate PPI into the Malay language. The

translation of PPI into the local language is considered essential so that the respondents' feelings, thoughts, perceptions, states of mind, and behaviors, which make up their mental toughness profile, can be precisely documented. Past studies have underlined careful planning and rigorous and comprehensive adoption of only the most established methodological approaches as mandatory requirements before embarking on the process of the translation, adaptation, and cross-cultural validation of an instrument for use in other cultures, languages, and countries (Beaton, Bombardier, Guillemin, & Ferraz, 2000; Jones, Lee, Phillips, Zhang, & Jaceldo, 2001).

Each culture may interpret a phrase or word differently. Hence, during the translation process in this study, the author ensured the questionnaire validity by considering the cross-cultural adaptation and linguistics of the questionnaire. In particular, this study aims to translate and validate the original English version of the PPI into Malay. Therefore, in order to reduce the translation problems that may occur, Vallerand's approach, which outlines some recommendations to ensure the quality of translation, was adopted (Banville, Desrosiers, & Genet-Volet, 2000).

METHODS

Based on the objectives of this study, translation involves a linguistic process, as well as the analysis and harmonizing of cultural elements that could influence the results of the Malay version of the instrument. This will make it workable because the results of the adapted questionnaire may be reliably and meaningfully compared when used in different cultures. This psychometric study was conducted among netball players who are consistently training under the supervision of a designated coach by a sports-school administration.

Participants

A total of 25 netball athletes, aged 15 to 16 years old, participated in this study. The sample was drawn from only one sports school in Malaysia. The athletes were told that there is no right or wrong answer for all statements in the questionnaire. The inventory was distributed to the athletes on weekdays before their training session. The athletes provided an informed consent form to take part in this study. As the subjects were under 18 years of age, each had to also provide written parental and guardian consent to participate in this study. Once informed consent was received, the subjects were reassured of their right to withdraw at any time in accordance with the code of ethics. The instruction from the researcher was enclosed in the questionnaire as a reminder to answer all items.

Instruments

Based on the reasons above, this study chose the Psychological Performance Inventory (PPI). PPI was developed to determine the respondent's overall mental toughness score using a forty-two item scale and seven six-item subscale scores: a) confidence in oneself (having the knowledge that one is capable of success and excellent performance); b) control of negative energy (one is capable of handling negative emotions such as frustration, fear, or anger, and can cope with events that are out of one's control); c) control of attention (one is able to focus); d) visualization and imagery control (one is able to remain optimistic by picturing oneself as such); e) motivation (one is willing to persevere); f) positive energy (one still enjoys and has fun); and g) control of attitude (one is always optimistic). The total scores that a respondent could obtain ranges from 42–210, where a desirable subscale score is 30 and the lowest subscale score is 6. A five-point Likert scale was used with 1-Almost always to 5-Almost never.

Translation Procedure of Psychological Performance Inventory (PPI)

In accordance with the literature, the translation procedure was conducted in 2 phases: Phase 1 consisted of the questionnaire translation to Malay, content validity establishment, and conducting the pilot test. Meanwhile, the psychometric assessment (reliability analysis, internal consistency analysis, and test-retest reliability analysis) was conducted in Phase 2 (Banville et al., 2000). The same procedure was also applied in Banville et al. (2000) in the field of health, fitness, and recreation and Araya-Vargas, Gapper-Morrow, Moncada-Jiménez, and Buckworth (2009) in the area of exercise psychology; both were used as a foundation for the translation and cross-cultural validation of PPI in this study. However, some modifications were done so the process would suit the aims of this study.

Specifically, the process involved seven steps: 1) preliminary version preparation; 2) preliminary version evaluation and experimental version preparation; 3) conducting the pretest; 4) content validity and concurrent validity evaluation; 5) reliability evaluation; 6) construct validity evaluation; and 7) norm establishment. Nevertheless, only Step 1 to Step 4 were conducted in this study while Step 6 and Step 7 were omitted since the objective of the study does not include demonstrating construct validity or establishing norms (Streiner, Norman, & Cairney, 2015) (presented in the Appendix—Figure 1).

Phase 1:

Step 1 – Preparation of Preliminary Versions

The technique recommended in this step is the back-translation technique, which requires four bilingual persons. In this study, four translators, A, B, C, and D, were invited to participate in this study. They consisted of bilingual language experts and bilingual university professors who have experience and are knowledgeable in the area of sports and exercise psychology, physical education, and sports science. Two language experts were also employed to ensure the translated version would be grammatically and terminologically correct. Meanwhile, content experts also assisted in this work to ensure that the meanings and content of the original PPI are preserved. First, two translators (A and B) translated the original version into the Malay language. Having two persons perform the translation in parallel avoids any bias as opposed to only one person conducting the process. The process of translation was carefully done with an emphasis on the preservation of content and meaning. The translators were instructed to ascertain the meaning of each statement rather than word-for-word translation. Once translators A and B finished, their versions were compared. If differences were found, the translators would engage in a discussion to arrive at a consensus.

Of the 42 statements, only four questions were translated exactly the same by translators A and B (i.e. Question number 8, 15, 5, 26) (presented in Appendix—Table 1). Among the other 38 statements, seven required further discussion because of some English words that had no equivalent in the Malay language (e.g., "can perform," "when confused," "get spacey" or "genuine"). After the translators had discussed the most difficult words, the statements were written so the original meaning would be preserved while respecting the Malay language grammar and syntax. As for the 31 remaining statements, A and B judged them to be similar, although the words used varied slightly. The wording of each item was adjusted so that athletes of 15 years or older would be able to understand. In these cases, A and B compared both versions and agreed to keep one, or collaboratively created a new version using a mixture of both in order to produce the best statement.

The Malay language version of this collaborative work was then given to two other bilingual persons (C and D) to back-translate it to English again. C and D had never seen the original version. Then, two independent translators compared the translated version with the original version to detect any differences.

Step 2 – Preliminary Version Evaluation and Experimental Version Preparation

In this step, the Malay-English translated version by C and D were compared with the original version to spot any similarities. The evaluation was performed by a committee consisting of five persons—C and D, two other bilingual people, A and B, and one research assistant (a Master's student in Sports Science, to keep the committee focused). The purpose of the committee was to prevent possible biases that could arise with only a single researcher. If the meaning of the "retranslated" statement was the same as the original, the translated statement was kept; if the meaning was different, the committee would revise the translated version so when retranslated in English, its meaning would be similar to the original version. Once all revisions have been made, an experimental version was produced.

In this study, no statement from C and D, when compared with the original, was identical. However, the committee determined that 33 statements (78%) had the same meaning. The 9 remaining statements (Malay language, original, and retranslated) were closely analyzed by the committee, and modifications were made to the Malay language statements so the meaning of the Malay language and original statements would be the same while still respecting the Malay language syntax. To identify probable issues of comprehension among the target population, a temporary draft of the Malay-language questionnaire was prepared for trial measurement.

Step 3 – Experimental Version Pretest

This step required the involvement of a subject from a representative sample. The important thing was that the representative subject embodied the respondents' characteristic. The subjects first answered the experimental version and indicated directly on the questionnaire words or expressions they did not understand or felt uncomfortable with by underlining them. If the statements were unclear, the subjects were asked to write down their suggestions to clarify the statement directly next to the statement. Sousa, Hartman, Miller, and Carroll (2009) recommended a sample size of 10-40 subjects. In this step, a pilot study was carried out with 25 athletes from one sports school representative in one region that met the required study criteria. Out of the 42 statements, one of the players marked eight questions, while more than one marked five questions and less. Each statement that received a comment was examined by the committee and modified, if necessary.

The three steps thus far describe the complete translation aspect of the study methodology. The next steps focus on tests to ensure the validity and reliability of the PPI Malay Version (PPI-M) when applied in the new culture.

Phase 2:

Step 4 – Face Validity Evaluation

Validity is defined as the degree to which a test measures what it needs to measure (Winter, 2000). It determines whether the research fully ensures what it was intended to measure or how truthful are the research. To ensure validity, the researcher needed to identify assumptions or make arguments to justify an inference or use for a specific purpose and then collect evidence to support these assumptions (Hagger & Chatzisarantis, 2009). No statistical test is associated with content validity since it is a qualitative assessment of the content (Berg & Latin, 2008). The content validity can be established by administering PPI-M questionnaire to the committee to assess the accuracy of the translated statements by measuring the concept associated with each statement. Thus, this study was conducted the face validity rather than the content validity. Based on the background of the experts involved in the translation and cultural adaptation process for this study, it was expected in the sense that almost all the terms used in the original as well as the back translation from Malay to English are perfectly match expressed by all committee member. The committee was reviewed, discussed, and modified the

questionnaires to address the problems noted, if any. In this case, the meaning of the original statement and the Malay Language statements had to be identical by going through a rigorous process and should perform according to guidelines and standards for the translation and cultural adaptation. Five individuals of varying backgrounds subsequently reviewed the preliminary final Malay Version of the PPI. This rigorous process found to have a high level of face validity, at which point the committee review stage was complete.

Step 5 – Reliability Evaluation

If the total population under study is accurately represented and there is consistency in the results of the study over time, then, reliability is confirmed. Furthermore, Heale and Twycross (2015) claimed that a research instrument will be reliable if the results of a study could be reproduced under a similar methodology. To ensure that the questionnaires were correlated, and the measures have interim consistency reliability, a reliability test was carried out (Table 2). The finalized Malay language version of PPI was tested for its reliability. To assess the internal consistency within each subscale of the version, an internal consistency technique was used.

Table 2: The Summarization of Reliability Tests on PPI-M

Internal Reliability	Test-retest Reliability
• Reliability refers to the extent to which it is free from random error. Coefficient Alpha or Cronbach's Alpha was used to measure the concept of consistency reliability. • The coefficient varies from 0 to 1. The level of internal consistency of Cronbach's alpha value are acceptable within .5 to .7 and shows a good level if it is more than .7 (Streiner et al., 2015).	• Test-retest reliability is obtained by repetition of the same measure on a second occasion (Sekaran & Bougie, 2016). • The terms test-retest comes from a questionnaire containing some items that are supposed to measure a concept is administered to a set of respondents for a certain time, and again to the same respondents, thus the test-retest coefficient is the correlation between the scores obtained at the two different times from one and the same set of respondents. The higher it is, the better the test-retest reliability and consequently, the stability of the measure across time (Sekaran & Bougie, 2016). • An acceptable level of reliability using a Pearson correlation is .70 (Stemler & Tsai, 2008).

Data Collection

Data was collected during weekdays as agreed upon with the school principal. Subjects were approached before their training session for both the pilot study and the actual study. The PPI-M was distributed among the subjects. A total time of 10 minutes was allocated for the respondents to complete the questionnaire. Two months later, the same participants completed the PPI-M questionnaire again. Then, the reliability of the survey questionnaire was measured. Data analysis was conducted with assistance from the IBM Statistical Package of the Social Sciences (SPSS) Software version 22. Examination of the relevance of statements in each variable in the survey was the main aim for conducting the reliability test. Reliability analysis consists of two different kinds of analysis: internal reliability and test-retest reliability.

RESULTS AND DISCUSSIONS

The reliability of the PPI was assessed using Cronbach's alpha index (for Likert-type scales). Cronbach's alpha and total item correlation were used to determine the internal consistency reliability of PPI-M. Results from the pilot study showed that Cronbach's alpha value for PPI-M ranged from .66 to .84 (Table 3). Reliabilities of .70 or better (but not much beyond .80) for

basic research and between.90 and.95 were recommended in cases where important decisions are to be made based on the test scores (Streiner et al., 2015). However, in the Social Sciences, a value of.70 or higher is a widely accepted value for a set of items to be included in a scale (Peat, Mellis, & Williams, 2002). Meanwhile, the reliability of individual scales would be high or moderate when the alpha values are.66 to.84 (Safrit & Wood, 1995); an alpha value between.65 –.95 (Chua, 2006) indicates an adequate scale.

As for individual scales, the Cronbach's alpha values in this study were slightly higher, compared to those in the original version, from.42 to.82. Besides, in the original version, the coefficient was lower for the negative energy subscale than the recommended value, for which Cronbach's alpha was.42. Thus, no further amendment to the PPI-M was required and the questionnaire was used for the actual study.

Table 3: The Comparison of Reliability Coefficients for Each Domain Between Original version and Malay Version of PPI

Domain	Item	Numbers of items	Cronbach Alpha (translation-BM)	Cronbach Alpha (Original)
Self-confidence	1, 8, 15, 22, 29, 36	6	.84	.69
Negative energy	2, 9, 16, 23, 30, 37	6	.74	.42
Attention control	3, 10, 17, 24, 31, 38	6	.73	.75
Visual and imagery control	4, 11, 18, 25, 32, 39	6	.66	.82
Motivational control	5,1 2, 19, 26, 33, 40	6	.81	.70
Positive energy	6, 13, 20, 27, 34, 41	6	.68	.71
Attitude control	7, 14, 21, 28, 35, 42	6	.81	.71
All items		42	.94	

Reliability Analysis

Internal Reliability for Mental Toughness

The validity and reliability of the questionnaire forms can be determined using a reliability test. Therefore, Cronbach's alpha was calculated for each attribute in the domain as part of the reliability analysis, where the actual study consisted of 46 subjects.

Berg and Latin (2008) claimed that a value of above.7 should be the ideal Cronbach's alpha coefficient for a scale. Streiner et al. (2015) stated, however, that a Cronbach's alpha value of.5 to.7 still indicates an acceptable level of internal consistency while a value of.7 means that the items have good internal consistency. The Cronbach's alpha for this study indicated acceptable internal consistency for all items in each scale although Cronbach's alpha for mental toughness during pre-intervention ranged from.65 to.85 (Table 4).

Meanwhile, the Cronbach's alpha for every domain of mental toughness during post-intervention was greater than.7 except for "visualization and imagery control" and "positive energy"; hence all items in each scale were confirmed to have good internal consistency. Two domains, however, approached.7, but this still indicated that the instruments are reliable for the study.

Table 4: Reliability Analysis for Mental Toughness during pre and post-intervention

Domain	No of Items	Pre- intervention	Post-intervention

		Cronbach Alpha	Cronbach Alpha
Self-confidence	6	.851	.749
Negative energy	6	.609	.792
Attention control	6	.647	.747
Visualization and Imagery Control	6	.721	.685
Motivation	6	.794	.762
Positive Energy	6	.675	.669
Attitude control	6	.748	.767

Test-retest Reliability for Mental Toughness

Test-retest reliability was conducted for mental toughness since it involves two time periods (pre- and post-intervention) and assists in identifying the correlation between the scores obtained at the two different times. A value of 0 to 1 is considered the normal range for this correlation coefficient (r) where the scale will be more reliable with a larger value of r. Polit and Beck (2010) posited that stable test measurements and no significant change in a measured construct (compared to two administrations of the scale) will result with a sufficiently large correlation coefficient.

As per Table 5, Pearson's correlation coefficient was.86, thus indicating that the score is better and the stability of the measure across time is ensured.

Table 5: Test-Retest Reliability Analysis for Mental Toughness

Across time	n	Pearson's correlation
Pre-score - Post-score	46	.862*

*Note: $p \leq .01$

DİSCUSSİONS

Using an existing questionnaire will save time and resources (Boynton & Greenhalgh, 2004). However, PPI that measures the mental toughness construct of interest is not available in all languages required for targeted respondents. As a result, the researcher may need to translate an existing one into the language of the intended respondents. Prior work has highlighted the literature available on psychometric principles, methodological concepts, and techniques regarding questionnaire translation and validation. To that end, the results of reliability and the validity of measurement are crucial because it is not sufficient to simply develop an equivalent questionnaire or produce a literal translation.

To maintain content validity, the questionnaire must be adapted for cultural differences and must have a good linguistic translation (Epstein, Santo, & Guillemin, 2015). Conversely, validation ensures that both the original version and the translated version of the questionnaire have the same equivalent properties for measuring constructs. To ensure that the questionnaire integrity is retained, cross-cultural adaptation was performed. This is because when two languages have non-equivalent words, translation can become problematic. Most importantly, different cultures may have different interpretations of words or phrases in the questionnaire that seem similar and this could alter the meaning of the questionnaire items from originally intended in the original version, making it a crucial aspect to be considered. Malaysia consists of multi-ethnic groups, with Malay being the native language. Therefore, this study translated PPI into Malay, as it is intended for use in Malaysia.

Items in a questionnaire will have response consistency and stability if it is reliable, which, in turn, contributes to its validity. To determine whether or not the items measure the same thing, one of the components of reliability, internal consistency, was used. Cronbach's alpha coefficient is the most common estimation of internal consistency (Yang & Green,

2011). The Malay version of PPI (PPI-M) demonstrated reliability and validity as a tool for measuring mental toughness comparable to the English version PPI, as shown by the Cronbach's alpha results obtained in this study. Furthermore, all 42 items were found to measure the same 7-subscales consistently, and, in turn, measured mental toughness concepts reliably.

Nevertheless, this is an exploratory analysis, which must be tested via the application of the PPI-M on a larger sample. However, the generalizability of the questionnaire could be limited from being applied to other regions in Malaysia because the study was carried out at a single sports school. Despite this fact, this limitation may not severely affect generalizability because the individuals studied are from the same demographic groups in Malaysia and therefore apply to the youth athlete criteria.

CONCLUSIONS

In conclusion, the present study has made two significant contributions to the field of Exercise Science and Psychology: 1) developed an adequate inventory for initiating cross-cultural studies applying the concept of mental toughness, and 2) performed a translation procedure, which may be applied for other inventories as well. Although translating a questionnaire is no easy task, the processes outlined in this article should enable researchers to develop questionnaires that are comprehensive and effective for the target population.

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APPENDİX

Jamatul Shahidah Shaari, Lim Boon Hooi, Jamilah Ahmad Radzi, Siswantoyo,
Sri Sumartininggsih & Nor Eeza Zainal Abidin