Original article

TRANSLATION AND VALIDATION OF THE THAI VERSION OF THE ATHLETIC MENTAL ENERGY SCALE (AMES-T)

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ABSTRACT

This study aimed to translate and to validate the Athletic Mental Energy Scale (AMES) into Thai version. In study 1, we investigated the content validity by inviting 15 participants (sport/ language experts= 5; athletes= 10) to examine the appropriateness of the content of a translated AMES-Thai. In study 2, the sample included 572 Thai student-athletes from University teams in Thailand (62.8% men and 37.2% women) who participate in various sports, both individual and team, and have a mean age of 19.7 years. Moreover, we examined the factorial structure and reliability of the AMES-Thai using confirmatory factor analysis (CFA) and reliability analysis. In study 3, the sample included 442 Thai student-athletes from university teams in Thailand; we investigated the convergent and discriminant validity via correlations among the AMES-Thai and athletes' stress, positive state of mind, and burnout. AMES-Thai had a moderate-to-high positive correlation with athletic mentality, reflecting the convergence validity of the Thai version of the AMES as having factors from the same structure as the original version. Results showed that the 6-factor, 18-item AMES-Thai had adequate validity and reliability. We recommend that Thai scholars and sports professionals use the AMES-Thai for future research and practice.

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นิพนธ์ต้นฉบับ

การแปลและความเที่ยงตรงของแบบวัดพลังงานของจิตใจในการเล่นกีฬาฉบับภาษาไทย

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บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อแปลและหาความเที่ยงตรงของแบบวัดพลังงานของจิตใจในการเล่นกีฬาฉบับ
ภาษาไทย ในการศึกษาที่ 1 ตรวจสอบความถูกต้องของเนื้อหาโดยเชิญผู้เข้าร่วม 15 คน (ผู้เชี่ยวชาญด้านจิตวิทยาการ
กีฬา/ภาษา=5; นักกีฬา=10) เพื่อแปลและตรวจสอบความเหมาะสมของเนื้อหาของแบบวัดพลังงานของจิตใจในการเล่น
กีฬาฉบับภาษาไทย ในการศึกษาที่ 2 กลุ่มตัวอย่างคือ นักศึกษา-นักกีฬา 572 คนจากทีมมหาวิทยาลัยในประเทศไทย
(ชาย 62.8% และหญิง 37.2%) ผู้เข้าร่วมเล่นกีฬาหลากหลายประเภท ทั้งประเภทบุคคลและประเภททีม และมีอายุเฉลี่ย
19.7 ปี ตรวจสอบการยืนยันทางโครงสร้างและความน่าเชื่อถือของแบบวัดพลังงานของจิตใจในการเล่นกีฬาฉบับ
ภาษาไทยโดยการวิเคราะห์องค์ประกอบเชิงยืนยันและหาความเชื่อมั่น ในการศึกษาที่ 3 กลุ่มตัวอย่าง คือ นักเรียน-
นักกีฬา 442 คนจากทีมมหาวิทยาลัยในประเทศไทยทำการตรวจสอบความความสัมพันธ์ระหว่างแบบวัดพลังงานของ
จิตใจในการเล่นกีฬาเป็นฉบับภาษาไทย กับความเครียดของนักกีฬา สภาพจิตใจเชิงบวก และความเหนื่อยหน่ายซึ่งพบว่า
แบบวัดมีความสัมพันธ์เชิงลบกับความเครียดในชีวิตเฉพาะด้านกีฬา ความเครียดในชีวิตโดยทั่วไป และความเหนื่อยหน่าย
นอกจากนี้แบบวัดพลังงานของจิตใจในการเล่นกีฬาฉบับภาษาไทยยังมีความสัมพันธ์เชิงบวกในระดับปานกลางถึงสูงกับ
สภาพจิตใจที่เป็นนักกีฬาซึ่งสะท้อนถึงความถูกต้องที่บรรจบกันของแบบวัดพลังงานของจิตใจในการเล่นกีฬาเป็นฉบับ
ภาษาไทยว่ามีปัจจัยเหล่านี้มาจากโครงสร้างเดียวกันกับแบบวัดต้นฉบับ ผลการวิจัยพบว่าแบบวัดพลังงานของจิตใจใน
การเล่นกีฬาเป็นฉบับภาษาไทยที่ประกอบด้วย 6 ปัจจัย 18 ข้อคำถามมีความถูกต้องและเชื่อถือได้เพียงพอ ซึ่งขอแนะนำ
นักวิชาการและผู้เชี่ยวชาญด้านกีฬาชาวไทยสามารถนำแบบวัดพลังงานของจิตใจในการเล่นกีฬาเป็นฉบับภาษาไทยไปใช้
เพื่อการวิจัยและฝึกฝนเพิ่มเติมในอนาคตได้

(วารสารวิทยาศาสตร์และเทคโนโลยีการกีฬา 2566; 23(1): 36-51)

คำสำคัญ: พลังงานของจิตใจ/ จิตวิทยาความเป็นเลิศด้านกีฬา/ การตรวจสอบข้ามวัฒนธรรม/ ประสิทธิภาพสูงสุด

INTRODUCTION

In the world of athletics, if any athlete wants to be at the top of their sport, they must train intensively, prepare under the best physical and psychological conditions, and perform consistently and flawlessly during the competition[1]. Many outstanding athletes are famous not only for their extraordinary skills but also for their psychological state during competition[2]. Many researchers have reported that the optimal psychological elements of calmness, concentration, confidence, and an insatiable desire to win are key components to athletic success [3, 4, 5].

Jim Loehr[6] proposed a pyramid model of energy to depict how different types of energy contribute to athletes' peak performance. In his model, the base is physical energy, with emotional energy at the second level and athletes' mental energy at the third level; spiritual energy sits at the top of all types of energy. Mental energy is considered to be very important because it relates to athletes' higher-order functioning, including abstract thinking, awareness, and self-regulation[6].

In order to explore athletes' optimal psychological states in sports, Lu and his colleagues[4] developed a concept they labeled "athletic mental energy (AME)" and defined it as "an athlete's perceived existing state of energy which is characterized by its intensity in motivation, confidence, concentration, and mood." Lu and colleagues[4] used 6 studies to develop a 6-factor, 18-item Athletic Mental Energy Scale (AMES).

In the AMES, the emotional factors of vigor, tirelessness, and calmness seem to be very meaningful for elite athletes[3, 7, 8, 9]. The other important components of the AMES are confidence, motivation, and concentration, which are cognitive in nature. In terms of motivation, sport psychology has indicated that many athletes achieve their best because they have an insatiable desire to succeed[10]. Additionally, self-confidence is also an important factor in elite sports. Generally, self-confidence is defined as one's beliefs about whether one can successfully accomplish a given task; much research in sports has indicated that self-confidence is a significant predictor of athletic success[11, 12]. Therefore, the AMES comprises both cognitive and affective components—including vigor, calmness, tiredness, concentration, confidence, and motivation.

Over the course of 6 studies, Lu and colleagues[4] demonstrated that the AMES is adequate and reliable. For example, in their[4] study 5, they administered the AMES to 78 Malaysian martial artists one day before a national tournament; then, they collected the participants' wins and losses from the tournament. Using a logistic regression statistical analysis, they found that the subscales of the AMES (i. e. , confidence, motivation, tirelessness, and calmness) predicted the competition outcomes.

Despite the AMES's usefulness in predicting athletic performance, unfortunately no such measure is available in Thailand. Since Thailand's first participation in the Olympic Games in 1952, Thailand has won 33 medals. The most famous sports in Thailand are boxing, taekwondo, and weightlifting: Thai athletes have won a total of 9 gold medals in these two events[13]. If Thai researchers can use the AMES in Thailand, they would be able to investigate the relationship between Thai athletes' mental energy and their performance. Moreover, they can use this measure as a counseling tool for understanding Thai athletes' mental energy states before a competition.

Thus, we sought to translate the AMES into Thai and examine its psychometric properties. We followed Cohen and Swerdlik's [14] suggestions for validating a psychological test. In study 1, we used back-translation to make an AMES draft and examine its content validity. In study 2, we examined the factor structure and basic indices of the scale's reliability. In study 3, we investigated the scale's convergent and discriminant validity by examining the relationships connecting athletic mental energy, athletes' life stress, athletes' positive state of mind, and athlete burnout.

STUDY 1

The objective of study 1 was to translate Lu and colleagues' (Lu et al., 2018) AMES into Thai and to investigate its content validity.

Methods

Participants.

Participants were 4 experts in Thai, English, and sports psychology, along with 1 native English speaker. In addition, we invited 10 student-athletes to read the final version of the translated AMES.

Procedures

We adopted a forward- and back-translation process, in line with Birslin's (1970) suggestions, to translate all 18 items of the AMES into Thai by following steps. In step 1 (forward translation), two bilingual translators who are proficient in English and sport psychology were asked to translate the AMES into Thai. Then, two translators compared each translated version and discussed the differences, after which they revised, discussed, and reached consensus on the AMES-Thai version. In step 2 (back translation), two news experts who are proficient in Thai, English, and sport psychology were invited to translate the AMES-Thai into English. In step 3, one native English speaker compared the original AMES and the back-translated English AMES-Thai to see whether there were any differences between the two. In addition, two Thai co-authors and the native English speaker discussed the semantic meanings of the translated AMES from English to Thai, after which they made a final version of the AMES-Thai. All of the translation procedures are illustrated in Figure 1.

After these three steps, we invited 10 Thai student-athletes to read the contents of the AMES-Thai, and we asked them to comment on the contents of the scale. Finally, we made final minor revisions after the 10 student-athletes' feedback.

Results of study 1

The final version of the AMES-Thai reflected the original meaning of the AMES. Particularly in the last step of the back-translation, the native English speaker gave us much valuable feedback about the original AMES and the back-translated English AMES-Thai. We accepted his suggestions, revising several points to make it clear and understandable. In addition, we adopted Jones and colleagues'[15] suggestions to examine the cultural equivalence, functional equivalence, item equivalence, and scalar equivalence of the scale (here, the AMES-Thai). Furthermore, we checked comprehension via an interview process with 10 student-athletes about the meanings and understanding of the items of the questionnaire; we asked questions like "When you finished reading this questionnaire, how much did you understand, and what did it mean?" This process used 'interview and explain'. The student-athletes reported that they had no difficulty reading and understanding the content of the final version of the AMES-Thai in terms of fluency, clarity, and understandability. Thus, we prepared the AMES-Thai for field testing.
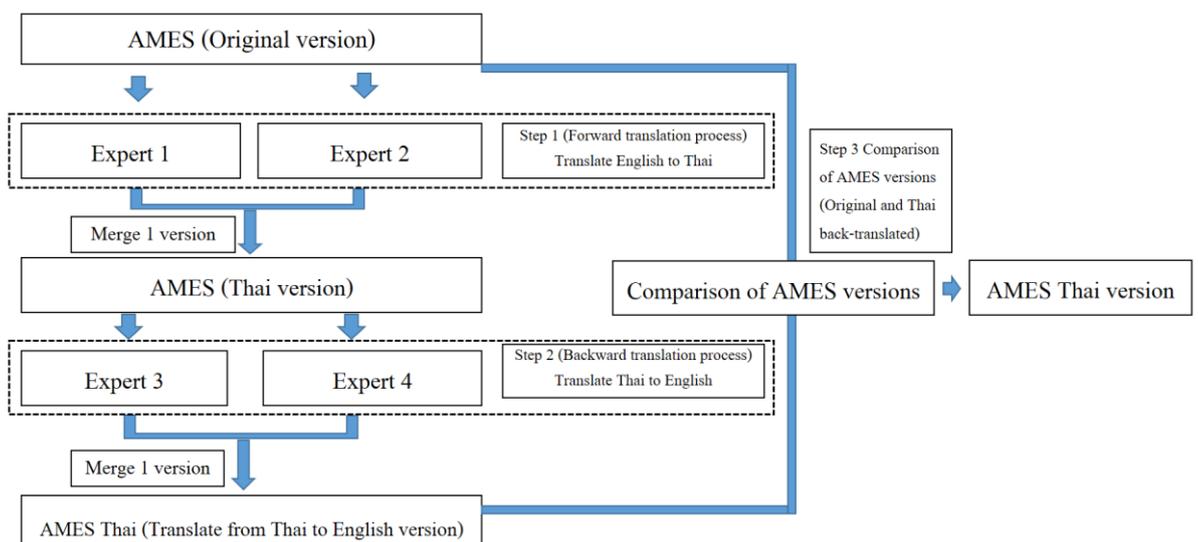

Figure 1 Forward- and back-translation procedures

Conclusion of study 1

The objective of study 1 was to translate the English AMES into Thai and to examine its content validity. Using a cross-cultural questionnaire translation approach, the researchers focused on translation techniques, choosing both forward-translation and backward-translation (as these together are better than one-step translation) and employing translators who are proficient in both languages and are familiar with both cultures. In addition to having experience in translating research scales, at the end of each step of the translation, the quality of the equivalence of the translated scale was compared with the original scale.

In addition, before using a translated measure, researchers must verify the quality of both the validity and the reliability of the translated measure. Research measures of sufficient quality can actually measure what needs to be studied, making the research results reliable and valid for the target population. We drafted an AMES-Thai with appropriate content validity; thus, we developed a basic scale to assess athletic mental energy through field testing in Thailand.

However, we still need other reliability and validity indices to confirm the psychometric properties of the AMES-Thai. To do so, we conducted study 2.

STUDY 2

The objective of study 2 was to examine the reliability and the factor validity of the AMES-Thai.

Methods

Participants.

We sampled 572 Thai student-athlete participants (male=359, female=213) from 12 universities with a mean age of 20.12 ± 1.58 years and an average experience in sports of 6 years. They play different team sports (including football, basketball, volleyball, futsal, hockey, beach volleyball, handball, sepak takraw, rugby, cricket, and softball) and individual sports (including taekwondo, track and field, wrestling, boxing, Thai boxing, shooting, tennis, swimming, pétanque, badminton, pencak silat, and e-sports). The number of days they spent training was 4.8 days per week at 3.2 hours of training per day. We adopted Comrey and Lee's (1992) suggestions for recruiting enough participants: according to Comrey and Lee (1992), a sample size of 500 cases is sufficient for confirmatory factor analysis (CFA).

Measurements & Procedures.

Before collecting data, we gained ethical approval from the Burapha University Human Research Ethics Committee (HU 138/2563).

We collected the data via online questionnaire (QR code). We gained consent from those volunteered to participate: if they agreed, we sent the QR code for completing the questionnaire; if not, we continued to recruit people.

Tools

Athletic Mental Energy Scale-Thai (*AMES-Thai*). The AMES-Thai assesses participants' perception of their existing energy state. The AMES-Thai includes 6 factors—motivation, confidence, concentration, vigor, tirelessness, and calmness—and three items for each factor. A sample question for each factor is provided: (a) I feel there is endless energy coming from my body (vigor); (b) I can control all sports movements and skills (confidence); (c) I feel excited for future competitions (motivation); (d) Even when the training is over, I still feel I have endless energy to use (tirelessness); (e) I am free of distraction during competition and training (concentration); and (f) Even when facing a tough opponent, I don't feel anxious (calmness). Participants read each item and identified their perceptions on a 6-point Likert scale ranging from 1 (not at all) to 6 (completely).

Statistical Analyses.

We analyzed descriptive information of the data, including means, standard deviations, skewness, kurtosis, and outliers, to check whether there is abnormal data. We assessed the reliability using Cronbach's alpha. We used AMOS version 22 statistical software to perform a CFA analysis (factor validity) using the following criteria suggested by Cheung and Rensvold (2002): the χ2/DF ratio (between 1–3); the goodness of fit index (GFI, greater than 0.90); the comparative fit index (CFI, greater than 0.90); the root mean square error of approximation (RMSEA, less than 0.08); and the standardized root mean square residual (SRMR, less than 0.05).

Results

We found no outliers, and the mean of all items was between 4.05–4.89 (SD= 0.93–1.24); the skewness was approximately -1.12–0.25 (kurtosis=.11–1.09). Thus, the preliminary analyses indicated that the raw data fit the statistical assumptions. The results revealed that the estimate was less than 3, which met the assumption of multivariate normality[16]. In addition, the results from the Pearson product-moment correlation analysis found that all items were correlated (r=.31–.79): an *r* value of + 1.00 or -1.00 indicates perfect predictability of one score when the other is known[17].

Table 1. Item Analysis of the18-item AMES-Thai

	High vs low	N	M	SD	t-value
AMESt1	1	167	3.23	1.288	-14.05**
	2	155	4.94	.865	
AMESt2	1	167	3.71	.958	-16.28**
	2	155	5.18	.639	
AMESt3	1	167	3.41	1.048	-18.71**
	2	155	5.17	.583	
AMESt4	1	167	3.86	1.199	-12.38**
	2	155	5.25	.784	
AMESt5	1	167	3.72	.931	-17.57**
	2	155	5.28	.652	
AMESt6	1	167	4.19	1.283	-6.53**
	2	155	5.07	1.111	
AMESt7	1	167	4.07	1.309	-11.59**
	2	155	5.43	.738	
AMESt8	1	167	3.31	1.040	-17.27**
	2	155	5.05	.763	
AMESt9	1	167	3.27	.915	-20.63**
	2	155	5.10	.662	
AMESt10	1	167	4.03	1.337	-12.93**
	2	155	5.51	.607	
AMESt11	1	167	3.29	.919	-18.91**
	2	155	5.01	.712	
AMESt12	1	167	3.01	.997	-21.09**
	2	155	5.01	.693	
AMESt13	1	167	3.53	.870	-20.00**
	2	155	5.15	.556	
AMESt14	1	167	3.41	1.082	-16.70**
	2	155	5.09	.658	

AMESt15	1	167	3.71	.872	-19.06**
	2	155	5.26	.556	
AMESt16	1	167	3.81	1.225	-13.32**
	2	155	5.25	.641	
AMESt17	1	167	3.46	1.016	-15.13**
	2	155	4.99	.794	
AMESt18	1	167	3.60	1.086	-12.29**
	2	155	4.97	.90	

Note: #1. **p<.01;

#2. 1= low score group; 2=high score group

Moreover, we found significant differences between those scored who scored higher than 75% and those who scored lower than 25% for all items, as Table 1 illustrates. This demonstrates that all of the AMES-Thai's items can differentiate between high scorers and low scorers (Kline, 1998). Moreover, as Figure 1 illustrates, the measurement model of the AMES-Thai indicated that a 6-factor, 18-item scale was satisfactory (χ^2/DF = 149.76, CFI = .99, GFI = .97, RMSEA= .004, SRMR = .003). The composite reliability for each subscale was found to be: vigor (.71), confidence (.80), motivation (.63), concentration (.57), tirelessness (78), and calmness (.79). The average variance extracted was found to be: vigor (.58), confidence (.66), motivation (.52), concentration (48), tirelessness (.64), and calmness (.65); these were all above the acceptable standard (.25).

Conclusion of study 2

We examined the factor structure of the AMES-Thai for the nomological validity of the 6-factor, 18-item AMES-Thai. The item analysis showed that the overall quality of the items of the AMES-Thai was adequate.

STUDY 3

The objective of study 3 was to examine the correlations between the AMES-Thai, college student-athletes' life stress, and college student-athletes' burnout.

Methods

Participants and procedures.

The number of student-athletes at universities in Thailand is 20,000 (data from The Sun Games 2020 (rsu.ac.th)). We used the Yamane table to determine our sample size. The proportion of traits of interest in the

population was 0.5, and the confidence level was 95%. We determined that a sufficient sample size was 392 participants.

We recruited a new sample (i.e., separate from study 2) from 15 universities across Thailand. In total, 442 student-athletes (male = 282, female = 160, M age =20.04 years, SD = 1.76) participated in this study.

Measures

Athlete Burnout Questionnaire (ABQ) [18]. The 3-factor, 15-item ABQ measures athletes' experiences of burnout. The scale has three subscales: reduced sense of athletic accomplishment (RA); perceived emotional and physical exhaustion (E); and devaluation of sports participation (D). To assess participants' burnout experiences, we asked them to read each item and identify their agreement with the statement using a six-point Likert scale ranging from 1 (never) to 6 (always). The reliability for each factor was: devaluation of sports participation (α = .89); reduced sense of athletic accomplishment (α = .86); and perceived emotional and physical exhaustion (α = .64). Except for the subscale of perceived emotional and physical exhaustion, the reliability coefficients were satisfactory.

Athletic Positive State of Mind Scale (APSMS) [19]. When people are under stress, they experience anxiety, depression, and hostility. In contrast, when an individual is in a positive state of mind, they feel positive moods such as caregiving, pleasure, and sharing. The one-factor APSMS includes 5 items: maintaining responsibility, attentional focus, productivity, restful repose, and sensual pleasure. These six major elements include attentional focus, productivity, maintaining responsibility, restful repose, and sensual pleasure. The Cronbach's α of the APSMS in this study was .86.

College Student-Athletes' Life Stress Scale (CSALSS). We used Lu and colleagues'[20] 8-factor, 24-item CSALSS to evaluate participants' daily life and sports-specific life stressors. The 24-item CSALSS includes questions about challenges student-athletes encounter in everyday life. The CSALSS has 8 factors: sports injury; performance demands; coach relationships; training adaptation; interpersonal relationships; romantic relationships; family relationships; and academic requirements. To assess participants' life stress, we asked them to identify the frequency of an event on a 6-point Likert scale ranging from 1 (never) to 6 (always). The Cronbach's α of the two factors in this study ranged from .88 to .92, indicating that the CSALSS was reliable.

Statistical Analyses.

To examine the convergent and discriminant validity, the statistical software SPSS 18.0 was used to analyze the correlations between the AMES-Thai and the APSMS, the CSALSS, and the ABQ.

Results

Table 2: The bivariate correlations of AME-Thai, APSMS, ABQ, and CSALSS.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.AMES-Thai	*.92*													
2.APSMS	.62*	*.86*												
3.ABQ	.00	.00	*.87*											
4.CSALSS-sport	.03	-.10*	.49**	*.88*										
5.CSALSS-life	-.02	-.18*	.45**	.69*	*.92*									
6.AME-Vi	.83**	.60**	-.02	-.31*	-.12*	*.73*								
7.AME-Cof	.86**	.61**	-.03	-.24*	-.06	.72**	*.73*							
8.AME-Mot	.80**	.69**	-.05	-.14*	-.12	.69**	.69**	*.83*						
9.AME-Tir	.83**	.49**	-.01	-.31*	-.14*	.61**	.64**	.38*	*.77*					
10.AME-Con	.83**	.54**	-.01	-.25*	-.05	.60**	.59**	.54*	.41*	*.77*				
11.AME-Cal	.80**	.41**	-.03	-.15*	-.01	.56**	.39**	.54*	.46*	.67*	*.73*			
12.ABQ-RA	-.40*	-.36*	.27**	.39*	.20*	-.40*	-.35*	-.33*	-.21*	-.25*	-.22*	*.64*		
13.ABQ-E	-.12*	-.07	.89**	.45*	.41**	-.14*	-.04	-.12	-.36*	-.13*	-.11	.54*	*.89*	
14.ABQ-D	-.05	-.07	.90**	.40*	.49**	-.09	-.07	-.29*	-.21*	-.21*	-.16*	.63*	.68*	*.86*
Mean	78.72	26.85	44.23	38.42	32.03	4.63	4.42	4.55	4.07	4.22	4.21	12.04	13.33	16.71
SD	12.86	4.98	9.27	12.40	13.66	0.83	0.81	0.85	0.93	0.91	0.89	2.20	4.24	4.81

Note. * $p < .05$;

[1]Cronbach alphas are presented on the diagonal as bold font.

[2]AME=total score of athletic mental energy; APSMS=athletic positive state of mind scale; ABQ=total score of athlete burnout questionnaire; CSALSS-sport = sport-specific life stress; CSALSS-life = general-life stress; AME-Vi = vigor; AME-Cof = confidence; AME-Mot = motivation; AME-Tir = tireless; AME-Con = concentration; AME-Cal= calm; ABQ-RA= reduced sense of athletic accomplishment; ABQ-E= emotional and physical exhaustion; ABQ-D= devaluation of sports participation.

As Table 2 shows, the correlations of the AMES-Thai with the other measures showed that the AMES-Thai was either negatively correlated with sport-specific life stress, general life stress, and burnout, or else demonstrated no correlations, reflecting the discriminant validity of the AMES-Thai. Moreover, the AMES-Thai had moderate to high positive associations with an athletic state of mind, which reflected convergent validity. All six factors of the AMES-Thai had high correlations with the composite score of the AMES-Thai (ranging from .80 to .86), thus revealing that these factors derived from the same construct.

Conclusion of study 3

The objective of study 3 was to provide further evidence of the psychometric properties of the 6-factor, 18-item AMES-Thai in terms of its convergent validity and discriminant validity with the CSALSS, APSMS, and ABQ. We found that the 6-factor, 18-item AMES-Thai is positively correlated with a positive state of mind and negatively correlated with life stress and burnout (i.e., discriminant validity). The AMES-Thai shows adequate factorial structure, nomological validity, discriminant validity, and reliability. However, the construct validity used test scores and criterion scores simultaneously.

General Discussion

In the main, the 6-factor, 18-item AMES-Thai maintained the same 6-factor structure of the original AMES[4]. Moreover, the Thai version (vigor = 0.71, confidence = 0.80, motivation = 0.63), concentration = 0.57, tirelessness = 0.7, and calmness = 0.79) has similar confidence values as the original version [4] (vigor = 0.51, confidence = 0.60, motivation = 0.67, tiredness = 0.73, concentration = 0.68, and calm =0.72).

In particular, the results concerning the convergent validity and the discriminant validity echo the theoretical explanation and empirical studies in sport psychology[21, 4]. The results of the convergent validity analysis found that athletic mental energy was positively correlated with student-athletes' positive state of mind; this is a meaningful theory. According to Horowitz and colleagues[22], a positive state of mind involves having a positive mood and being productive, creative, and free of worry, depression, and hostility. Thus, the convergent validity results provide a significant finding that athletes who experience high mental energy also have a highly positive state of mind.

The results of the discriminant validity analysis also support past research, showing that athletes high in athletic mental energy are low in life stress[4] and burnout[21]. Specifically, Chiu and colleagues found that high athletic mental energy decreased the relationship with athletes' stress-burnout. Thus, sports professionals need to boost athletes' mental energy, not only to enhance their performance but also to promote their overall well-being.

The other implication of this study's findings is the cross-cultural validation. Sun and colleagues[23] contended that culture influences one's values and attitudes, which in turn affect one's emotional responses and behavior. Markus and Kitayama[24] also contended that culture has a strong influence on perceptions about self and others. Thus, careful procedures are needed when introducing an existing psychological measure to another culture. In addition, research has suggested[25, 26] that much adaptation and validation are needed when transferring an existing concept and/or measure to another culture; this includes appropriate translation and field testing.

Additionally, we performed 3 studies to obtain solid indices of reliability and validity. All of these efforts ensured that we developed a valid and reliable psychological measure to use in Thailand.

Limitations and Suggestions for Future Research

Several limitations must be addressed. First, although the AMES-Thai succeeds in its initial psychometric indices, it still needs more work in the future. It has been suggested that any development of a psychological measure is a never-ending procedure[14]; a psychological measure always needs more work to confirm its validity

and reliability. In this context, for example, we did not examine the AIMS-Thai's measurement invariance; therefore, we suggest that future studies examine the measurement invariance of the AMES-Thai across gender or sport type. Furthermore, our study sampled college student-athletes as participants; whether our results can be generalized to adolescent athletes or to professional athletes needs to be further examined. Moreover, because athletic mental energy is a "state-like" experience, it may change from day to day with certain physical conditions (e.g., fatigue). However, we did not examine the test-retest reliability. We suggest that future studies examine other reliability indices, such as inter-method reliability and half-split reliability[27].

For future investigations, we suggest that Thai researchers use the 6-factor, 18-item AMES-Thai to examine whether there is an association between athletic mental energy and other psychological variables, such as psychological skills, mental toughness, and rehabilitation. In addition, we suggest that Thai researchers use the AMES-Thai to examine its prediction of athletic performance in different sports.

In terms of application, we recommend that Thai coaches, sports administrators, and sport psychology consultants use the AMES-Thai to assess Thai athletes' mental energy states before a competition. Additionally, they can use the AMES-Thai to diagnose Thai athletes' mental energy after heavy training; in doing so, they can offer appropriate suggestions for coaches. For enhanced athletic mental energy, Lu and colleagues (Lu et al., 2018) stated that adequate life management, proper sports training, and psychological skills training can enhance athletes' athletic mental energy.

General conclusion

The Thai version of the Athletic Mental Energy Scale had adequate validity and reliability. The AMES is relevant to sport psychology and can influence athletes' investment in sports training and competition. Those with low AMES scores can be expected to perform low in sports engagement[4].

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แบบสอบถามพลังงานจิตใจของนักกีฬา

คำสั่ง: ด้านล่างมีคำสั่ง 18 ข้อที่อธิบายว่า "คุณรู้สึกอย่างไรตอนนี้" ในการฝึกซ้อม / การแข่งขันกีฬา กรุณาวงกลมหมายเลขที่แสดงถึงความรู้สึกส่วนใหญ่ของคุณที่คุณรู้สึก		ไม่รู้สึกเลย	ไม่ค่อยรู้สึก	รู้สึกน้อย	ปานกลาง	รู้สึกมาก	รู้สึกมากที่สุด
1	ฉันรู้สึกได้ถึงจิตวิญญาณที่ไม่ยอมแพ้ง่ายๆ ที่จะทำทุกอย่างในกีฬา	1	2	3	4	5	6
2	ฉันรู้สึกว่ามีพลังงานที่ไม่มีที่สิ้นสุดมาจากภายในร่างกายของฉัน	1	2	3	4	5	6
3	ฉันรู้สึกว่า ฉันสามารถชนะการแข่งขันทั้งหมดได้ในอนาคต	1	2	3	4	5	6
4	ฉันรู้สึกตื่นเต้นในการแข่งขันในอนาคต	1	2	3	4	5	6
5	ไม่มีสิ่งใดที่จะรบกวนฉันได้ในการแข่งขัน	1	2	3	4	5	6
6	ไม่มีสิ่งใดที่จะเข้ามากวนใจฉันได้ในระหว่างการฝึกซ้อม	1	2	3	4	5	6
7	ไม่ว่าการฝึกจะใช้เวลายาวนานแค่ไหนฉันก็ไม่รู้สึกเหนื่อย	1	2	3	4	5	6
8	ฉันเต็มไปด้วยความหลงใหลในกีฬาที่ฉันเล่น	1	2	3	4	5	6
9	ฉันสามารถเคลื่อนไหวและใช้ทักษะของฉันได้อย่างเป็นอัตโนมัติ	1	2	3	4	5	6
10	ฉันไม่มีความฟุ้งซ่านในระหว่างการแข่งขันและการฝึกซ้อม	1	2	3	4	5	6
11	แม้การแข่งขันจะจบลงไปแล้ว ฉันก็ยังรู้สึกว่าฉันมีพลังงานเหลือเฟือที่จะใช้ต่อไป	1	2	3	4	5	6
12	แม้การฝึกซ้อมจะเสร็จแล้ว ฉันก็ยังรู้สึกว่าฉันมีพลังงานเหลือเฟือที่จะใช้ต่อไป	1	2	3	4	5	6
13	ฉันสามารถควบคุมการเคลื่อนไหวและทักษะได้อย่างดี	1	2	3	4	5	6
14	เมื่อเผชิญกับคู่แข่งในการแข่งขัน ฉันจะมีความรู้สึกสงบนิ่ง	1	2	3	4	5	6
15	ทั้งในระหว่างฝึกซ้อมหรือแข่งขัน ฉันรู้สึกถึงพลังงานที่เต็มเปี่ยม	1	2	3	4	5	6
16	ฉันต้องการแสดงให้ผู้อื่นเห็นว่า ในการเล่นกีฬาฉันยอดเยี่ยมที่สุด	1	2	3	4	5	6
17	เมื่อต้องเข้าแข่งขัน ฉันไม่รู้สึกถึงความกังวลใจ	1	2	3	4	5	6
18	เมื่อต้องเผชิญกับคู่แข่งที่แข็งแกร่งกว่า ฉันไม่ได้รู้สึกว่ามันคือความกดดัน	1	2	3	4	5	6