Validity of the Brunel Mood Scale for use with Malaysian athletes

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Abstract
The aim of the present study was to investigate the factorial validity of the Brunel Mood Scale for use with Malaysian athletes. Athletes (N = 1485 athletes) competing at the Malaysian Games completed the Brunel of Mood Scale (BRUMS). Confirmatory Factor Analysis (CFA) results indicated a Confirmatory Fit Index (CFI) of .90 and Root Mean Squared Error of Approximation (RMSEA) was 0.05. The CFI was below the 0.95 criterion for acceptability and the RMSEA value was within the limits for acceptability suggested by Hu and Bentler (1999). We suggest that results provide some support for validity of the BRUMS for use with Malaysian athletes. Given the large sample size used in the present study, descriptive statistics could be used as normative data for Malaysian athletes.

Key words: Emotion, mood, affect, psychometrics, testing, construct validity.

Introduction

Evidence demonstrates that athletes report experiencing intense feelings before, during and following competitive sport (Lane, 2007; Terry and Lane, 2000; Terry et al., 1999, 2003). Feeling states such as emotions and mood are typically assessed using self-report scales and of the available research, the Profile of Mood States (McNair et al., 1971) has been one of the most widely used. The POMS is a single adjective checklist and as such, it cannot distinguish whether the subjective feeling state is a mood or an emotion (Beedie et al., 2005). The POMS assesses six mood states: anger, confusion, depression, fatigue, tension, and vigor.

The original POMS was developed and validated for use in clinical settings before researchers began to use it to assess mood states of athletes. Subsequent studies have demonstrated that scores on the POMS are; a) predictive of performance (Beedie et al., 2000), b) useful indicators of over-training (Berger et al., 1999), and c) related to changes in environmental factors such as altitude, heat and cold (Lane et al., 2004). Further, normative data for use in sport has been developed (Terry and Lane, 2000).

However, research has pointed out that the 65-item POMS can appear lengthy for research in situations where brevity is paramount. One such situation is shortly before competition where it is important not to disturb the athlete's normal pre-competition behavior. With this purpose in mind, Terry et al. (1999) developed a short version of the POMS, originally for use with adolescents, but later validated for use with adult athletes (Terry et al., 2003).

Terry et al (1999, 2003) argued that comprehensibility was a key aspect of brevity. To ensure that this was the case, Terry et al. (1999) checked the comprehensibility of items by asking participants rate the relative ease in which participants could understand the meaning of the items. Terry et al. (1999) found the 24-item 6-factor measure was supported through single and multisample confirmatory factor analysis. It should be noted that the name of the scale was changed from the Profile of Mood States-Adolescents to the Brunel Mood Scale (BRUMS: Terry et al., 2003). Its name was revised as validation has been conducted among adults and restriction to adolescents was no longer appropriate. From herein the scale is referred to as the BRUMS.

Subsequent research that has tested the factor structure of the BRUMS has been supported in specific-sports such as wakeboarding (Fazackerley et al., 2003) and among special populations, namely adolescents with intellectual disability (Argus et al., 2004). The scale has also been cross-validated for use with Hungarian, Italian (Lane, Soos et al., 2007) and Malaysian athletes (Hashim et al., 2010). The BRUMS has also shown predictive validity (Lane and Chappell, 2001; Lane et al., 2001), and be responsive to the effects of exercise (Lane and Lovejoy, 2001). Further, the BRUMS has been used in applied settings in the screening of athletes (Galambos et al., 2005) and normative data for use with athletes has been developed for use with UK athletes (Terry and Lane, 2010). In terms of normative data for use with non-UK samples, Hashim et al (2010) recruited 355 athletes only, whereas the original validation studies used samples in excess of 600. The aim of the present study was to continue the validation of the BRUMS for use in Malaysian athletes.

Methods

Participants

Volunteer participants were 1485 (Male, N = 929, Age M = 19.17, SD = 2.49; Female, N = 556, Age M = 18.35, SD = 2.58) athletes who participated in Malaysia Games 2010. Participants were drawn from the following sports: Aquatic (n = 7), archery (n = 80), athletics (n = 56), badminton (n = 55), basketball (n = 34), beach volleyball (n = 10), bowling (n = 16), canoe (n = 11), cycling (n = 89), equestrian (n = 9), fencing, (n = 36), football (n = 48), golf (n = 3), hockey (n = 180), judo (n = 27), kabaddi (n = 50), lawn bowling (n =105), netball (n = 56), petanque (n = 64), rhythmic gymnastics (n = 10), rugby (n = 56), sailing (n = 72), sepaktakraw (n = 113), shooting (n = 14), silambam (n = 49), silat (n = 128), squash (n = 13), table tennis (n = 13), tennis (n = 9), volleyball (n = 35), weight lifting (n = 32), and wushu (n = 5).

Measure

The 24-item Brunel Mood Scale (BRUMS: Terry et al., 1999; 2003) has six factors with four items in each factor. Examples of tension items include "worried" and "anxious"; anger items include "furious" and "bad-tempered". Examples of fatigue items include "worn out" and "exhausted"; vigor items include "lively" and "energetic". Examples of confusion items include "mixed-up" and "uncertain", and depression items include "miserable" and "downhearted". Items were rated on a 5-point scale anchored by "not at all" (0) to "extremely" (4).

Translation procedure

The following procedure was followed to translate the version in Malaysian (see Kuan, 2007; Khani et al., 2009). Three experts who were competent in both English and Malay language with a psychology background translated the English versions of Brunel Mood Scales (BRUMS) to Malay. Following this another three experts translated back the questionnaire from Malay versions to English (back-translation). The original and the back-translation were further compared by an individual who was proficient in both languages.

To examine the content validity, five people who were competent in psychology rated the clarity of each item in the translated version using a 4-point rating scale as follows: *1 = Not clear; 2 = Fairly clear; 3 = Clear; 4 = Very clear.* The content validity index (CVI) was computed for each with results demonstrating a CVI of over 80% for each item (Kani et al., 2009).

Procedure

Data were collected during the *Malaysian Games* (also known as 'Sukan Malaysia' in Malay language). The Research Committee of National Sports Institute of Malaysia granted permission to collect data. Participants completed the BRUMS one day prior to the event.

Data analysis

Confirmatory factor analysis (CFA) using EQS V7 (Bentler and Wu, 1995) was used to test the model, which specified that items were related to their hypothesized factor with the variance of the factor fixed at 1. Consistent with theoretical predictions and previous empirical support, the latent factors anger, confusion, depression, fatigue, tension and vigour were allowed to correlate. We used the two-index strategy for assessing model fit namely the Comparative Fit Index and the Root Mean Square Error of Approximation (RMSEA), which indicates the mean discrepancy between the observed co variances and those implied by the model per degree of freedom, and therefore has the advantage of being sensitive to model complexity. For the RMSEA a value of .05 or lower indicates a good fit and values up to .08 indicate an acceptable fit (Browne and Cudeck, 1993). Byrne (1998) described the RMSEA as "one of the most informative criteria in structural equation modelling" (p. 112). For the CFI, Hu and Bentler (1999) suggested that values should approach 0.95.

Results

Multivariate kurtosis results indicated that assumptions of normal distributed were violated (Mardia's coefficient = 278; Normalized Estimate = 151). Data were estimated using the Satorra-Bentler maximum likelihood estimation method. CFA results indicated a significant $X^2 = 1120$, $_{df} = 237$, $p < 0.001$. The CFI was 0.90, hence the below the 0.95 criterion for acceptability. The RMSEA value was 0.05 and therefore within the limits for acceptability. Scrutiny of parts of the model that were strong and parts that are weak was conducted through examination of factor loadings and correlations between factors (see Table 1). As Table 1 indicates, factor loadings for items are within a relatively narrow range, ranging from 0.46 to 0.79. Therefore, none of the items demonstrated a weak relationship with its hypothesized factor. Alpha coefficients for each factor are within acceptable limits (see Table 2). Normative data are presented in Table 3.

Table 1. Descriptive statistics and factor loadings for items on the BRUMS

	Mean	SD	Factor loading
Tension			
Panicky	.65	.82	.50
Anxious	1.11	1.03	.78
Worried	.86	.99	.81
Nervous	1.16	1.01	.63
Anger			
Annoyed	.55	.94	.71
Bitter	.35	.73	.67
Angry	.50	.90	.65
Bad tempered	.61	.95	.50
Depression			
Depressed	.85	.93	.67
Downhearted	.48	.88	.69
Unhappy	.43	.82	.65
Miserable	.41	.75	.58
Fatigue			
Worn out	.55	.80	.65
Exhausted	.56	.80	.75
Sleepy	.92	1.05	.63
Tired	1.16	1.01	.58
Vigor			
Lively	2.86	1.00	.52
Energetic	2.98	1.03	.75
Active	2.88	1.06	.80
Alert	2.19	1.29	.46
Confusion			
Confused	.81	.91	.56
Muddled	.44	.79	.69
Mixed- up	.47	.74	.74
Uncertain	.95	1.03	.48

Significant correlation coefficients were reported for each relationship tested. As Table 2 indicates, strong relationships emerged among anger, confusion, depression, fatigue and tension with relatively weak inverse relationships reported between the same subscales and vigor.

Discussion

Demonstration of validity is a fundamental part of science. The present study continued the validation of the BRUMS by extending validity for use with Malaysian

Table 2. Alpha values, descriptive statistics and correlation matrix for BRUMS subscales

	Alpha	M	SD	Anger	Tension	Depression	Fatigue	Vigor
Anger	.72	2.02	2.64					
Tension	.77	3.77	2.96	.62 *				
Depression	.74	2.18	2.55	.96 *	.64 *			
Fatigue	.70	3.20	2.76	.79 *	.64 *	.83 *		
Vigor	.71	10.90	3.21	-.24 *	-.22 *	-.33 *	-.27 *	
Confusion	.70	2.67	2.53	.90 *	.74 *	.91 *	.82	-.26 *

* p < 0.01

athletes. This extends recent work that has extended validity of the BRUMS to different populations including a recent study that tested its validity among Malaysian athletes (Hashim et al., 2010). The present study extends this work by using a much larger sample, a feature of the research that is helpful when developing a dataset that could be used as the basis for norms. Results were supportive of recent research to the extent that the factor structure of the scale was largely supported and the weakest aspect of the model was the confusion scale, and particularly the item "Uncertain". Recent research has argued that confusion is more of a cognitive rather than affective state and could be excluded from the measure on these grounds alone (Lane et al., 2007). Although confusion demonstrated strong relationships with other subscale scores, it is possible that feeling confused could be an antecedent or consequence of an emotional state rather than part of it. In a study that extended an extended version of the BRUMS (by including two additional factors: calmness and happiness), Lane et al. (2007) removed confusion on the basis of the arguments presented. Hashim et al. (2010) found the item uncertain demonstrated weak loadings with confusion, and cross-loaded it with tension. The nature of the item uncertain could feasible be a part of the tension scale, particularly as tension is also characterized by feeling nervous and worried. Tension is closely related to anxiety and uncertainty about goal pursuit is central to this concept. It should be noted that other items in the subscale have less affective tone (mixed-up, muddled, and confused).

It should be noted that the research strategy was to test the hypothesized six-factor model originally supported by Terry et al. (1999). Recent research tested the Malay version of the BRUMS against alternative models such as a single and two-factor model (see Hashim et al., 2010). This approach was not followed in the present study as it is argued that combining the unpleasant states in the POMS into a single factor can result in a loss of information. For example, an athlete might feel angry but not fatigued if the anger is a consequence of an argument with a coach. Equally, an athlete might feel fatigued as a consequence of a hard training session but not report feeling anger. We suggest that researchers and practitioners alike use the independent subscales, even though, as in the case of the present study, they can be strongly interrelated.

In terms of the direction of inter-correlations between subscales, results are consistent with those reported by Terry et al. (1999; 2003). However, inter-correlations among BRUMS subscales are stronger than those reported by Terry et al, an observation that can be applied to each correlation. It should be noted that Terry et al. found vigor did not relate significantly to confusion, anger and tension whereas intercorrelations between in the present study showed an inverse relationship. Further, in the CFA conducted by Terry et al, the correlation between vigor, anger, confusion and tension was set to zero. A comparison of descriptive statistics with those reported by Terry et al demonstrates that participants in the present study reported significantly higher scores of depressed mood. Depressed mood has been shown to influence the intensity of other mood states and strengthen the correlation among independent mood states (Lane, 2007). Lane (2007) summarized studies that tested the Lane and Terry (2000) model that show that when participants report symptoms of depression, the correlation between independent mood states increases; that is, if a participant reports feeling depressed, he also tends to report feeling

Table 3. Normative data for the BRUMS among Malaysian athletes (N = 1485)

	Tension	Anger	Depression	Fatigue	Vigor	Confusion
0	37	42	41	38	16	39
1	41	46	45	42	19	43
2	44	50	49	46	22	47
3	47	54	53	49	25	51
4	51	58	57	53	29	55
5	54	61	61	57	32	59
6	58	65	65	60	35	63
7	61	69	69	64	38	67
8	64	73	73	67	41	71
9	68	76	77	71	44	75
10	71	80	81	75	47	79
11	74	84	85	78	50	83
12	78	88	89	82	53	87
13	81	92	92	86	57	91
14	85	96	96	89	60	95
15	88	99	100	93	63	99
16	91	103	104	96	66	103

confused, angry and tense.

However, before applying this logic to the present study it is important to consider possible cultural differences. It is possible that Malaysian athletes report their feelings on subscales such as depression more freely than those in a Western country (see Mastor et al., 2000). Lane and Terry (2000) reported that the norm for the depression scale of the BRUMS in Western countries is zero; that is, participants report the lowest score possible for all items. This representation of their feelings might be accurate, but it is possible that an individual will recognize that reporting to feel depressed is not consistent with a cultural norm that advocates feeling high scores for pleasant emotions such as excitement (i.e., those items on the vigor scale). We suggest that future research is needed to investigate processes underlying the nature of self-report; that is explore how individuals process information in order to rate how they are feeling. Two key areas are important here; the first is the extent to which people have accurate insights to how they are feeling. Evidence suggests that people vary in their ability to recall and assess emotion related experiences (Petrides et al., 2007). We suggest that interviews with might offer some insight whether an individual is genuinely in the way reported in the scale. The second is that research should look to explore the meaning people attribute to such emotions. Recent research in sport psychology has started to emphasize the importance of exploring cultural factors (Schinke and Hanrahan, 2009). We suggest that this be extended to examining the nature of emotions in different cultures and the research should begin with examining validity issues as validity is such an important aspect of the scientific process.

The importance of exploring cultural factors is a growing line of investigation in sport psychology (see Schinke and Hanrahan, 2009; Terry, 2009). Terry (2009) suggested that the belief systems of different cultures vary and influence client-practitioner interactions and as such could influence how emotions are expressed and regulated. In fact, there has been a recent growth in research investigating the influence of culture on emotions and emotion regulation (Mesquita and Albert, 2007). The way in which people appraise the environment or stimuli is proposed to be important in subsequent emotional experiences (Mesquita and Albert, 2007).

At least three suggestions emerge for researchers and practitioners from the present study. The first is that researchers and practitioners alike can use the BRUMS with greater confidence. The second is that descriptive statistics can be used to produce normative data which can help practitioners interpret raw scores. A limitation of the sport psychology literature is that few scales have normative data on which to interpret scores despite the development of norms being advocated as best practice (Anastasi and Urbina, 1997). The third is that research should use qualitative methods to explore the nature of emotions and mood states within each culture.

Conclusion

In conclusion, findings offer some support for the validity of the BRUMS for use with Malaysian athletes and normative data is present. We suggest future research should look to explore the nature of emotion and mood in different cultures.

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Key points

- Findings from the present study lend support to the validity of the BRUMS for use with Malaysian athletes.
- Given the size of the sample used in the present study, we suggest descriptive data be used as the normative data for researchers using the scale with Malaysian athletes.
- It is suggested that future research investigate the effects of cultural differences on emotional states experienced by athletes before, during and post-competition.

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