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Factorial Validation of Malaysian Adapted Brunel Mood Scale in an Adolescent Sample

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Abstract

Purpose: **The present study investigated the psychometric properties of a Malaysian adapted Brunel Mood Scale.**

Methods: **The questionnaire was administered to 355 young sport athletes with a mean age of 14.69 + 1.70 years. Confirmatory factor analysis (CFA) and Cronbach's alpha were used to determine the factorial validity and the internal consistency of the questionnaire respectively.**

Results: **CFA results revealed adequate model fit, best represented by a 6-factor model with one of the items removed (item 24). Internal consistency of the questionnaire was marginally supported through alpha reliability method. Alpha coefficients of 0.72, 0.64, 0.73, 0.69, 0.65, and 0.58 were obtained for tension, depression, anger, vigour, fatigue and confusion subscales respectively. Closer inspection of items for confusion revealed a 'problematic' item (item 24/uncertain). Removing this item increased the alpha coefficient to 0.67 for this subscale.**

Conclusion: **It was concluded that this questionnaire may be used to measure differentiated negative and positive mood states among Malaysian adolescent athletes. However, further analyses involving independent samples are needed to confirm the present findings.**

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INTRODUCTION

The construct of mood has been the subject of interest for many sport psychology researchers[1, 2]. This is evident from the number of researches that have been conducted in this area[3]. The interest in mood states research is in part due to the belief that athletes' performance success could be predicted on the basis of their mood states[4]. It was postulated that performance success is associated with higher positive moods and lower negative moods. Specifically, a view exists suggesting that successful athletes possess a unique profile of mood states which is known as the iceberg profile. This profile, resembling an iceberg, reflects higher scores on vigour (positive mood), and lower scores on tension, depression, anger, fatigue, and confusion (negative moods)[4].

Despite encouraging findings from previous researches supporting this notion, several studies have shown equivocal findings regarding mood-performance relationship. For instance, in a meta-analysis study examining the predictive utility of the iceberg profile, Rowley et al[5] revealed a small effect size of mood profile in predicting levels of achievements. Moreover, in a more recent meta-analysis, Beedie et al[6] have revealed a similar finding.

The equivocacy of the findings in the mood-performance literature has been attributed to several factors including methodological inconsistency and measurement difficulties, especially the use of different mood measures[1,7]. In ensuring consistency in the interpretation of the findings from the present study, we considered mood as dynamic and "non-specific psychological dispositions to evaluate, interpret and act on past, current or future concerns in certain patterned ways"[8]. Although mood has been conceptualized from several frameworks, the present study conceptualized mood as unipolar dimensions including vigour, tension, anger, depression, fatigue and confusion.

Following Lane and Terry[2], positive mood (i.e., vigour) is conceptually defined as energized feelings and alertness. In terms of negative mood states, depression is referring to feelings of worthlessness and hopelessness. Furthermore, fatigue is typified by physical and mental tiredness whereas confusion is characterized by feelings of disorientation and uncertainty. Moreover, anger refers to feelings varying in intensity such as mild annoyance to fury and rage while tension is referred to feelings such as nervousness and apprehension[2].

In line with this conceptual framework, a commonly used instrument to measure mood states is the Profile of Mood States (POMS)[9]. Despite its popularity, it has been criticized over its appropriateness to be used with younger participants as well as the brevity required in completing the measure[7]. Profile of Mood State-Adolescents (POMS-A;[7]), which is a 24-item measure of mood states among adolescents was developed in response to these limitations. Similar to POMS, POMS-A assesses 6 subscales as follows: anger, confusion, depression, fatigue, tension and vigor. Based on multi-sample analyses, Terry and colleagues[7] reported strong psychometric properties of this questionnaire. More recently, the utility of this questionnaire has been extended to adult samples and consequently, has been renamed Brunel Mood Scale (BRUMS)[10].

Since its initial development, BRUMS has been a precursor to many studies, such as Jakson and Lane[11] and Lane et al.[12]. Besides, it has been adapted into Malaysian language, but no validation studies have been conducted to determine the psychometric properties of this adapted version. Given that BRUMS[10] was originally developed with English as the medium of instruction, adaptation of this measurement scale in Malaysian samples necessitates further assessment of its psychometric properties for at least two reasons. Firstly, the present study would provide evidence of the psychometric properties of the Malaysian adapted version of BRUMS[10], which represents an important step for stimulating further mood states related research in Malaysia. Secondly, a valid adapted version can provide Malaysian researchers with psychometrically sound tool to access respondents with difficulties understanding English language[13]. Although a newer version of 32-item BRUMS[10] is now available[14, 15], we opted to adopt the 24-item version considering the wealth of mood related research that has been conducted using this version. Hence, we view that it may be more beneficial for understanding mood related issues among Malaysian athletes.

In summary, understanding the nature of mood may benefits athletes in reaching optimal performance. However, empirical findings have been inconsistent as far as mood-performance relationship is concerned. This inconsistency has been partly attributed to the conceptual inconsistency and measurement difficulty. Given the potential contribution of a psychometrically sound instrument, this study sought to investigate the psychometric properties of the adapted version of BRUMS[10], particularly its factorial validity and internal consistency. The research question being posed is how valid and reliable the existing Malaysian adapted version of BRUMS[10] is. We hypothesized that the adapted BRUMS[10] factorial structure and the reliability indices will reflect that of the original version. In testing this hypothesis, data using

Malaysian adapted BRUMS[10] were collected from adolescent athletes and confirmatory factor analysis and reliability analysis were performed.

METHODS AND SUBJECTS

The present cross-sectional study was designed to examine the factorial validity and reliability of the Malaysian adapted BRUMS[10].

Subjects:

Adolescent athletes (N=355) from one of the eastern states of Malaysia participated in the study. From the total sample, 60% of the participants were male and 40% were female. The participants aged 13 to 18, with a mean age of 14.69±1.70 years. Majority of the participants involved in Taekwondo (65%). The remaining of the participants involved in football (10%), volleyball (5%), handball (5%), athletics (4%) and 11% in other sports such as cycling, rugby and sepak takraw. In exception of some of the Taekwondo players who involved in national level competitions, all other participants were limited to district level competitions. Heterogeneity of participants' skills should not be problematic because it fosters greater generalization of findings. Informed consent was obtained from the participants prior to administration of questionnaire. The sample size was determined on the basis of the recommended 10 participants per questionnaire item as suggested by Tabachnick and Fidell[16] for factor analysis. Thus, the total sample exceeded the minimal required sample size for BRUMS factorial validation analysis (i.e., 240 participants).

Brunel Mood Scale (BRUMS)[10]:

The Malaysian translated version of the BRUMS was used in the present study. It was based on the original instrument developed to serve as a brief measure of mood states among adolescent and adult populations. The BRUMS[10] contains 24 simple mood descriptors such as being angry, energetic, nervous and unhappy. Using a response timeframe of "how you feel right now?" respondents indicated whether they experienced such feelings on a 5-point scale (0 = not at all, 1 = a little, 2 = moderately, 3 = quite a bit, 4 = extremely). Questionnaire administration took about 5-10 minutes to complete.

Procedures:

Prior to data collection, permission to conduct the study was obtained from relevant authorities including the University Human Ethics Committee, the Ministry of Education and Training, the school Principals and the coaches. Participants were recruited through their respective coaches and the school Principals. In order to ensure a wide range of moods is represented in the sample, data collections were conducted in multiple settings such as before training and during regular classroom (45%) and 1 day before competition (65%). The data collection sessions were conducted by the second and the third authors. Before administering the questionnaire, participants were briefed regarding the purpose of the study. They were told that they would respond a series of adjectives describing their present moods. To avoid social desirability bias, they were informed that the survey was not for team selection and there were no right or wrong answers. They were also told that participation was voluntary and they might decline participation without any penalty.

Statistical Analysis:

Three statistical procedures were utilized. Descriptive statistics were used for data screening and descriptive data, while confirmatory factor analysis and Cronbach's alpha were used to examine the factorial validity and internal consistency of the questionnaire respectively. Maximum likelihood estimation procedure was used along with a range of fit indices to compare the models. The selected indices were the chi-square statistics (χ^2), goodness of fit index (GFI)[17], the root mean square residuals (RMR)[18] and the root mean square error of approximation (RMSEA)[19]. Furthermore, the expected cross validation index (ECVI) and the parsimony-adjusted CFI (PCFI) were also used. A good model fit is indicated by values of 0.90 or higher for the GFI[17]. The RMR provides an average difference between the variance of the sample and estimated populations. RMR values less than 0.05 reflect a close fit, while values of 0.1 or lower indicate reasonable fit for the RMR[18]. For the RMSEA, values of 0.05 or lower indicate close fit while values less than 0.08 indicate acceptable fit[19]. An index recommended for comparing models in smaller samples is the ECVI. Models with smaller values indicate the best potential of replication in samples of equivalent size and precision of the ECVI can be presented in confidence interval. Lastly, PCFI takes into account the complexity of the model when calculating goodness of fit. PCFI values above 0.70 have been considered as indicating good fit, with higher values indicating better fit[20].

Model testing followed a model building procedures as proposed by Kline[20]. Firstly, a 1-factor model was tested to explore the proposition that BRUMS[10] was best conceptualized as a measure of undifferentiated mood states. This was then followed by a 2-factor model consisting of positive and negative moods. Thereafter, a six factor model as in the original BRUMS[10] factor structure was tested (Fig. 1).

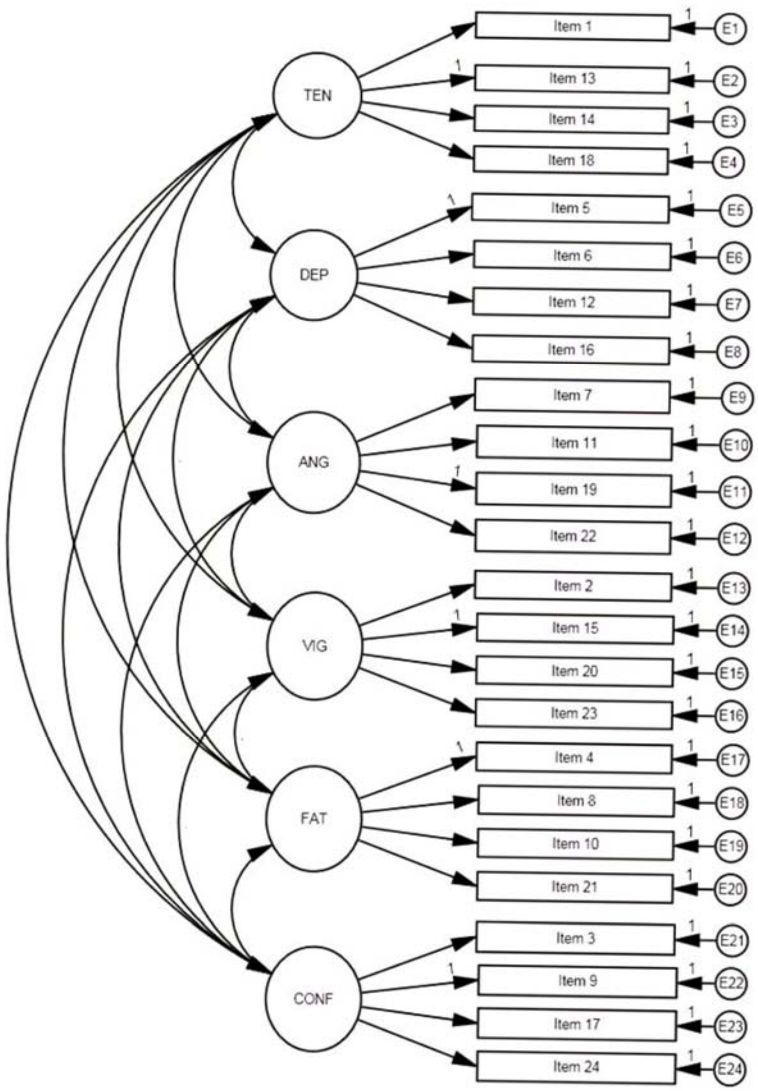

Fig. 1: Original BRUMS 6-factor Model

Note: TEN = Tension; DEP = Depression; ANG = Anger ; VIG = Vigour; FAT = Fatigue; CONF = Confusion

Table 1: Goodness of fit indices of the tested models

	χ^2	df	$\Delta\chi^2$	Δdf	χ^2/df	GFI	PCCFI	RMR	ECVI	RMSEA
1-factor	916.12	252	-	-	3.63	0.80	0.652	0.09	2.85	0.08
2-factor model	664.70	251	251.14*	1	2.64	0.85	0.75	0.06	2.15	0.07
6-factor model	478.42	239	168.34#	12	2.07	0.89	0.78	0.06	1.71	0.05
7-factor model	520.89	246	24.53‡	7	2.11	0.90	0.79	0.06	1.78	0.05
Modified 6-factor model♬	451.85	217	26.57†	22	2.08	0.90	0.77	0.05	1.16	0.05
Modified 7-factor model♬	490.58	224	30.31♯	22	2.19	0.89	0.78	0.05	1.68	0.06

* Compared to 1-factor model
# Compared to 2-factor model
‡ Compared to 6-factor model
†Compared to original 6-factor model
♯Compared to original 7-factor model
♫Modified 6-factor and 7-factor models implied removal of item 24 from the analysis

RESULTS

Prior to conducting the main analysis, the data was examined for accuracy, missing values and distributional properties. Missing values were minimal and mean substitutions were used where necessary. One-factor model was tested to explore whether BRUMS[10] was best represented as a measure of undifferentiated mood states among participants in this study. Given the fact that BRUMS[10] was designed to measure positive and negative moods, this model was expected to yield the worst model fit. Evidently, the results yielded inadequate fit of the model (Table 1).

Then, a two-factor model incorporating positive and negative moods was tested. The model fit indices yielded a significant model improvement ($\Delta\chi^2$=251.14; Δ df=1; P<0.001). However, GFI value was still below that of the recommended level. Given these findings, a six-factor model incorporating depression, tension, fatigue, anger, confusion and vigour was tested. A significant improvement in model fit was observed again ($\Delta\chi^2$ =168.34; Δdf =12; P<0.001). In fact, inspection of individual item loadings yielded significant loadings for all the items and the standardized regression weight revealed sufficiently high factor loadings implying support for convergent validity.

However, inspection of the latent factor inter-correlation revealed high subscales intercorrelation implying only partial support for discriminant validity of the subscales (Table 2). High latent intercorrelations indicated that the items measure a common factor in addition to its specific factors. Thus, to test this proposition, a 7-factor model was then tested. This model included an additional higher order latent factor on the negative mood factors (Fig. 2).

Table 2: Pearson *r* for BRUMS subscale scores

Subscales	Vigour	Depression	Tension	Confusion	Anger	Fatigue
Vigour	1	-0.19	-0.05	-0.20	-0.09	-0.23
Depression		1	0.72	0.91	0.92	0.82
Tension			1	0.84	0.63	0.52
Confusion				1	0.80	0.82
Anger					1	0.83
Fatigue						1

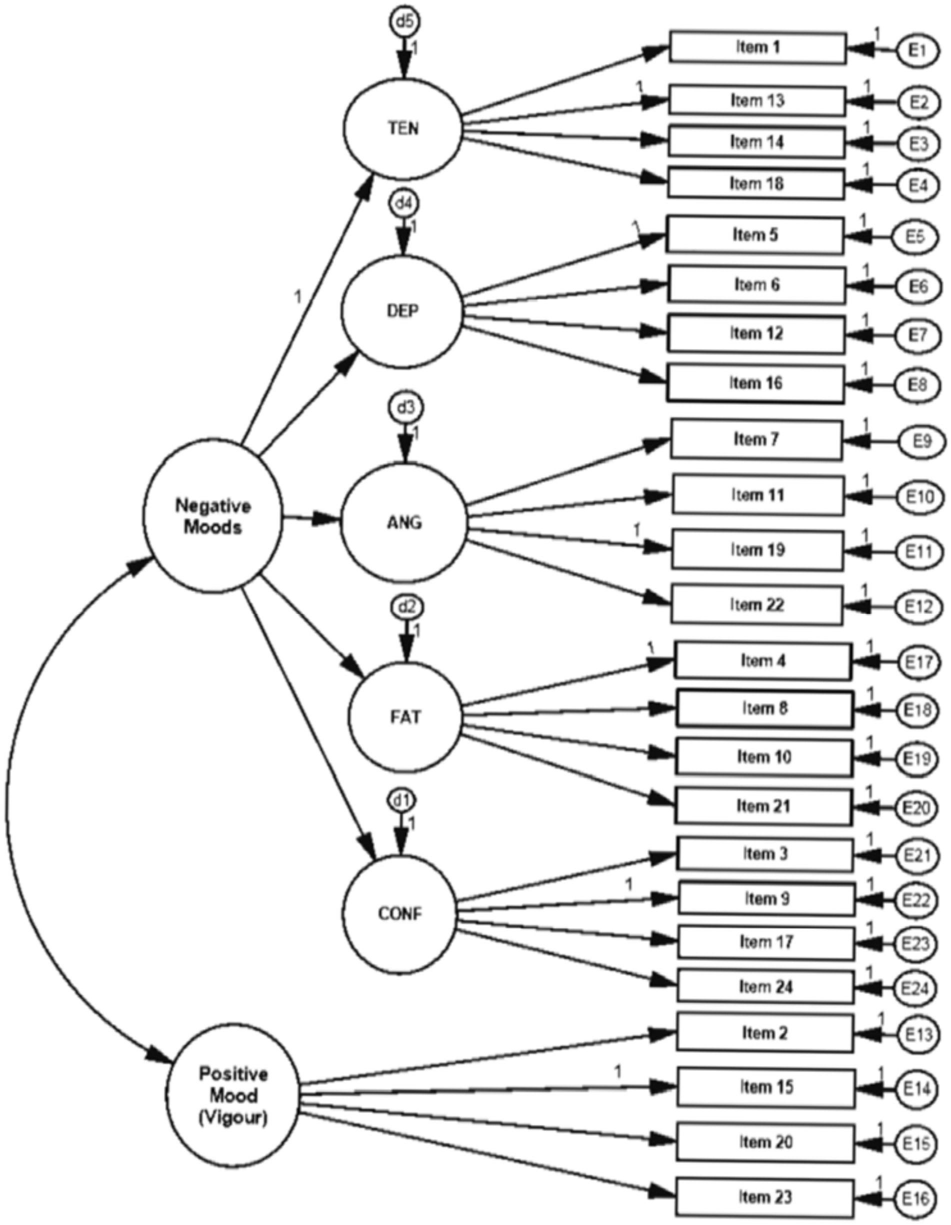

Fig. 2: 7-Factor Model

Note: TEN = Tension; DEP = Depression; ANG = Anger ; VIG = Vigour; FAT = Fatigue; CONF = Confusion

The results yielded a close model fit. Furthermore, inspection of individual paths yielded significant unstandardized factor loadings for all the items.

Additionally, standardized factor loadings ranged from 0.31 to 0.98 were also obtained. Moreover, path loadings for the common factor (negative mood) as well as the specific factors (depression, tension, fatigue, anger and confusion) supported the notion of shared variance of the items. Specifically, comparable path loadings were observed between items loadings on the common factor and the specific factors (Table 3).

In terms of the subscales internal consistency, alpha

Table 3: Items loadings on the common factor and specific factors

Subscales/Items	Common factor (Negative mood)	Specific factors
Tension 1 (item 1)	0.33	0.46
Tension 2 (item 13)	0.53	0.73
Tension 3 (item 14)	0.54	0.74
Tension 4 (item 18)	0.50	0.68
Fatigue 1 (item 4)	0.53	0.61
Fatigue 2 (item 8)	0.55	0.64
Fatigue 3 (item 10)	0.44	0.50
Fatigue 4 (item 21)	0.48	0.56
Confusion1 (item 3)	0.49	0.51
Confusion2 (item 9)	0.65	0.68
Confusion3 (item 17)	0.58	0.61
Confusion4 (item 24)	0.29	0.31
Depression1 (item5)	0.67	0.49
Depression2 (item 6)	0.57	0.58
Depression3 (item, 12)	0.51	0.52
Depression4 (item 16)	0.45	0.46
Anger1 (Item 7)	0.60	0.70
Anger2 (Item 11)	0.52	0.60
Anger3 (Item 19)	0.56	0.65
Anger4 (Item 22)	0.53	0.61

coefficients for the subscales, especially the confusion subscale, was below that of the recommended level. Indeed, alpha coefficients of 0.72, 0.64, 0.73, 0.69, 0.65 and 0.58 were obtained for tension, depression, anger, vigour, fatigue and confusion subscales respectively. Closer inspection of items for confusion revealed a ‘problematic’ item (item 24).

Removing this item increased the alpha coefficient for confusion subscale to 0.67. In light of this finding, we performed further analysis involving 6-factor and 7-factor models with item 24 removed. Expectedly, this procedure resulted in a significant improvement in model fit.

DISCUSSION

This study aimed to provide evidence of psychometric properties of the Malay-translated version of BRUMS. Given the fact that BRUMS[10] was developed and validated in English spoken samples, further validation of the measure is necessary to ensure equivalence between the original and the translated versions. Evidence of factorial validity was established using CFA. The results revealed that the 1-factor model revealed an inadequate model fit. This was expected given the fact that BRUMS[10] is a measure of negative and positive moods. The findings provide further evidence that respondents were able to differentiate between the two moods assessed by BRUMS[10] .

However, further analysis of the 2-factor model incorporating positive and negative mood factors provided only satisfactory fit for the model. The findings implicated that the BRUMS[10] measures more than just two general positive and negative moods. Indeed, analysis of a 6-factor model yielded acceptable fit. Although overall goodness of fit indices, standardized and unstandardized regression weights revealed favorable findings for the 6-factor model, we obtained high subscales intercorrelation values between depression subscale and other negative mood subscales. This finding implies low discriminant validity between the subscales. Although the findings contradicted Terry et al[7,10], who found high discriminant validity of the original scale, this finding (i.e., high subscales intercorrelation) was not unique for the present study. In fact, previous validation studies of the original POMS and its derivatives have also revealed similar findings[20, 21]. For instance, in a validation study of Arabic adapted POMS, Aroian et al[21] observed unusually high correlation between depression and other negative mood subscales. In fact, another study comparing the original and Korean adapted POMS also revealed high subscales intercorrelation. The intercorrelation values were especially higher for the adapted version[22]. Similarly, study performed by Baker et al[23] using the simplified POMS also revealed high intercorrelation among the negative moods subscales.

A potential explanation for the present finding may be reflected in the conceptual model of mood proposed by Lane and Terry[7] with a focus on depressed mood. Specifically, Lane and Terry[7] suggest that negative mood may be precipitated by depressive feelings. Hence, depressive mood plays a central role in moderating other negative moods. In this instance, an increment or reduction in the depression scores will dictate changes in other negative mood scores in the same direction. Thus, it is speculated that the moderating role of depression on other negative mood dimension explains the high relationship between depression and other negative moods' subscales. This speculation is not unfounded. In fact, in a study involving Malaysian Karateka athletes, Wong et al[24] found high correlation between negative mood subscales, in particular between depression, anger, fatigue and confusion, especially in females athletes. They reasoned that anger was used by athletes as a psyching up mechanism prior to competition to boost their confidence levels. Furthermore, high levels of fatigue and tension result from pre-competition restlessness[24]. This notion may be related to the present sample given that majority of our participants were combat sport athletes preparing for competition. However, further validation studies using data taken at various times should be conducted to confirm our speculation.

High subscales intercorrelation might also imply that the items measure a common factor in addition to its intended factors. We tested this proposition by specifying a 7-factor model whereby a higher order latent factor was set for the negative moods. Evidently, the result confirmed the notion that the negative mood items could also measure a common negative mood factor as seen in the comparable loadings of direct and indirect effects of items on the specific and the common factor. Although the findings provide support for the factorial validity of the questionnaire, we obtained relatively low reliability coefficients for the subscales, especially the confusion subscale. In fact, removing an item (item 24/uncertain) increased the alpha coefficient value. Furthermore, we also observed improvement in the model fit indices. Complexity of this item could also be observed in a study of Portuguese translated BRUMS[25]. In that study, item 24 cross loaded on tension subscale. For the present study, however, it remained a challenge for us to interpret this finding given the fact that the translated wording for this item was viewed as appropriate. Thus, further analysis involving independent samples is critically needed to confirm the finding.

CONCLUSION

Our findings provide initial support for the factorial validity of the Malaysian adapted BRUMS[10]. However, the reliability coefficients for four of the subscales were satisfactory at best. Indeed, for confusion subscale, item 24 should be excluded for greater subscale internal consistency. In practical terms, the findings suggest that BRUMS[10] can be used as a measure of differentiated negative moods, without item 24. Additionally, its use as a measure of a general negative mood is also supported. While we believe these findings contribute to the BRUMS[10] validity literature, we must, of course, acknowledge the potential limitations surrounding our study. Firstly, as in other survey based research, our findings may be influenced by recall errors and social desirability biases. Secondly, as the sample was conducted with predominantly contact sport athletes, further studies involving other sports is warranted to confirm whether our finding is sample specific or more general.

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