Health, 2016, 8, 125-132
Published Online January 2016 in SciRes. http://www.scirp.org/journal/health
http://dx.doi.org/10.4236/health.2016.82015

The Brunel Mood Scale Rating in Mental Health for Physically Active and Apparently Healthy Populations

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Received 27 August 2015; accepted 25 January 2016; published 28 January 2016

Abstract

There is a positive relationship between mood states and mental health. The aim of the present study was to investigate the construct validity and internal consistency of the Brunel Mood Scale (BRUMS) for use with different populations, which are physically active and apparently healthy. Measures were obtained from 1295 male (N = 709, 34 ± 20 years, mean ± SD) and female (N = 576, 43 ± 24 years, mean ± SD) volunteers. Factor analysis was used, verifying that six factors (components) accounted for 62.65% of the total variance of the scale. The Varimax method with Kaiser Normalization for the rotation of the factors for the main components, and it was observed that the 24 scale items loaded on six mood factors (anger, depression, tension, vigor, fatigue, and confusion). Internal consistency was good for all the factors identified. We suggest that the results provide some support for validity of the BRUMS for use with different populations, which are physically active and apparently healthy.

Keywords

Mental Health, Mood States, Psychometrics, Brunel Mood Scale, BRUMS

How to cite this paper: Brandt, R., *et al*. (2016) The Brunel Mood Scale Rating in Mental Health for Physically Active and Apparently Healthy Populations. *Health*, **8**, 125-132. http://dx.doi.org/10.4236/health.2016.82015

1. Introduction

Over the past few decades, there has been a growing body of literature on mental health [1]. However, there is still a need to develop related research into the association between physical activity and mental health [2], as problems in this context are a worldwide concern in public health [3], affecting all age groups and accounting for significant expenditure by governments [4].

There is a positive relationship between mood states and mental health [5] [6]. It is considered that the high level of vigor associated with lower levels of tension, depression, anger, fatigue and confusion is related to a better mental health condition [7] [8].

Among the instruments that evaluate moods, the POMS (Profile of Mood States) stands out as one of the most widely used in different populations [9] [10]. The Brunel Mood Scale (BRUMS), derived from the POMS, the validation of which in Brazil was performed by Rohlfs *et al*. [11], was presented as a tool for detection of the over-training syndrome. In addition, such scales have been used in different populations and contexts in Brazil [12]-[14] and other countries [15]-[17].

The 24-item BRUMS measures six identifiable mood states (Tension, Depression, Anger, Vigor, Fatigue, and Confusion) through a self-report inventory. The respondents rating a list of adjectives, on a 5-point Likert scale from 0 (not at all) to 4 (extremely), on the basis of how they had been feeling in the previous week, or in the moment of evaluation [12] [18]. The six affective mood states subscales are not diagnostic indicators, but refer to sub-clinical psychological states (mood states) [19].

This study aims to investigate the construct validity and internal consistency of the BRUMS for different populations, which are physically active and apparently healthy.

2. Method

This is a descriptive cross-sectional study with non-probability sampling (Sample size calculation was not conducted before sampling). The participants in the study were 1,295 individuals from Santa Catarina state, south of Brazil, of both sexes, physically active and apparently healthy: 709 (54.7%) men with a mean age of 34 years (±20) and 586 (45.3%) women, with a mean age of 43 years (±24). Data were collected during 2013 year, from February to November.

The BRUMS [11] has 24 items arranged into six subscales: anger, confusion, depression, fatigue, tension and vigor (**Table 1**), each with four items. The research participant selects, from a numerical rating scale of zero to four (0 = not at all, 1 = a bit, 2 = moderate, 3 = enough; 4 = extremely), the option they believe best represents the situation at that time, using questions such as “How do you feel now?”, “How have been feeling in the past week, including today?”, or “How have you been feeling?”.

The items on each subscale are:

- Anger: annoyed, bitter, angry, bad-tempered;
- Confusion: confused, muddled, mixed-up, uncertain;
- Depression: depressed, downhearted, unhappy, miserable;
- Fatigue: worn out, exhausted, sleepy, tired;
- Tension: panicky, anxious, worried, nervous;
- Vigor: lively, energetic, active, alert.

Table 1. Dimensions of BRUMS.

DIMENSION	DEFINITION
Tension	State of musculoskeletal tension and worry.
Depression	Emotional state of despondency, sadness, unhappiness.
Anger	State of hostility, for others.
Vigor	State of energy, physical force.
Fatigue	State of tiredness, low energy.
Confusion	State of feeling stunned, instability in emotions.

Reference: Brandt *et al*. [20].

The sum of the responses of each subscale results in a score that ranges from zero to 16. The questionnaire does not generate an overall score, and each scale should be examined individually, although the constructs are related.

Survey participants were characterized with respect to other variables, based on the study of Brandt *et al*. [12], regarding self perception of sleep quality and self-related health. Self perceived health status and quality of sleep, composed Likert scale with responses from 0 ("very bad") to 4 ("excellent") [20]. These questions were used to compare means of moods, depending on the variables mentioned in the literature, allowing the visualization of the use of the scale in the research.

All survey participants signed an informed consent and it was approved by the Research Ethics Committee (44/2011), according to Resolution 196/96 of the National Health Council. A previously trained researcher administered the sample individually. The research procedures were explained and the participants asked to point out if the matter was not clear. For elderly participants, a printed sheet was presented with the response options. The response time was no longer than six minutes.

Data were tabulated and analyzed using SPSS software version 21.0. The internal consistency of the subscales was assessed using Cronbach's alpha. The authors of the original instrument [21], found the alpha to be greater than 0.76, so it is considered an instrument with good internal consistency.

Construct validity was assessed through exploratory factor analysis, which identified the common components in a large number of variables. The factor analysis was performed according to the steps proposed by Dancey and Reidy [22].

We used the principal components method for extracting the factors and considered only those that presented an eigenvalue of one. For selected factors, a correlation matrix was generated, where relationships between items and factors were observed through factor loadings. For the purposes of the matrix, the orthogonal rotation Varimax method was applied, which maximizes high correlations and minimizes casualties, facilitating analysis.

To analyze the results of the mood states, descriptive and inferential statistics (mean and standard deviation) were used (Kruskal-Wallis and Mann-Whitney).

3. Results

In order to confirm the theoretical factors, factor analysis was used, verifying that the six factors (components) accounted for 62.65% of the total variance of the scale (**Table 2**). The KMO (Kaiser-Mayer-Olkin) test (X^2 = 0.909, $p < 0.001$) indicated the proportion of the data variance and their values can be considered suitable, as well as the Bartlett sphericity test ($X^2 = 11259.9$, $p < 0.05$), concerning the correlation between the data.

Table 3 shows the correlations (factor loadings) for each item with each factor, respectively. We used the method of the main components with the Varimax method rotation of the factors, with Kaiser normalization. The saturation with values was greater than 0.30 and the items appear ordered by factor.

It is observed that the 24 scale items loaded on six mood factors (anger, depression, tension, vigor, fatigue and confusion), corresponding to the analyses found by Rohlfs *et al*. [11] in the BRUMS validation to search for Brazilian athletes and non-athletes.

Table 2. Eigenvalues and explained variance components of the BRUMS.

COMPONENT	*Eigenvalues initials*		
	Total	**% Variance**	**% cumulative**
1 (Anger)	7.27	30.33	30.33
2 (Depression)	2.62	10.92	41.25
3 (Tension)	1.68	7.03	48.28
4 (Vigor)	1.41	5.91	54.20
5 (Fatigue)	1.13	4.72	58.92
6 (Confusion)	1.01	3.73	62.65

Extraction method: Principal component analysis.

Table 3. Exploratory factor load for each item in the six factors extracted from the BRUMS.

Component	1	2	3	4	5	6	Cronback Alfa
ITENS	Anger	Depression	Tension	Vigor	Fatigue	Confusion	
Annoyed	0.722						0.830
Bitter	0.785						0.826
Angry	0.813						0.831
Bad tempered	0.671						0.830
Depressed		0.648					0.831
Downhearted		0.621					0.831
Unhappy		0.647					0.832
Miserable		0.440					0.832
Panicky			0.388				0.829
Anxious			0.806				0.831
Worried			0.724				0.834
Nervous			0.741				0.831
Lively				0.725			0.851
Energetic				0.773			0.851
Active				0.789			0.851
Alert				0.639			0.852
Worn out					0.776		0.830
Exhausted					0.803		0.829
Sleepy					0.491		0.835
Tired					0.785		0.831
Confused						0.693	0.828
Muddled						0.486	0.828
Mixed-up						0.614	0.832
Uncertain						0.601	0.828

Extraction method: Principal component analysis. Rotation Method: Varimax, with Kaiser normalization.

Anger and Vigor had factor loadings above 0.63 in all items, without existing cross-loading. In Depression, the items, “depressed”, “downhearted”, and “unhappy” showed high factor loadings, greater than 0.62. The item “miserable” showed a lower factor loading (0.440). There was cross-loading with the item “confused”. For Tension, the items “anxious”, “worried”, and “nervous” obtained factor loadings higher than 0.72, with no cross-loading. Fatigue items obtained factor loadings above 0.70 except for “sleepy”, which showed a lower factor loading (0.491). Confusion presented three items with factor loadings above 0.60. The item “muddled” had a lower factor loading and introduced cross-loading with the Depression factor.

The internal consistency of the 24 items was high ($\alpha = 0.85$). Internal consistency was good for all the factors identified: Anger $\alpha = 0.65$; Confusion $\alpha = 0.63$; Depression $\alpha = 0.66$; Fatigue $\alpha = 0.60$; Tension $\alpha = 0.65$, and Vigor $\alpha = 0.81$.

The participants, both men and women, showed high levels of Vigor and low levels of Tension, Depression, Anger, Fatigue and Confusion (**Figure 1**), and there are significant differences in the variables Anger, Vigor and Fatigue between men and women.

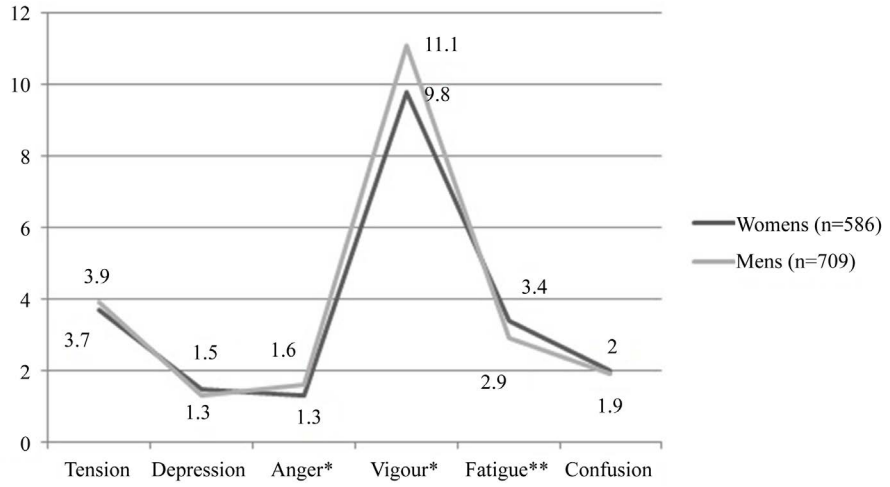

Figure 1. Mood states of men and women engaged in physical activity, apparently healthy. *Significant difference at $p < 0.05$. **Significant difference at $p < 0.001$.

Separating the participants into age groups (**Table 4**), there is a significant difference between the moods of the youngest participants (under 18), adults (between 18 and 60 years) and the elderly (over 60 years).

By analyzing the mood depending on self-perceived health status, participants who showed better perception had lower levels of Depression, Fatigue and Confusion and Vigor, when compared to those with poorer self-rated health. With the relationship between sleep and moods, all factors are significantly different between those with a better perception of quality of sleep.

4. Discussion

The aim of this study was to investigate the construct validity and internal consistency of the BRUMS, so as to recognize it as an instrument for measuring mental health in different populations, which are physically active and apparently healthy.

The BRUMS has been used in different populations of athletes and non-athletes, young people and adults [12] [23], with heart disease [24], and with fibromyalgia [13] [14], among others. Its validation for physically active and apparently healthy populations showed consistent results, with good reliability and construct validity, as evidenced by the alpha coefficient and factor loadings, found to be higher than other instrument validation studies [25].

Generally, the factors were properly loaded in their respective domains. The low cross-existence between the loading factors is a positive element in the present study, given that other validations showed a higher amount of cross-loading which does not compromise their results [26]. It has been found that there are six factors with eigenvalues above one, similar to those found in Rohlfs *et al*. [11]. A high internal consistency was observed, with values of 0.85, whereas all areas had values appropriate for its validation.

In the analysis of the results for the BRUMS application, it is evident that there is a difference in the moods of men and women, already presented in other studies, as well as for the different age groups [7] [12] [14] [27]. Moreover, in the latter, there is a significant difference in all mood factors. When analyzing the results of the mood states, it is suggested that researchers investigate these characteristic differences in their populations, thereby reducing the possibility of error in the data analysis.

In analyzing the results of the self-assessment of health and sleep, it is clear who has a tendency to better health and sleep, has a mood with greater vigor and less tension, depression, anger, fatigue and confusion. This would be consistent with the proposed profile by Morgan [8] entitled the ‘iceberg’ profile (**Figure 1**), this being an ideal mental health model. Corroborating this study demonstrates the importance of sleep to mental health, in the sense of insufficient or poor sleep can cause mental disorders, impairing cognitive function and performance [28] [29].

From these analyses it is evident that the use of BRUMS beyond the detection of the over-training syndrome [11], where it has been used in research to delineate the mood profile of different populations, is that it may also

Table 4. Factors of mood about age, self perceived health status and self perception of sleep quality in physically active subjects, apparently healthy.

	Tension		Depression		Anger		Vigor		Fatigue		Confusion	
Associated factors	$\bar{x}$	±	$\bar{x}$	±	$\bar{x}$	±	$\bar{x}$	±	$\bar{x}$	±	$\bar{x}$	±
Age group	**		**		**		**		**		**	
Less than 18 years (n = 271)	4.8	2.9	1.1	1.2	1.4	2.2	10.7	2.8	3.1	2.7	2.4	2.6
Between 18 and 60 (n = 624)	4.4	3.2	1.6	2.6	1.9	2.9	10.9	3.1	3.6	3.4	2.1	2.6
More than 60 years (n = 385)	2.1	2.4	1.2	2.1	0.7	1.7	9.7	2.8	2.5	2.9	1.1	1.9
Health assessment			**				**		*		*	
Excellent (n = 292)	3.7	3.2	0.8	1.7	1.2	2.3	11.6	2.9	2.7	3.1	1.4	2.1
Good (n = 589)	4.1	2.9	1.3	2.2	1.6	2.5	10.6	2.7	3.2	3.1	2.2	2.4
Regular (n = 134)	3.7	3.1	1.9	2.9	1.7	2.8	9.8	3.1	3.5	3.1	2.1	2.6
Poor (n = 11)	5.7	4.5	3.9	3.5	2.3	3.1	8.7	3.8	4.8	3.8	2.6	3.9
Very bad (n = 5)	2.2	1.6	1.2	2.1	0.6	1.3	10.4	2.9	1.4	1.9	1.0	1.7
Sleep quality perception	*		**		**		**		**		**	
Excellent (n = 105)	4.1	3.0	0.8	1.6	1.4	2.0	12.0	3.1	2.6	2.5	1.5	2.0
Good (n = 419)	4.3	2.9	1.2	2.1	1.5	2.4	11.1	2.7	3.1	2.9	1.9	2.2
Regular (n = 231)	4.8	3.0	1.4	2.4	1.9	2.7	10.5	3.1	3.9	3.6	2.4	2.7
Poor (n = 44)	5.5	3.9	2.7	3.8	3.7	4.2	10.4	2.9	5.3	3.6	3.4	3.4
Very bad (n = 5)	6.2	5.7	7.2	3.9	5.8	4.8	8.0	2.2	6.4	3.7	6.8	4.9

*Significant difference at $p < 0.05$. **Significant difference at $p < 0.001$.

be used as a mental health indicator.

5. Conclusion

From the above, considering that researchers are in different contexts and with different populations, their use of the BRUMS can investigate mental health in different populations, which are physically active and apparently healthy.

Authors' Contributions

All authors participated in the acquisition of data and revision of the manuscript. All authors determined the design, interpreted the data and drafted the manuscript. All authors read and gave final approval for the version submitted for publication.

Declaration of Interest

The authors report no conflict of interest. All authors were responsible for the content and writing of this paper.

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