



Changes in mood states of Brazilian jiu-jitsu athletes during training and competition

Alexandro Andrade¹ · Rodrigo Batalha Silva¹ · Miguel Alencar Flores Junior¹ · Carlos Branco Rosa¹ · Fábio Hech Dominski¹

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Abstract

Background The literature demonstrates the influence of psychological aspects on sport performance of athletes. Mood can vary in intensity and duration and involves six factors: tension, depression, anger, fatigue, confusion, and vigor.

Aim This study aimed to verify changes in mood states of Brazilian jiu-jitsu athletes during training and competition.

Methods Fourteen Brazilian male jiu-jitsu athletes that competed in state-level competition [adults with mean age of 29.07 (± 5.12) years] participated of the study. Two questionnaires were used. The first characterized the athletes, and the second was the Brunel Mood Scale. Mood was evaluated at four points: two-point pre-competition (1 and 2 weeks before competition), post-weighing, and post-competition.

Results Brazilian jiu-jitsu athletes presented high vigor, moderate levels of tension, and low levels of depression, anger, fatigue, and mental confusion at these four points. In the competitive period, low levels of depression, anger, fatigue, and confusion and high vigor were observed in the pre-competition period. In the post-competition period, there was an increase in levels of depression, anger, fatigue, and confusion and decreased vigor. Regarding the training and competition periods, there was a significant difference in mood states in tension ($p < 0.05$), fatigue ($p < 0.05$), and mental confusion ($p < 0.05$).

Conclusion Brazilian jiu-jitsu athletes presented, on average in the four different periods, high vigor associated with low levels of depression, anger, fatigue, and mental confusion and a moderate level of tension. This mood profile is similar to the Iceberg Profile. It states that competition is a place and moment that exerts influence on the mood states of Brazilian jiu-jitsu athletes.

Keywords Martial arts · Exercise · Psychology · Sport psychology

Introduction

Evidence in the literature demonstrates the influence of psychological aspects on sport performance of athletes. Mood states are shown as a variable that reflects emotional, bodily, and behavioral states as well as feelings, thoughts, and degree of enthusiasm in performing tasks [1]. Mood can vary in intensity and duration and involves six factors, five are negative (tension, depression, anger, fatigue, and confusion), and one is positive (vigor) [2]. The literature indicates that the near-ideal mood profile for better athletic performance is characterized by higher vigor in relation to the other factors. This is called the Iceberg Profile [3].

Sports performance can be influenced by changes in mood states if it is not in a favorable condition for better performance [4]. Such changes interfere with cognition, decision making, and the execution of motor skills in training and

✉ Alexandro Andrade
alexandro.andrade.phd@gmail.com

Rodrigo Batalha Silva
rbatalhasilva@gmail.com

Miguel Alencar Flores Junior
dedeoflores@hotmail.com

Carlos Branco Rosa
carlosbrancorosa@hotmail.com

Fábio Hech Dominski
fabiohdominski@hotmail.com

¹ College of Health and Sport Science, Santa Catarina State University-UDESC, Rua Pascoal Simone 358, Coqueiros, Florianópolis, SC 88080-350, Brazil

competition [5]. Among the factors that can cause changes in mood, there is in high-performance sports pressure for results, excessive training, high number of competitions, and the specificities of each modality [5–8].

Some studies have demonstrated the importance of verifying mood changes during training and competition due to the influence on successful performance. Researches have been carried with athletes of sports such as water polo and football, and in exercises modalities as CrossFit® and dance [1, 9–12], but little is found related to combat sports [13]. We observed one study that evaluated pre-competition physical, physiological, and psychosocial states of Taekwondo athletes, including mood states that showed a large effect of the pre-competitive period in depression, vigor, fatigue, and confusion [14].

Combat sports have been gaining popularity and interest from researchers. Due to the increase in practitioners and the popularization of mixed martial arts [15], there has been a growth in Brazilian jiu-jitsu practice in recent years [16], as this is a modality present in mixed martial arts and aims to force withdrawal of the opponent through throws, immobilizations, imbalances, choke holds, and locks applied to the joints of the opponent's body.

Studies addressing psychological variables such as mood in combat sports are scarce [17], and much of the literature on mood states in athletes in general are studies with data collection performed only at one point, usually in the pre-competitive period [16, 18, 19]. Studies collecting data from more than one period in training and competition were performed in volleyball [20], soccer [2], and basketball [21]. However, there were no studies on mood states at different times addressing athletes of combat sports in the training periods and before and after competition.

In this sense, this study aimed to verify the changes in mood states of Brazilian jiu-jitsu athletes during training and competition.

Methods

Participants

The participants in the study were 14 Brazilian male jiu-jitsu athletes who practiced the modality of one to three years competing in their certain belts that participated in national, state and international competitions. This project was approved by the Human Research Ethics Committee (CEPSH) of the Santa Catarina State University (UDESC) under protocol 44/2011 and conformed to the declaration of Helsinki.

The athletes had a mean age of 29.07 (± 5.12) years (min 24, max 37); all of them were male. Athletes had 76.35 (± 10.23) kg body weight and 1.77 (± 6.26) m height on

average. Most of the athletes had a college degree (42.9%), had practiced Brazilian jiu-jitsu from 1 to 3 years (50%), were graduated in blue (35.7%) belt and had competed in state or international-level competition (35.7% each). Regarding the performance in the competition investigated (international-level championship), most of athletes lost their fight (9/64.3%) compared to those that won (5/35.7%) (Table 1).

Measures

Athletes were characterized through a mixed questionnaire with open, closed, and mixed questions, based on a Likert scale. This instrument has questions about athletes' characterization (gender, schooling, years of practice, and competition level) and self-evaluation of health.

Table 1 Characterization of gender, schooling, years of practice, graduation, competition level, health, and performance of elite Brazilian jiu-jitsu athletes

	<i>n</i>	%
Gender		
Male	14	100
Schooling		
High school	4	28.9
College	6	42.9
Postgraduate	1	7.1
Master' degree	3	21.4
Years of practice		
1–3 years	7	50
4–7 years	4	28.6
More than 7 years	3	21.4
Graduation		
White	2	14.3
Blue	5	35.7
Purple	4	28.6
Brown	1	7.1
Black	2	14.3
Competition level		
Regional	5	35.7
National	4	28.6
International	5	35.7
Self-perception of health		
Bad	1	7.1
Regular	5	35.7
Good	7	50
Excellent	1	7.1
Performance		
Won	5	35.7
Lost	9	64.3

Mood states were evaluated using the Brunel Mood Scale (BRUMS) [2]. The BRUMS was validated in 2003 by Terry et al. [22] in athletes and non-athletes and was declared fit to assess the mood profile possibly related to overtraining syndrome. The use of this instrument assists in the organization and planning of training loads and in the control of stress in participants of performance and physical exercises. This instrument is a short-adapted version of the Profile of Mood States (POMS) [23]. The BRUMS presented good internal consistency in its validation with Cronbach's alpha values higher than 0.70. The instrument is composed of 24 items based on a five-level scale (0 = "nothing"/4 = "extremely"), through which the individual should position him or herself considering how he or she is feeling at the time. Subsequently, the items are grouped into six dimensions: Tension (state of musculoskeletal tension and concern), Depression (emotional state of discouragement, sadness, and unhappiness), Anger (state of hostility towards others), Vigor (state of energy and physical force), Fatigue (state of tiredness and low energy), and Confusion (Stunned state and emotions' instability), each composed of four items. The sum of the responses of each dimension results in a score ranging from 0 to 16 points. Because most of the literature presents the mood profile of the investigated athletes based on only one data collection, the present study established the mood profile of the athletes from the mean mood states at four points. For analysis in the present study, besides the four points (median and interquartile ranges), the means of mood states were grouped in two periods: training and competition.

Data collection

Data were collected through prior scheduling with coaches and athletes. Athletes were invited to participate in the study after an explanation of the study objectives. Those who agreed to participate signed the free and informed consent form.

To verify the mood changes, the collection was done at four distinct points: in the training period, 2 weeks and 1 week prior to the competition (before training sessions and at training location of the athletes) and, in the competition period, minutes before the official weigh-in (pre-competition) and minutes after the end of the competition (post-competition). The data collect of competition period was performed during an international-level championship (South American Jiu-Jitsu Championship) held in Florianópolis, Santa Catarina, promoted and organized by the International Brazilian Jiu-Jitsu Federation. Thus, 64 mood collections were performed. Initially, the athletes completed the characterization questionnaire (only at the first collection—2 weeks prior to the competition) and then the BRUMS (all data collections) with an average duration of 5 min per athlete.

Statistical analysis

Data analysis was conducted using "Statistic Packing for the Social Sciences" program—SPSS version 20.0. The data were treated through descriptive and inferential statistics. The normality of the data was verified by means of the Shapiro–Wilk test, which pointed out the non-parametricity of the data. The normality was violated so the medians and interquartile ranges were presented. The Wilcoxon test was used to compare the means at two different points, and the Friedman test was used to compare the mean between related samples at the four points followed by Dunn's Post Hoc test. The significance level was defined as $p < 0.05$.

Results

Considering all four points investigated—training and competition, in general, Brazilian jiu-jitsu athletes presented a high level of vigor; moderate levels of tension; and low levels of depression, anger, fatigue, and confusion (Fig. 1).

The comparison of the median and interquartile ranges of the athletes' mood states at each point is presented in Table 2. It was observed that the athletes presented higher levels of tension in the post-competition period in relation to the 1 week before the competition ($p < 0.05$). The same was observed regarding the pre-competition period and the 1 week before the competition ($p < 0.05$). There was no significant difference in depression and anger among the four moments. The level of vigor in the pre-competition period differed significantly from the other points, being higher before the competition ($p < 0.05$). Brazilian jiu-jitsu athletes presented greater fatigue in the 2-week period before competition when compared to pre- ($p < 0.05$) and post-competition ($p < 0.05$). Confusion was higher in the athletes after competing and post competing than it was a week before the competition ($p < 0.05$). There was no difference in mood states among Brazilian jiu-jitsu athletes that won or lost the fights (post-competition period) (Table 2).

Regarding training and competition periods, there was a significant difference in mood states of tension ($p < 0.05$), fatigue ($p < 0.05$), and mental confusion ($p < 0.05$). Higher averages of tension and mental confusion were observed in the competition period, and lower average fatigue was observed in the training period (Fig. 2).

Discussion

The present study aimed to verify the changes in the mood states of Brazilian jiu-jitsu athletes and is an innovative study, as it performed data collections at several timepoints, with Brazilian jiu-jitsu athletes, to identify the period in

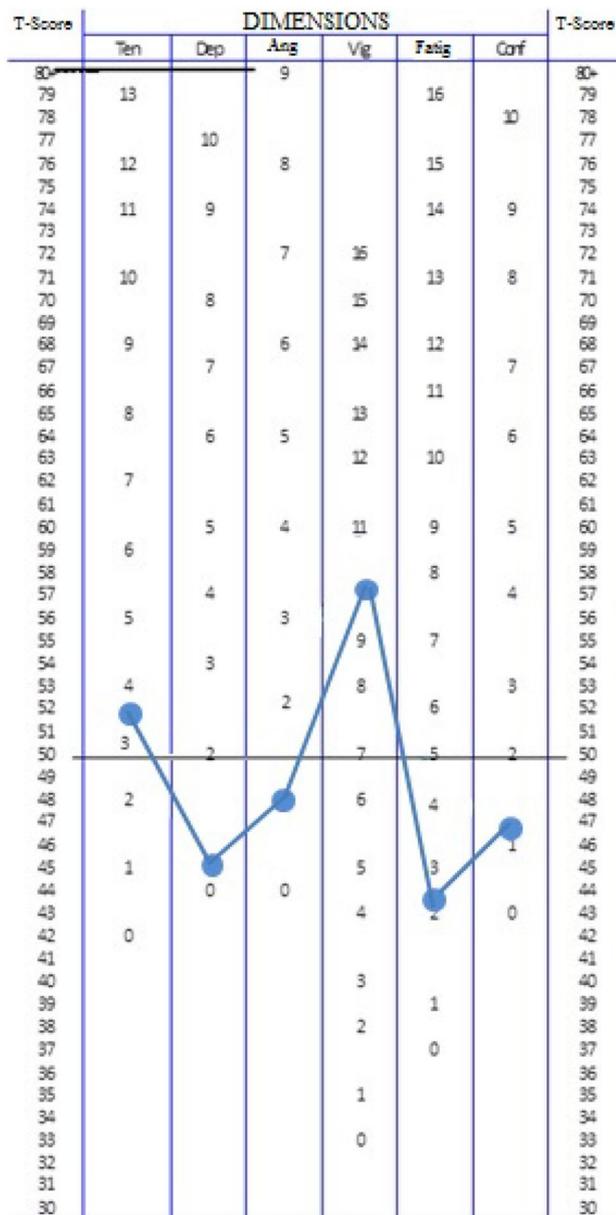


Fig. 1 Profile of mood states (mean values) of Brazilian jiu-jitsu athletes' in training and competition ($n = 14$)

which these variations are significant. Variations of mood states are sensitive to the experiences of the individual and occur according to the circumstances perceived in the external environment [18] in which competition is a place and moment of influence on the athlete. Scientific production in combat sports remains scarce [16, 24], so the present research also contributes with increased evidence regarding the psychological aspects of athletes.

The athletes presented a pre-competition mood profile similar to the Iceberg Profile, in which vigor is a factor with a higher index than the other dimensions—depression,

anger, fatigue, and confusion—that presented low levels [3]. Then, the dimensions considered negative scored below 50, and the positive one scored above 50, as found in the study by Andreato et al. [25]. This would be the closest profile to the ideal to leave the athlete in the best condition in both training and competition [22].

The literature shows that the Iceberg Mood Profile implies no impairment in performance, indicating that there is no overload in training [26]. Although the athletes presented high levels of fatigue in the training, they presented low levels in the competitive period, mainly in the pre-competition period. In training, high levels of fatigue may be considered an expected result in high-performance athletes due to physical wear and tear in consecutive training days [27]. Another factor that can alter the psychological aspects are the nutrient-restrictive diets that combat sports athletes generally follow to compete in a lower category than their normal weight, believing that they will gain an advantage when fighting in a smaller weight category [28]. This reduction in body mass has already been shown to correlate with an increase in negative mood aspects [29]. However, the weight lost was not investigated in our sample.

It was observed that the athletes' fatigue levels decrease according to the proximity of the competition, indicating that the weeks prior to competition in Brazilian jiu-jitsu may be dedicated to pre-competition “tapering,” and there is no great wear of physical training in these moments as training is dedicated to the technique of execution of movements and strategies of combat. Another aspect that can alter athletes' fatigue is the rapid weight loss process. A greater fatigue level was found in cadet wrestlers who lost weight near competition day [29].

Moderate levels of tension were observed in the competition period, being higher in relation to the training, corroborating the study of Brandt et al. [30] with athletes of the same modality. Such an outcome may be related to the anxiety that athletes present before competitions [25]. Special attention should be paid to this factor, because this variable refers to musculoskeletal tension and may be related to the incidence of injuries due to the lower physical and mental capacity that the athlete presents in moments of moderate and elevated tension [18].

Although the anger was not different between the four moments, this variable has a facilitating effect to increase levels of vigor and may be linked to arousal levels [30], making it an important variable mainly in combat sports. Specifically, in the case of Brazilian jiu-jitsu, a moderate level of this variable can be considered positive, since it can delay fatigue, altering body perceptions [30]. Just as high levels of anger can be harmful, interfering with their focus and perception of control, leading to ineffective utilization of athletes' skills [31]. Therefore, in the absence of

Table 2 Comparison of median and interquartile range of Brazilian jiu-jitsu athletes' mood in training (2 weeks and 1 week before) and competition (pre- and post-competition) ($n = 14$)

Period	Tension		Depression		Anger		Vigor		Fatigue		Confusion	
	Mdn	IQR	Mdn	IQR	Mdn	IQR	Mdn	IQR	Mdn	IQR	Mdn	IQR
(a) 2 weeks before	2.50	3.25	0	2.00	0	1.25	9.00 ^c	2.75	4.00 ^{c,d}	4.00	0	1.25
(b) 1 week before	2.00 ^{c,d}	1.50	0	1.00	0	1.00	10.00 ^c	2.25	3.00 ^c	1.25	0 ^{c,d}	0.25
(c) Pre-competition	5.00 ^b	2.50	0	0	0	1.00	12.00 ^{a,b,d}	2.00	0 ^{a,b}	1.00	1.50 ^b	2.00
(d) Post-competition	4.00 ^b	2.00	1.00	3.25	2.00	2.25	10.00 ^c	3.00	1.00 ^a	2.25	1.00 ^b	1.25
Performance (post-competition)												
Won ($n=9$)	4.00	5.50	1.00	2.50	3.00	3.50	10.00	5.00	1.00	2.00	1.00	3.50
Lost ($n=5$)	4.00	2.50	1.00	4.00	1.00	2.50	10.00	4.50	1.00	4.00	1.00	1.50

Mdn median, IQR interquartile range

^aDifferent from 2 weeks before

^bDifferent from 1 week before

^cDifferent from pre-competition

^dDifferent from post-competition

$p < 0.05$

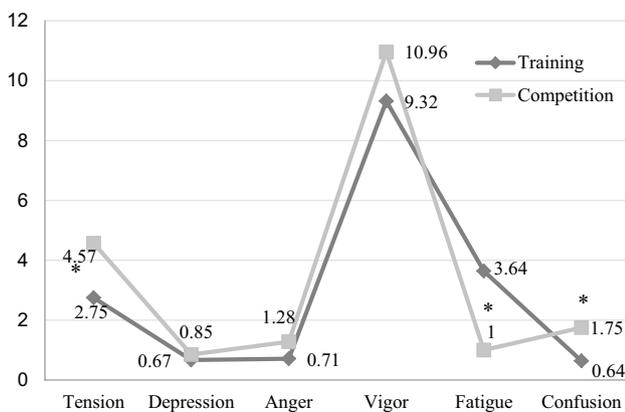


Fig. 2 Mean values of Brazilian jiu-jitsu athletes' mood states in training and competition period ($n = 14$). *Significant difference at $p < 0.05$

depression, anger can be a motivating factor for Brazilian jiu-jitsu athletes.

The vigor, dimension characterized by physical energy, activity, feelings of excitement, disposition, and animation, is directly linked to a better sports performance [3] and had its highest level at the moment before the competition, placing the athletes in good condition. Vigor levels remained high during all analyzed periods. If there was a decrease in vigor during the competition period, such reduction could be associated with excessive training [2], which was not observed in the sample. Still, low vigor may denote a poor perception of the athlete's physical and emotional capacities [32].

Increased confusion of athletes in the competition period over the training period may impair performance as it may be situated as a response to anxiety and depression [16].

Confusion is characterized by being stunned, feelings of uncertainty, and instability in controlling emotions and attention. The increase in pre- and post-competition confusion may be related to the outcome of the fight, in case of defeat, but this was not verified in the present study.

Regarding the mood of the winner and non-winner athletes, in our sample, no difference was found in mood states, corroborating with results found in Malaysian karate athletes [33]. Although the theory states that in combat sports, anger and tension can be beneficial to fighters, and this has not been observed in studies that analyze the mood states of winners and non-winner. More studies, with a greater number of athletes and in different modalities are necessary to have a better explanation on the ideal mood for fighters.

In other modalities, a difference is found in the mood states of winners. In sailors, this difference was found in depression, vigor, and fatigue. Winning athletes presented lower depression and fatigue and greater vigor when compared to non-winners, as well as, the chance of winning is higher when depression and fatigue decreases and vigor increase [16]. In volleyball, athletes who won showed less tension and confusion compared to those who lost [18].

The awareness of the importance of the work in the psychological aspects of the athletes is theoretically well diffused; however, in the sports practice, there is not ample performance of professionals in the area—sports psychologists. In Brazil, psychological intervention is often not inserted in the training programs [23].

Besides the contribution with evidences on the psychological aspects of Brazilian jiu-jitsu athletes to the scientific research, through the analysis of mood states, the results of the study have practical implications and should be considered beyond the field of sport psychology due to the influence and results from physical training of athletes,

such as higher fatigue levels during the training period and reduced in the pre-competitive period. In addition to the widely use in research, the instrument for assessing mood states allows in professional practice, during training and competition, the simple and rapid monitoring of important variables that are related to a better athlete's condition for competition, which may reflect in the performance. Furthermore, with the accompaniment of mood states in these periods the coaches and psychologists can detect mood disorders that may be related to excessive training, indicating the need for adjustments in the training load.

Although similar studies also present a small number of athletes investigated, the size of the sample of fighters evaluated is shown as a limitation in this study, which is maximized by the number of data collected on mood states. Due to the number of athletes, especially of female athletes, analyses of mood states were not performed with the sample stratified by gender. Moreover, the weight loss was not investigated in this sample. Therefore, this type of research is suggested in future studies, because, while the literature is almost exclusively about the male sex, the number of women practicing this modality is increasing.

Another limitation of the study was that the data collect during the training period was carried out only during the last 2 weeks of training for competition. The design of this data collect is explained by these 2 weeks being moments that Brazilian jiu-jitsu athletes can significantly alter their mood state.

Conclusions

In summary, Brazilian jiu-jitsu athletes presented high vigor associated with low levels of depression, anger, fatigue, and confusion and moderate level of tension. This mood profile is similar to the Iceberg Profile, which is considered ideal to put athletes in better conditions for competition.

Higher pre-competition tension levels were observed in relation to training as well as vigor. Anger, depression, and confusion were higher post-competition than in the other moments. Fatigue was higher in the training period compared to competition. It is concluded that the competition is a place and moment that exerts influence on the mood states of Brazilian jiu-jitsu athletes.

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Compliance with ethical standards

Conflict of interest No conflict of interest, financial or otherwise, are declared by the authors.

Ethical approval Ethical approval was obtained from Santa Catarina State University (Approval number 44/2011).

Informed consent Informed consent was obtained from all individual participants included in the study.

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