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An Investigation into the Relationship Between Pre-Competition Mood States, Age, Gender and a National Ranking in Artistic Gymnastics

by

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This study investigated the relationship between pre-competition mood state factors in gymnastics by gender, age and a national ranking. Participant-gymnasts (total n=116, male n=49, female n=67) completed a Brunel Mood Scale (BRUMS) one day prior to their main competition of the year. Information was also gathered from gymnasts of gender, age and a national ranking. Consistent with theoretical predictions, results confirmed that a number of pre-competition mood states differed by age with both juniors and seniors having a higher level of anger than children (p<.05 respectively). Also, seniors demonstrated higher tension than children (p<.001). However, only anger showed significant differences by gender with male gymnasts demonstrating higher levels of anger than female gymnasts (p<.05), and with international gymnasts registering higher levels of anger compared with second class gymnasts (p<.05). Authors suggest that future research should investigate relationships between the pre-competition mood in other gymnastics-related disciplines and sports, as well as competitive performances.

Key words: *pre-competition mood states, national ranking, artistic gymnastics.*

Introduction

The nature of competitive sport, such as artistic gymnastics, demands continual performance improvements. Sports psychologists, coaches, and trainers require to know athletes' psychological needs to ensure necessary assistance and support, and also to know how to prevent injuries and negative psychological responses to training and competition. Research has tended to focus on prior psychological states of athletes as predictors of subsequent sport performances with pre-competition mood states being influential (Henschen et al., 1990).

Mood and Performance

A mood is generally defined as a state of emotional or affective arousal of varying, impermanent duration (Weinberg and Gould, 2015). A mood state is a situation specific, somewhat transient, psychological response to an environmental stimulus (Cox, 2012). Studies of the effect of mood states on athletes' performances have contributed significantly to the knowledge and practice of psychology of sport in recent years (Lane et al., 2007). Although many athletes have good performances in practice sessions, during competitions not all are able to transfer their practice session capabilities and abilities to the competitive forum (Esfahani et al., 2011). Lane et al. (2010) have suggested that this reduction in the performance outcome is related to negative mood states due to reduction of motivation, concentration and other sports-related mental skills.

Mood Measures in Sport

For many years, sport psychology researchers relied almost exclusively upon the

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Profile of Mood States (POMS: McNair et al., 1971) as the measure of a mood when examining links with athletic performance. The use of the POMS in sport was pioneered by Morgan and his co-workers (Morgan, 1974; Morgan and Johnson, 1978; Morgan and Pollock, 1977) who demonstrated that, when compared to population norms, the mood profiles of athletes particularly at the elite level were characterised by above average vigour scores and below average scores for tension, depression, anger, fatigue and confusion. Morgan termed such a pattern of mood responses an iceberg profile and proposed that it was reflective of positive mental health (Morgan, 1980, 1985; Raglin, 2001).

Since its introduction, the POMS and its derivatives (Grove and Prapavessis, 1992) had been used to assess mood responses in over 400 sport-related papers (LeUnes, 2000). However, despite this popularity and many noted uses, the appropriateness of the POMS for work with athletes was questioned (Grove and Prapavessis, 1992; Terry et al., 1999) as it was developed and validated using samples of adults and psychiatric outpatients rather than athletes. Consequently, Terry et al. (2003) developed a version of the POMS (POMS-A) designed specifically for use in sport and exercise domains. This was further refined to become the BRUMS (Terry et al., 2003) and is now the instrument of choice in sports settings to consider the mood and performance in both individual and team sports, e.g. athletics (ultra-running) (Lane and Wilson, 2011), basketball, hockey (Lastella et al., 2015) and football (Basumatary, 2013). The BRUMS has also been cross-validated for use with populations throughout the world e.g. with athletes from Hungary, Italy (Lane et al., 2007) and Iran (Baghepour et al., 2013).

Studies investigating mood states in sport and exercise have used the BRUMS to predict dichotomous (win/lose) outcomes in some sports competitions (Lane et al., 2005). Mood measures have had most success in predicting performance in sports that are short in duration, involve individuals rather than teams, and in sports groups with homogenous abilities, such as in Lane and Jarett's (2005) examination of individual golfers during competition. Those authors noted that individuals reported feelings of anger, calmness and happiness simultaneously. Similar studies have been conducted in combat sports such as judo (Stevens et al., 2006), wrestling (Marttinen, 2011) and archery (Basumatary and Pramanik, 2014).

It has been suggested that some individuals use feelings associated with anger as a strategy to aid performance, considering that anger can facilitate positive performances under certain conditions (Beedie et al., 2000; Lane and Terry, 2000). Wong and his team found similarly with female winning karateka scoring higher on anger in their study (Wong et al., 2006). Interestingly, these findings are at odds with investigations undertaken by Lane et al. (2009, 2010) in which university athletes were participants. These studies identified that higher levels of vigour, calmness and happiness coupled with lower anger, confusion, depression, fatigue and tension scores were associated with optimal sport performance. It is speculated that this may be related to the level of athlete or sport aspirations, or the type of sport in which athletes participate. The predictive capacities of the mood state in sport have been extended beyond win/loss themes. For example, Kentta et al. (2006) found a correlation between a mood state and overtraining syndrome in elite kayakers. An elevated depression score allied with changing vigour and fatigue scores featured in athletes who underwent intensified training, suggesting that regular mood state investigation may help detect athletes who require more recovery, thereby preventing staleness.

Similarly, a prevalent mood state has been linked with predictions of when injury may occur. Findings from a study, in which 30 invasion and combat athletes were examined, showed significant differences between psychological state profiles taken retrospectively before injured, best and worst performances (Devonport et al., 2005). The authors found that the probability of injury was higher when higher depression and fatigue and lower vigour was present pre-competition.

With strong suggestions of contextually derived responses to the BRUMS (Cox, 2012), further work is needed to develop the reliability of the model. Thus, this present study aimed to investigate mood states at differing times in the training and competition cycle by considering a sports activity that has been neglected in the

literature (artistic gymnastics), amongst a variety of performance levels, and with age as an additional variable. It was hypothesised in our study that there would be significant differences between pre-competition mood states by gender, age groups and gymnasts' national rankings.

Material and Methods

Ethics Approval

Following appropriate procedures, the Rector of the Hungarian University of Physical Education, who acts as the highest authority for research ethics, granted approval to conduct the study. On receipt of ethical approval, written informed consent was obtained from all participants prior to the survey (with parental consent for those under 18 years). The protocol was conducted in accordance with the Declaration of Helsinki.

Participants

There are six gymnastics disciplines within the FIG (International Gymnastics Federation) and the National Gymnastics Federation's classifications. The current study focused on one cognate grouping by using data from artistic gymnasts only.

Participants were 116 volunteer gymnastics athletes (Age: M=19.79, SD=5.52; Males n=49, Females n=67) recruited from the Hungarian National Gymnastics Federation, using the Federation's database. This Federation categorises gymnasts as international (n=20), national (n=43) and second class (n= 53).

Many of the papers that we had reviewed focused on adult populations. And, while some investigated young adults and adolescent athletes, no study examined children. Only a few studies have investigated how emotion impacts on skill-levels of youth and adult players (Campo et al., 2012). In gymnastics, performers can develop into high-performance competitive athletes at very young ages, thus it was important that our study included children. Accordingly the authors established three age categories: children (10-14 years of age), junior (15-20 years of age) and senior (21-31 years of age).

For analysis by a national ranking, each gymnast was allocated to one of three groups, based upon their previous year's contest profile on the National Hungarian Gymnastics Federation database.

Instrument

Competitors filled out a paper based questionnaire (BRUMS) alone and in person at training sessions one day before what was designated as the main 2013 competition. The 32-item questionnaire determined eight factors: vigour (active, alert, energetic, and lively), anger (angry, annoyed, bad tempered, bitter), tension (anxious, nervous, panicky, worried), calmness (calm, composed, relaxed, restful), happiness (cheerful, contented, happy, satisfied), depression (depressed, downhearted, miserable, unhappy), fatigue (exhausted, sleepy, tired, worn-out) and confusion (confused, uncertain, mixed-up, muddled).

Reliability analysis (Cronbach alpha for all study variables) was conducted. According to the statistically accepted 0.7 criterion value (Tavakol and Dennick, 2011), the reliability analysis Cronbach Alpha Scores demonstrated high reliability for tension (0.76), anger (0.81), vigour (0.80), happiness (0.79), depression (0.76), fatigue (0.77) and confusion (0.70). Only the calmness (0.67) subscale indicated moderate reliability.

Athletes' mood states were assessed on the day before the main competition with a five-point Likert-scale. Responses ranged from 0 (not at all) to 4 (extremely) depending on whether artistic gymnasts' feelings did not correspond at all, corresponded a little bit, moderately, quite a bit or extremely to the mood words provided in the questionnaire.

Data analysis

Descriptive statistics and multivariate analysis of variance (MANOVA) were performed to test associations and group differences by gender, age and the national ranking (grading). A 2 (gender) x 3 (age groups) x 3 (national ranking) MANOVA was computed in order to assess all dependent variables. The dependent variables included pre-competition positive mood states (vigour, calmness, happiness) and negative mood states (anger, tension, depression, fatigue, confusion). The level of significance was set at an alpha level of 0.05. All statistical analyses were undertaken using SPSS v. 22 statistical software (SPSS Inc., Chicago, ILL, USA).

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Results

According to the MANOVA, no either 3-way or 2-way interactions were found. However, there were significant multivariate medium effects (Field, 2005) identified for gender (Pillai's Trace = .293, $F_{2,820}$ = 1.70, p<.05, effect size=.29) and age (Pillai's Trace = .535, $F_{4,1660}$= 1.52, p<.05, effect size=.34).

Univariate tests showed significant differences by gender for anger ($F_{1,101}$ = 3.98, p<.05), by age for anger ($F_{2,101}$ = 10.80, p<.001), tension ($F_{2,101}$ = 10.33, p<.001), calmness ($F_{2,101}$ = 3.21, p<.05), depression ($F_{2,101}$ = 3.84, p<.05) and fatigue ($F_{2,101}$ = 5.30, p<.05) and the national ranking for anger ($F_{2,101}$ = 7.11, p<.001) as well, see Table 1.

When responses by gender were considered, male gymnasts demonstrated higher levels of anger than female counterparts (p<0.05).

The *post hoc* test (with Bonferroni correction) revealed age differences as both junior (p<.05) and senior (p<.05) gymnasts had a higher level of anger than children gymnasts. Also, seniors demonstrated higher tension than children (p<.001). However, children stayed more calm than seniors (p<.05) before competition. Furthermore, juniors felt higher fatigue than children (p<.05) before competition. Having compared groups by a performance ranking, data revealed that a higher level of anger developed in international gymnasts as opposed to second class gymnasts (p<.05).

Figures 1-3 display "M" shapes or "Double Iceberg Profiles" importantly with two peaks. The BRUMS includes three positive subscales (vigour, happiness and calmness) which normally are presented as the archetypal 'Iceberg' profile. However, our study was presented diagrammatically as a "M" or "Double Iceberg" shape. According to gender comparison, only the anger category showed a significant difference (p<0.05), with male performers demonstrating higher levels of anger than female counterparts (Figure 1).

As for age differences, a number of mood categories were significant. In the week prior to the competition, both senior and junior gymnasts were more angry (p<0.05) than children, while in terms of calmness, children were reported to be significantly calmer (p<0.05) than seniors. Juniors reported higher levels of fatigue (p<0.05) than children (Figure 2).

Finally, having compared artistic gymnasts by their national ranking, anger demonstrated a significant difference with international standard gymnasts being more angry (p<0.05) before the competition than either national or second class level performers (Figure 3).

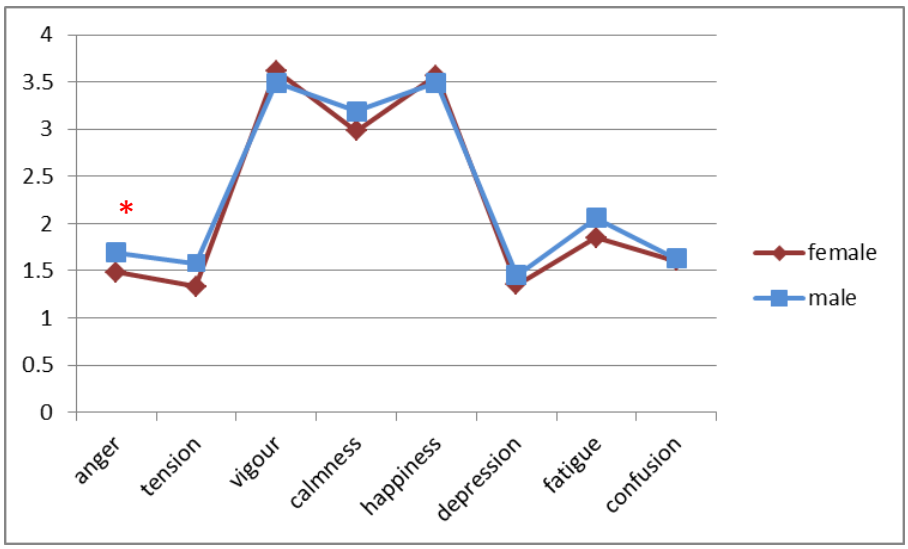

Figure 1

Double Peak Iceberg or "M" Profile of mood states in gymnasts by gender

*Note: * p<.05*

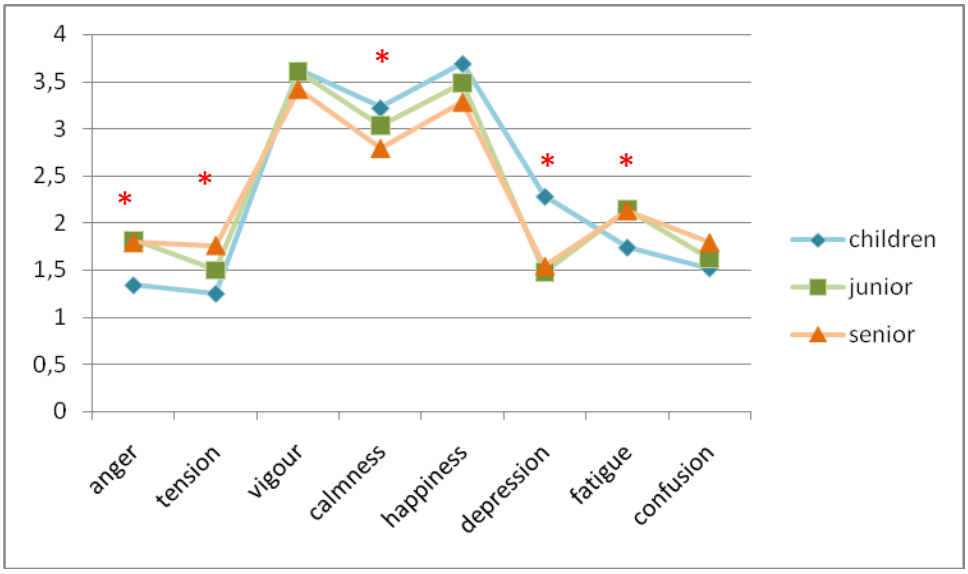

Figure 2

Double Peak Iceberg or "M" Profile of mood states in gymnasts by age groups
*Note: * p<.05*

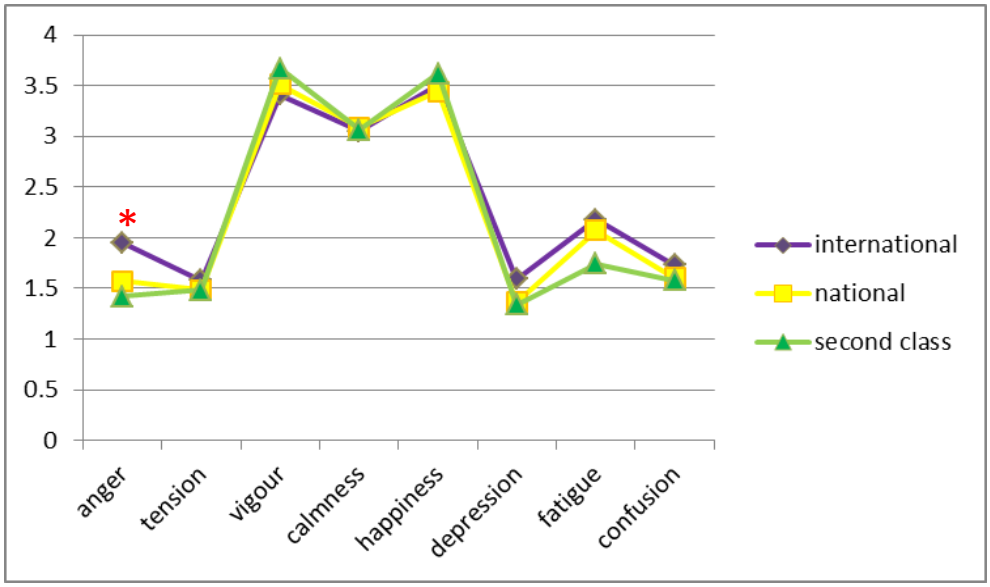

Figure 3

Double Peak Iceberg or "M" Profile of mood states in gymnasts by the national ranking
*Note: * p<.05*

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Table 1

Descriptive values (frequency and mean) of mood states by gender, age and the national ranking

		anger	tension	vigour	calmness	happiness	depression	fatigue	confusion
Mean	female (n=67)	1.48	1.33	3.62	2.98	3.57	1.35	1.85	1.60
	male (n=49)	**1.69***	1.58	3.49	3.19	3.49	1.45	2.06	1.63
Mean	children (n=58)	1.34	1.25	3.62	**3.22***	3.69	2.28	1.74	1.52
	junior (n=30)	**1.81***	1.49	3.60	3.03	3.48	1.47	**2.14***	1.61
	senior (n=28)	**1.79***	1.76*	3.42	2.79	3.28	1.54	2.13	2.79
Mean	international (n=20)	**1.95***	1.58	3.41	3.05	3.51	1.59	2.18	1.73
	national (n=43)	1.57	1.48	3.51	3.09	3.44	1.36	2.07	1.60
	second class (n=53)	1.42	1.48	3.67	3.06	3.62	1.34	1.74	1.58

*Note: * p<.05*

Discussion

The aim of this study was to examine pre-competition mood states of national gymnasts before their main annual competition in order to identify a relationship between mood factors by gender, age and national rankings. The results are important and unique due to the range of gender, abilities, experience and age of the gymnasts, the nature of gymnastics itself with high psychological and physical requirements, as well as the scarcity of this type of studies in the literature (Berisha and Halili, 2015).

The main finding of the present study was that anger was differentiated by the age-group and gender one day prior to the competition which may negatively influence and determine performance at the subsequent gymnastics competition. To support this assertion, Pieter et al. (2006) identified decrements that were associated with anger and tension before running competitions. In line with these findings were results obtained by Esfahani et al. (2011) who found that tension, depression and vigour had strong relationships with the performance of basketball players.

In our sample, significant differences were observed among the three groups in terms of mood factors. We found significant results in the anger factor between the second class gymnasts and international class gymnasts. The international class gymnasts had higher anger values before the main competition. Greater physical workloads, more pressure and higher expectations are components of their sporting careers when compared with lower level athletes. Therefore, if those factors worsen, the gymnasts may be more affected. Also, higher expectations tend to induce higher anger factors, albeit this was not confirmed by Lane et al.'s (2010) research. They suggested that successful competitors had higher values of positive factors and unsuccessful competitors had higher tension, anger and depression factors. It could be that there are individual differences amongst this group, with better performing gymnasts showing less anger in comparison. Lane et al. (1999) revealed that tension and anger in kickboxers were associated with losing when accompanied by depression. Anger was also found to be higher in young successful taekwondo athletes, as was tension

(Pieter et al., 2006). Wong et al. (2006) reported higher anger in female successful karateka. These findings accord with our results which identified strong correlations between depression and tension, as well as depression and anger (r=0.69; r=0.76, respectively).

The aforementioned findings may be explained by the Lane's (2001) work that identified the disparate effect that anger may have on performances dependant on the moderating effect of depression. This study reported that anger in non-depressed groups had positive (facilitated) effects on performances, whereas anger in depressed groups tended to have debilitating effects. For the test sample, significant differences were reported among the three age groups in terms of mood factors. Significantly higher values in the anger factor for junior and senior athletes were observed when compared with those of children. This could be due to the fact that gymnasts with more sport experience and longer sports age, understand the importance of the competition and take competition preparation more seriously, therefore exhibiting higher values in anger. Significantly higher value of calmness was noted in children when compared with senior gymnasts, which could perhaps be explained by the greater pressure placed on the older gymnasts' performance outcomes. The fatigue value was significantly higher in junior gymnasts than in children with a possible cause being related to the higher work outputs and training loads compared to children, allied with age-related fatigue from adolescent growth and maturation processes.

Overall, our study on mood states supported the recently identified "'M shape" or double peaked "iceberg profile" (Soós et al., 2014) as displayed in Figures 1-3 indicating that vigour and happiness factors emerged from the other factors by gender, age and national ranking groups. In earlier surveys with the POMS, only one positive factor was highlighted (the vigour factor), providing only one peak in the "iceberg profile" (e.g. Morgan, 1980 and many subsequent studies). In our study, similarly as in the Soós et al.'s survey (2014), the happiness factor's high value created a new, additional peak. Thus, it can be said that the national gymnasts' mood values created a "double iceberg profile". Whether this is a cultural variation or one of sports specificity remains to be examined.

The authors identified two key limitations of the study that should be addressed. First, the investigation involved a strong subjective component of performance based on ranking lists which were influenced by external (to the study) judges at a variety of competitions. The timing of the data collection was also considered as a limitation with data being gathered one day prior to the competition as opposed to immediately beforehand. Thus, it was likely that all gymnasts were in varying phases of preparation and this may have impacted some mood factors. To confound those two limitations, future research should ensure that data is gathered immediately before the main competition. This would have the benefit of ensuring that all gymnasts were in the same immediate pre-competition preparatory stage with similar workloads and recovery strategies in place.

Conclusions

It can be concluded that the results from the administration of the BRUMS were related to performance standards. In the first instance, this study could be extended by the involvement of other gymnastics disciplines, as each has its own individual performance characteristics.

The findings of this study lend support to the notion that gymnastics performance status is associated with variations in mood states one day prior to a competition. However, if the recommendation to gather data immediately pre-competition is considered, examination of the role of the mood state on the specific competitive outcome could be undertaken. Other areas for future research should consider the participant sample. While this study used Hungarian National artistic gymnasts as participants, it is unclear as to whether the "double iceberg profile" would stand with gymnasts from other gymnastics disciplines, or gymnasts from other countries. It is suggested that future works should investigate relationships between the mood and goal orientation before competition in other gymnastics disciplines, sports and a variety of nations. This would ensure greater reliability of testing.

Finally, scales are useful to identify diverse trends. However, details of practices or environments that impact gymnasts and lead

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them to respond in particular ways are unknown. Observation of gymnasts in training and discussion with the athletes during this phase would help identify what causes the feelings that they noted. For example, if depressed gymnasts reported anger, what was its cause? The importance of such details cannot be discounted as Spielberger (1991) noted that anger had specific behaviours typified by feelings of fury and bad temper. He related this to injustice or frustration from goal directed behaviour. However, using a scale such as the BRUMS gives no clear indication of what has caused such feelings, and therefore, no evidence for interventions to reduce this debilitating response in depressed individuals prior to the next competition. Thus, a mixed-method approach would be valuable.

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