Tharion, WJ, Karis, AJ, & Potter, AW. Mood states of U.S. Army Ranger students associated with a competitive road march. J Sport Human Perf 2013;1(3):1-9
doi: 10.12922/jshp.0022.2013

JSHP
JOURNAL OF SPORT AND HUMAN PERFORMANCE

ORIGINAL RESEARCH OPEN ACCESS

MOOD STATES OF U.S. ARMY RANGER STUDENTS ASSOCIATED WITH A COMPETITIVE ROAD MARCH

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ABSTRACT

Mood state has been associated with performance in athletes; U.S. Army Rangers are the Army's equivalent to the elite athlete. **Purpose:** To examine the relationship between mood and success on a qualification road march during Ranger School. **Methods:** Thirty-nine male Ranger students (mean ± sd; age, 25 ± 4 yrs; ht: 177 ± 5 cm, wt: 80 ± 9 kg; % body fat: 15 ± 4%, two-mile run fitness test: 12:50 ± 0:58 min) from two training classes participated. Road march distances were 8 and 12 miles for summer and winter classes, respectively. Environmental conditions were summer: 24.4° to 25.0°C air temperature (Ta), 82% to 89% relative humidity (RH), winter: -6.2°C to -4.4°C Ta and 51% to 60% RH. To achieve a passing grade and avoid being dropped from Ranger School, students needed to complete the march under a 16:25 min/mile pace while carrying ~31 kg of equipment. The Profile of Mood States (POMS) questionnaire was administered immediately after the march. The POMS assesses six moods (tension, depression, anger, vigor, fatigue, and confusion). **Results:** Road march times were 2:00 $\pm$ 0:07 (hr:min) (avg 15:02 min/mile) for the 8-mile course and 3:03 $\pm$ 0:12 (avg 15:15 min/mile) for the 12-mile course. A significant correlation between two-mile run times and road march times existed (r = 0.80, p = 0.001 (summer) and r = 0.47, p = 0.05 (winter)). Correlations between mood and road march times were not significant for the winter class. However, significant correlations for tension r = 0.60; p = 0.004), depression: r = 0.60; p = 0.004), fatigue: r= 0.60; p = 0.004), and confusion: r = 0.53; p = 0.01) and road march times were seen in the summer class. Interaction effects from an analysis of variance between class (summer vs. winter) and passing the qualification standard (pass vs. fail) existed for tension (p = 0.001), depression (p = 0.28), fatigue (p = 0.001), and confusion (p = 0.022). **Conclusions:** Mood and performance were not related during the winter march. During the more environmentally- challenging summer march, mood was related to performance with more negative moods associated with those not meeting the U.S. Army Ranger School standard. The combined effects of the physical stress of completing the road march for time, the hotter environmental temperatures during the summer, and the disappointment of not meeting the Ranger School standard, likely contributed to these negative mood states.

Keywords: Ranger, Profile of Mood States, POMS, Military Training, Psychological State

INTRODUCTION

Modern dismounted soldiers regularly engage in strenuous work activities that impose significant physical and mental burdens (15). These activities often require soldiers to carry heavy loads of 40 kg or more for missions lasting from several hours to multiple days or more (3). Long duration operations have been shown to significantly impact the overall mood state of individuals and these degraded mood states have been correlated to decreased effectiveness in accomplishing military tasks (7). High stress, combat-like training environments of elite military units such as U.S. Army Rangers and U.S. Navy Seals have been shown to have a negative impact on individual mood-states (5,8). Environmental stress even in seasoned elite warfighters, e.g., graduates/survivors of U.S. Army Ranger School, can degrade mood and cognitive, physical, and military task performance (6). Nutritional, physiological, immunological, and cognitive assessments have been made during U.S. Army Ranger School (11,18). Lieberman et al (6) assessed mood of Ranger students after the completion of the 61-day Ranger School course. However, to our knowledge no mood assessments have been made of Ranger School students during their Ranger qualifying course.

The relationship between mood and military performance seemingly has many parallels with that of mood and athletic performance. The relationship of mood has been well documented over the years with athletes. Summaries of various studies of athletes' mood profiles and the relationship of mood to athletic performance have been summarized in reviews by Renger (16) and LeUnes and Burger (4). Particularly relevant to military long duration operations or military road marching are the studies with endurance athletes such as runners, rowers, swimmers, and ultramarathoners (12,14,19,20). In general, it has been reported that more negative moods are associated with poorer performance in these athletes. Depending on the situation, this could indicate overtraining and increased likelihood of illness and injury (13).

One of the most recognized tools for assessing mood is the Profile of Mood States (POMS) developed by McNair et al. (9). The POMS can be used either as a trait survey, whereby general mood of the individual is assessed by asking how one generally feels, or as a state survey whereby mood is assessed at a particular point in time. When elite and non-elite athletes are asked about their trait mood state they typically score higher compared to college norms on the one positive mood (vigor) assessed by the POMS, while scoring lower than college norms on the five negative moods (tension, depression, anger, fatigue and confusion). This pattern was termed the "Iceberg Profile" by Morgan (12). Similarly, non-elite U.S. Army soldiers and Marines were found to have a flattened "Iceberg Profile", with the five negative moods being below college norms but vigor, the lone positive mood state having approximately the same level as the college norm value (1). Alternatively, Special Forces soldiers' profile was a true "Iceberg Profile" similar to that found in athletes (1).

While mood and athletic performance, and the impact of sustained military operations on mood have been examined, the relationship between mood and road march performance has only been examined once (2). In that study, the road march was part of regular infantry training. This study differs from the Knapik et al. (2) study in that there was a completion time standard that had to be met to remain in the U.S. Army Ranger School; hence the performance implications were greater. To our knowledge no studies have been published examining mood associated with a pass/fail qualifying road march. This

study examined the relationship between mood and U.S. Army Ranger School qualifying road march performance.

METHODS

Volunteers and Road March

Thirty-nine male Ranger students from two training classes (a July 2008 summer class n = 21 and a winter 2009 February class n = 18) were studied. Volunteers were briefed on the purpose, risks, and benefits of the study and each gave their written informed consent prior to study participation. This study was approved by the Scientific Review and Human Use Review Committees at the U.S. Army Research Institute of Environmental Medicine (Natick, MA). These test volunteers (age: 25 $\pm$ 4 yrs, height: 177 $\pm$ 5 cm, weight: 80 $\pm$ 9 kg, and 2-mile run time: 12:50 $\pm$ 0:58 min:sec) were participants in the U.S. Army Ranger School qualifying road march. Average aerobic fitness (VO_2 max) estimated using the Mello et al. (10) equation of two-mile run time and body weight, was 55.8 $ml \bullet kg^{-1} \bullet min^{-1}$. There were no significant differences in individual characteristics (age, ht, etc.) between classes.

Road March

The road march was conducted on the 4th day of the Ranger Training Brigade's (RTB's) 61-day Ranger School. It was conducted on paved and hard-packed dirt roads at Ft. Benning, GA. Conduct of the march was under the direction of the RTB instructors, and no changes were made as a result of the research study. The distance for the summer class was 8 miles (~12.9 km) and for the winter class was 12 miles (~19.3 km). Differences in course length between classes was set at the discretion of the RTB, but their rationale was that the hot and more difficult summer conditions necessitated a shorter course, to ensure safety of the students and to make the difficulty of meeting the standard approximately the same as that of classes held in cooler weather. The environmental conditions for the summer were: ambient temperatures (Ta) of 24.4 °C to 25.0 °C and a relative humidity (RH) of 82% to 89%. For the winter march, Ta were -6.2 °C to -4.4 °C; and a RH of 51% to 60%. Students were required to complete each road march in a 16:25 min/mile pace, i.e., under 2:04 (hr:min) for the summer course and 3:05 (hr:min) for the winter course. Times were recorded and verified by wrist worn global positioning systems (GPS) (Garmin Ltd., Olathe, KS). Volunteers each carried approximately 31.2 $\pm$ 1.5 kg during the march, with no significant differences between the two classes in the amount of weight carried.

Mood State Assessment

The POMS (9) was administered immediately after the road march. The POMS is a 65-item adjective survey that describes a person's feelings. Each item is scored from 0 to 4. The survey may be factored into six mood states (tension, depression, anger, vigor, fatigue and confusion). The responses were based on the following question: "Describe how you were feeling during the road march?"

Statistical Analysis

Statistical analyses were calculated using SPSS 19.0 Statistical Software (SPSS Inc., an IBM Company, Chicago, IL). Descriptive statistics are presented as means $\pm$ standard deviations (SD). Pearson correlation coefficients were used to determine the relationship between various mood states and road march finish time. Two-way analyses of variances (ANOVAs) for road march times and for each mood state were run to examine the effect of class (summer vs. winter) and whether the student passed the qualification standard (pass vs. fail) of the road march. A

chi-square analysis was performed to determine frequency of passing the qualification standard between the summer and winter courses.

RESULTS

Road March Performance

The road march was completed at a non-significantly faster pace during the shorter 8-mile summer course (15:02 ± 0:59 min/mile) compared to the 12-mile winter course (15:16 ± 1:02 min/mile). Total time to complete the march for both classes, whether they passed or not, and % of students passing the qualifying standards are shown in Table 1. There were significant differences (expected) in total time to complete the longer summer course vs. the winter course (p <0.0001) and also between those who passed vs. those who failed the road march (p <0001). No difference in frequency of achieving a passing grade existed between classes. Road march performance was significantly correlated to self-reported two-mile run time on the Army Fitness Performance Test (AFPT); summer: r = 0.80, p = 0.001 and winter: r = 0.47, p = 0.05.

Mood and Road March Performance

Figure 1 shows the standardized mood states using T-Scores from college norm values (T-Score = 50) (9). Table 2 is a summary of the raw mood scores and the correlation of the various mood states to road march performance. Significant differences between class (summer vs. winter), passing the road march qualification test (pass vs. fail), and the class x passing interaction effect for each mood state are also presented.

Mood differences were observed as a main effect of class (summer vs. winter) for tension (Table 1). The main effect of passing the qualification road march (pass vs. fail) and the interaction effects of class by passing were significant for tension, depression, fatigue and confusion. The p values are listed in the table. Significant correlations existed for the summer road march between finish time and mood states, but did not exist for the winter class (Table 2).

Table 1. Road march time for Summer and Winter classes for those who passed the qualifying standard vs. those that did not.

	Pass Time (hr:min:sec)	Fail Time (hr:min:sec)	All Time (hr:min:sec)	% Passing
Summer (8-Mile)	1:57:10 ± 0:07:07	2:08:14 ± 0:01:42	2:00:20 ± 0:07:54	72
Winter (12-Mile)	2:56:26 ± 0:10:32	3:14:08 ± 0:05:25	3:03:19 ± 0:12:26	61

Figure 1. Standardized T-Score moods for summer and winter classes.

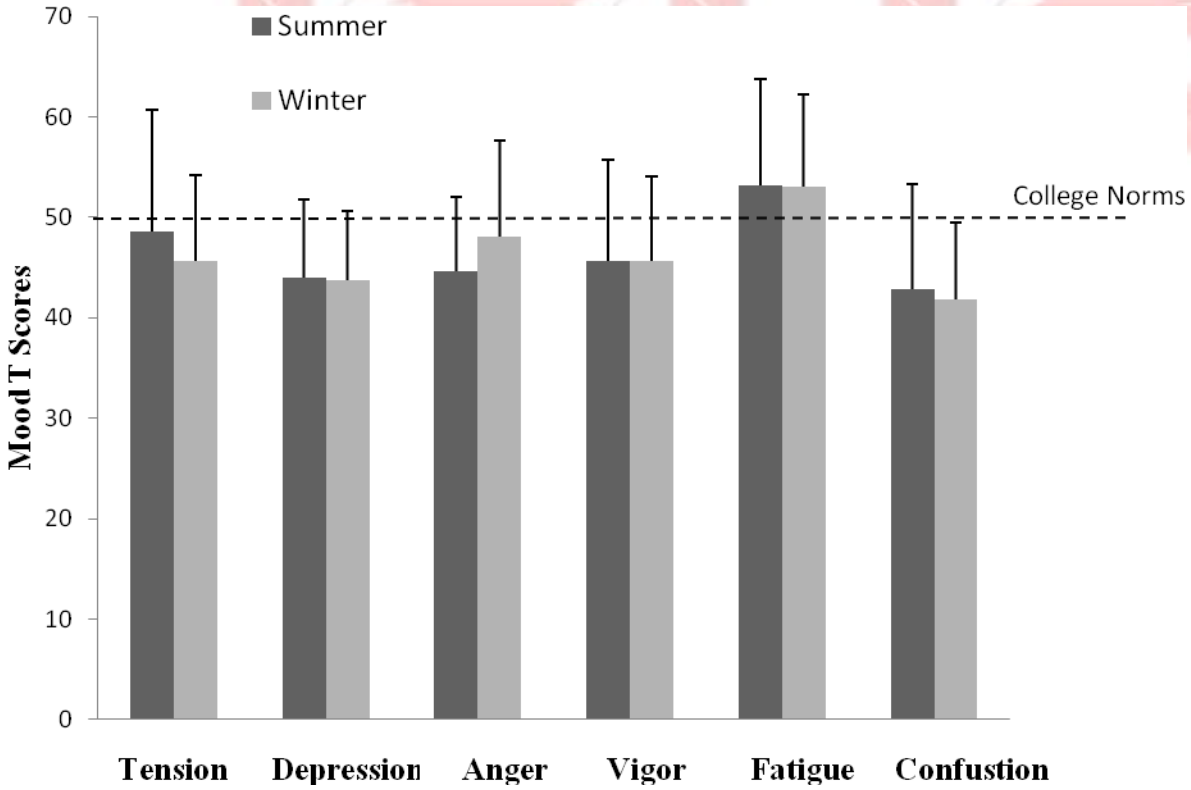

Table 2. Mood states based road march success for summer and winter classes.

	Tension	Depression	Anger	Vigor	Fatigue	Confusion
Summer (All)						
Pass	12.7 ± 9.8	7.0 ± 8.5	5.5 ± 5.8	13.1 ± 6.4	11.9 ± 6.8	6.6 ± 5.2
Fail	8.3 ± 9.8	3.3 ± 5.0	4.7 ± 4.9	13.5 ± 6.6	9.0 ± 5.0	4.5 ± 2.5
	23.7 ± 9.8	16.3 ± 8.7	7.7 ± 7.7	12.2 ± 6.4	19.2 ± 5.2	12.7 ± 6.9
r (*p*)	0.60 (0.004)	0.60 (0.004)	0.37 (NS)	-0.18 (NS)	0.60 (0.004)	0.53 (0.01)
Winter (All)						
	9.6 ± 6.3	6.1 ± 7.6	7.4 ± 7.3	12.7 ± 5.2	12.1 ± 5.1	6.4 ± 3.6
Pass	9.9 ± 5.9	5.2 ± 3.7	8.2 ± 6.9	13.0 ± 6.2	12.9 ± 4.7	6.0 ± 3.1
Fail	9.1 ± 7.4	7.4 ± 11.6	6.1 ± 8.3	12.3 ± 3.3	10.9 ± 5.9	6.9 ± 4.3
r (*p*)	0.01 (NS)	0.24 (NS)	0.05 (NS)	-0.02 (NS)	-0.19 (NS)	0.01 (NS)
ANOVA						
Class (*p*)	0.008	NS	NS	NS	NS	NS
Pass (*p*)	0.003	0.003	NS	NS	0.026	0.005
Class X Pass (*p*)	0.001	0.028	NS	NS	0.001	0.022

DISCUSSION

All volunteers in this study completed the 8-mile (summer) or 12-mile (winter) road marches. Of those soldiers participating in this study, 72% of summer class students and 61% of winter class students passed the Ranger School standard. Interaction effects for POMS measures of tension, depression, fatigue and confusion were observed with the highest levels of these negative moods seen in those that failed to meet the qualifying standard in the 8-mile summer course. Previous findings with ultramarathoners showed that the rigors of competing and finishing a 50- or 100-mile running event elicited greater feelings of negative moods especially psychological fatigue (20). In that study, finishers of the race experienced more negative mood feelings than those who dropped out of the race. The authors concluded that the greater negative feelings especially of affective fatigue were related to the greater depth of physiological fatigue (e.g., depletion of glycogen) and the need for sleep (e.g., ultramarathoners in a 100-mile race run between 18 and 30 hours continuously). Within the present study, fatigue was greatest in those who failed to meet the qualifying standard for the 8-mile summer course. This illustrates that it is not marching time alone that dictates the level of fatigue or other poorer mood feelings. What cannot be answered from this data, was did mood influence performance, or did individuals report on their moods after reflecting on their performance? The survey asked how one felt during the march, but it was administered after the march. It is likely mood at the time of the administration (after the march) influenced individual's responses. Furthermore, even if volunteers answered the survey of how they felt during the march, most knew the standard they would need to achieve. If they slowed their pace they would know they would be in jeopardy of not passing the qualifying standard. Examining changes in mood or controlling for pre-march mood may have assisted in determining whether mood affected performance or vice-versa. However, this research was embedded within the regular training activities of the U.S. Army Ranger School, and time to assess mood state before the march was not possible. Other research has suggested that the relationship seen may support both explanations.

Sheard and Golby (17) showed that individuals who were randomly assigned to receive psychological skills training developed a more positive psychological profile. Those with the more positive psychological profile developed through training then swam faster in freestyle swimming events during competitions. Knapik et al. (2) noted an increase in feelings of fatigue and a decrease in feelings of vigor following a 20-km road march while carrying a load of 46 kg. The Knapik et al. (2) study was timed but did not include a career changing pass/fail standard as in this study. No differences in mood were examined based on finish time in the Knapik et al. (2). study. The negative moods exhibited in the Knapik et al. (2) study were not as negative as those who failed to pass the qualifying standard in the present study; providing some evidence that failing to perform to the Ranger School performance standards likely contributed to the elevated feelings of tension, depression and confusion. Furthermore, in athletic events like the ultramarathon, feelings of tension usually are reduced after the race is over, as the uncertainty of the event has now been removed (20). Knapik et al (2) did not see a reduction (or an increase) in tension after the road march which they attributed to the familiarity of the event for the participating soldiers. In the present study, there were greater levels of tension in those who did not meet the Ranger School standard during the summer class compared to those that did meet

the standard. These elevated negative feelings are likely in addition to mood changes that could be expected from the physical strain imposed by the march itself. The combined stress of the hot environment of the march, and the frustration of being removed from the Ranger course may have elicited these feelings.

Previous research with soldiers undergoing a simulated sustained operation illustrated that moods assessed by the POMS became progressively more negative as the result of four days of continuous military duties (15). The comparison of POMS moods on the 4th day of the Nindl et al (15) study (Table 2) is relevant because the RTB road march occurred on the 4th day of Ranger School, and Ranger school is similar in the continued operational stress combined with the lack of sleep as was described in Nindl et al. (15). However, in the Nindl et al. (15) study, while moods were more negative after 4 days of sustained operations compared to at the beginning of the mission, they were not as negative in the 4 mood states that showed significant differences (tension, depression, fatigue and confusion) as those experienced by students in the present study who failed to pass the qualifying standard. However, they were similar or greater than those who completed the march with a qualifying time. From this comparison it might be hypothesized that while mood was not assessed prior to the road march or at the beginning of the first day of Ranger School, it seems reasonable to suggest that each day moods became progressively more negative. Furthermore, when the course was held in the summer under environmentally challenging conditions, failure exacerbates these negative moods.

CONCLUSIONS

During the more environmentally challenging summer march, mood was related to performance with more negative moods associated with those not meeting the U.S. Army Ranger School road march standard. Moods were not related to performance during the winter march. The combined effects of the physiologically taxing march, the hotter environmental temperatures during the summer, and the disappointment and frustration of not meeting the Ranger School standard likely contributed to these increased negative mood states in these individuals. That is, bad moods were seen in those who knew they were about to fail the road march standard which in turn would result in them being removed from U.S. Army Ranger School.

ACKNOWLEDGEMENTS/ DISCLAIMERS

We thank the leadership at the Ranger Training Brigade at Fort Benning, GA for their willingness to incorporate this research project into their training. We express our gratitude to the soldiers that participated in this study.

The authors have no financial or other personal interest in the research findings. Funding for this research was from the U.S. Army Medical Research and Materiel Command. The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Army or Department of Defense.

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