

Acute Effects of a Single Bout of High-intensity Training on the Mood of Adolescent Athletes

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Abstract—Purpose: The purpose of this study was to explore the association between acute high-intensity training with mood and cognitive function, and whether this association varies with life-related stress. **Methods:** A pre-and-post single group design was chosen. Subjects were junior-high and high school athletes (aged 12- 17 years). Mood was measured before and immediately after acute high-intensity training. Changes in pre-and-post test scores were analyzed by Paired-Samples T Test. **Results:** Acute high-intensity training could improve the mood of adolescent athletes. **Conclusion:** Overall, the findings of this study suggested that acute high-intensity training is positively related to young athletes' mood, and the mood of young athletes with high levels of life-related stress were more likely to be improved.

Keywords—adolescent athletes, high-intensity training, mental health, mood, life-related stress

I. INTRODUCTION

Over the past 30 years, there have been a large number of studies committed to understanding the impact of exercise on mood, the research in this field has become one of the hot issues in current academic circle. In several meta- analyses, it is emphasized that the mood improvement observed after a moderate level of exercise does not occur after a single session of intense physical exercise. On the contrary, mood can even be worsened compared with the state before exercise [1]. Exercise intensity is a moderator and it has frequently been studied in acute exercise field. In the theory of driving theories and the inverted-U hypothesis, the intensity of exercise is regarded as the independent variable, and the influence of different exercise intensity on mood can be different. The

difference lies in the fact that the drive theories suggest that the largest benefits will be observed at high intensity, however the Inverted-U hypothesis holds the idea that high intensity exercise may be ineffective or negative [2]. The present evidence suggests that the inverted-U hypothesis seems to be more popular, and has been supported by more researches. The cue utilization theory (Easterbrook) thinks that there is an inverted-U relationship between the athletes' attention and the arousal level (exercise intensity); laboratory research on the inverted-U hypothesis (arousal and the stability of the hand) also was confirmed [3]; and the relationship between the intensity of exercise and mood approximates an inverted-U [4][5].

However, the drive theories and the inverted-U hypothesis both emphasize only the stimulus and response characteristics, without the consideration of personal, social and psychological factors. Thus, they can't explain inter- individual differences or intra-individual differences in "affective response". Therefore, researchers turn to the interactive influence among athletic identity, life-related stress and high-intensity training in athletes. We suggest that it is necessary to take the social attributes of athletes into consideration, so as to understand an athlete thoroughly.

The purpose of the experiment summarized here was to explore the association between acute high-intensity training with mood, and whether this association varies with life-related stress. It was hypothesized that: (i) acute high- intensity training would result in significant improvement in mood; (ii) acute high-intensity training would result in significant

improvement in mood among young athletes, especially the athletes who have higher life-related stress.

II. METHOD

A. Participants

The sample consisted of 37 Chinese young athletes ($N_{male} = 18$ and $N_{female} = 19$) who regularly participated in organized sports. Ages of participants is between 12 and 17 ($M = 15.2$, $SD = 1.94$). Participants were trained and competed in track and field athletic events (100 meters, 200 meters, 400 meters, 800 meters, 110 meters hurdles,

400 meters hurdles). The participants' exposure to the specific sport (event) ranged from 1.5 years to 8 years ($M = 3.48$, $SD = 1.70$).

B. Study Design (Table 1)

A pre-and-post single group design was chosen.

TABLE I. HIGH-INTENSITY TRAINING PROGRAMS

Variables	50 meters	100 meters	130 meters	200 meters	400 meters
Repeated bouts	2	2	2	2	2
Intensity	85%	90%	85%	80%	85%
Recovery Duration between bouts	30s	30s	60s	60s	60s

^a. Note: Recovery duration between groups 90s

C. Measures

Profile of Mood States [6]. There is an emotional state assessment scale that consists of six dimensions: tension, anger, depression, confusion, vigor, and fatigue. Several adjectives (e.g., nervous, angry, confident) was employed to measure each dimension, totally 65 adjectives. Responses to each item (five per mood) scale the intensity of the mood as: 0

(indicating not at all), 1 (a little), 2 (moderately), 3 (quite a bit) and 4 (extremely). In 1992, a shorter version of the

POMS contained 40 items was developed by R. Grove et al., and increased "self-esteem" scale [7]. In 1995, Zhu Beili et al. revised the original 40-item POMS and established the simple POMS scale for China [8]. The model demonstrated a good fit to Chinese students, $p \approx 0.01$. Moreover, internal consistency reliability scores were between 0.62~0.82, and the average score of α was 0.71.

Adolescent Self-Rating Life Events Check List. The ASLEC is on the basis of previous studies by Liu XC et al., according to the characteristics of the Chinese youth, in order to assess the social psychological stress of adolescents. The scale has been widely used and has been amended by several institutions. The ASLEC contained 27 negative events that could cause psychological stress in adolescents, and the test-retest reliability and internal consistency reliability were at a high level, thus it can be used to assess the social psychological stress of adolescent athletes [9].

D. Procedure

Before the experiment: After signing the informed consent, the participants then performed practice trials of the psychological tests after first being provided with instructions.

E. Data Analysis

Microsoft Excel was used for preliminary data processing. Self-report data were scored and input into Excel. The primary analyses used SPSS Statistics (Version 17.0). Paired-Samples T Test was used to test whether there are significant differences before and after acute high-intensity training.

III. RESULTS

A. Profile of Mood States

As illustrated in Fig. 1, tension, depression, anger, confusion, self-esteem were significantly lower after the training condition when compared with seated rest, especially tension and confusion. At the same time, fatigue increased and energy decreased.

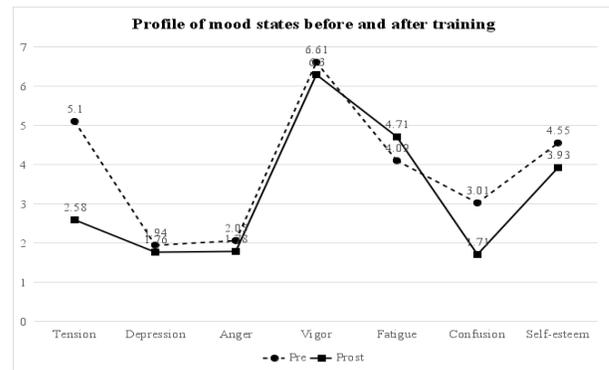


Fig. 1. Profile of mood states before and after training

B. Correlations between mood and life-related stress

The life-related stress scores of 37 athletes were divided into high score group and low score group (high score group: above-average score; low score group: below-average score), and then the changes of TMD before and after training of the two groups were compared. As illustrated in Fig. 2, the TMD was significantly decreased after training for athletes with higher level of life-related stress, while the TMD had no obvious change after training for athletes with lower level of life-related stress.

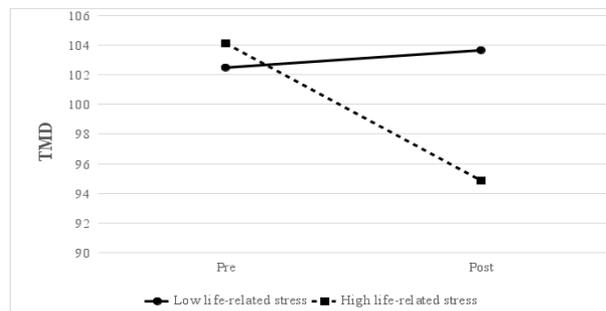


Fig. 2. Correlations between mood and life-related stress

IV. DISCUSSION

The key findings of this study are that: Acute high-intensity training could improve the mood of adolescent athletes, and the improvement of mood in athletes with higher level of life-related stress is more significant than athletes with lower level of life-related stress.

The hypothesis predicted that acute high-intensity training would result in significant improvement in mood among young athletes, especially the athletes who have higher life-related stress. The hypothesis was confirmed: the mood of adolescent athletes was improved after acute high-intensity training, and the improvement of mood in athletes with higher level of life-related stress is more significant than athletes with lower level of life-related stress. Athletes are social individuals who are exposed to both physical and psychological stresses on a consistent basis, ranging from exercise-and competition-based stressor to daily and life-

related stressors [10][11]. Therefore, negative mood caused by life-related events will be transferred to training and relieved through the stimulation of intensive training. For young athletes, due to their immature mind and lack of social experience, living environmental factors can easily affect their training, especially the high-intensity training. If coped well the burden will be eased, otherwise, the athletes will be burdened. Therefore, there may be a need to carefully monitor the intensity of training at the time of rapid growth and development.

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REFERENCES

- [1] Peluso M A M, "Atividade física e saúde mental: a associação entre exercício e humor," *Clinics*, vol. 60, no. 1, pp. 61-70, 2005.
- [2] Chang, Y. K., Labban, J. D., Gapin, J. I., & Etnier, J. L., "The effects of acute exercise on cognitive performance: a meta-analysis," *Brain Research*, vol. 1453, no. 1, p. 87, 2012.
- [3] Martens, R., & Landers, D. M., "Motor performance under stress: a test of the inverted-u hypothesis," *Journal of Personality & Social Psychology*, vol. 16, no. 1, p.29, 1970.
- [4] Berger, B. G., & Motl, R. W., "Exercise and mood: a selective review and synthesis of research employing the profile of mood states," *Journal of Applied Sport Psychology*, vol. 12, no. 1, pp. 69-92, 2000.
- [5] Ojanen, M., "Can the true effects of exercise on psychological variables be separated from placebo effects?" *International Journal of Sport Psychology*, vol. 25, no. 1, pp.63-80, 1994.
- [6] Menair, D. M., Lorr, M., & Droppleman, C. F., "The profile of mood states manual," 1971.
- [7] Grove, J. R., & Prapavessis, H., "Preliminary evidence for the reliability and validity of an abbreviated profile of mood states," *Int.j.sport Psychol*, vol. 23, no. 2, pp. 93-109, 1992.
- [8] Zhu Beili, "Brief introduction of POMS scale and its model for China," *Journal of Tianjin Institute of Physical Education*, vol. 10, no. 1, pp. 35-37, 1995.
- [9] Chen H, Jia CX, & Liu XC., "Psychometric properties and application of Adolescent Self-Rating Life Events Checklist (ASLEC)," *Chin J Public Health*, vol. 32, no. 8, pp.1116-1119, 2016.
- [10] Puffer, J. C., & Mcshane, J. M., "Depression and chronic fatigue in athletes," *Clinics in Sports Medicine*, vol. 11, no.2, pp. 327-38, 1992.

- [11] Sabato, T. M., Walch, T. J., & Caine, D. J., "The elite young athlete: strategies to ensure physical and emotional health," *Open Access Journal of Sports Medicine*, vol. 7, pp. 99-113, 2016.