Psychophysiological Stress Indicators In College Athletes: Comparison Of Physiological Responses With Different Types Of Stressors

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ABSTRACT:

PURPOSE: To compare the physiological responses to different types of stressors in college athletes.

METHODS: 20 male college athletes (17 to 23 y) were evaluated. Psychophysiological assessment of stress was done by a ProCompTM Infiniti Biofeedback System. Physiological responses were recorded and categorized as "stressed" (Heart Rate [HR] >90 b/min, Electromyography [EMG] >5 µV, Skin Conductance [SC] >5 uS and Respiration [Resp] >16 br/min) and "not stressed"; The evaluation consisted of 7 stages lasting 2 min each (BASELINE, exposed to a PHYSIOLOGICAL stressor [unpleasant sounds], 1st REST, exposed to a COGNITIVE stressor [mathematical task], 2nd REST, exposed to an EMOTIONAL stressor [talk about a stressful memory] and 3rd REST). A statistical analysis was carried out with X2, Phi coefficient, and Cochran's Q test.

RESULTS: Significant changes were found in the proportion of "stressed" subjects in the physiological responses of HR and SC, and a trend towards significance in EMG throughout the evaluation. The indicators that most approached the expected response (increase with stressor and decrease at rest) during the evaluation were HR and SC; EMG tended to approach. The significant differences observed in the proportion of subjects "stressed" by stages and by indicators were in BASELINE, 1st REST and 2nd REST, and with a trend towards significance in COGNITIVE, being Resp the indicator that showed the highest proportion. The effect size for significant differences was moderate to high.

CONCLUSIONS: The subjects obtained expected responses (increase/decrease) over time in most of the indicators, except in Resp, so in our sample, it was not an indicator related to stress. The proportion of subjects "stressed" during stressing stages were not significant but were different during rests, which may mean that the greater proportion of subjects increased their physiological responses in a similar way to stressors but could recover differently during rests.

INTRODUCTION

Stress is defined as the physiological, cognitive, and behavioral response to a stimulus perceived as threatening. The purpose of this response is to adapt to the developing environment (Lazarus & Folkman, 1984). With a potential stressor, the system is activated by neural (sympathetic nervous system (SNS)) and endocrine (hypothalamic-pituitary-adrenal axis (HPA)) components (Cohen et al., 2000; Kaye & Lightman, 2005; Cannon, 1929). The SNS is responsible for mobilizing the body's resources during emergencies, so when faced with a stressful situation it causes physiological responses such as an increase in heart rate, breathing, temperature, sweating and muscle tension (Maholtra, 2009). Chronic stress affects brain function, causing the deterioration of some executive functions such as attention, memory and decision making; the generation of stress-related disorders can affect physical health and social life as well (Subhani et al., 2018). The manifestation of stress is a factor that can affect the athlete's performance positively or negatively. In sports, stress usually manifests, mainly facing a competition. Sometimes, when not handled properly, it results in extreme excitement (activation), which can generate: interruption of thought, lack of concentration, confusion and physical tension; and as a consequence, a decrease in sports performance (Zaichkowsk & Fuchs, 1986). Knowing how the athlete manifests his stress and who presents major difficulties to manage it is the first step to improve that factor.

METHODS

The sample consisted of 20 male college athletes between 17 and 23 years old, belonging to sports: wrestling, volleyball, and beach volleyball of a high-performance college program.

The psychophysiological assessment of stress was done by a ProCompTM Infiniti Biofeedback System. The evaluation was based in Khazan (2009) and Arena & Schwartz (2005), and it consisted of 7 stages lasting 2 min each (Figure 1).

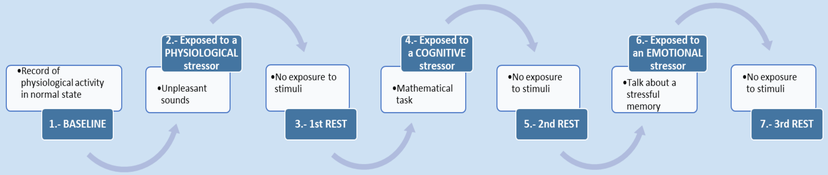

Figure 1. Stages of the psychophysiological assessment of stress.

Physiological responses were recorded and categorized as "stressed" (Heart Rate [HR] >90 b/min, Electromyography [EMG] >5 µV, Skin Conductance [SC] >5 uS, and Respiration [RESP] >16 br/min) and "not stressed". A statistical analysis was carried out with X^2, Phi coefficient, and Cochran's Q test, using the SPSS 20.0 software.

RESULTS

Significant changes were found in the proportion of "stressed" participants in the physiological responses of HR and SC, and a trend towards significance in EMG throughout the evaluation. The indicators that most approached the expected response (increase with the stressor and decrease at rest) during the assessment were HR and SC; EMG tended to approach, and RESP was further away (Figure 2). The significant differences observed in the proportion of participants "stressed" by stages and by indicators were in BASELINE, 1st REST and 2nd REST, and with a trend towards significance in COGNITIVE, being RESP the indicator that showed the highest proportion. The effect size for significant differences was moderate to high (Figure 3).

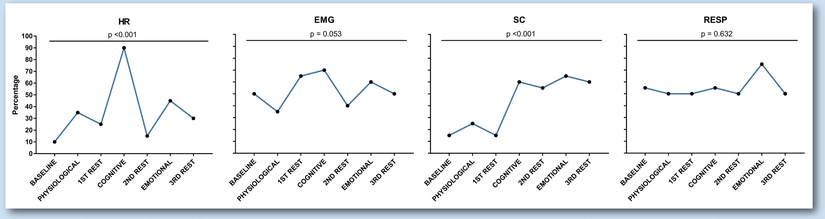

Figure 2. Proportion of "Stressed" participants by stage and physiological response. (HR: heart rate; EMG: electromyography; SC: skin conductance; RESP: respiration). P-values obtained with Cochran's Q test for related samples.

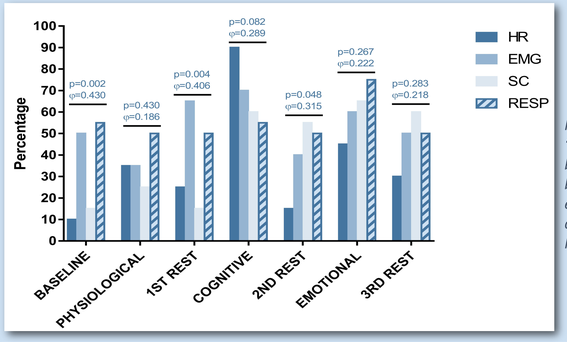

Figure 3. Comparison of "Stressed" participants between physiological response by stage. (HR: heart rate; EMG: electromyography; SC: skin conductance; RESP: respiration). P-values obtained with X^2 test.

CONCLUSIONS

The participants obtained the expected responses (increase/decrease) over time in most indicators (HR, EMG, and SC) of physiological responses to stress, except in RESP. Thus, in our sample, it was not an indicator related to stress. The proportion of "stressed" participants during the stressful stimulus stages was not significant, but was different during the rests, which may mean that the higher percentage of participants increased their physiological responses in a similar way to the stressors, but could recover differently during the rest, possibly because they do not have the resources to coping adequately with stress. It is advisable to continue with the research line by expanding the sample and considering other stress indicators to confirm the information obtained.

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