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Letter to Editor

Heart Rate Variability to Evaluate Stress and Recovery: Is it a Valid Method?

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Abstract

Heart rate variability (HRV) became one of the most used physiological variables to quantify stress and recovery in sports. HRV can be assessed by different forms, for instance, the root mean square of successive R-R interval differences (RMSSD) is commonly used to predict the parasympathetic activity [3, 4]. Reduced RMSSD indicates high sympathetic activity that means more stress and possibly more indisposition for training.

Keywords: heart rate variability, stress

HRV as a predictor of stress and recovery

Since the end of 1970's researchers have understood the importance of evaluating sympathetic and parasympathetic activity through autonomic nervous system (ANS) in cardiac diseases to prevent death, and later in athletes to predict stress and recovery [1]. In recent days the technology is helping coaches and athletes to understand how the internal training load, for instance, ANS is modulating through training or competition wearing the chest/wrist/arm/head straps, watches, and other devices named wearables. It is common to observe sports teams making daily ANS assessments with wearables to monitor the stress and recovery making specific changes based on ANS to improve athletes performance [2].

Due to the relatively easy access to the wearables, empirical methods have been used aiming to predict stress. To understand how the coaches normally use the ANS assessments in sports team athletes for example, it is important to compare some studies evolving ANS assessment through days, weeks and months. Recent studies have shown that HRV assessments three to five days a week provide very good reliability (ICCs .74-.99) [5]. Also, it is important to measure HRV weekly for at least three weeks to understand the basal HRV activity [6]. The R-R interval is very sensitive to the external environments such as air humidity, weather temperature, noise, time of the day. It is susceptible to coffee intake or drinks-based coffee, alcoholic beverages, sleep quality and emotional behavior, so that factors might interfere with the HRV [7]. Due to this fact, it is essential for coaches and athletes to make HRV assessments simultaneously, avoiding any substance that can interfere with the R-R intervals and in a quiet place. A fast method to monitor HRV that was already validated is the Ultra-Short-Method using only two minutes of analysis [8].

The HRV can be monitored mainly before and after the sports activity. Many studies reported that measures five, 10 or 30min after the sports activity is not enough to stabilize the HRV to basal levels [9]. It seems that at least 90min is requested to verify the positive/negative stress responses in high-intensity exercises, such as CrossFit, soccer, handball or weightlifting [10-13].

Although these affirmations, the training plan over the weeks when it made in a correct form, tends to increase the parasympathetic values, indicating enhanced performance and stabilization of HRV [14, 15].

Perspectives for the future

Available research indicates that RMSSD-based HRV is a potential tool to evaluate stress and recovery in athletes. Also, it is essential to use other tools to evaluate neuromuscular fatigue, such as vertical jumps or plyometric push-ups to make the proper changes in the training plan. Modifying the workloads between times is vital for athletes to observe positive HRV responses through a specific season. Thus, with this scoping study, we are able to identify research gaps to be addressed in future studies, mainly involving chronic responses.

Conclusion

Strength and conditioning coaches and athletes may use HRV methods with reliability to quantify stress and recover more accurately. RMSSD is a validated tool to evaluate ANS in athletes aiming to control stress

responses through the specific training season. Finally, weekly HRV assessments might guide coaches to understand how the athletes should perform the daily and weekly training/competition based on stress and recovery.

Conflicts of Interest

The author declare no conflict of interest.

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