

The combination of deep breathing and mental imagery promotes cardiovascular recovery in firefighters

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Introduction

At each intervention, firefighters may be confronted with hostile environments that can lead to severe injuries or even death (Perroni et al. 2014). Their rescue operations involve intense physical activity associated with a high level of cardiovascular stress. Consequently and as underlined by Marcel-Millet and colleagues (2018), it is absolutely crucial that each firefighter benefits from optimal and rapid recovery between each operation during his 24-hour shift in order to maintain his performance level, as well as the health of his heart. In this way, the present study investigates the effects of a 30-min recovery protocol combining deep breathing and mental imagery on the cardiac adaptations and performance of French firefighters during the repetition of two Cooper tests.

Methods

Forty firefighters were divided into two experimental groups which undertook two maximum fitness tests separated by either the control recovery protocol (30 min reading time; n=20) or the experimental recovery protocol (30 min of deep breathing and mental imagery; n=20). Measurements of the performance at the maximum fitness tests and of the heart rate (HR) and between two R-waves of the cardiac electrical activity for the heart rate variability (HRV) were performed with an HR monitor (S810i, Polar, Aulnay-sous-Bois, France) throughout the experiment. For all the measurements, when normal distribution and equality of variances were respected, data were analyzed with a 2’2 mixed ANOVA. Sessions (pre, post) were within-participant factors while recovery protocol group (EXP, CTRL) was a between-participant factor. Then, Tukey HSD post hoc tests were carried out, where appropriate. When non-normal distributions were verified (all the HRV parameters, Shapiro-Wilk tests, all $p < 0.01$), between-participant group effects were investigated with Mann-Whitney U-tests, and within-participant session effects were investigated with Wilcoxon tests for paired samples.

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Results

When compared to the pre-tests, the percentage evolution ratios in the post-tests for the Cooper performance (-2.4% in the control condition compared to the experimental recovery protocol), the heart rate recovery (+3.5%), the HRV analyses and more particularly the high frequency power band (HF; [0.15:0.40] Hz) that is thought to show the parasympathetic dominance were promoted by the experimental protocol, compared to simple reading.

Discussion

In light of these results, the tested recovery protocol combining deep breathing and mental imagery when compare to a simple reading rest allows a better maintenance of physical fitness performance, promotes heart rate recovery and parasympathetic reactivation. Consequently, we propose in a first time the use of practices of deep-breathing combined with mental imagery to improve firefighters' recovery. In a second time, future studies will investigate the replicability of the present results in even more ecological conditions for the firemen, i.e. between real rescue interventions and within 24-hour shift guards. Finally, the impact of such protocols on the risks of mortality in firefighters should be investigated.

References

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