

The Effects of Focus of Attention on Heart Rate During a Static Balance Task

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Introduction

An external focus of attention has been shown to be superior in a suprapostural task (McNevin & Wulf, 2002) and also results in a decreased heart rate while performing a simulated driving task (Mullen, Jones, Faull, & Kingston, 2012). In the Mullen et al. (2012) study, the participants heart rates were only recorded during the middle three minutes of the task, which did not provide critical information as to when the change in heart rate occurred (e.g., immediately or throughout the task).

Purpose

The purpose of this study was to investigate the connection between the physiological and cognitive systems via heart rate measures under various foci of attention. It was hypothesized that the utilization of an external focus of attention would decrease a participant's heart rate compared to trials completed utilizing an internal and control conditions.

Method

Twenty-three volunteers (n = 15 males, n = 8 females, Mage = 23.3 years, SD = 5.63) participated in this study. Participants stood barefooted on a force platform (capture rate of 200Hz) with their dominant arm bent 90° at the elbow with a neutral grip (see Photo 1). Participants were fitted with a sternum heart rate monitor (capture rate of 1Hz). Using a within-participant design, all participants initially completed 3 trials in the Control condition in which they were asked to “balance to the best of your ability.” The three trials completed in the Internal and External conditions were counterbalanced. While in the Internal condition, participants were asked to “focus on minimizing movement of your hand, while maintaining balance to the best of your ability.” While in the External condition, participants were asked to “focus on minimizing movement of the sheet, while maintaining balance to the best of your ability.”



Photo 1. Participant performing the balance task.

Results

Center of pressure data were analyzed using a repeated measures univariate ANOVA. Heart rate data were analyzed using a 3 (condition) X 30 (heart rate measures) ANOVA with repeated measures. Results indicated there were no significant center of pressure differences between the three conditions, $F(2, 44) = .689, p > .05$ (see Figure 1). The ANOVA that analyzed heart rate revealed there was a significant main effect for Condition, $F(2, 44) = 23.73, p < .001$. Also, the ANOVA indicated that there was a main effect for Second, $F(2, 29) = 34.149, p < .001$. Additionally, the analysis showed that there was an interaction between the two factors (i.e., Condition and Second), $F(2, 58) = 2.613, p < .001$. A least significant difference *post-hoc* analysis of the Condition main effect indicated that participants had a significantly lower average heart rate while in the Control (81.2 bpm) condition compared to trials completed in the External (84.7 bpm) and Internal (84.7 bpm) conditions. The analysis also indicated that the External and Internal conditions were not significantly different. *Post-hoc* testing of the Second main effect indicated that heart rate changed through the course of the trial in all three conditions (see Figure 2). Lastly, *post-hoc* testing showed that the significant interaction was the result of the External condition having a more rapid drop in heart rate compared to trials completed in the Internal condition.

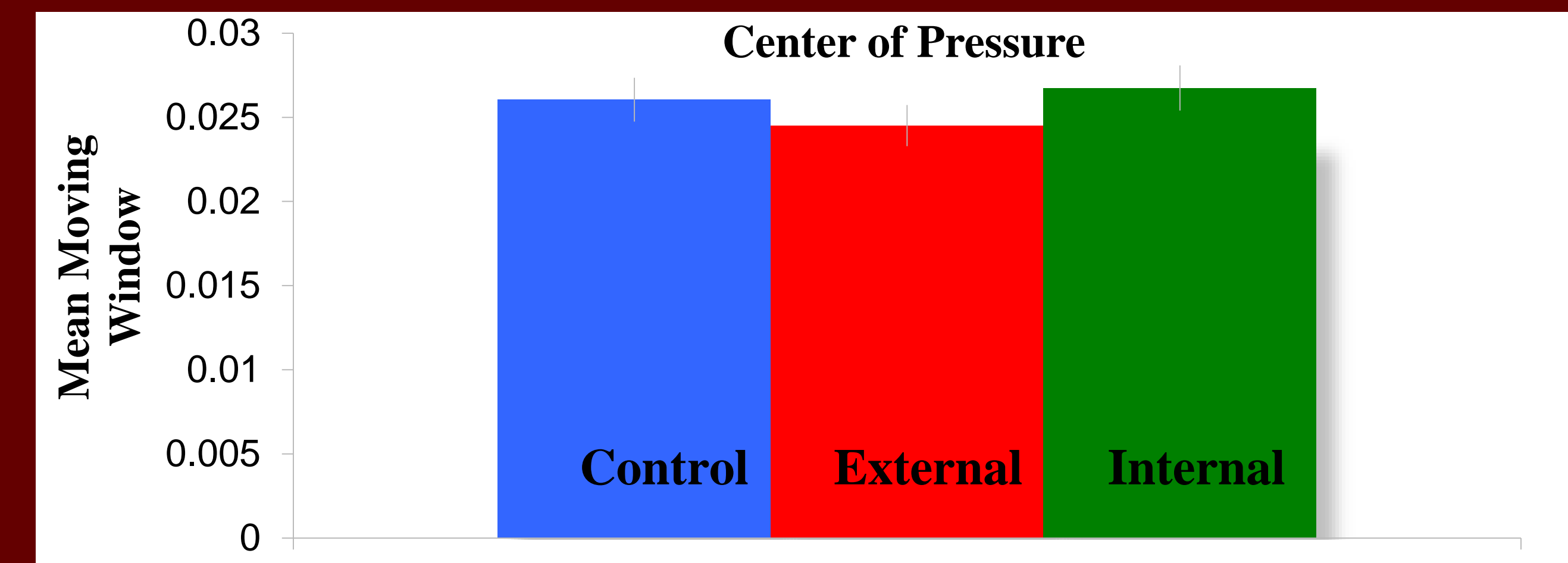


Figure 1. Average moving window for Control, External, and Internal focus of attention conditions. Error bars represent standard deviation.

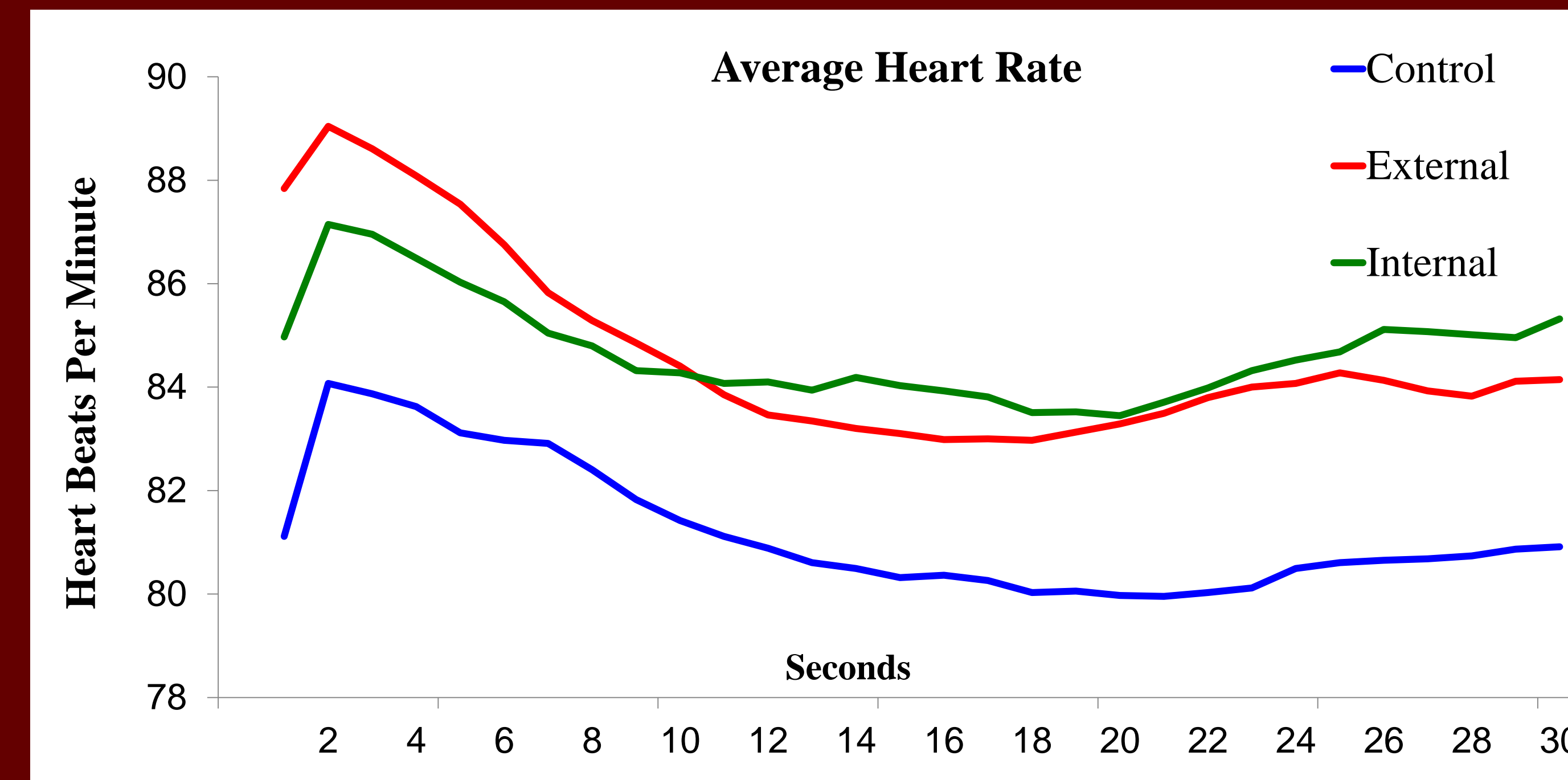


Figure 2. Heart rates for the Control, External, and Internal focus of attention conditions, revealing changes in heart rate over time.

Conclusion

The findings suggest to elicit a lower heart rate, no specific focus of attention should be inducted. These findings also suggest that directing attention externally may result in a more rapid drop in heart rate compared to directing attention internally. The results of this experiment demonstrate a clear connection between the cognitive system and the cardiovascular system. In particular, it is interesting to note that subtle changes in verbal instructions resulted in meaningful changes in heart rate. Moreover, these findings are valuable for practitioners working with patients who've had a cardiac event.

References

- McNevin, N. H., & Wulf, G. (2002). Attentional focus on supra-postural tasks affects postural control. *Human Movement Science, 21*, 187-202.
- Mullen, R., Jones, E. S., Faull, A., & Kieran, K. (2012). Attentional focus and performance anxiety: Effects on simulated race-driving performance and heart rate variability. *Frontiers in Movement Science and Sport Psychology, 3*, 1-10.