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Introduction

- Fatigue is a result of physiological and psychological limits.[1,2,4]
- Associative thoughts (thoughts of physical sensations) and dissociative thoughts (thoughts not regarding physical sensations) compete for attentional focus during exercise and can influence exercise performance and fatigue.[3,7]
- Distractions during exercise, such as watching TV or interactive exercise, increase dissociative thoughts and reduce rate of perceived exertion (RPE).[4,5,6,8]
- Limited research exists regarding the effects of a virtual training partner on exercise performance and fatigue.[6]

Purpose

- To examine whether the use of a virtual training partner (ghost) will improve performance by increasing dissociative thoughts.
- We hypothesized that the use of a ghost during exercise would decrease heart rate (HR), RPE, time to completion, and increase dissociative thoughts.

Methods

- Eleven recreationally active female college students (age = 21.45 ± 0.52yr) performed two 4-mile time trials along a scenic route displayed on an Expresso® Interactive Bicycle.
- Both trials required participants to bike four miles as fast as they could; however, the second trial included a ghost on the route and participants were asked to keep up with or beat the ghost.
- Participants were told the ghost during the second trial was set to their exact pace from the first trial; however, it was set to a pace 8.8 ± 1.5% faster than the participant's first trial time.
- HR, RPE, associative and dissociative thoughts, watts, and time were recorded at every mile throughout the course.
- Associative and dissociative thoughts were measured on a 10-point scale where higher numbers represented dissociative thoughts.
- Participants were briefed on the differences between associative and dissociative thoughts before the first trial.

Results

- Overall cycling time was significantly faster ($t(10) = 3.37$, $p = .007$) for the ghost trial (ghost: 976.64s ± 102.55s; control: 1029.91s ± 117.93s).
- The interaction between trial and individual mile time was not significant ($F(3) = 1.57$, $p = .218$).
- Mile two (ghost: 296.64s ± 36.72s; control: 312s ± 30.65s; $p = .022$) and mile three (ghost: 238.82s ± 28.2s; control: 264.09s ± 50.28s; $p = .038$) were significantly faster in the ghost trial.
- Dissociative thoughts were significantly higher during the ghost trial in miles one (ghost: 6.73 ± 1.62; control: 5.18 ± 1.60; $p = .046$), two (ghost: 6.09 ± 1.51; control: 4.14 ± 1.76; $p = .003$), and three (ghost: 6.77 ± .984; control: 5.09 ± 1.51; $p = .004$).
- There were no significant differences in HR, RPE, and watts between trials.

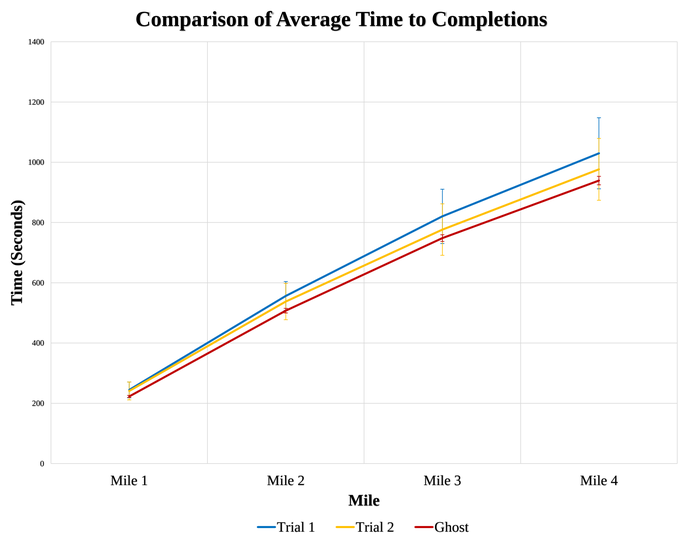

Figure 1. Average times to completions between the participants in trial one, participants in trial two, and the ghost in trial two

Figure 2. A female participant riding the Expresso® Interactive Bicycle

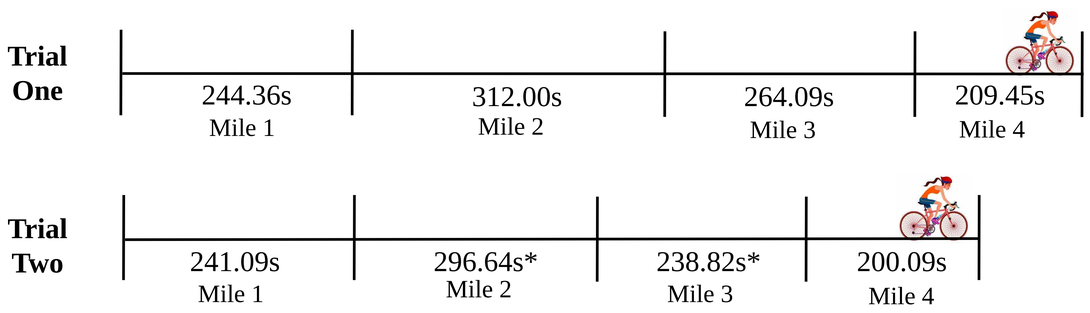

Figure 3. Mean times of each mile in four mile time trial (seconds)

*Significant difference between trials ($p < 0.05$)

Discussion

- Overall cycling time improved when using a ghost even though subjects were asked to cycle to exhaustion during trial one.
- Dissociative thoughts were higher in the first three miles of the ghost trial although there were no significant changes in RPE.
- Previous research demonstrates that dissociative thoughts have a negative correlation with RPE, suggesting that improvements in performance may be due to minimized efferent signals directed towards the muscles from the brain.[3,4,5,7]
- Greater dissociative thoughts, despite a similarity in RPE between trials, could suggest that attentional focus was diverted from the participants' physical discomforts which gave them enough focus and motivation to produce an overall faster performance.
- Limitations include small sample size, slight differences in ghost pacing between participants, and the range of pace each ghost was set to from each participant's first trial.
- Future research may examine different types of exercise and virtual training partners, as well as wider populations, such as athletes.

Conclusion

A diversion in attentional focus from physical sensations to the ghost was evident by greater dissociative thoughts during the ghost trial. Virtual training partners have the potential to contribute to reductions in fatigue and increase performance during cycling time trials.

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