

Five More Minutes: Effects of Sleep Inertia on Middle-Distance Running



Michael Brown
Dr. Lindsey LaPlant



Introduction

- Sleep inertia is a latent transitory period, between sleep and wakefulness, often characterized by decreased cognitive speed and performance (Jewett et al., 1999).
- Sleep inertia has been shown to negatively impact performance factors such as reaction time, coordination, decision making, and subjective alertness (Miccoli, Versace, Koterle, & Cavallero, 2008; Wilkinson & Stretton, 1971; Bruck & Pisani, 1999; Jewett et al., 1999).
- In an investigation of the time course of sleep inertia, Jewett et al. (1999) found that subjective alertness and cognitive throughput approached an asymptote 2-4 hours after waking up.
- Little research has been done to show a relationship between sleep inertia and athletic performance, yet a study measuring 4-km cycling time-trial performance found sleep inertia to negatively impact time-trial times (Thompson et al., 2014).
- Asaoka et al. (2010) found sleep inertia led to a higher rate of perceived exertion (RPE) on cognitive tasks which could lead to decreased athletic performance.
- According to the results from Jewett et al. (1999), it is possible decreased athletic performance and higher RPE will continue for up to four hours post-waking.

Procedure

- A between-subjects design was used in this experiment.
- On the day of the experiment, all participants woke up at 6:30 am and met with the researcher at 6:50 am at the track.
- The sleep inertia group started the physical and cognitive tasks at 7:00 am.
- The physical task was a one-mile time trial and self-reported RPE. The cognitive task was a two-minute reaction time test using the app "rgReaction".
- Once a participant finished the first task, they recorded their results and started the other.
- The control group checked in with the researcher at 7:00 am, and then were allowed to leave. They returned at 10:20 am to complete the performance tasks at 10:30 am.
- Neither group was allowed to warm up prior to the time trial.
- The athletic and cognitive performance tasks were counterbalanced to avoid order effects.



Discussion

- The results of this experiment did not support my hypothesis. The nonsignificant results between groups suggests that there is not a competitive benefit to staying awake four hours before competing
- Jewett et al. (1999) and Miccoli et al. (2008) found that effects of sleep inertia diminished rapidly in the first hour of wakefulness. It is possible that the negative effects of sleep inertia had already diminished enough so that any effect could not have been determined within the context of this experiment.
- In opposition to my hypothesis, the sleep inertia men ran faster than the men in the control. It is likely that interpersonal competition and social facilitation during the time trial contributed to this difference. Participants in the control group did not start the one-mile time trial at the same time, while those in the sleep inertia group did. This lack of interpersonal competition could have negatively impacted the times for the control group.
- While there were no significant order effects, there was a trend towards significance in RPE (rate of perceived exertion). Those who performed the reaction time task first had higher scores for RPE than those who did the time trial first. Mental fatigue has been shown to lead to overestimation of physical exertion (Marcora, Staiano, & Manning, 2009). It is likely that those who performed the cognitive task first experienced greater mental fatigue than the other group, thus leading to their higher scores for RPE.
- Sleep of the participants could not be monitored since they did not sleep in a laboratory setting. It is possible that participants woke up earlier or later than requested yet still arrived to check-in on time. This would have influenced the amount of sleep inertia they were experiencing. While random assignment should have controlled for individual differences such as this, the small sample size used in this study gave more statistical weight to these differences.
- Power was low for this experiment due to the small sample size. Therefore, it was harder to detect any difference if one exists.
- Further research testing this question should be conducted using a larger sample size to better determine the relationship between sleep inertia and running performance.
- Jewett et al. (1999) suggested that activities that increase "cerebral metabolism and core body temperature" could reduce the negative effects of sleep inertia. Athletes employ various strategies to do this, including listening to pump-up music, drinking caffeine, and engaging in warm-up protocols. While this study did not test the effects of these three factors, future studies could be done to measure the effect they have on sleep inertia and athletic performance.

Research Question & Hypothesis

- Does keeping athletes awake starting four hours before competition actually benefit the athletes?
- I hypothesized that sleep inertia would negatively impact athletic and cognitive performance 30 minutes after awakening, but this effect would dissipate four hours post-awakening.
- This study aimed to fill gaps in the literature since no research was found that measured the effect of sleep inertia on running performance, and most studies measured sleep inertia only immediately or soon after waking up.

Results

	N	One-Mile (min)	RPE	Reaction Time (sec)
Sleep Inertia	9	6:01	6.67	.32
Control	5	6:05	6.40	.34

- An independent sample t-test was used to determine the significance of sleep inertia on athletic and cognitive performance.
- No significant difference was found between groups in one-mile time trial time, $t(12) = -.189, p = .854, d = -.112$; RPE, $t(12) = .296, p = .772, d = .175$; and cognitive performance, $t(12) = -1.161, p = .268, d = -.687$.
- Power for each independent variables was less than .29.
- There was as significant effect on mile time between the men in the sleep inertia group ($N = 3, M = 5:11, SD = 0:10$) and the control group ($N = 3, M = 5:36, SD = 0:07$), $t(4) = -3.36, p = .028, d = -2.74$.
- There were no significant order effects.

Participants

- Participants were 14 distance and middle-distance runners from a Division 3 collegiate track and field team.
- There were 8 female participants ($M = 19.5, SD = .76$) and 6 male participants ($M = 19.67, SD = 1.86$).
- They recorded the amount of time they sleep on a typical night ($M = 6:57, SD = 0:49$), the amount they slept the previous night ($M = 6:06, SD = 1:19$), and the quality of their sleep on a 5-point Likert scale ($M = 2.93, SD = .83$).

