Comparison of Sleep Deprivation Effects in Student Athletes and Non-Athletes (Preliminary Results)

Alexa R. Frederick, Brianna E. Comport, Kiearra D. Lewis, Yldalis Almanzar, Michael A. Kurtz, Stephenie Kunkel, PA, and Thomas B. Price, Ph.D.
Health Sciences Program, School of Arts & Sciences

Introduction

The effects of exercise and sleep in college athletes have been studied for the past 50yrs.(1). This study examined the effect of 24hrs sleep deprivation on reaction time (RT) and memory recall of words (MR) in student athletes and student non-athletes. Recent research has shown that collegiate athletes are at higher risk for lack of sleep and feelings of exhaustion than non-athletes (2). While 8-9hrs sleep per night is needed in young adults (21-30yrs old), the average sleep duration is only 6.7hrs/nt (3,4). Even a brief period of sleep deprivation can significantly affect cognitive performance, including attention-intensive performance such as omission errors, short term working memory, and learning capacity, as well as producing longer response times (4). Measurable impairment of cognitive responses occur with as little as 16hrs of sleep deprivation (4), and the level of impairment may increase to rival that of alcohol (5). Individual differences (genetic, learning) may also influence results, increasing variability (4,6). Normal sleep habits can have a significant detrimental effect on overall mood (4) and academic performance in college students, and this effect may be intensified in college athletes who must maintain demanding training and study schedules.

Hypothesis: Sleep deprivation will produce different responses for RT and MR in college athletes compared with non-athletes.

Methods

We studied 22 subjects, 12F & 10M. 7 were student athletes & 15 were student non-athletes. Subjects were asked to record their normal sleep pattern over the week before the experiment.

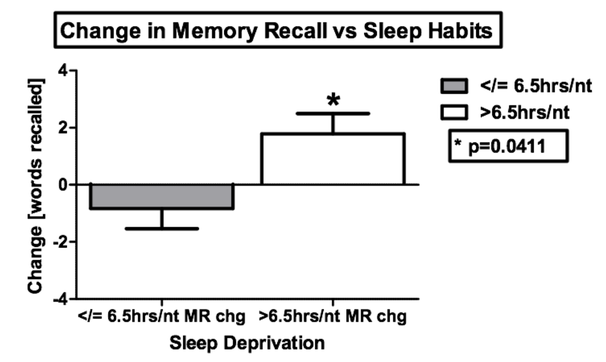
Table 1: Subject data.

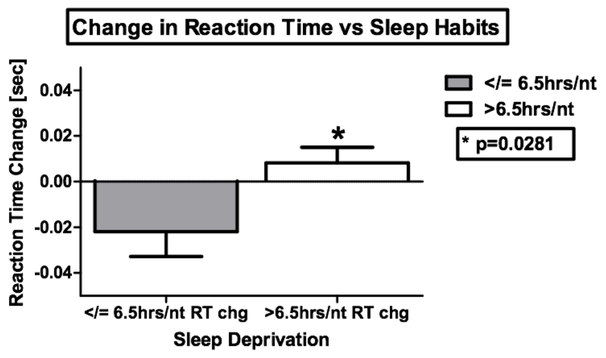
	Athletes	Non-Athletes
Age [yrs]	20.1±0.5	21.4±0.7
Weight [lbs]	163±9.7	162±10.5
Height [in]	67.3±2.1	65.4±0.9
Average Sleep [hrs/nt]	8.7±0.4	6.6±0.3 *

The morning of the experiment, subjects arrived and performed a visual reaction time (RT) test and a test of memory recall (MR) of 20 words. Subjects were given 1min to look at the words, and then wrote as many as they could remember in 1min following a 15sec delay. Participants were allowed to go on with their normal day, reporting back to the lab in the evening, and remaining awake all night. Memory recall (MR) and reaction time (RT) tests were performed again following 24 hours of sleep deprivation.

Results

When athletes & non-athletes were compared, no significant differences were observed in either memory recall (MR) or reaction time (RT) either the morning before or after 24hrs sleep deprivation. Male versus female responses in MR and RT were similarly unaffected by sleep deprivation. Sleep records for athletes and non-athletes indicated that athletes were routinely getting more sleep (8.7±0.4 hours/night) than non-athletes (6.8±0.4 hrs/nt) (p=0.0089). When athletes and non-athletes were grouped and then separated by the amount of sleep they routinely received (≤6.5 hrs/nt versus >6.5 hrs/nt) results became significant. In the group receiving ≤6.5 hrs/nt reaction times were slower (0.436sec) than the more rested group (0.353sec) (p=0.0087), but became insignificant after sleep deprivation. The most prominent differences were seen when the sleep deprivation induced change in both MR and RT were compared between the group that chronically received less sleep and the routinely well-rested group (see figure). It is noted that these results are preliminary, and that the number of athletes currently in the study is small. When complete this study is expected to have 30 athletes and 30 non-athletes, and differences between athletes and non-athletes may become significant.





Discussion

These results indicate that the daily sleep habits of college students exert greater control over the effect of sleep deprivation upon cognitive performance than whether or not the student is an athlete. Athletes in the current study averaged more sleep than non-athletes, in disagreement with previous results (2). Athletes did not perform differently than non-athletes in either cognitive test (MR or RT) before and after sleep deprivation, again in disagreement with previous results (7,8). When tested for MR the group that averaged ≤6.5hrs/nt was more affected by 24hrs sleep deprivation (losing 0.8 words), while the more rested group >6.5hrs/nt gained 1.8 words following sleep deprivation. Conversely, RT improved in the ≤6.5hrs/nt group and was slower in the >6.5hrs/nt group following sleep deprivation. These results suggest two different neurological mechanisms for MR and RT. Students who are used to less sleep appear to tolerate extended deprivation when tested for reaction time, but do not perform as well in memory recall of a list of words.

Conclusions

Based upon this preliminary data, we conclude that the primary controlling variable for the response to 24hrs sleep deprivation is the daily sleep habits of the individual. We predict that as the number of subjects tested increases significant differences between athletes and non-athletes will arise.

REFRENCES:

1. Baekeland F and R Lasky. *Perceptual and Motor Skills.* (1966), 23:1203-1207.
2. Armstrong, S and J Oomen-Early. *J.of Am.Coll Hlth.* (2009), 57(5) 521-526.
3. Breslau, N, T Roth,L. Rosenthal, and P Andreski. *Am.J.Public Hlth.* (1997), 87:1649-1653.
4. Durmer, JS and DF Dinges. *Sleep in Neurological Practice: Seminars in Neurology.* (2005), 25(1):117-129.
5. Powell, NB, RW Riley, KB Schechtman, MB Blumen, DF Dinges, and C Guilleminault. *Laryngoscope.* (1999 Oct), 109(10):1648-1654.
6. Dorrian, J, NL Rogers, and DF Dinges. *In: Kushida CA, ed. Sleep Deprivation.* (2005), New York: Marcel Dekker, Inc.
7. Mah, CD, KE Mah, EJ Kezirian, and WC Dement. *Sleep.* (2011), 34(7):943-950.
8. Taheri, M and E Arabameri. *Asian J.Sports Med.* (2012), 3(1):15-20.