Awareness of reaction time variations with sleep schedule measured on a smartphone can improve sleep habits and performance

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Introduction

Studies have demonstrated that subjective perception of alertness and performance can be inaccurate especially in a sleep deprived state. Alertness measured by average reaction time (RT) over 3 minutes has also been shown to be highly correlated to physical performance. Smartphones can now allow easy and regular RT testing with sleep schedule correlations.

Objective

The aim of this study is to evaluate if using this type of tool can increase a subject's awareness about sleep deprivation effects and lead to improved sleep schedules and reaction times.

Method

A healthy 41 year old male used the sleep-2-Peak iPhone application from September 2nd to November 30th 2012.

This application allowed daily sleep schedule recording and multiple daily average RT testing consisting of 12 trials with irregular time intervals over 2 minutes. Average of RT test results, average bedtimes and average out of bed times were computed for each month.

The application presented a results diary and graphics to the subject illustrating relationships between RT and bedtime, RT and out of bed time and RT and time of day of the test.

Results

A total of 182 RT tests were performed (55 in September, 57 in October and 70 in November). Tests were performed at different times of the day with similar distribution. There was a significant correlation between bedtime and RT (r=.249, p<0.01) and between time in bed and RT (r=-.235, p<0.01). Multiple regression calculated from bedtime, total sleep time and time elapsed from beginning of study was used to predict RT. A significant correlation was present between predicted and measured RT (r=.51 p<0.01)

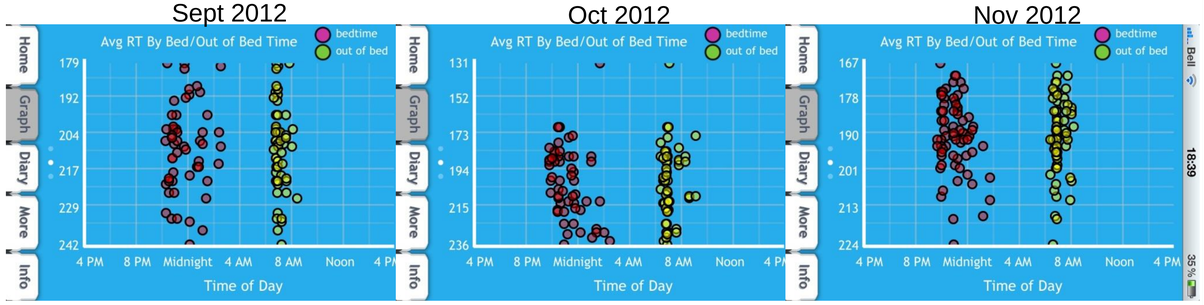
Mean RT was of 208.82ms in September, 200.82ms in October and 189.61ms in November. Bedtimes were earlier at the end of the 3 months with an average bedtime 57 minutes earlier in November compared to September 2012. Improvement in bedtime regularity was also observed.

r=.249, p<0.01

r=-.235, p<0.01

r=.51, p<0.01

Sept 2012 | Oct 2012 | Nov 2012



Conclusion and Discussion

Given that reaction time tests are known to present minimal learning effect, the improvement in RT is considered to be related to other factors, with sleep schedules improvement being the most significant. These observations are in accordance with known facts that getting more sleep and maintaining a better sleep routine leads to better alertness (i.e. improved RT).

However, our study suggests that using a smartphone application to monitor RT throughout the day may serve as an incentive to increase awareness of the importance to implement healthy sleep habits and schedules.

Considering that a decrease in RT can be seen before appearance of fatigue or drowsiness, measuring RT can help an individual realize that his sleep-wake schedule doesn't allow best performances. This subject could see with the application that later bedtimes were rarely associated with good RT the next day and that RT in the evening was poorer in general. These test results directly applicable to the user could have encouraged him to limit evening activities and improve his sleep schedule during the study period.

This type of smartphone application could be a tool to help measure easily alertness variations and increase awareness of the users to the effect of sleep deprivation.

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