5-23-2017

The Effects of the Incentive Approach on Physical Activity and Sleep Utilizing Wearable Fitness Technology

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Abstract

PURPOSE: Wearable fitness technology (WFT) is a relevant tool in analyzing physical activity and sleep. Sleep and physical activity have symbiotic roles in maintaining wellness and returning the body to homeostasis. Currently, research is lacking in demonstrating effects of intensification on physical activity using WFT. This study analyzed the effects of incentivisation on physical activity and its relationship to sleep using the UP Jawbone. **METHODS:** 35 Bethel University students (16 males, 19 females) were recruited, ages 18-23 (20.49 years ± 1.44 years) and randomized into the control (17) or incentivized group (18). Sleep and physical activity data were recorded for 4 weeks through the UP Jawbone and documented in Excel. Data analysis compared time spent in deep sleep (minutes), overall sleep duration (minutes) steps per day, and logged workout time (minutes). **RESULTS:** Statistical analysis was performed using SPSS v.25. An independent sample t-test comparing total steps taken by the control and incentivized groups demonstrated no significance ($p = 0.207$). A 3 way ANOVA comparing the steps taken by both groups showed no significance ($p = 0.683, 0.845$). A correlation of daily steps, deep sleep, and sleep duration demonstrated significance between deep sleep and sleep duration for the control ($r = 0.493$) and incentivized groups ($r = 0.715$). **CONCLUSION:** Data indicated no significant difference in physical activity between control and incentivisation groups, indicating that WFT such as the jawbone may not impact motivation. Stronger correlation between deep sleep and sleep duration in the incentivized group demonstrates a possible impact of motivation on sleep patterns.

Introduction

Researchers have spent time looking for ways to improve one's physical activity levels. Physical activity has shown to be directly correlated to one's health and overall wellbeing. Researchers Greg Atkinson and Damien Davenne put together a meta-analysis looking at how sleep has been shown to affect physical activity, and vice versa. Due to the thermoregulation involved in circadian rhythms and natural fluctuations in core body temperature during regular sleep, physical activity has shown to be impacted with increased amounts of daily physical activity (Atkinson & Davenne, 2007). Research reveals that deep sleep and physical activity are vital to hormone maintenance, allowing the body to reach optimal homeostasis.

Wearable fitness technology (WFT) is gaining popularity among the general population today. Previous studies demonstrate that people are likely to adopt devices that are easy to use, considered useful, and when influenced by subjective norms. Additionally, studies show that utilization of WFT may contribute to health benefits such as weight loss, higher activity level, and increased general health (Lunney et. al, 2016). However, there is a lack of research regarding the role of incentive and motivation in regards to WFT. Therefore, this study analyzes the effectiveness of the incentive approach on sleep and activity patterns using the UP Move Jawbone device (Figure 1).

Figure 1: Jawbone UP Move Device

Methods

35 subjects (16 male, 19 female) were recruited from Bethel University St. Paul, MN by email announcements and by classroom visits. All participants fell into the age range of 18-23 years (20.49 years ± 1.44 years) and fit the inclusion criterion. Before initial consultations, participants were randomly assigned into incentivized (n = 18) and control (n = 17) groups. During initial consultations, each participant went through anthropometric measurements (height, weight, blood pressure), risk stratification, health history, informed consent, physical activity and sleep questionnaire, and Jawbone device set-up. The Jawbone device configuration occurred after the participant walked on a treadmill for 0.20-0.25 miles. After the configuration, each participant was instructed on the use of the jawbone device. If they were a part of the incentivized group, they were reminded about their goal to be as physically active as possible for the following four weeks of data collection. After the four weeks of data collection, each participant came back in for a post-test. During the post-test, the participants again went through anthropometric measurements (height, weight, blood pressure) and the same physical activity and sleep questionnaire. Upon completion of all post-tests, the data collected via the Jawbone device was analyzed and statistically measured through SPSS software. Data collected included, participants data for total steps, total logged workout time (minutes), total deep sleep (minutes), and total sleep duration (minutes) for both the incentivized and control groups.

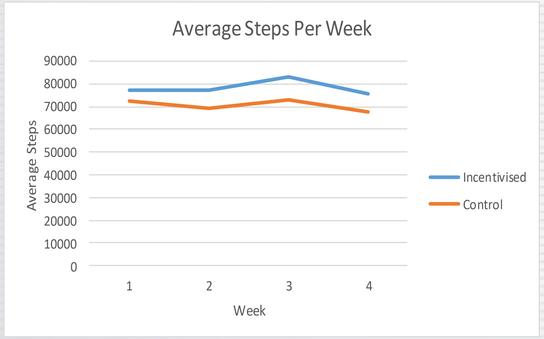

Figure 2: Line graph comparing average steps per week between the control group and the incentivized group

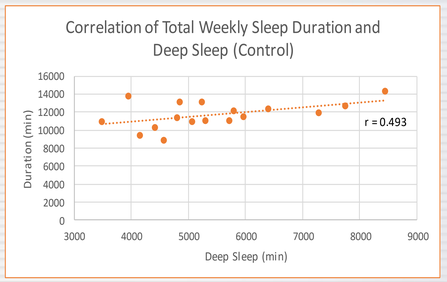

Figure 3: Correlation graph between duration of sleep and deep sleep for the control group

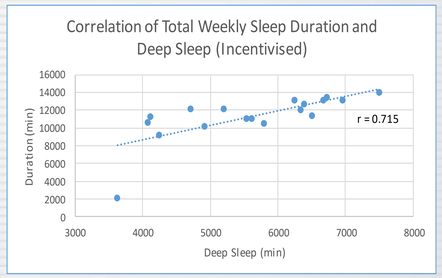

Figure 4: Correlation graph between duration of sleep and deep sleep for the incentivized group

Results

Statistical analysis was performed using SPSS v.25. An independent sample t-test comparing total steps taken by the control and incentivized groups demonstrated no statistical significance ($p = 0.207$) (figure 2). A 3 way ANOVA comparing the total steps taken by both groups also showed no statistical significance ($p = 0.683, 0.845$). A correlation of daily steps taken, deep sleep (minutes), and total sleep duration (minutes) demonstrated statistical significance between deep sleep and sleep duration for the control ($r = 0.493$) and incentivized groups ($r = 0.715$) (Figures 3&4). Results reveal that incentives can strengthen the correlation between deep sleep and sleep duration.

Conclusion

Maintaining a healthy sleep schedule and working towards being physically active is important in creating total wellness for the body as well as helping to prevent chronic disease (Sothern et. al, 1999). This study's aim was to see if motivation was influenced when a reward was introduced to participants. As resulted, there was no significant difference in physical activity between the incentivized group and the control group. However, the research did find significant correlations between deep sleep and sleep durations for both groups. In addition, the research showed a stronger correlation between deep sleep and sleep duration in the incentivized group. Although this does not directly correlate with the goal of the study, this does help aid further research to understanding how sleep and physical activity influence one another.

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