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Do Eye Masks (Smart Googles) Provide Repose That Deserve the Name Sleep?

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Abstract

Sleep health is essential to overall health. For some three in ten adults, falling asleep is a difficulty. As the physiological process of falling asleep first entails relaxation then, timing is typical of the person's bedtime which marks the start of the sleep cycle or circadian rhythm. However, behavioral factors of stress and worry are sufficient to perturb an individual's nature circadian rhythm of sleep then wake cycles. The marketplace is filled with gadgets and advice to remedy sleep difficulties. Some current gadgets garnering increasing popularity are the eye mask and the technically advanced eye mask or smart goggles that provide heat and massage to the eye orbit area that soothes the sleeper and enhances their ability to relax and fall asleep. This study entailed an investigation of the utility of the smart google to enhance sleep onset. A random sample of young adult university students assigned to smart google use/no use for one week completed the study. The smart google was preferred as much as it was found to be heavy (uncomfortable) based on participant ratings. Comparisons of ratings of the smart google use and sleep quality are presented.

Keywords

Light, Sleep Quality, Student Sleep, Eye Mask

1. Do Eye Masks (Smart Googles) Provide Repose That Deserve the Name Sleep?

Sleep is determined by a homeostatic physiological process of first, increased sleep propensity followed by sleep entrainment to the sleep cycle with the release of melatonin ninety minutes following sleep onset [1] [2]. An individual's cognitive and physical behavior can influence these two internal factors determining sleep [3] [4]. The common difficulty of falling asleep or staying asleep varies from tran-

sient episodes to nightly frustrations of difficulty falling or staying asleep. The university student group represents one of the more prevalent groups of individuals with poor sleep in terms of insomnia bouts [1]. There are considerable marketing responses that present to the discomfort of individuals with sleep disturbances [4]. Currently, eye masks with technical features of heat and massages called smart googles are very popular [4]. For example, a smart goggle represented in Figure 1, is advertised to provide comforting heat and massage to ease into sleep (See Appendix for device specifications).

Figure 1. Smart goggles.

Light counters the release of melatonin and sleep. Early morning, natural light helps the sleeper to feel awake. Research studies have identified the influence of types of lights (e.g., phone, television, monitors) as disruptions to sleep, thus, blocking light, intuitively is thought to help with sleep, hence, the popularity of eye masks and smart goggles to block light and thereby provide comfort. Intrinsic photosensitive eye (reina) cells are critical for relaying light information to the brain [5] [6]. In a study of undergraduate research participants randomly assigned to wearing an eye mask or eye mask with holes, a substantial difference in sleep quality was found. A statistically significant difference between those with eye mask versus eye mask with holes in terms of reduced sleep disturbance in the former was reported [4]-[6]. Additionally, improved sleep quality in terms of longer sleep times, increased deep sleep durations and few awakenings after sleep onset were measured in participants using a smart goggle with settings on gentle eye and temple massage and low heat [7] [8].

The use of eye masks in patient populations predates the current popularity [4]. The eye mask used prescribed by physicians serves as a protection function to various eye conditions and other medical disorders. Sleep quality overall and reduced time to sleep were measured in a population of cardiac patients wearing eye masks [7]. In a similar study, reduction in sleep onset, overall sleep quality and reduction in daytime fatigue were found in chronic pain patients. In Ophthalmology, the use of eye masks at sleep has been remodeled for the protection of the eye during sleep [9]. While not a medical disorder, dry eyes are reported by a significant number of university students [10]. Prolonged screen time, long exposure to bright classroom and laboratory lighting add to eye dryness. Unfortunately, university students may neglect good eye care practices with the result

of dry eyes. For some nutritional factors and dehydration may be contributing factors as well. The eye mask, typically made of cotton, silk or bamboo promotes comfort and thereby relaxation [4]. The massage and heat from smart goggles are thought to relieve eye strain, promote blood circulation and ease tension [6] [7]. Smart goggles, the eye mask with technology helps to increase comfort making conditions optimal for relaxation and therefore the ability to fall asleep. In addition to blocking light that turns off sleep, the ease gained from heat and massage facilitates relaxation and improves overall sleep quality. In addition, once worn, the sleeper's sense of privacy and thereby relaxation increases with the dark environment from a sleep mask [4] [11]. This also reduces the risk for wakeups after sleep onset. By blocking out light, the individual wearing smart goggles can also experience reduced tension, increased relaxation and comfort from the enhanced personal space created. Sleep has been found to improve with smart goggle use [7]. Specifically, gentle massage and low heat settings on the smart goggle used for fifteen minutes at bedtime was found to be optimal for improved sleep quality [7] [8]. The resultant sleep is described as shorter time to sleep, less wakeups and perception of an adequate amount of sleep. This outcome translates to better sleep quality for individuals wearing eye masks. This study was designed to investigate the utility of the smart google to sleep quality in a university student population.

2. Method

2.1. Participants

Nineteen participants volunteered for the study in exchange for course credit at Liberal Arts University in the Midwest. The study was approved by the IRB. Sixteen protocols were completed, three were dropped due to noncompliance with sleep logging requested.

2.2. Instruments/Measures

All participants completed self-report measures following their informed consent. The KSR Student Sleepiness Scale (KSR-SSS) is a twenty-three item listing of circumstances common to University students that are rated in terms whether the person feels sleepy in that circumstance using ratings of 1 as not sleep, 2 as somewhat sleepy and 3 as sleepy. A total score of 69 points is obtained. The participants completed the Pittsburgh Sleep Quality Index (PSQI), a standard measure in the field with a median score of 6, indicating mild sleep disturbance overall. The Young Adult Sleep Environment Inventory (YASEI) is a twenty item inventory of statements describing good sleep habits that are rated in terms of true, false or not applicable giving a total score of 40. Participants completed the Sleep Knowledge Test (SKT)of thirty-eight items which are rated as true or false. Participants scored a 24 or 62% knowledge, as a group, of good sleep practices. Participants completed a social rhythm lighting scale of the type and length of lighting they experienced in a typical day. All participants completed a sleep log for one week. The sleep

efficiency index was computed using daily sleep times and time in bed. Figure 2 depicts the association between the average daily sleep efficiency and average ratings of the smart goggle experience. Participants rated their experience with the smart goggle after twenty minutes in terms of the presence or absence of the following sensations: heaviness, warmth, relaxing and irritating.

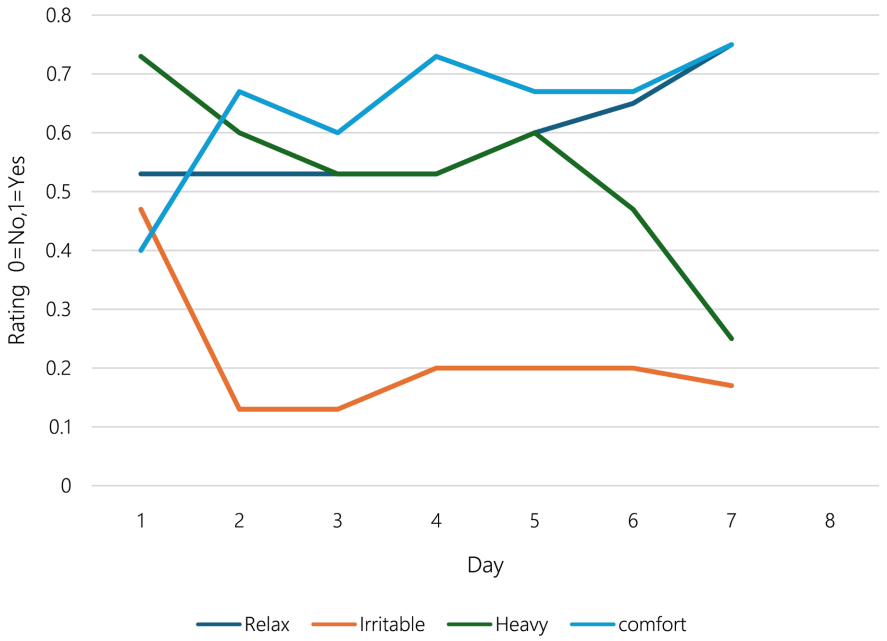

Figure 2. Average smart goggle mask rating.

2.3. Procedure

Participants were provided with an explanation of the study and then all questions were answered. After completing the IRB informed consent, the participants were requested to complete the self-report measures then each participant received a smart goggle (with instructions for use) and sleep log form to complete for one week. By random assignment, all participants either sleep the first four nights of the week with the smart goggle for twenty minutes at bedtime followed by no smart goggle or sleep with no smart goggle the first four nights followed by using the smart goggle for twenty minutes.

3. Results

81% of the participants were females. The participants' ages ranged from 19 to 25 years old with a median age of 20 years. 50% of the participants were Junior or Senior standing, all participants were full time students. The participant average KSR-SSS was 33 or in the moderate to very sleepy. The participants completed the Pittsburgh Sleep Quality Index, a standard measure in the field with a median score of 6, indicating mild sleep disturbance overall. The participants scored 28, or 74% (average level) good sleep hygiene behaviors conducive to sleep in the YASEI. Participants, as a group, spend most of their time in their bedroom in both

daytime and nighttime with varying levels of light from indirect candle or nightlights to lamps/overhead lighting/monitor screen lighting. It is estimated that this range was approximately 20 to 750 lux. The second most common room occupied was the classroom, or university campus for two to eleven hours with lighting estimates ranging from 500 to 1200 lux (e.g., classrooms, fitness center). The sleep logs analysis indicated a median 7 am wakeup time and range of 9:30 pm to 3:30 am bedtimes. The sleep efficiency index was computed using daily sleep times and time in bed. Figure 2 depicts the association between the average ratings of the smart goggle experience. Participants rated their experience with the smart goggle after twenty minutes in terms of the presence or absence of the following sensations: heaviness, warmth, relaxing and irritating. Comparative analysis of smart goggle use/no use and self-report measures and sleep log were not statistically significant. Figure 3 depicts the average daily sleep efficiencies of the participants. A 85% sleep efficiency or higher is considered good sleep quality and the findings illustrated in Figure 3 indicate an increase in sleep efficiencies, overall for the participants with the use of the smart goggles (13). With the small sample size and descriptive variables, non-parametric analyses investigating the association of smart goggle ratings sleep quality were not statistically significant. Visual analysis of Figure 2 reflects a positive trend corresponding to the 50% level of positive ratings (calming, relaxing) for smart goggle.

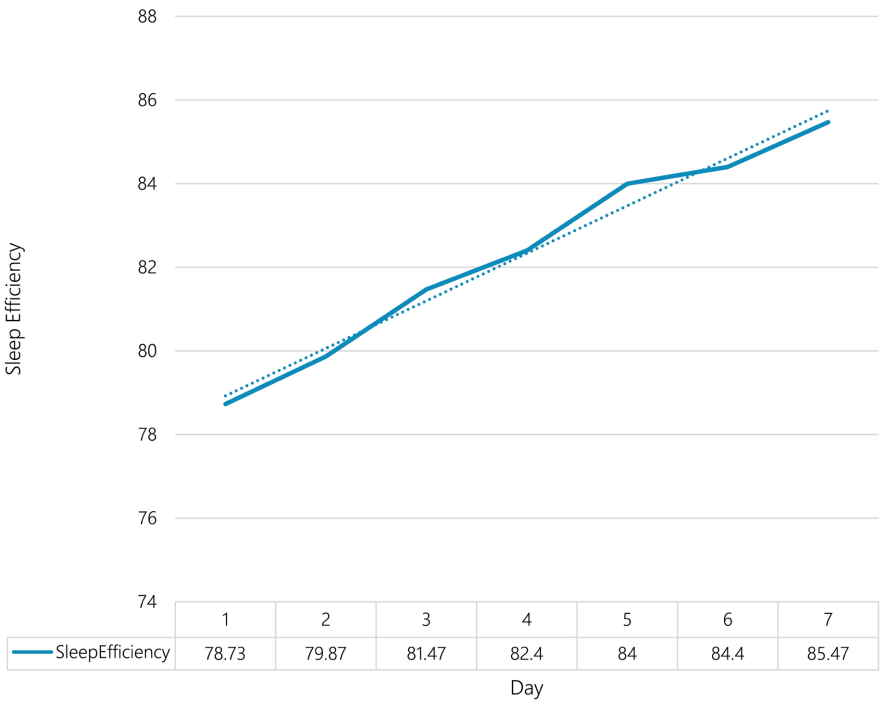

Figure 3. Sleep efficiency by day.

4. Conclusion

The variety of eye masks/smart goggles and their uses seem to be individually determined. While medical practice has used eye masks and now, smart goggles for

various eye conditions, the natural, medical diagnosis free population selects the use and type based on personally defined levels of comfort [4] [7]-[9]. The positive use ratings inform our thinking that smart goggles may have an individually defined purpose in the University population given the stress, fatigue and eye strain from lighting exposure they encounter [4] [11]-[14]. While some of the eyestrain is due to University excess eye dryness and eye strain from hours of intense lighting exposures in classrooms, laboratories, gymnasiums and common rooms, and the personal selection of the University aged population for dependence on their phone, tablet, computer and monitor for video games. To be clear, we think the use of smart goggles is a viable choice for the University student. While the focus of this study on eye mask/smart goggle use and sleep quality did not focus on stress levels, the common finding of stress in young adults/University student populations suggests it is an important consideration to address [1] [12]-[14]. We think, our non-significant results for strongly favoring the use of smart goggles and a trend in the association with sleep quality changes, may suggest other utility factors for smart goggles. Smart goggles could be an aid, a "stress break" to be used at any point during the day, to reduce eye strain for long days in classes, hours of computer screen online classwork and paramount to the focus of this article, as an aid to facilitate relaxation to induce sleep. [1] [10] [11]. In effect, we are introducing the component of eye health, along with sleep health consideration for the overall health of the University student [1] [12]. Our results suggest, from the positive trend in increased sleep efficiencies, that for some, smart goggles may facilitate relaxation for sleep. Our study in terms of sample size and length of recording sleep and smart goggle use warrants a limitation that is to be countered with future studies in this area. We conclude that the individual preference for the use of a smart goggle is to be measured with a trial period to have participants in a study that accepts smart goggle use and not accommodating to the use of the smart goggle. Last, we feel that we have, in a small way, uncovered an important area in students' health, their eye health. Addressing eye strain and eye fatigue from classroom/laboratory/internship office lighting exposure is important to further study. While our reconciling some favor for the smart goggle due to it possible relaxing effect, we think more comprehensive measurement of environmental lighting in young adult/University student lives to investigate their eye health is necessary. At this writing, we have identified this component as a possibility and acknowledged that it was not measured, we know that in our future studies, a more complete assessment of lighting exposures is needed in terms of its influence as an environmental factor that disturbs sleep. We feel the conclusions from this study are elements of rigorous measurements planned for future studies of young adult/University sleep health/health [13].

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix: Smart Goggle in Figure 1 Specifications*

- Heat temperature (100 - 108 degrees farh.) across settings of low, medium, high
- 15 minute interval then automatic shut off
- 5 massage modes rhythmic percussion massage: low-low medium-medium-medium high-high; presets: automatic mode/vitality mode/sleep mode/eye care mode/comfort mode
- Adjustable headband
- Bluetooth capacity for music; built in music that could be turned on or off
- 1000 mHh
- 6.3 × 4.72 × 3.54 inches; 10.46 ounces
- Type C charging cable
- Recommended for eye fatigue, dry eyes, to reduce stress. Not recommended if eye surgery history, recent past or current eye infection, eye pain

* = Note that participants were provided with the smart goggle and allowed to use settings they preferred.