BSc in Psychology

Sleep in Adolescents: Association with Social Media, Mental Health and Problem Behaviour

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Foreword and Acknowledgements

Submitted in partial fulfillment of the requirements of the BSc Psychology degree, Reykjavik University, this thesis is presented in the style of an article for submission to a peer-reviewed journal.
Abstract

Sleep is a big part of human life and is vital for physical and mental function. In today’s society sleep is not getting its rightful attention and sleep duration has decreased over the last decades. The study used a sample group from a larger study performed in 2014 which consisted of 2,055 randomly selected Icelandic adolescents in 8th, 9th and 10th grade. The sample group was selected out of 11,013 individuals of a database collected by Rannsókn & Greining. The study defines insufficient sleep as six hours or less a night in accordance to the recommended sleep guidelines for this age group. The study showed association between insufficient sleep and poorer mental health, longer time spent on social media and more frequent engagement of problem behaviour. The study added up to the previous literature that sleep is a key factor and cannot be overlooked. We could conclude that parents should emphasize on monitoring their adolescents sleep and follow recommended sleep guidelines. Additionally, social media usage through electronic devices should be minimized, especially before bedtime. These factors could result in longer and a sleep of more quality.

Keywords: sleep, adolescents, social media use, mental health, problem behaviour


Lykilorð: svefn, unglingar, samfélagsmiðla notkun, andleg heilsa, vandamála hegðun
Sleep in Adolescents: Association with Social Media, Mental Health and Problem Behaviour

Sleep is a big part of every creature’s life journey and is essential to good health and proper function of physical and mental activity (Buysse, 2014). In the fast phased society of today its major role is sometimes forgotten and short sleepers are rewarded for their ability to sleep less and be more active. Signs of it are already seen and sleep duration has decreased, children today sleep less than their counterparts did just few decades ago (Dollman, Ridley, Olds, & Lowe, 2007). Teens in particular are not fulfilling the criteria of set hours each night (Carskadon, 1990). Inadequate sleep can lead to mood and behaviour problems, day time sleepiness and an increased vulnerability to drugs such as alcohol (Carskadon, 1990). There are established guidelines of sleep duration for every age group and teens should aim at 7 to 11 hours per night (Hirshkowitz et al., 2015).

There are two things that manly induce sleep, firstly the circadian rhythm which is called the body clock and relies on environmental cues such as light and secondly, sleep homeostasis which often is referred to as sleep pressure and grows with the time spent awake (Campbell & Feinberg, 2005). Sleep has two defined stages, one known as non-rapid eye movement (NREM) and the second known as rapid eye movement (REM). NREM sleep has 4 stages that can be split up by the intensity or depth which increases with slower brain frequency, the duration of intense sleep depth increases or lessens with preceding waking hours (Campbell & Feinberg, 2005). REM sleep, known as the dream stage sleep, has been shown to get significantly longer with an increase demand of learning in daily life, in this stage our body gets completely paralyzed except our eyes keep moving and the brain is highly active, nearly as much as in waking (Poe, Walsh, & Bjorness, 2010).

One sleep cycle consists of all five stages discussed above, REM sleep and then the four stages of NREM. One sleep cycle takes about 90 minutes and ideally we go through
them five times over the course of one night. A study on college students who were deprived of one night’s sleep showed that they did worse in critical thinking than those who got enough sleep. However, the group who lacked sleep were confident about their own critical thinking which shows that people are not good at valuing how little sleep affects them (Walters, 1997). Fallone, Acebo, Seifer, and Carskadon (2005) demonstrate what effect sleep restriction has on kids. 78 healthy kids were put on specific sleep schedule, where time in bed (TIB) was first self–selected, then optimized and finally restricted. The restricted sleep sequence resulted in a significant bad effect on academic performance and behaviour, it also revealed that a single night of five hour sleep affects thinking and creativity skills. For this reason, parents should be knowledgeable about their child sleep pattern. However, Blunden et al. (2004) showed that primary care takers are not that well informed about the importance of adequate sleep in children, resulting in it being rarely paid attention to until it effects the child in a bad way.

Smaldone, Honig, and Byrne (2007) found that approximately 21% of American school aged elementary children are affected by sleep deprivation and parents of children that do not get sufficient sleep are more likely to report that their child has a problem at school. A study on 443 Dutch school children concluded that 43% had difficulty getting up in the morning and 25% did not feel rested at school, but feeling rested associates with better school functioning and those who had less difficulty getting up in the morning showed more achievement motivation (Den Wittenboer, 2000). In a subsequent experiment done by Sadeh, Gruber, and Raviv (2003) show that only moderate sleep restriction affects neurobehavioral functioning in children. They also found out that if children are asked to extend their sleep duration, they seem to be able to do that without an effort. According to Stickgold (as cited in Lambert, 2005) today’s society is in the middle of the greatest sleep deprivation experiment ever conducted and it is likely to have negative effect. This may be linked to social trends
such as owning a smartphone, but that has been associated with more electronic media usage in bed right before going to sleep which leads to later bedtime (Lemola, Perkinson-Gloor, Brand, Dewald-Kaufmann, & Grob, 2015). Also Owen et al. (1999) found that watching television before bed or having a television set in a child’s bedroom resulted in later sleep onset which subsequently leads to less sleep duration and additional likelihood of sleep problems. There are mainly three things that have been pointed out in relations to its effect on sleep, firstly watching a video or talking to someone could result in an emotional or physical arousal that has anti-relaxing effects, secondly using such devices means that you are not sleeping and that effects sleep duration and thirdly the light that these devices give delay the circadian rhythm (Cain & Gradisar, 2010). Being exposed to the blue light that our electronic devices give out before bedtime have also been proven to affect us in various other ways such as delay the onset of REM sleep, suppress the production of sleep promoting hormone melatonin and reduce alertness the following morning (Cain & Gradisar, 2010).

Levenson, Shensa, Sidani, Colditz, and Primack (2016) found that those individuals who engage more frequently in social media and for longer time had an increase chance of experiencing sleep problems. There are evidence showing that sleep problems in childhood are associated with higher prevalence of anxiety and depression in adulthood (Gregory et al., 2005). There seems to be a linear relationship between the time spent on social media and depression among young adults (Sidani et al., 2016). In a study performed by Vgontzas et al. (2012) on insomnia individuals were short sleep was defined as sleeping 6 hours or less a night and long sleep seven hours or more, the persistent short sleepers were more psychologically distressed at baseline than those who are not short sleepers according to scores on MMPI-2 evaluating personality. Mental health is jeopardized with sleep deprivation as shown in the case of Randy Gardner who set a record by waking for 11 days straight, he
started to have trouble remembering, having hallucinations and at one point accused an aired radio show of mocking him personally (Coren, 1998).

A study performed by Killgore et al. (2008) showed that the lack of sleep produced poorer score on emotional intelligence test, which supports the conclusion that the lack of sleep temporally affects both cognition, emotion and behaviour. The lack of sleep has also been linked to behavioural problems such as aggression and a study performed by Ireland and Culpin (2006) on young offenders and juvenile showed that less sleep quantity and quality anticipated a rise in overall aggression. Aggression has been linked to criminal activities and other antisocial behaviours, this has been shown in a longitudinal study covering 22 years (Huesmann, Eron, Lefkowitz, & Walder, 1984).

Sleep is a vital part of life but people are sleeping less and less because of social norms, such as television watching and social media usage. As mentioned earlier by Stickgold (as cited in Lambert, 2005) we are in the middle of a sleep deprivation experiment that will definitely have negative consequences. Such as negative effects on mental health that will show up in increased frequency of depression and anxiety, poorer neurobehavioral development and a growth in aggression.

The overall aim of the study is to examine sleep in adolescents, firstly to examine if more social media usage is associated with less sleep, secondly weather poorer mental health is associated with insufficient sleep and thirdly if more frequent engagement of problem behaviour correlates with less sleep.

**Method**

**Participants**

The participants of the study were students in 8th, 9th and 10th grade of elementary school. In 2014, Hrefna et al. (2014) did a study in all elementary schools in Iceland. A
The questionnaire was laid out to all students in 8th, 9th and 10th grade, 11,013 answered the questionnaire or 86.3% of the students. Participants were all volunteers and did not receive any payment for their participation in the study.

The following study uses randomly selected answers from 2,055 participants of Hrefna’s study (1,036 females, 992 males, $M_{age} = 15$ years, age range 13-18 years). Twenty-seven participants did not give up their gender.

**Materials**

The questionnaire used is from *Icelandic Centre for Social Research and Analysis* (ICSRA) and consists of questions asking about various aspects of students’ lives.

The questionnaire used in 2014 by Hrefna et al. included 82 questions on 30 pages and mainly used *Likert-Scale*. For the following study four questions out of the 82 were used. The first three questions involved average hours of sleep, self-evaluation of mental health and time spent on social media. The fourth question involved statements about various problem behaviour over the last 12 months. In addition to that there was a basic question about gender.

**Sleep.** To measure participant’s sleep they were asked the following question: “How many hours on average do you normally sleep at night?” And the following answers were available: 9 hours or more, around 9 hours, around 8 hours, around 7 hours, around 6 hours, 6 hours or less. When processing the data a change was made and the six categories were combined into two groups, *Sufficient sleep* and *Insufficient sleep*. This was done according to official sleep recommendations for this age group (14-17 years old) which states that seven to eleven hours of sleep is appropriate but anything below is not (Hirshkowitz et al., 2015). Therefore, the answers 9 hours or more, around 9 hours, around 8 hours and around 7 hours were combined into and named *sufficient sleep*. Then the other answers around 6 hours and 6 hours or less were combined and called *Insufficient sleep*. The *Sufficient sleep* group got the
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value 1 and were 1,727 (86.5%) and the Insufficient sleep got the value 0 and were 269 (13.5%).

Social media use. To measure the time spent on social media participants were asked the following question “How much time on average do you spend on the following: Being on social media on the internet for example on Facebook, Twitter, Instagram, Vine, Tumblr, WhatsApp, Snapchat, Skype” the response to the question ranged from 1 (almost no time) to 8 (6 hours or more). When processing the date a change was made and the responses were combined into three groups; those that answered Almost no time, thirty minutes to an hour and around one hour, were combined and called Little time. Those who answered around two hours and around three hours were combined and called Average time and finally those that answered, around four hours, around five hours and six hours or more were combined and called Long time. This was done on the basis of a study by Mediakix (2017) stating that the average person spends around 116 minutes a day on social media.

Problem behaviour. Few questions were combined to measure problem behaviour that all involved inappropriate actions such as showing aggression by fighting and skipping school. The following questions were asked: “How often in the last 12 months, did the following of these six statement happen”: break rules at home, broke rules at school, got into a fight, skipped school, fled from home, and got in to trouble for lying and stealing. Answers were collected using Likert scale which ranges from 1 (rare/almost never) to 4 (almost always or always). After combining all answers the range reach from 0-24 and the variable was named problem behaviour. The variable was split into three groups, First group ranged from 0-6 was named Low, the second group ranged from 7-12 and got the name Medium and third group range was from 13-24 and got named High. A Cronbach’s Alpha was performed to measure internal consistency, Cronbach’s $\alpha = 0.791$. Which indicates a high level of internal consistency.
Mental health. To measure mental wellbeing participants were asked the following question “How good is your mental health?” and the responses were measured on a 4 point Likert scale, range from 1 (very good) to 4 (bad).

Gender. To accumulate the distribution of males and females the following question was asked; “Are you a boy or a girl”. Girls were slightly more or 1,036 (51.1%) compared to boys 992 (48.9%).

Procedure

The procedure of the study Youth in Iceland 2014 was monitored by ICSRA in October 2014 (Hrefna et al., 2014). Before the study was performed a letter was sent to all parents of kids younger than 18 years old, informing them about the study and instructing them in what they should do if they did not want their child to participate. The study was sent to all elementary schools in Iceland to be laid out to in every 8th, 9th and 10th grade. Teachers were given specific instruction on what they should say and do when distributing the questionnaire. Participants were instructed to answer the questions as best they could and ask for help if needed, also they were told not to write any credentials down so their answers could not be traced back to them. After finishing the study the answers were to be put in a special envelope and returned back to the teacher.

Design and Data Analysis

Data analysis of the study involved using the computer statistics program IMB SPSS Statistics 24. Study design was within subjects and to see if there was association between the independent variables; Social media usage, Mental health and Problem behaviour, to the dependent variable; Sleep. A Chi square test of association was conducted. A two-way ANOVA was also performed by using gender with each independent variable to test for
interaction effect and main effect on sleep, a Bonferroni Post Hoc test was then performed to grasp the difference between groups of the independent variables to sleep.

**Results**

Descriptive statistics for all variables used are illustrated in Table 1, it shows the distribution within each variable. Chi square test for association was conducted between gender and sleep showing statistical significant relationship between the two variables $\chi^2 (1) = 7.325, p = .007$. Girls were more likely to get insufficient sleep (15.4%) compared to boys (11.2%).

**Sleep and Social Media Usage**

To test the hypothesis that time spent on social media affects sleep, a chi-square test of association and a two way ANOVA were conducted. A chi-square test of association was first conducted between sleep and time spent on social media. A significant association was found between the two variables, $\chi^2 (2, 1910) = 51.550, p < .001$. Those that spent a *Long time* on social media were more likely to get *Insufficient sleep* (26.4%) compared to those that spent *Little time* (9.7%). A two way ANOVA was conducted to examine if there was an interaction affect between gender and social media usage on sleep. There was a statistically significant main effect of Social media usage on sleep [$F(2, 1883) = 23.656, p = .001$]; however the effect size was small (partial eta squared = .025). A post hoc analyses using Bonferroni revealed a statistically significant difference between *Long* social media usage (M= .740, SD= .021) and *Average* social media usage (M= .864, SD= .014) and *Little* social media usage (M= .902, SD= .010) (both $p < .001$) to sleep, it also indicated a statistically significant difference in sleep between *Average* social media usage and *Little* social media usage ($p = .044$). The main effect for gender [$F(1,1883) = 1.651, p = .199$] and the interaction effect, ($F(2, 1883) = .107, p = .899$) did not reach statistical significance.
Table 1

Descriptive Statistics of all Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>%</th>
<th>(N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td>2,028</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>48.9% (992)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>51.1% (1,036)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep</td>
<td>1,996</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insufficient sleep</td>
<td>13.5% (269)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sufficient sleep</td>
<td>86.5% (1,727)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social media usage</td>
<td>1,939</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Little time</td>
<td>55.5% (1,077)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average time</td>
<td>30.4% (589)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long time</td>
<td>14.1% (273)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental health</td>
<td>1,988</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very good</td>
<td>44.1% (876)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>37.9% (754)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alright</td>
<td>12.5% (248)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bad</td>
<td>5.5% (110)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem behaviour</td>
<td>1,981</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>51.6% (1,022)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>45.4% (900)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>3.0% (59)</td>
<td></td>
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</tr>
</tbody>
</table>

Sleep and Mental Health

To test the hypothesis that Insufficient sleep is associated with poorer mental health, a chi-square test of association was conducted between the two variables. A significant association was found $\chi^2 (3, N = 1955) = 231.531, p = < .001$. Those individuals that rated their mental health bad had (56.9%) chance of getting Insufficient sleep compared to only (6%) in the Very good mental health group. A two way ANOVA was conducted to examine if there was an interaction affect between mental health and gender on sleep. There was a statistically significant main effect for mental health [$F(3, 1925) = 74.746, p < .001$]; the effect size was medium (partial eta squared = .104). A post hoc analyses using Bonferroni
indicated a statistically significant difference between mean scores for Very good mental health (M= .941, SD= .011), Good mental health (M= .871, SE= .012) Alright mental health (M= .776, SD= .022) and Bad mental health (M= .436, SE= .034) (All p < .001) to sleep. The main effect for gender [F(1, 1925) = .007, p = .934] and the interaction effect [F(3, 1925) = .791, p = .499] did not reach statistical significance.

Sleep and Problem Behaviour

To test the hypothesis that increased frequency of problem behaviour is associated with Insufficient sleep. A chi-square test of association was conducted between sleep and problem behaviour. A significant association was found $\chi^2 (2, N = 1952) = 59.328, p < .001$. Individuals who were in the High frequency problem group were more likely (39.7%) of getting Insufficient sleep compared to Low group engage of problem behaviour (8.9%). A two way ANOVA was conducted to examine the impact of gender and problem behaviour on sleep. There was a statistically significant main effect for problem behaviour, [$F(2, 1927) = 32.736, p < .001$]; however, the effect size was small (partial eta squared = .033). Post hoc comparison using Bonferroni revealed a statistically significant difference between all groups in problem behaviour to sleep at ($p < .001$), Low problem behaviour (M= .914, SE= .011), Medium problem behaviour (M= .834, SE= .011) and High problem behaviour (M= .586, SE= .046). The main effect for gender (F(1, 1927) = 2.621, $p = .106$) and the interaction effect [$F(2, 1927) = 1.551, p = .212$) did not reach statistical significance.

Discussion

The primary goal of this study was to determine if insufficient sleep in adolescent could be linked to poorer mental health, social media usage and problem behaviour. Results showed that individuals who spent the longest time on social media were more likely to get insufficient sleep compared to those that spent less time on social media. The two way
ANOVA showed a relatively small effect size and a Bonferroni post hoc test revealed that the difference in sleep was most significant between those that spent long time on social media and those that spent little time ($p < .001$). These results support previous studies on this matter. Study by Levenson, Shensa, Sidani, Colditz, and Primack (2016) showed that individuals who engage more frequently and for longer time on social media have an increase chance of experiencing sleep disturbances. We should be able to assume that an increased social media usage means that an individual spends more time on an electronic device such as laptop computers or smartphones and we know that the usage of an electronic devices, as such, all expose the blue screen light. This blue screen light has been linked to reduction of alertness, delaying circadian rhythm, REM sleep and supressing the production of Melatonin (Caine & Gradisar, 2010). Additionally, Lemola, Perkins-Gloor, Brand, Dewald-Kaufmann, & Grob, (2015) have showed that owning an electronic device, such as a smartphone is associated with later bedtime and also linked to higher use of electronic media, mainly before going to bed. Similarly, Owen et al. (1999) found out that having a television set in a child’s bedroom delayed sleep onset and duration.

Results from the study support the hypothesis that poorer mental health and insufficient sleep are linked. Mental health and sleep showed a statistically significant association, the likelihood of insufficient sleep increased with poorer mental health. The effective sizes was relatively large (partial era squared= .104) and post hoc Bonferroni indicated a significant difference between all mental health groups, those that had bad mental health were most likely to get insufficient sleep compared to other groups ($p < .001$). From these findings we cannot determine if those individuals with poorer mental health sleep less or that less sleep causes poorer mental health. However, a previous study by Vgontzas et al. (2012) found that short sleepers are more psychologically stressed at baseline compared to non-short sleepers assessed with MMPI-2. Sleep problems early in childhood have been link
to a higher prevalence of depression and anxiety later on (Gregory et al., 2005). These findings may indicate that the insufficient sleep could be one of the reasons of poorer mental health of an individual.

The study results also confirmed the hypothesis that higher frequency engagement in problem behaviour was more linked to insufficient sleep compared to less frequent problem behaviour. The effect size was rather small (partial eta squared=.033). Bonferroni post hoc revealed a statistically significant difference between all groups regarding sleep ($p<.001$). Which supports previous study by Ireland and Culpin (2006) who found that less sleep quantity and quality anticipated a rise in overall aggression which has been associated with anti-social behaviour such as the factors asked about in the current study. Results from the study fit well with former data. However, we are not able to say if insufficient sleep causes problem behaviour, poorer mental health or an increase usage of social media or if these factors are just contributors to less sleep or both. Future studies should aim to better understand how these factor work together with sleep and look into other variables such as physical health and sleep. The findings of this study will be a good input in the discussion about the importance of sleep, as sleep duration is declining (Dollman, Ridley, Olds, & Lowe, 2007). It may be used to encourage parents to monitor their child’s sleep and make them follow the recommended sleep guidelines, because parents seem to be not that well informed about their children sleep patterns as Smaldone, Honig, and Byrne (2007) showed. Because given the chance children seem without much difficulty able to increase their sleep (Sadeh et al., 2003). The educational system would probably benefit from such actions because restriction of sleep shows a significant bad effect on academic performance (Fallone et al., 2005).
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