



Effects of Poor Subjective Sleep Quality on Symptoms of Depression and Anxiety among Adolescents

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Foreword

Submitted in partial fulfilment 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 – English

Poor quality of sleep over a long period of time and shorter sleep duration have various negative effects on individual's mental and physical health. The aim of this study was to examine the relationship between poor quality of sleep and increased symptoms of depression and anxiety among adolescents in Iceland and whether this relationship varies with gender. The study also examined the effect of adolescents' sleep duration on same terms. Earlier findings have implied that poor quality of sleep along with short sleep duration is to correlate with high negative and low positive emotions. Studies have also implied that there is a gender difference in adolescent mental health but few studies have examined and compared these factors with sleep habits among adolescents. The current study used data from an ongoing research, *Effects of exercise on well-being and quality of life among college students*. The sample size was a total of 240 Icelandic first-year students from three different colleges in the capital region. The sample contained 83 boys (36%) and 148 girls (64%). The current study explored the first part of the research. The data was collected via self-report where participants valued subjective quality of sleep and sleep duration as well as their mental health for the last 3 weeks. The results showed a significant main effect of poor quality of sleep and gender along with increased symptoms of anxiety and depression. However, no relation between sleep duration and gender was found. The results support previous findings that poor subjective quality of sleep can increase effects on deprivation and anxiety. The poorer the quality of sleep, the more symptoms of depression and anxiety were found among the adolescents.

Keywords: quality of sleep, adolescence, well-being, quality of life, depression and anxiety

Abstract – Íslenska

Svefn hefur mikið verið rannsakaður í gegnum tíðina. Skortur á svefni og léleg gæði nætursvefns hafa verið tengd við neikvæð áhrif hugrænnar getu, hreyfingar og neikvæðra tilfinninga. Markmið rannsóknarinnar var að kanna hvaða áhrif lítil gæði svefns gætu haft á andlega líðan, og þá sérstaklega þegar litið er til einkenna þunglyndis og kvíða hjá ungmennum. Einnig var meðal svefntími kannaður og borinn saman við andlega líðan. Margar af fyrri rannsóknum hafa sambætt nokkra þætti og borið saman við svefngæði unglunga, en lítil áhersla hefur verið lögð á aðeins andlega líðan og þá sérstaklega kvíða og þunglyndi ein og sér. Úrtakið var í heildina 240 íslenskir framhaldsskólanemendur. Fjöldi drengja í úrtakinu var 83 (36%) og stúlkna 148 (64%). Aðeins var unnið upp úr fyrsta hluta rannsóknarinnar þar sem rannsóknin í heild sinni kannaði einnig hreyfingu ungmenna með tilteknu inngrípi sem ekki var þörf á að nýta í þessari rannsókn. Þátttakendur svöruðu spurningalista þar sem þau voru beðin um að gera huglægt mat á svefngæðum sínum undanfarnar þrjár vikur ásamt mati á andlegri líðan. Niðurstöður dreifigreiningar sýndu marktæka samvirkni á milli þess að upplifa minni svefngæði og aukin einkenni þunglyndis og kvíða. Því minni svefngæði, því meiri einkenni þunglyndis og kvíða voru fundin á meðal unglinganna.

Lykilorð: gæði svefns, ungmenni, vellíðan, lífsgæði, þunglyndi og kvíði

Effects of poor subjective sleep quality on symptoms of depression and anxiety among adolescents

Research in the field of sleep has shown that sleep is important and that poor quality of sleep and shorter sleep duration have been associated with various disorders, such as obesity, prehypertension, behavioral problems and decreased cognitive ability (George et al., 2013; Javaheri et.al, 2008; Meijer et.al, 2010; Morrison et al.,1992). Although many questions regarding sleep quality and what happens when our need for sleep is not met are still unanswered, studies have shown that sleep quality affects both health and the overall quality of an individual's life (Yi, Shin, & Shin, 2006). Interest in this field of research has increased and studies have put more effort into fully investigating the risks that can emerge when the need for sleep is not met. Research on sleep disturbances has shown that insomnia, for example, is a risk factor for the development of psychiatric disorders (Baglioni et al., 2010; Gehrman et al., 2013). Furthermore, Baglioni et al. (2010) found that poor quality of sleep was correlated with high negative and low positive emotions.

Adolescents' biological clock differs from adults sleeping habits, which makes them stay awake longer and increases their desire to sleep in (Wolfson & Carskadon, 2005). This often leads to shorter sleep, as they have to wake up early for school in the morning, causing symptoms of depression, lower self-esteem and lower grades in school (Fredriksen et al, 2004; Wolfson & Carskadon, 1998). Recent findings have suggested that wakefulness could actually be an early sign of sleep deprivation or chronic partial sleep restrictions (Alhola & Polo-Kantola, 2007). A study by Wolfson and Carskadon (1998) which examined the sleeping habits of 3,120 high school students, showed that sleep duration decreases by 40-50 minutes between the ages of 13 and 19. Later bedtimes and an early rise time were part of the reason for this. Girls sleep routines are more organized, they go to sleep earlier and wake up earlier than boys, but that is not a good indicator of well-being (Tsai & Li, 2004).

Adolescents with decreased sleep duration about 25 minutes on average were more likely to struggle in school, fail classes and increase daytime sleepiness according to Wolfson et.al (1998). Those who slept 8 hours and 15 minutes per night got the optimal rest and were more likely to get higher grades. Research by Kaneita et al. (2007) examined the relationship between various sleep habits and mental health. The results suggested that 8 hours of a good night's sleep should be enough for individuals around the age of 20. The data examined 24,686 individuals who were aged 20 years or older. The results indicated that sleep duration that lasted 7 hours or less, or 9 hours or more, resulted in more depression among subjects than among those who slept between 7 and 9 hours on average. Other studies that have focused on sleep duration have indicated that decreased sleep duration is a predictor for lower grades, lower self-esteem and increased symptoms of depression along with unintentional injuries and obesity in adolescents (Fredriksen et al., 2004; Noland et al., 2009). Study by Liu et al. (2012) indicated similar results that short sleep duration increased the risk of obesity. Sleep problems are somewhat persistent over time from ages 13-15 years according to research by Morrison (1992), so it seems relatively important to intervene if children show signs of sleeplessness (Alhola & Polo-Kantola, 2007). In Morrison's et al. research (1992), a sample of 943 adolescents were questioned about their sleep problems and a quarter of the sample reported needing more sleep and felt more depressed, anxious and easily distracted if they did not get sufficient sleep. According to previous studies, quality of sleep depends a lot on how long we sleep instead of how well we sleep.

Previous studies have focused a lot on sleep duration in order to assess participants' quality of sleep (Gehrman et al., 2013). Although, a research by Pilcer et al. (1997) suggested that professionals should focus on sleep quality instead of sleep quantity in addition to understand and measure adolescent's mental health and well-being. Another research by Jean-Louise et al. (2000) which examined whether longer sleep duration would predict a

better health-related quality of life, as measured by *Quality of well-being scale* (Kaplan et al. 1998), showed that greater sleep duration is not associated with increased well-being.

Relatively little research have been made concerning gender difference regarding sleep habits and sleep disturbances (Blatter et al., 2006). During adolescence, a dramatic change occurs in girls mental health between the age 11-13 years and they become more vulnerable to distress and are twice as likely to have experiences an episode of anxiety disorder or depression than boys (Cyranowski et al., 2000a; Lewinsohn et al., 1998).

A research by Ling et al. (2004) examined sleeping habits among 237 students (ages 18-24 years) were students were asked to hold a 7-day sleeping log. The results showed that even though girls had more organized sleep routines than boys (got earlier to bed and woke up earlier), they were much more disposed to distress than the boys. This applied to every age group, according to Ling's study. It raises the question, why research on gender difference regarding distress and the relation to sleep has so far not received as much attention as research on sleep duration (Javaheri et al., 2008; Kaneita et al., 2006; Liu et al., 2012).

The aim of this study was to examine the relationship between quality of sleep and symptoms of depression and anxiety among adolescents in Iceland. Since previous studies have shown a clear relationship between sleep duration and mental health, it was hypothesized in this research that short sleep duration could increase symptoms of depression and anxiety. The second hypothesis was that quality of sleep, independent of sleep duration, would affect symptoms of depression and anxiety. The third hypothesis was that the results would vary by gender.

Method

Participants

The present study used data from an ongoing research, *Effects of Exercise on Well-being and Quality of Life Among College Students*, by Heiðdís B. Valdimarsdóttir and Birna Baldursdóttir (unpublished research work). A total of 240 Icelandic first-year students from three different colleges in the Capital region were initially sampled. A random sample was selected from each school and participants in the selected classes were introduced to the study. According to the power analysis of the data from a cross-sectional findings on college students, compared with the results of the preliminary examination, the sample ($n = 240$ students) was found sufficient to analyze variances in outcomes related to depression and anxiety symptoms. The sample contained 83 boys (36%) and 148 girls (64%). As a reward for participating in the study, each participant received a ticket to the cinema. Participants were allowed to withdraw their participation at any point during the research.

Measures

Depression and anxiety measures

The *Symptom Checklist-90-Revised* (SCL-90-R) was used to examine the symptoms of depression and anxiety in the study (Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974). The 90-item self-report scale has been prevalent in the subject of measuring psychological symptoms as well as psychological distress. The SCL-90-R was developed by Leonard R. Derogatis around 1970 and has been used ever since (Derogatis & Unger, 2010).

The questionnaire used a total of 7 items from the SCL-90-R. The participants were asked “*How often have you felt the following distress or discomfort for the last three weeks?*” There followed seven items which the participants were asked to rate on a five point scale ranging from “*never*” to “*very often*” Regarding anxiety, the statements were: “*you felt*

nervous” and *“you felt sudden fear for no reason”*. The items relating to symptoms of depression were: *“you were sad and had little interest in doing things”*, *“you felt lonely”*, *“you had difficulties falling asleep or staying asleep”*, *“you felt like your future was hopeless”*, *“you thought about killing yourself”*.

Subjective sleep measures

The *Sleep Quality Scale* (SQS) (Yi et al., 2006) developed out of five questions from the *School Sleep Habits Survey* (Shahid et al., 2012) and one question from the *Pittsburg Insomnia Rating Scales* (Buysse et al. 1989) was used to measure participants’ quality of sleep.

Participants were asked to value their subjective quality of sleep by answering eight questions regarding the past three weeks. The participants were asked to think about how they had slept, the nights of Monday to Friday. The first item was *“how long did it take for you to fall asleep?”* This was answered on the following five point scale: *“I fell asleep as soon as I laid my head on the pillow”*, *“it took me less than 30 minutes”*, *“it took me about ½ to 1 hour”*, *“it took me 1-3 hours”*, *“it took me more than 3 hours, or I did not fall asleep”*. The second item was *“some wake up in the middle of the night, some do not. How often have you woken up in the middle of the night, for the last three weeks?”* The answers were on the following five point scale: *“never”*, *“once”*, *“2 to 3 times”*, *“4 to 5 times”* and *“more than 5 times”*. The third question was *“for the last three weeks, how often have you woken up earlier than you would have preferred and not been able to fall asleep again?”* The answers were on a five point scales: *“never”*, *“once”*, *“2 to 3 times”*, *“often”* and *“every morning/night”*. The fourth question was *“do you think that your general quality of sleep is?”* And the options were on a 5 point scale were: *“very good”*, *“good”*, *“average”*, *“poor”* and *“very poor”*. The fifth question was *“how often in the last three weeks have you felt that you got enough sleep?”* and the answers, on a 5 point scale, were: *“always”*, *“often”*, *“sometimes”* and *“not that*

often” and *“never*”. The sixth question was *“in the last three weeks, what kind of mood have you been in?”* The answers, on a 5 point scale, were: *“very good”*, *“good”*, *“neither good nor bad”*, *“bad”*, *“very bad”*. The seventh question was *“for the last three weeks, in what kind of a mood have are you generally been in the first ½ hour after you wake up?”* The answers were on a 5 point scale: *“very good”*, *“good”*, *“neither good nor bad”*, *“bad”* or *“very bad”*. In the last question, which related to sleep duration, participants were asked *“for the last three weeks, how many hours a night have you slept?”* and then answered with the number of hours they thought they had slept.

Design and Procedure

The data was analyzed in two 2x2 fixed factor ANOVAs with gender (male vs. female) and sleep quality/duration (high vs. low) as the fixed factors for depression and anxiety separately.

Two preliminary studies had been made by the researchers as a power analyses to ensure the reliability and validity of the research. A written approval was given by the institutional ethics committee and by the researches. The current study explored the first part of the upcoming research previously mentioned. The upcoming research used pedometers as an intervention for one group to compare their activity with a control group, in order to see whether there would be a difference in mental health and physical activity. The current research examined the students’ sleeping habits and mental health so there was no need for the pedometer and control group data.

The teachers followed written instructions by the researchers and introduced the questionnaire to the participants in a classroom during school hours. As instructed, answering the questionnaires took 30-40 minutes. The participants were informed that they could withdraw their participation at any time and that their responses could not be traced. All

responses were placed in an unmarked envelope to ensure the participants' privacy. Also to protect participants' privacy, each one got specific number so the researches would be able to compare their answers later on without knowing their names. Participants were also informed that their parent/s or guardian/s would receive the same information via email and would have to approve their participation by handing in a written approval within a few days.

Data and statistical analyses

All statistical analyses were performed with IBM statistic, SPSS version 20. The items of The Symptom Checklist-90-Revised that were used to measure symptoms of depression and anxiety were recoded and computed into two dependent variables, depression and anxiety. The statistical analyses of the sleep items were computed. For clearer results on the effects of quality of sleep, the sleeping variables were divided into groups of "high" and "low". The former contained the 30% with the highest subjective quality of sleep and the latter the 30% with the lowest subjective quality of sleep. Participants with missing values on one or more of the seven sleep items were excluded from subjective sleep quality analyses. In all analyses the level of significance was set at $p = .05$.

Ethical issues

Participants and their parents were informed about the study, the intervention and the questions that the participants would be asked. The participants and their parent/s or guardian/s had to give written approval of their participation prior to the intervention in the study. All data collection was approved by the Icelandic human review committee.

Results

This study examined the relationship between the quality of sleep and symptoms of depression and anxiety and whether this relationship varied with gender. Four fixed factor ANOVAs were conducted to analyze the data for depression and anxiety separately, the factors being sleep quality/duration (high vs. low) x gender (boys vs. girls). The alpha criterion for significance was set at .05. Table 1 shows descriptive statistics for all variables.

Table 1.

Descriptive statistic

			<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Range</i>
Sleep Duration	Boy		83	6.9	1.3	8.0
	Girl		148	7.1	1.0	6.5
	Total		231	7.0	1.1	7.2
Quality of Sleep	Boy	LSQ	22	2.91	0.60	1
		HSQ	31	1.63	0.21	1
	Girl	LSQ	33	2.83	0.23	1
		HSQ	48	1.59	0.23	1
	Total	LSQ	54	1.60	0.50	1
		HSQ	79	1.61	0.49	1
Depression	Boy		83	1.44	0.50	2
	Girl		148	1.81	0.80	3.2
	Total		231	1.12	0.65	2.6
Anxiety	Boy		83	1.3	0.60	3
	Girl		148	1.8	1.03	4
	Total		231	1.55	0.81	3.5

Quality of sleep, gender differences and depression

The results from the two-way ANOVA for depression showed a significant main effect for the gender $F(1,130) = 20.484, p = .001$, Partial Eta Squared = .136. Girls ($M = 1.88$) showed more symptoms of depression than boys ($M = 1.46$). The results showed a significant main effect of quality of sleep $F(1,130) = 71.547, p = .001$, Partial Eta Squared = .355 and showed a significant interaction between the variables quality of sleep and gender $F(1,130) = 9.846, p = .002$, Partial Eta Squared = .070. As can be seen in Figure 1, both boys and girls show more symptoms of depression with low quality of sleep compared to high quality of sleep but this difference was bigger for girls.

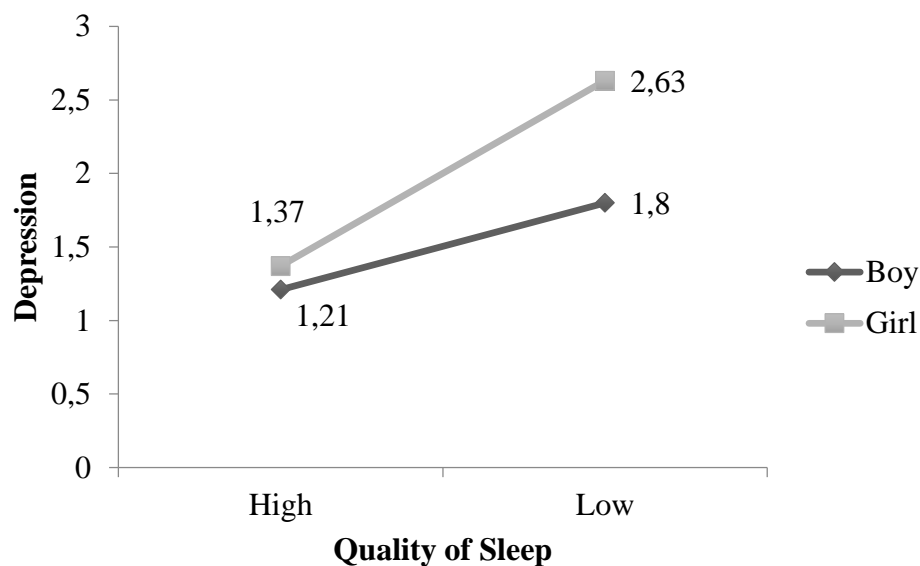


Figure 1. Two-way ANOVA between QOS and gender and the variation with depression

Quality of sleep, gender difference and anxiety

The results from the two-way ANOVA for anxiety showed a significant main effect for the gender $F(1,130) = 13.828, p = .001$, Partial Eta Squared = .096. Girls ($M=1.81$) showed more symptoms of anxiety than boys ($M=1.33$), as shown in figure 2.

The results for the two-way ANOVA for anxiety showed a significant main effect for quality of sleep $F(1,130) = 15.402, p = .001$, Partial Eta Squared = .106. and showed significant interaction between the variables quality of sleep and gender $F(1,130) = 10.957, p = .001$, Partial Eta Squared = .078.

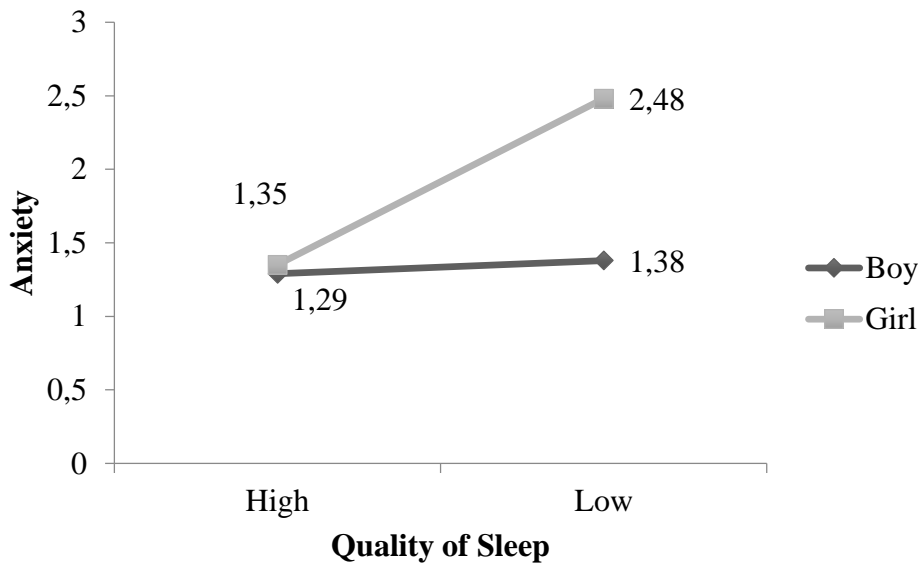


Figure 2. Two-way ANOVA between QOS and gender and the variation with anxiety

Sleep duration, depression and anxiety

When looking at sleep duration the results from the two-way ANOVA for depression showed a significant main effect for gender $F(1,187) = 12.740, p = .001$. The results did not show a significant main effect for sleep duration $F(15,187) = 1.619, p = .072$, but a reasonably strong effect size, Partial Eta Squared = .115. The results did not show significant interaction between the variables sleep duration and gender $F(8,187) = .827, p = .580$, Partial Eta Squared = .034. The results from the two-way ANOVA for anxiety showed a significant main effect for the gender $F(1,187) = 9.604, p = .002$. The results did not show a significant main effect for sleep duration $F(15,187) = 1.053, p = .403$, Partial Eta Squared = .078. The results did not show significant interaction between the variables sleep duration and gender $F(8,187) = .817, p = .589$, and weak Partial Eta Squared = .034.

Discussion

This study examined the relationship between the quality of sleep and symptoms of depression and anxiety and whether this relationship varies with gender. The study also examined the relationship between sleep duration and symptoms of depression and anxiety and whether it varies with gender as well.

Previous studies had emphasized on sleep duration to explain and evaluate the quality of sleep (Wolfson & Carskadon, 1998). Other studies have used scales (Buysse et al., 1989) and sleep duration measures to examine adolescents quality of sleep, but few studies have examined these factors separately (Pilcher et al. , 1997). Previous studies on gender difference and well-being have shown that girls, regardless of sleep habits, are more distressed than boys at this age (Cyranowski et al. , 2000b; Greca & Lopez, 1998; Piccinelli & Wilkinson, 2000).

The results from the analyses of variance in this study consisted of two separate factors, quality of sleep and sleep duration. The results were consistent with the previous studies regarding the quality of sleep and the relationship with depression and anxiety (Pilcher et al., 1997). Poor subjective quality of sleep resulted in increased symptoms of depression and anxiety among the adolescents. The girls showed more symptoms of depression and anxiety when confronted with low quality of sleep in this study (Greca & Lopez, 1998). Girls showed more symptoms of depression and anxiety overall, when subjective quality of sleep was high or low.

The results from the analyses of variance for sleep duration was unexpected. The results showed no relation between sleep duration among adolescents and increased symptoms of depression and anxiety which indicates that sleep duration and quality of sleep are two separate factors. These results emphasize the importance of including the quality of

sleep as an independent factor when studying the relation between sleep habits and mental health.

The main limitations of this study was that the number of girls in the sample was significantly higher than the number of boys which could decrease the results accuracy. Self-reports were used as a measurement for sleep duration, the quality of sleep (Yi et al., 2006) as well as symptoms of depression and anxiety (Derogatis et al., 2010). It is the participant's responsibility to value and assess how their mental health and sleep habits have been for the last three weeks. Although, self-reports have proven to be valid and reliable way to measure well-being and behavior (Howard, 1994).

Despite these limitations the study increased the level of knowledge regarding the effectiveness of quality of sleep as this measurement seems to work independently from sleep duration. Even though the sample contained higher percentage of girls than boys, the sample was large which makes the total results, regardless of gender more reliable.

Conclusion

The results of this study indicate that it is important to look at quality of sleep and sleep duration separately when examining the relationship between mental health and sleep habits. Since there is no relationship between sleep duration and mental health, whereas the results show a clear relationship between the quality of sleep and mental health, sleep duration is therefore not a good measurement of the actual sleep quality as indicated by earlier studies and the quality of sleep itself, through questionnaires, should be examined in relation to mental health and sleep habits.

For further research in this particular area the study should focus more on difference between the genders and why girls are more vulnerable to symptoms of depression and anxiety than boys.

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Appendix A

Chosen questions

1. Are you a boy or a girl?

☐ Boy

☐ Girl

2. What year are you born?

☐ 1994

☐ 1995

☐ 1996

☐ 1997

☐ 1998

☐ Another year: Year 19__

43. How often have you felt the following distress or discomfort for the last three weeks?

a) Headache

f) Pain in the stomach

h) Tremors

j) Nervous

k) Sudden fear for no reason

m) You were sad and had little interest in doing things

o) You felt lonely

q) You had difficulty falling asleep or staying asleep

u) You felt like your future was hopeless

v) You thought about killing yourself

Respond choices:

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Quite often
- ☐ Very often

The following Questions nr.78-85 are about your sleep habits and sleep quality. When answering these questions, think about how you slept the nights of Monday to Friday in the last three weeks.

78. If you think about the general quality of your sleep the past three weeks, how long did it take for you to fall sleep on average?

- ☐ I fell asleep as soon as I laid my head on the pillow (It took few minutes to fell asleep)
- ☐ It took me less than 30 minutes
- ☐ It took me about ½ to 1 hour
- ☐ It took me 1-3 hours
- ☐ It took me more than 3 hour, or I did not fall asleep

79. Some wake up in the middle of the night, some do not. How often have you woken up in the middle of the night, for the last three weeks?

- ☐ Never
- ☐ Once
- ☐ 2 or 3 times

- ☐ 4 to 5 times
- ☐ More often than 5 times

80. For the last three weeks, how often have you woken up earlier than you would have preferred and not been able to fall asleep again?

- ☐ Never
- ☐ Once
- ☐ 2 to 3 times
- ☐ Often
- ☐ Every morning/night

81. Do you think that your general quality of sleep is..

- ☐ Very good
- ☐ Good
- ☐ Average
- ☐ Poor
- ☐ Very poor

82. How often, in the last three weeks have you felt that you got enough sleep?

- ☐ Always
- ☐ Often
- ☐ Sometimes
- ☐ Not that often
- ☐ Never

83. In the last three weeks, what kind of mood have you been in?

- ☐ Very good
- ☐ Good
- ☐ Neither good nor bad
- ☐ Bad
- ☐ Very bad

84. For the last three weeks, in what kind of a mood have you generally been in the first $\frac{1}{2}$ hour after you have woken up?

- ☐ Very good
- ☐ Good
- ☐ Neither good nor bad
- ☐ Bad
- ☐ Very bad

85. For the last three weeks, how many hours a night have you slept? Here you're asked to remember the nights between Monday and Friday.

____ Hours