

EFFECT OF USING SMARTPHONE BEFORE BED ON SLEEP QUALITY
AMONG UNDERGRADUATE STUDENT
AT CHULALONGLONG UNIVERSITY BANGKOK THAILAND

Miss Mookrawee Bunyalug



จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

บทคัดย่อและแฟ้มข้อมูลฉบับเต็มของวิทยานิพนธ์ตั้งแต่ปีการศึกษา 2554 ที่ให้บริการในคลังปัญญาจุฬาฯ (CUIR)
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ผลของการใช้โทรศัพท์มือถือก่อนนอนต่อคุณภาพการนอนหลับในนิสิตระดับปริญญาศึกษาของ
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By Miss Mookrawee Bunyalug

Field of Study Public Health

Thesis Advisor Assistant Professor Naowarat Kanchanakhan,
Ph.D.

Accepted by the College of Public Health Sciences, Chulalongkorn
University in Partial Fulfillment of the Requirements for the Master's Degree

..... Dean of the College of Public Health Sciences
(Professor Sathirakorn Pongpanich, Ph.D.)

THESIS COMMITTEE

..... Chairman
(Associate Professor Ratana Somrongsong, Ph.D.)

..... Thesis Advisor
(Assistant Professor Naowarat Kanchanakhan, Ph.D.)

..... External Examiner
(Nanta Auamkul, M.D., M.P.H)

CHULALONGKORN UNIVERSITY

มุกรวิ บุญญลักษณ์ : ผลของการใช้โทรศัพท์มือถือก่อนนอนต่อคุณภาพการนอนหลับใน
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 BANGKOK THAILAND) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ผศ. ดร. เนาวรัตน์ กาญจน
 การ, 88 หน้า.

มนุษย์จะสามารถทำงานได้ดีเมื่อร่างกายได้นอนหลับพักผ่อนอย่างเพียงพอ แต่ในปัจจุบัน
 มนุษย์ใช้สมาร์ตโฟนก่อนนอนเพิ่มมากขึ้น ซึ่งทำให้ส่งผลกระทบต่อคุณภาพการนอน ดังนั้น
 การศึกษาแบบภาคตัดขวางในครั้งนี้ มีวัตถุประสงค์เพื่อศึกษาความสัมพันธ์ระหว่างการใช้สมาร์ต
 โฟนก่อนนอนกับคุณภาพการนอนหลับของนิสิตระดับปริญญาตรี จุฬาลงกรณ์มหาวิทยาลัย โดยมี
 กลุ่มตัวอย่างจำนวน 423 คน ทั้งเพศชายและหญิง แบบสอบถามแบ่งออกเป็น 4 ส่วน ได้แก่ 1)
 ข้อมูลทั่วไปของกลุ่มตัวอย่าง และปัจจัยที่ส่งผลต่อการนอนหลับ 2) ความเครียด 3) แบบประเมิน
 ปัญหาจากการใช้สมาร์ตโฟน และพฤติกรรมการใช้สมาร์ตโฟน และ4) คุณภาพการนอนหลับ
 นักวิจัยทำการเก็บข้อมูลโดยให้นิสิตเป็นผู้ประเมินตนเอง ในการวิจัยนี้ได้ใช้สถิติพรรณนา และ
 สถิติอ้างอิง คือ ไคสแควส์ในการวิเคราะห์ข้อมูล ผลการศึกษา พบว่า 96.9% ของนิสิตใช้สมาร์ต
 โฟนก่อนนอน และ 90.8% ที่ใช้สมาร์ตโฟนก่อนนอนบนเตียงนอน ปัญหาในการใช้สมาร์ตโฟน อยู่
 ในระดับที่ไม่ดี 63.6% การทดสอบความสัมพันธ์พบว่า ลักษณะทางประชากร (อายุและเงินที่ได้รับ
 ต่อเดือน) ปัจจัยที่ส่งผลต่อการนอนหลับ (เครื่องดื่มน้ำที่มีคาเฟอีน และความเครียด) และการใช้
 สมาร์ตโฟนบนเตียงมีความสัมพันธ์กับคุณภาพการนอนหลับอย่างมีนัยสำคัญ ($p < 0.003$) โดย
 สรุป การศึกษานี้แสดงให้เห็นว่า นิสิตขาดความตระหนักในเรื่องการใช้สมาร์ตโฟนก่อนนอนที่มี
 ผลต่อคุณภาพการนอนหลับ ดังนั้น เพื่อให้ นิสิตตระหนักถึงความสำคัญ และอันตรายที่อาจส่งผล
 กระทบต่อสุขภาพของตนเอง จึงควรมีการจัดทำโครงการเพื่อประชาสัมพันธ์ถึงผลกระทบดังกล่าว

สาขาวิชา สาธารณสุขศาสตร์

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ลายมือชื่อนิสิต

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Introduction: People perform better when they have a good sleep but the smartphone usage is the one activity that people do before bedtime which can interrupt their sleep. So, this study aimed to describe the association between using smartphone before bedtime and sleep quality of undergrad student of Chulalongkorn University.

Methodology: This is the cross-sectional study. The sample size is 423 students, both male and female. There are 4 sections of the questionnaire; 1) General Information and Covariate factors, 2) Stress, 3) Smartphone Use Behavior and Mobile Phone Problematic Use Scale and 4) Sleep Quality (PSQI). Collecting the data by self-report. The descriptive statistic and Chi-square were used to analyze the data.

Result: The study shows 96.9% of the participants use the smartphone before bedtime, besides 90.8% of the use it in bed. The Mobile Phone Problematic Use Scale (MPPUS) with the sleep quality is in poor level with 63.5%. The General Information (age and monthly allowance), covariate factor (caffeine drink and stress) and smartphone use in bed are significantly associated with sleep quality also in significant association with sleep quality ($p < 0.003$)

Discussion: Overall, all the result has showed some gap that the participant is lack of concern about the smartphone use before bedtime with the sleep quality, the raising of smartphone use it not only rise among undergraduate student, but in every age group. Therefore, this problem should be solved by creating a campaign to educate the people, so that they can be aware of.

Field of Study: Public Health

Student's Signature

Academic Year: 2016

Advisor's Signature

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CHAPTER I INTRODUCTION

1.1. Background and rational

Every human need a resting period which known as sleep. Sleep is an important tool that help the body to restore, refresh and maintain the body system. It helps the body to slow down the function after exhausted during day time. Sleep is a condition of body and mind that relax for a several hours at night time with the eyes close and the whole body is immobile posture. The recommend length of sleep is around 7-8 hours for most of the people, but sometime different age group need different sleep length.

Even though the body is immobilized but the brain and body function still active. Sleep divided into 2 basic types 1) Rapid eye movement (REM) and 2) Non-Rapid eye movement (non-REM). In non-REM consist of 3 stages. When sleep the first stage cycle starts it will be non-REM, in non-REM occur only 5-10 minutes at this stage the person can be awake easily. The second stage of non-REM the body temperature will drop and the heart rate is slower, most of the people spend 50% of their sleep at this stage (Washington, 2011). Last stage of non-REM is the deep sleep, very difficult to be awake, it is considering to the “Restorative Stage”. For REM-stage to get the clearer picture it is the stage where people start dreaming, the eye move quickly in different direction and the heart rate is faster.

Recent studies show that people performance is better when they have a good quality of sleep. They learn thing better and can memorize faster. Having an enough quality of sleep can prevent you from having a mental health, physical health and quality of life problems. Your brain will work better with a good quality of sleep. Sleep can help to improve human being skill in learning thing or even in making a decision. Lack of sleep may cause people to be mood swing, sad, depressed or even lack of motivation. So, sleep quality is an important tool for being healthy (Smith, 2015).

Many researches have shown that smartphone have a link with sleep quality whether by the screen light, the electromagnetic field, and even the thing that we received from using smartphone which can cause stress. For example, the brighter the screen we use at night the harder we can fall sleep. In all electronic devices emitting the blue light which it causes the pineal gland to produce less melatonin, a sleep hormones

(Mortazavi, 2016). The light was received through the eyes and then it will send the signal to the hypothalamus that it is still a daytime, so that the melatonin suppression occurs. The pineal gland will be activating after the absence of light. The smartphone can cause a bad effect on health and sleep quality (Mortazavi, 2016).

Undergraduate student at Chulalongkorn University has been selected in this study because Chulalongkorn University is located in central of Bangkok. So mostly the student here tends to use smartphone since it is an urban life style. Moreover, at Chulalongkorn University have a big population group of student that it can somehow can be the representative of college student in Bangkok as a whole.

In Thailand, the prevalence of poor sleep quality among college student is 48%. One study had shown that college student sleep quality was affect by the use of mobile phone. Yet it is also affect the study performance (Kawasaki N, 2006). However, few studies have been investigated effect of smartphone use before bed and sleep quality among Thai college students. Therefore, this study aims to investigate the associate between smartphone usages before bedtime with the sleep quality among students at Chulalongkorn University

1.2 Research Questions

1.2.1 What are the prevalence of smartphone use before bed and poor sleep quality among undergraduate students of Chulalongkorn University, Thailand?

1.2.2 What are associate factors (Demographic characteristic and sleep covariate factors) of sleep quality among undergraduate students of Chulalongkorn University?

1.2.3 Does using smartphone before bedtime associate with sleep quality of undergraduate student of Chulalongkorn University?

1.3 Research Objectives

1.3.1 To describe demographic characteristic, sleep covariate factors, the prevalence of smartphone use before bed and poor sleep quality among undergraduate students of Chulalongkorn University, Thailand.

1.3.2 To determine the association between demographic characteristic, sleep covariate factors and sleep quality of undergraduate students of Chulalongkorn University.

1.3.3 To access the association between using smartphone before bedtime and sleep quality of undergraduate students of Chulalongkorn University.

1.4 Research Hypothesis

There is an association between the using smartphone before bedtime and sleep quality among undergraduate students of Chulalongkorn University.



1.5 Conceptual Framework

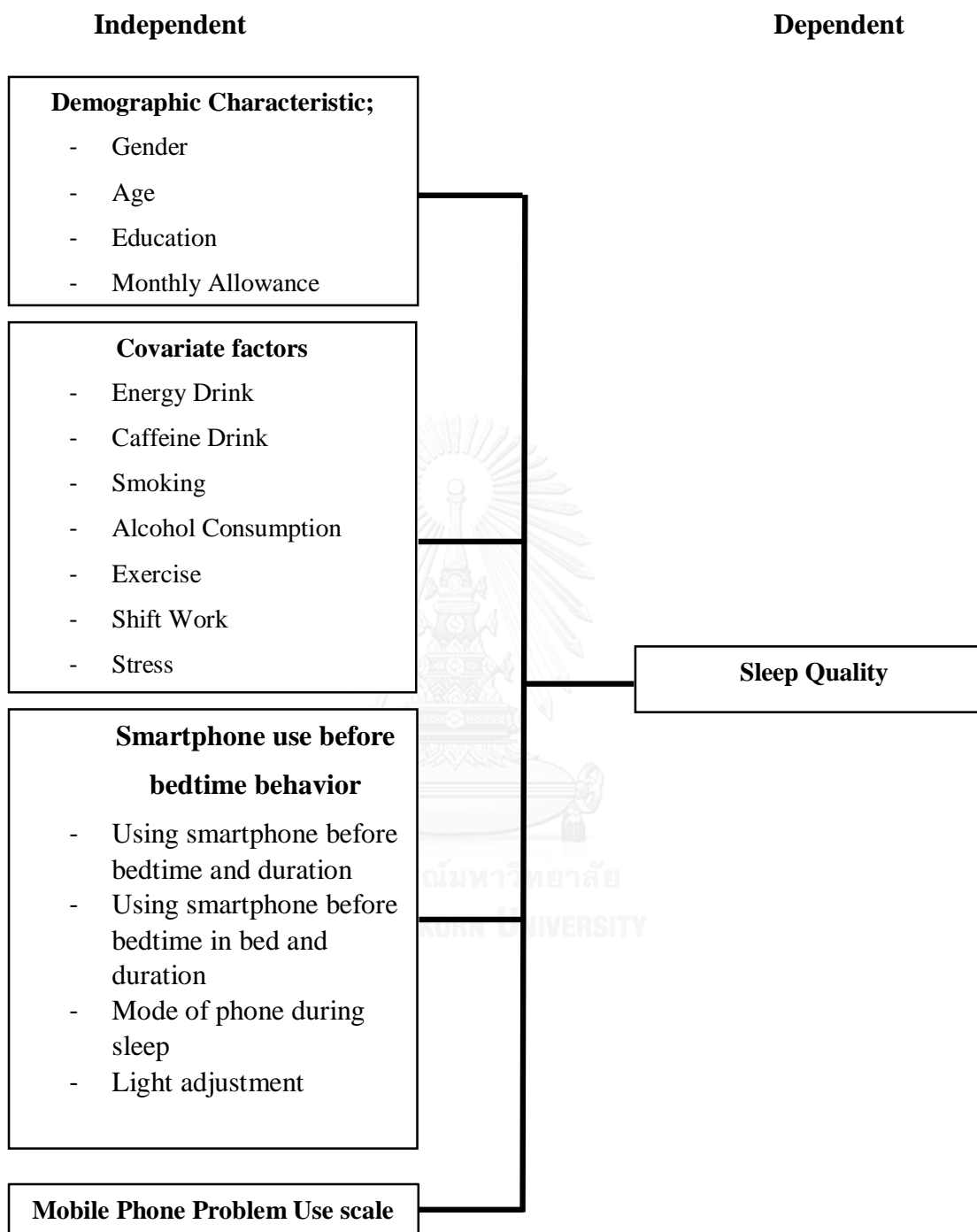


Figure 1 Conceptual Framework

1.6 Operational Definitions

- 1) **Gender** mean physically male and female.
- 2) **Education** means in what year of Bachelor degree is that participant up to and what is the current GPA of the student.
- 3) **Monthly Allowance** refer to the money that participant receive from their guardian, parents or jobs per month.
- 4) **Energy Drink** is the drink that make you active and alert for a couple hours.
- 5) **Caffeine Drink** refers to the drink that contain the caffeine for example coffee.
- 6) **Smoking** refer to the one who has habit of smoking.
- 7) **Alcohol Consumption** mean the one who drink alcohol daily, or alcoholic.
- 8) **Smartphone use before bed** refers to the one who use their smartphone approximately 3 hours before you off to bed(Sleep).
- 9) **Duration of use before bed** mean the total time that the participant uses their smartphone before the participant is going to sleep.
- 10) **Screen Light adjustment** means the screen light adjustment on the smartphone.
- 11) **Use smartphone in bed** refer to did the participant use the smartphone while they are in bed and for how long they use it.
- 12) **Mode of phone during sleep** mean what mode is the participant use when they off to bed.
- 13) **Stress** means the condition of being under pressure or feeling of thread.
- 14) **Physical activity** means the movement of the body or doing as exercise.
- 15) **Shift work** mean doing work at day or night time. Working hour that is irregular office hour other than 8.00-17.00pm.
- 16) **Sleep Quality** refers to the one who take the PSQI and result show their score is below 5, he/she consider as good sleep quality. While the one who got score above 5 known as poor sleep quality.
- 17) **Mobile Phone Problematic Use Scale** is the tool measurement to see whether does mobile phone using has impact in human life. The higher score indicate that mobile has an impact in human life.

CHAPTER II

LITERATURE REVIEW

2.1 Sleep

2.1.1 Mechanism of Sleep

Apparently, our body requires sleeping just like how we need eating, drinking, and breathing (Better-Sleep-Guide.com.). Nowadays sleep can be studied or understood by the brain wave which is seen by electroencephalogram, EEG. Electroencephalogram or EEG helps the scientist to divide sleep into two major components: REM (Rapid Eye Movement) and non-REM (non-Rapid Eye Movement). REM is known as the dreaming stage and non-REM is known as quiet sleep which consists of 3 stages: N1, N2, and N3.

Non-REM is the stage of an inactive brain in a movable body. One chemical, hypocretin (also called orexin), seems to play an important role in regulating when the flip between states occurs and keeping you in the new state. The hypocretins (orexins) are recently described hypothalamic neuropeptides thought to have an important role in the regulation of sleep and arousal states (I. O. Ebrahim, Howard, R. S., Kopelman, M. D., Sharief, M. K., & Williams, A. J., 2002). Stage N1 is the waking stage moving to light sleep. It is the stage where body temperature begins to drop, muscles relax, and eyes move slowly. At this stage, it is still easy to be awake. People spend about 5 minutes on N1. The pattern of N1 on EEG is called "Theta Waves". For stage N2, the heart and breathing rate become slower compared when you are awakening. People will spend about half of the night in N2. There are two key features in N2 that are shown by EEG: Sleep Spindle, it disconnects the brain from the outside sensory, and K-complex, a sort of built-in alertness system that keeps you poised to awaken if necessary. Last but not least, stage N3 is the deep sleep or slow wave. Slow brain waves called delta waves become a major feature on the EEG. Scientists believe that slow-wave sleep helps to renew and repair itself. The pituitary gland will release the growth hormones that stimulate tissue growth and muscle repair. The older people will spend less time on N3 stage, nearly absent in most people over age 65.

REM is the dreaming stage where our body becomes paralyzed but the brain is still active. Body temperature rises, blood pressure increases, and so does your heart rate. The

sympathetic nervous system (SNS), which creates the fight or flight response, is twice as active as when you are awake. All the EEG brain wave will show in figure 2

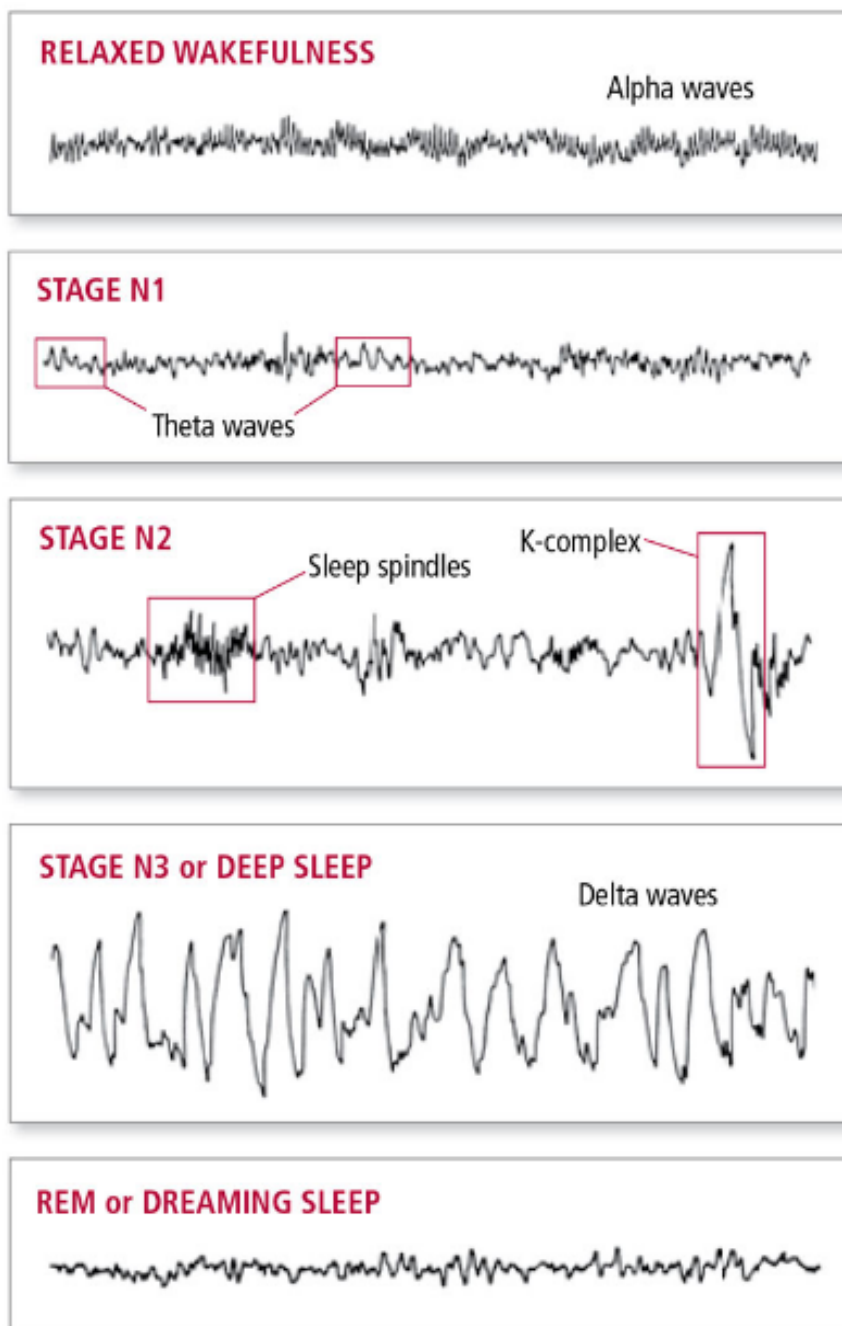


Figure 2 EEG brain wave patterns during sleep

These brain waves were taken by electroencephalogram, which sleep experts will use it as to identify the stage of sleep. It begins with relaxed wakefulness, when you start to close your eyes. Follow by the non-REM, N1, N2 and N3. Lastly, the REM or dream stage. Each of the stage have a unique pattern.

There are many benefit of sleep whether to boost your immune system, brain functioning, blood circulation and more (Pietrangelo A., 2014). In each age group, it requires the difference sleep duration such as in newborn they might need up to 14-17 hours per day while teens are requiring to sleep 8-10 hours per day. The more appropriate duration of sleep you have the healthier you will be. Surprisingly, sleep also play role on balance the body weight by having an enough sleep may perhaps help you maintain your weight and in opposition, sleep loss goes along with an increased risk of weight gain (M., 2011). Over time, chronic sleep deprivation may lead to an array of serious medical conditions including obesity, diabetes, heart disease, and even early mortality. Sleep deficiency increases production of the stress hormone called cortisol, so you will have a higher risk of being stress compare to the one who has enough sleep. Lack of sleep will lower your hormone level called “Leptin”, which tells your brain that you’ve had enough to eat which will lead you to obesity (Better-Sleep-Guide.com.)

2.1.2 Covariate Factors

There are many factors that will interfere with the sleep cycle such as energy drinks, smoking, drinking alcohol, and stress and etc. Many studies have shown the link between the covariate factors and sleep quality. One study has done a survey on college student in Thailand and found out that stimulant drinks, alcohol consumption and smoking are positively associated with poor sleep quality of the student (V. Lohsoonthorn, 2013). For instance, it is 1.5 time higher risk of poor sleep quality for the one who consume stimulant beverage at least once per week (V. Lohsoonthorn, 2013). Moreover, doing a shift work will also cause your circadian rhythm imbalance by the light exposure schedule. It is good for circadian rhythm to exposure to light in the early morning, on the other hand if exposure the light at night it will delay the circadian rhythm (Boivin, 2014). Another covariate factor is physical activity it is claim that exercise can promote you to a good sleep. Yet exercise has been considering as a possible treatment for psychophysiological insomnia too. As it will be briefly discussing below:

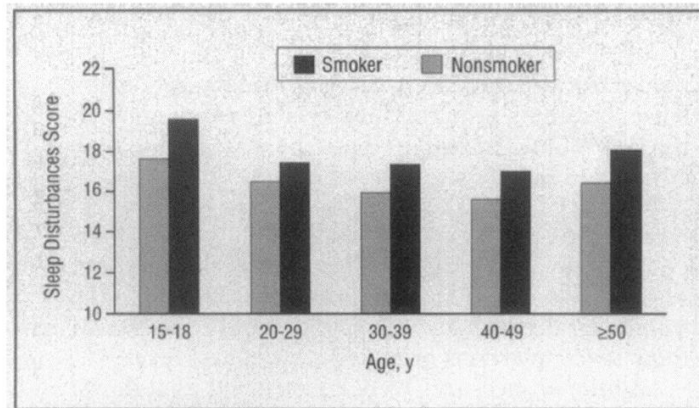
Energy drink is any of kind of beverage that are considered as a source of energy, particularly a soft drink containing a high dose of sugar or caffeine or another stimulant chemical. It is also providing an extra boost in energy, promote wakefulness, maintain alertness, and provide cognitive and mood enhancement. These beverages have stimulant effects on central nervous system (CNS) and when consuming it will increase the drinker's performance physically and mentally (Oteri, 2007). Most of the energy drink that have been drinking nowadays is containing caffeine, taurine, L-carnitine, carbohydrates, glucuronolactone, vitamins, and other herbal supplements. The majority of energy drink contains caffeine, which is a stimulant factor and each brand of energy drink contains different ranging of caffeine from 50mg to 550mg per can or bottle (Reissig, 2009). One study showing that 'taurine' is the most ingredients that might be the most interact negatively with caffeine and alcohol due to its effect on cell volume and renal-mediated transport (Schöffl, 2011).

Studied by Reyner and Horne show the effects of the energy drink and sleepiness. In the study, it showed the self-report of drinking the energy drink cause the drowsiness while driving (Reyner, 2002). Reyner and Horne did a double-blind study one group who consume the energy drink and the other got a placebo drink, as a result the one who drink said that they are sleepy and alertness decrease while they were driving (Reyner, 2002). Another study showed quit the same result that the one who consume the energy drink, their alertness will decrease and increase the daytime sleepiness in the next day, this is due to the high consumption of the energy drink at night (Calamaro, 2009). However, currently there are not much study show that energy drink really has impact on sleep quality, therefore further research is needed to be done.

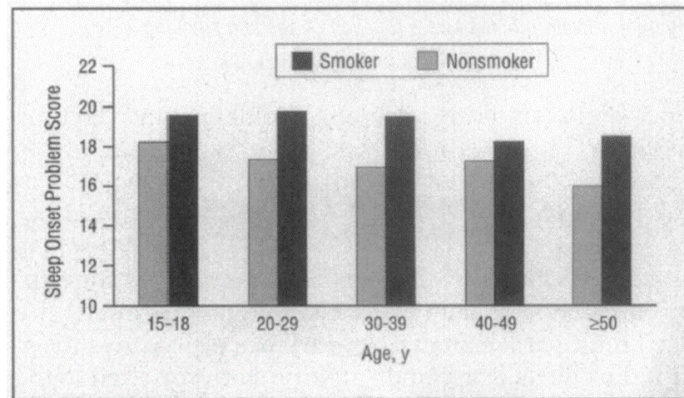
A crystal-like compound that have been found specifically in tea and coffee plants is a stimulant of the central nervous system in human body. Most people enjoy caffeine due to its effects on the brain to be active. Caffeine users also feel tired in the morning without their cup of coffee, therefore having a cup of coffee actually reverses the withdrawal effects. One study showed that a group of 18 to 58-year-old, 90 percent of individual drink caffeine in the afternoon (12.00-18.00) and 68.5 percent drink it in the evening (18.0-00.00) (Penolazzi, 2012). Normally, the dose of caffeine that is known to be effective is in the range of 200-400mg. The use of high dose of caffeine containing in the beverages, including energy drinks has led to a doubling of caffeine-

related emergency department visits from 2007-2011(Drake, 2013). The increase ED visit in association with cardiovascular and other adverse events has been labeled a “rising public health problem in the US” and has led the Food and Drug Administration to investigate the cardiovascular safety of high caffeine content beverage (Drake, 2013). Surprisingly, caffeine is significant effect on sleep disruptive especially when drink it later in the day (Nordt, 2012). Study from Drake conducted 12 normal healthy sleepers and give them 400mg of caffeine every 6, 3, 0 hour before going to bed and the result show the significant effect on sleep disturbance (Drake, 2013).

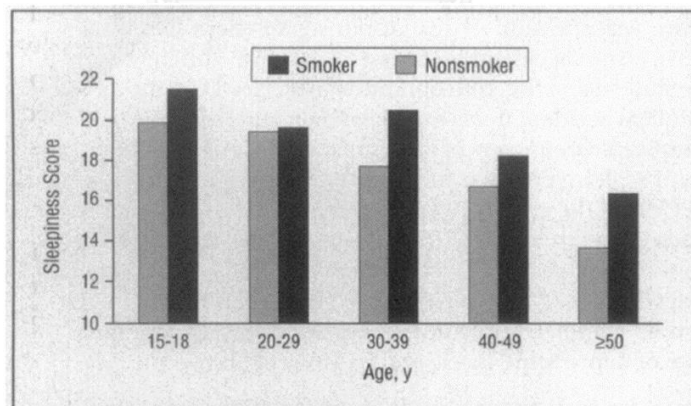
An act of smoking tobacco, a visible inflation of carbon or other particles in air, typically one released from a burning substance. For sake, smoker has poorer sleep quality than the non-smoker (Lexcen, 1993). Since nicotine is one component in tobacco, it is a stimulant which certainly increase sleep latency and reduce total sleep time and rapid eye movement sleep (Buysse DJ, 1990). The surveyed of MacGregor and Balding, they had selected 3727 children age of 14 in England. As a result, it shown that the one who smoke tend to go to bed later than non-smoker (MacGregor ID, 1988). Therefore, the smoker kids will spend less time on bed compare to nonsmoker kids (MacGregor ID, 1988). Similarly, in study from Palmer and Harrison, they also found the same pattern in the adult (Palmer, 1980). One study has found a conspicuous association between cigarette smoking and sleep disturbance (Phillips, 1995). The study strongly advises that poor sleep habits, poor sleep quality, and impairment of daytime functioning across a wide age range is associated with cigarette smoking (Phillips, 1995). The result of the studied are show in figure 3



Problems staying asleep as a function of age and smoking.



Problems going to sleep as a function of age and smoking.



Daytime sleepiness as a function of age and smoking.

Figure 3 *Cigarette Smoking is associated with poor sleep habits*

A colorless explosive flammable liquid that is produced by the natural fermentation of sugars and is the intoxicating constituent of wine, beer, spirits, and other drinks, and is also used as an industrial solvent and as fuel. The earliest known publication of the impact of alcohol on nighttime sleep back in 1883 when Monninghof

and Piesbergen conducted an observational study of sleep depth in response to alcohol and exercise (I. O. Ebrahim, Shapiro, Williams, & Fenwick, 2013). In 1961, Nathaniel Kleitman said that hypnotics and alcohol suppress rapid eye movement (REM) sleep (Kleitman, 1961). Two years later it was strongly confirmed that using polysomnography (PSG) will suppress the effects of a pre-sleep dose of alcohol (Kleitman, 1961). This placebo controlled study distinguished the alcohol sleep study protocol by formalizing the adjusting of subjects to the original sleep laboratory environment and the footage of a baseline night (Gresham, 1963). According to National Sleep Foundation, drinking alcohol before bed is associated with slow-wave sleep patterns called delta activity. That's the kind of deep sleep that allows for memory development and learning (Foundation). At the same time, another type of brain pattern, alpha activity, is also turned on and when you are resting quietly Alpha activity will be active (Foundation). After drinking alcohol, together the alpha and delta activity in the brain may inhibit restorative sleep (Foundation). One explanation is that alcohol may affect the normal production of chemicals in the body that activate sleepiness when you've been awake for a long time, and decrease once you've had enough sleep. After drinking, production of adenosine (a sleep-inducing chemical in the brain) is increased, allowing for a fast onset of sleep. But it subsides as quickly as it came, making you more likely to wake up before you're truly rested (Foundation).

College or University has been found to be stressful for several young adults (Pierceall, 2007). Many of college students' claim that they are "frequently overwhelmed" from 1985 to 2002 it has been increase up to 10% (Sax 1997, 2003). Past studies also reported that 75% to 80% of college students are having moderately stressed and 10% to 12% are severely stressed (Pierceall, 2007). Hudd et al. found that college students who reported higher levels of stress also consumed a greater amount of "junk food," were less likely to exercise, and less likely to obtain adequate amounts of sleep (Hudd, 2000). Stress is a condition of mental or emotional strain or tension resulting from adverse or very difficult situations. Cortisol is the primary stress hormone secreted from the adrenals gland. A large body of evidence has associated excessive release with suppression of the immune system and it is largely responsible for the down regulation of immune function as a result of stress (Czerbska, 2007). Cortisol is secreted in a specific pattern during a 24 hours period. Any changes in this

pattern indicate adrenal stress syndrome. The normal pattern is high levels of cortisol in the morning, which gradually decrease and obtains our lowest levels at midnight as shown in figure 4 Cortisol has in inverse relationship with melatonin so at night when cortisol levels decrease, melatonin increases to induce sleep(Waldenlind, 1987). When we are asleep, our bodies are in a fasting state so cortisol levels rise to maintain our blood sugar to feed brain and blood cells. Therefore, the more stress we had the low melatonin production and led to the poor sleep quality.

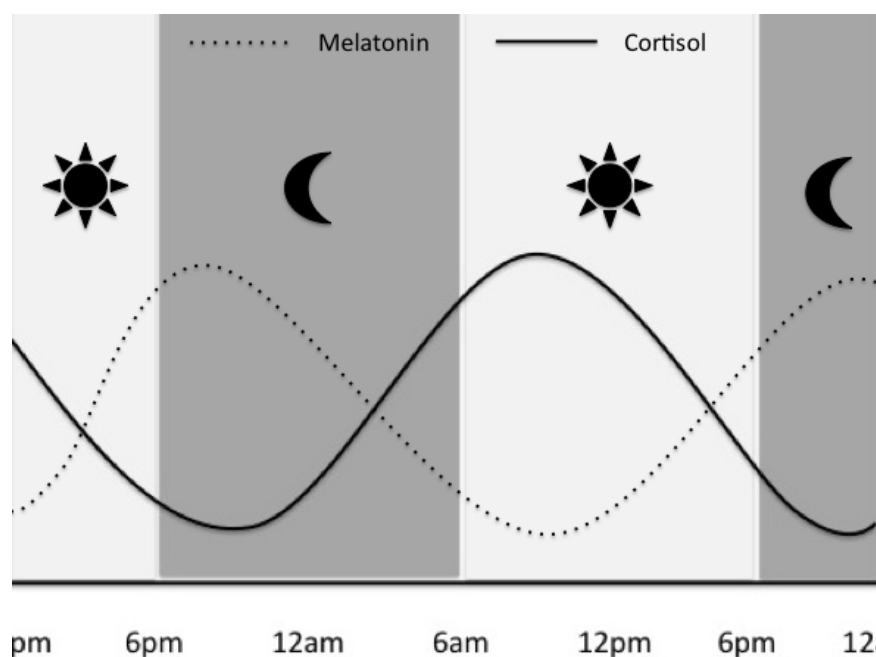


Figure 4 Cortisol and Melatonin level

Physical activity basically means movement of the body that uses energy such as walking, gardening, climbing the stairs, playing soccer, or dancing. Although sleep and exercise may seem to be mediated by totally different physiological mechanisms, there is growing evidence for clinically important relationships between these two behaviors. It is known that passive body heating facilitates the nighttime sleep of healthy elderly with insomnia. As more scientific knowledge has been gained about sleep, more links between sleep and physical activity have been suggested over and above the general and much-discussed notions that exercise is good for sleep (Youngstedt, 2005). Endogenous concentrations of melatonin are affected by exercise,

even though there are conflicting findings regarding the direction of this effect (Atkinson, 2007). These conflicting results could be due to differences in lighting conditions and time of day of exercise. In one study, Lucia et al., examined world-class cyclists during the Tour of Spain stage race lasting 3 weeks. They found that, although urinary levels of 6-sulphatoxymelatonin (a melatonin metabolite) increased in the evening compared to the pre-stage values, generally there was a decline in 6-sulphatoxymelatonin as the race progressed (Lucia A, 2001).

Shift work is work that takes place on a schedule outside the traditional 9 am – 5 pm day. Shift work is associated with cardiovascular disease, gastrointestinal disease, increased accident risk, disturbed sleep and increased fatigue (T. Åkerstedt, 1998). Shift workers practically always report more sleep disturbances than day workers. The night sleep before the first night shift is usually rather long, starts rather early, and lasts to ~08:00 h or later (Rutenfranz, 1981). It is frequently (30–50% prevalence) associated with napping in the afternoon before the first night shift, especially if the preceding main sleep has been short. The ensuing sleep is, according to electroencephalogram (EEG) studies, reduced by 2–4 (T. ÅKERSTEDT, 1995). Most of the sleep loss involves stage 2 and rapid eye movement (REM) sleep, whereas slow wave sleep (SWS) is unaffected. The subjective aspects of sleep seem little affected, apart from the reports of premature awakenings and of not getting enough sleep (T Åkerstedt, 1991). The reason for the health problems in shift work is the conflict between displaced work hours and the output of the biological clock. The circadian adjustment of shift workers, however, is counteracted by a light exposure during the early morning. Thus, adjustment to night work is seldom accomplished and at least partial day orientation is maintained. Irregular work hours seem to exert strong, acute effects on sleep and alertness in relation to night and morning work. The effects seem, however, to linger, and also affect days off. The mechanism behind the disturbances is the sleep-interfering properties of the circadian system during day sleep and the corresponding sleep-promoting properties during night work. There are, however, no clear indications that irregular work hours cause chronic insomnia.

2.1.3 Demographic Characteristic

Demographic characteristic also link with the sleep quality. In this research, the demographic variable will focus on four variables which are gender, age, and education.

A common sleep problem among college students is sleep deprivation and resulting excessive daytime sleepiness (EDS). According to the National Sleep Foundation, 59% of adults 18 to 29 years of age describe themselves as night-owls. Unable to fall asleep earlier in the evening, they cannot get enough sleep if they must get up early. Wolfson and Carskadon reported that reduced sleep time, later bedtime and awakening, irregular sleep/wake patterns, and poor sleep quality negatively impacted adolescents' school performance (Wolfson AR, 2003). The National Sleep Foundation³ found that high school students who reported insufficient sleep or daytime sleepiness also reported depressed mood and lower grades, whereas 80% of students who reported getting enough sleep made As and Bs in school (Foundation.). Among college students who carried a full academic load, those who reported poorer sleep quality were likely to perform worse on academic tests (Howell AJ, 2004). Evidence in the literature shows that adolescents generally experience sleep disorders, and that females tend to have poorer sleep quality compared with males (Sanchez, 2013).

2.2 Smart Phone

2.2.1 Smart phone global trend

In general, smart phone is a multifunctional cell phone that provides voice communication and texting message and enables data processing as well as enhanced wireless connectivity. There are over 1.5 billion of smartphone user worldwide and it had been predict that by 2016 the number of the smartphone will be sold more than 1 billion (Demirci, 2015). Nowadays, smartphone become very important in our life. Every men and women carry out their smartphone with them as if it became part of their life. Especially teenagers they are very addicted to smartphone, they use smartphone for calling, texting and surfing the internet. Japanese studied shown the most situation that people age range of 25-49 will use they mobile phone are 1) Right before bed, 2) Relaxing at home and 3) while they are waiting (Hirasawa). And the top reason that Japanese people use their phone are for Emailing and playing game (Hirasawa). Some Features are popular with a Broad Spectrum of Smartphone Owners; Social Networking, watching video, and listen to music are especially popular among young users (Smith, 2015).

2.2.2 Smart phone in Thailand

In Thailand, the smart phone become one of the priority thing to have. Smartphone is most popular in the age of 20 to 24 years old (Veedvil). Another study shown the predict number of smartphone user in Thailand from 14.4 million user in 2013 and will be rapidly increase to 27.5 million users in 2021 (President). Additional study shown the predict number of smartphone user in Thailand from 14.4 million user in 2013 and will be rapidly increase to 27.5 million users in 2021 (President). One survey was conduct 181 female and 177 male Thai university students and to 240 female and 140 male Thai high school students and was test by CPDQ, cellular phone dependence questionnaire (Kawasaki N, 2006). The total scores for the Thai university students were higher than the Thai high school students. Furthermore, the score from female high school students confirmed a large difference compared to male university students, male high school students (Kawasaki N, 2006). According to the Ministry of Information and Communication Technology of Thailand, they have done the project of collecting data of the number of mobile phone user by age group in Thailand. The data in the Table 2.1 is the number of people age of 15-19 and 20-24 which are in the undergraduate student age (Office). It was shown that the number of people using mobile phone is increase gradually as shown in figure 5

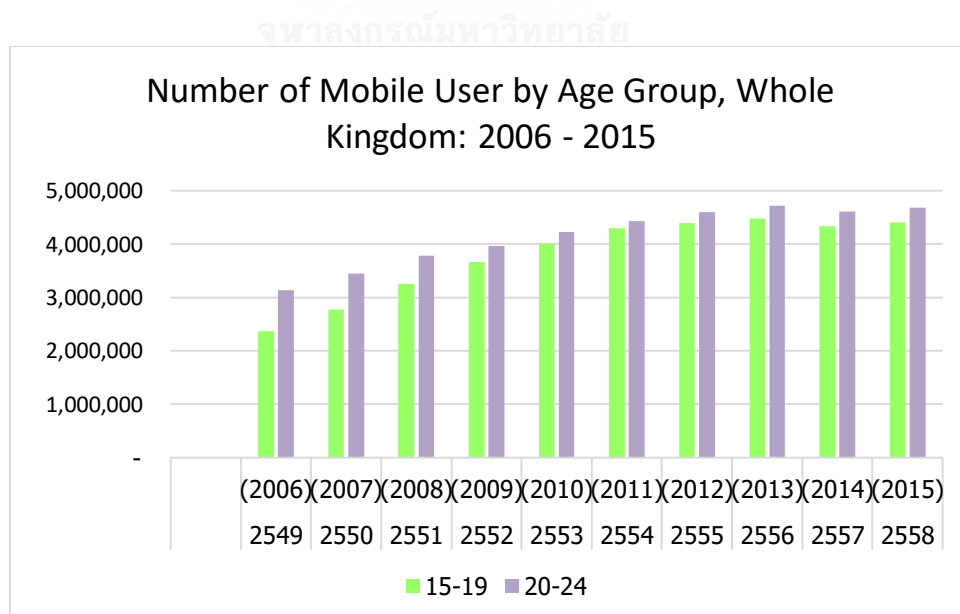


Figure 5 Number of Mobile User by Age Group, Thailand

2.2.3 Smart phone and health effect

The number of cellular phone is increasing every year and there have been reports of health disorder related to the high-frequency radio waves. The World Health Organization (WHO) has done the International EMF (Media sees electromagnetic fields) Project in 1996 to evaluate the science, recommend research to fill the gaps in knowledge and to conduct formal health risk assessments of Radio Frequency such as cancer it has be inform by many scientific report (M., 2011). Other health outcomes examined following RF exposure include headaches, general malaise, short-term memory loss, nausea, changes in electroencephalography and other central nervous system functions, and sleep disturbances (M., 2011). Many studies also claim that blue light from the smart phone associate with human health whether to effect the eyes or the brain function (Mortazavi, 2016). Moreover, the overuse of smart phone can cause the physical health problem such as pain in the wristlet and blurred vision (Demirci, 2015)

2.3 Sleep quality and smartphone

You might have heard that it is recommended to put your smartphone, cell phone, or other electronic devices away while you are sleep. Generally, people tend to keep their phone with themselves all the time and tend to use it before bedtime. Some people might use their smartphone at night with the dark environment, this can result a very bad health effect. The blue light that we have received from the smartphone it has ability to suppress the melatonin production (Mortazavi, 2016). Using the mobile in bedroom is associate with the delayed timing of sleep. In 2008, the study shown that people who expose with smartphone radiation will took longer time fall asleep and decrease the duration of deep sleep (Agency, 2008). A Swedish study linked the heavy smartphone with sleep problems, stress and depression (Hall, 2013).

The study conducts 166 participants the age of 20-30 were compare the smartphone user with the non-smartphone user by using Pittsburg Sleep Quality Index (PSQI) and the result show that non smartphone user have a better sleep (M., 2011). The cohort study was conduct in young adult age of 20-24 and there were 4156 participants were asking the questions at baseline and 1 year follow up, the outcome of the study present that high mobile phone use was associated with sleep disturbances

and depression in men and women were found the linked only with depression(Thomé, 2011). Japanese study showed the use of mobile phone for calling and sending messages after turning light off is associated with sleep disturbance among Japanese adolescent (Munezawa, 2011).

Since there are claimed that college students have a hard time to sleep or even poor quality of sleep (Brown, 2002). Therefore, one research was conduct to see the association with mobile phone use and sleep quality among college students. The research has 315 students and they were participating by answering the questionnaire such as sleep quality index and mobile phone problem use scale. As a result, the study has shown that mobile phone use is related with sleep quality, but not the sleep length (White, 2011). Another research in 2015 also support the study on the mobile phone link with sleep quality. More than 700 students were asked to do the online questionnaire about technology usage, the result turn that it affect the student as nighttime awakening, and also sleep problems (Rosen, 2016)

2.4 Measurement Tools

2.4.1 Sleep Quality: Pittsburgh Sleep Quality Index

Pittsburgh Sleep Quality Index (PSQI) was originated by Daniel J. Buysse and his colleagues at University of Pittsburgh. It was first developed for psychiatric patients who complaints about their sleep. It is a self-rated questionnaire to determine the sleep quality and sleep disturbance. There are four main goals in this questionnaire 1) provide a reliable, valid, and standardized measure of sleep quality; 2) to distinguish the “Good” and “Poor” sleepers; 3) to provide an easy guide for subject to use and clinicians and researchers to interpret; and 4) to provide a brief, clinically useful assessment of variety of sleep disturbances that might affect sleep quality (Buysse, 1989)

Pittsburgh Sleep Quality Index consists of 19 questions under seven components: sleep quality (1 question), sleep latency (2 questions), sleep duration (1 question), habitual sleep efficiency (3 questions), sleep disturbance (9 questions), use of sleeping medication (1 question) and daytime dysfunction (2 questions). The questionnaire was derived from three sources: clinical intuition and experience with sleep disorder patient, a review of previous sleep quality questionnaire reported in the literature; and clinically experience with the instrument during the 18 months of field

testing. In fact, PSQI have 19 self-rated questions and the other 5 questions rated by bed partner or roommates. The extra 5 questions were excluded from PSQI scoring since it is use for clinical information only. All seven components score each weighted equally on a 0-3 scale. The seven-component sored are then summed to yield a global PSQI score, which has a range of 0-21: higher scores indicate worse sleep quality. The cutoff point of poor sleeper is the one who gain score of more than 5 (Buysse, 1989)

A global PSQI score > 5 yielded a diagnostic sensitivity of 89.6% and specificity of 86.5% ($\kappa=0.75$, $p < 0.001$). Internal homogeneity of separate item was assessed using Cronbach's alpha statistic and corrected component total correlation coefficients. The test-retest also perform in the study. The Cronbach's alpha of PQSI is 0.83 in Buysse's study. Later on, Pittsburgh Sleep Quality Index has been a standardized of Sleep Quality questionnaire and has been use worldwide since it has a very good reliability and validity. It also has been translated into several languages.

2.4.2 Smartphone: Mobile Phone Problematic Use Scale

Mobile Phone Problematic Use Scale was created by Bianchi and Phillips, Psychology Department, Monash University, Australia. The questionnaire first was used predict usage and, specially, problematic mobile phone use from extraversion, self-esteem, neuroticism, gender, and age. Bianchi and Phillips attempts to establish an instrument to measure the phenomenon, based on the literature relating to addiction and incorporating questions relating to the social aspect of mobile phone use. Construct validity of Mobile Phone Problem Usage Scale (MPPUS) will be demonstrated by its relationship to other indicators of problem use. A test of internal reliability (Cronbach's alpha) was calculated on the MMPUS to demonstrate the level of internal consistency among items. The Cronbach's alpha of this questionnaire is 0.93 which is in a high level of internal consistency (Bianchi, 2005).

The questionnaire consists of 27 questions which all the questions were based on addiction literature and currently known knowledge of behavioral and technological addiction. The questionnaire covers the issue of tolerance, escape from other problem, withdrawal, craving, and negative life consequence in the areas of social, familial, work, and financial difficulties. All questions were scale ranging from 1 ("not true at all") -10 ("extremely true") (Bianchi, 2005). The score ranges from 27-270, unfortunately in the study of Bianchi and Phillips they didn't point out the cutoff point,

thy mentioned only the mean score of 65, min 27 and max 210. On the other hand, the study from University Tehran, Iran, they developed MPPUS from Bianchi and Phillips, they got Cronbach's alpha of 0.91. Study from Iran shown the cutoff point of the questionnaire at 160 by using the sensitivity of .950 as the indicator (Soroush Mohammadi Kalhori, 2015). Cell phone dependency and non-dependency could be distinguished with sensitivity (0.83) and specificity (0.80) (Kalhori, 2015).



CHAPTER III

RESEARCH METHODOLOGY

3.1 Study Design

This research was a cross-sectional study with the objective to estimate the prevalence and determine the association of demographic characteristic data, covariate factors, smartphone user before bed and sleep quality among undergraduate students of Chulalongkorn University, Thailand. The details cover the following items.

3.2 Study Area and Study Period

The study took place at Chulalongkorn University, which located in Bangkok, Thailand. The period of study was approximately 4 months, April to July 2017.

3.3 Study Population

The participants covered only Thai program Undergraduate student of Chulalongkorn University.

3.3.1 Inclusion Criteria

- 1) Both Male and Female
- 2) The students who own a smartphone
- 3) The one who age above 18 years old
- 4) The one who willing to be part of the project
- 5) Thai Student that enroll in the academic year, 2016

3.3.2 Exclusion Criteria

- 1) The one who has hearing loss
- 2) The participant that are on the psychological pill
- 3) The one who take sleeping pills

3.4 Sampling Size

The study population conducted by Sample Size Estimation: Cross Sectional (one group)-Proportion

$$n = \frac{Z_{\alpha/2}^2 PQ}{d^2}$$

n=sample size

$Z_{\alpha/2}$ = Statistic for level of confidence

P= Proportion of success (expected prevalence or true proportion)

Q= Proportion of failure (1-P)

d= error

For the level of confidence:

$$Z_{\alpha/2} = 1.96$$

P= 0.48 (Prevalence of poor sleep quality derived from the study of Lohsoonthorn et al., 2003)

d= 0.05 (we expected to see 5% difference of proportion)

A sample size was calculated based on the prevalence of poor sleep quality with the rate of 48% from a study of Lohsoonthorn et al. with 95% CI, and 5% of poor sleep quality rate for minimum error. The researcher used the prevalence of poor sleep quality because the research wanted to see the sleep quality among the undergraduate student. Yet in this research the sleep quality tested by PSQI that showed whether the subject have normal or poor sleep quality.

Therefore:

$$n = \frac{[1.96^2(.48 * .52)]}{.05^2}$$

$$n = \frac{3.8416 * 0.2496}{0.0025}$$

$$= 383.5 \quad = 384$$

The sample size of this was 384 students with added more 10% of the non-response case so the final sample size was 423 students for this project.

3.5 Sampling Technique

The sampling technique of this study was convenient sampling. The participant was randomly selected upon whom the researcher met and agree to participate. All the participant must be passed the inclusion criteria too.

3.6 Measurement tools

There were four parts of questionnaire as follow:

3.6.1 General Question: 16 questions

The screening questionnaire focused on the demographic characteristic background and also ask about the covariate factors. The researcher has screened the participant by starting a short conversation so that the researcher was able to know whether the participants were qualified the inclusion criteria. After that the researcher was handed the self-report questionnaire to the participant to fill out. For the covariate factors the research had ask for the information according to the conceptual framework that the research have plan in Chapter 1.

3.6.2 Stress: 5 questions

This study had use the stress questionnaire, ST5, from Department of Mental Health, Thailand. The questionnaire was mainly focus on sleep problem, emotional and concentration. There were five questions and each question score 0-3; zero mean not at all and three is always. The score was divided into 4 range after adding up all 5 questions together which result as 0-4 less stress, 5-7 mild stress, 8-9 very stress, and 10-15 severe stress (Department of Mental Health, Thailand, 2017).

3.6.3 Smartphone use

The questionnaire for smartphone use was divided into 2 parts one is the standardize questionnaire, Mobile Phone Problematic Use Scale (MPPUS), and the other one is created by the researcher.

Mobile Phone Problematic Use Scale was created by Bianchi and Phillips, Psychology Department, Monash University, Australia. The questionnaire first was used predict usage and, specially, problematic mobile phone use from extraversion, self-esteem, neuroticism, gender, and age. Bianchi and Phillips attempted to establish an instrument to measure the phenomenon, based on the literature relating to addiction and incorporating questions relating to the social aspect of mobile phone use.

Construct validity of Mobile Phone Problem Usage Scale (MPPUS) was demonstrated by its relationship to other indicators of problem use. A test of internal reliability (Cronbach's alpha) was calculated on the MMPUS to demonstrate the level of internal consistency among items. The Cronbach's alpha of this questionnaire is 0.93 which was in a high level of internal consistency. The questionnaire consisted of 27 questions which all the questions were based on addiction literature and currently known knowledge of behavioral and technological addiction. The questionnaire covers the issue of tolerance, escape from other problem, withdrawal, craving, and negative life consequence in the areas of social, familial, work, and financial difficulties. All questions were scale ranging from 1 ("not true at all") -10 ("extremely true"). The score ranged from 27-270, unfortunately in the study of Bianchi and Phillips they didn't point out the cutoff point, they mentioned only the mean score of 65, min 27 and max 210.

For the other questionnaire that the researcher created it had 11 questions. The question was based on the behavior of using smartphone. And all the factor that mentioned in the smartphone use in the conceptual framework was ask in this part. The researcher has translated the Mobile Phone Problematic Use Scale and the Smartphone use base on participant's behavior into Thai Language and have done forward-backward translation by the experts, copywriter and Learning & Development Manager.

3.6.4 Sleep Quality: 19 questions

Pittsburgh Sleep Quality Index (PSQI) was developed by Buysse et al., it was standardized self-administered questionnaire to measure the overall sleep quality during the past 1 month of the participant. The score of each component was 0-3. The questionnaire score was 0-21 and participant who has scored above 5 was consider as poor sleep. Each item of the total 19 questions were belong to 7 categories:

- Subject Sleep Quantity: Question 6
- Sleep Latency: Question 2, 5
- Sleep Duration: Question 4
- Habitual Sleep efficiency: Question 1, 3, 4
- Sleep Disturbance: Question 5.1-5.9
- Use of Sleep medication: Question 7
- Daytime Dysfunction: Question 8 and 9

In this research was based on PSQI Thai version by Tullaya Sitasuwan and team, they did the test-retest reliability (intraclass correlation coefficient = 0.89) (Sitasuwan, 2014). The researcher did ask the permission to use the PSQI Thai version already

The original PSQI have 19 questions plus another five extra questions (10.1-10.5) that included on the one who has roommate or a partner and his or her partner have to answer the questions. And those five questions would not be count in the score, it was only use for clinical use. On the other hand, in Thai version by Tullaya and team they only translate only 2 extra questions which are number 10.1 and 10.2. However, in this research it was exceptional if the participant's partner is not with them on that day. The researcher has used the answer according to what participant answer. The researcher has asked the permission from the owner already for using her questionnaire in this research.

3.6.5 Validity

PSQI Thai version by Tullaya and team have done the validity test in the primary insomnia group which result all patients in the primary insomnia group had global scores of >5 ; this was true also for 24 patients (85.71%) with major depression and 49 with OSA (71.01%). Only 6.7% (2 of 30) of the control group scored >5 . The ANCOVA showed that the difference in the Thai-PSQI global score between the control and disease groups was statistically significant ($p < 0.001$) (Sitasuwan, 2014).

Validity of MPPUS was measure by Bianchi and Phillips, which they showed that there was a moderately strong positive correlation between the scores on the MPPUS and the reported time spent using the mobile phone, $r = 0.45$, $p < 0.01$. Moreover, the MPPUS was also moderately correlated with an established scale for measuring addiction—the APS, $r = +0.34$, $p < 0.01$ (Bianchi, 2005). These moderate to strong correlations with other measures of mobile phone use and an established scale for measuring addiction support the construct validity of the MPPUS and provide evidence for the construct of problem mobile phone use.

However, the researcher has done the content validity to see whether the questionnaire is appropriate for this research or not by three experts. The researcher had sent out the questionnaires to each of the experts and the experts have approved that the questionnaires are suitable for this research project.

3.6.6 Reliability

The research tried out for 40 sets of questionnaires with undergraduate student at Chulalongkorn University, Thailand. The Cronbach's Alpha more than 0.7 indicate the reliability for the item in the questionnaires. The result of reliability of the variables as the table 1 below;

Table 1 The reliability of the variables

Questionnaires	Cronbach's Alpha
1. Stress	0.703
2. Smartphone Use	0.923
3. Sleep Quality	0.796

3.7 Data Collection:

The design of the data collection was self-report and verbally. First, the researcher has drawn out how many faculty are there in Chulalongkorn University. Then the researcher went to each faculty to seek for the participants. After that the researcher has informed the participant what is the study about and ask them whether they are willing to participate this project or not if yes, the participant have signed the consent form. Formerly, the researcher has waited until the participants finish filling the self-report questionnaire and return to the researcher. During the time that the participant was filling the questionnaire sometime the researcher was having a chance to talk with the participant too. Some case when participant had return the questionnaire to the researcher, researcher did look through the page and have some discussion with the participant.

In case that the participant was not able to fill out by themselves the researcher was the one who read and filled out for them. Yet if the participant was not able to fill out the questionnaire on that day, the researcher did an appointment for return the questionnaire with a seal envelope later on.

3.8 Data Analysis

The data has been analyzed by using Statistical Package for the Social Science for Windows (SPSS) version 17 licensed for Chulalongkorn University.

3.8.1 To describe demographic characteristic, sleep covariate factors, the prevalence of smartphone user before bed and bad sleep quality among undergraduate students of Chulalongkorn University, Thailand. The researcher used the descriptive statistical to analyzed the data by finding the mean, max, min, SD and etc.

3.8.2 To determine the association between demographic characteristic, sleep covariate factors and sleep quality of undergraduate students of Chulalongkorn University. The researcher has viewed the data as the binary data so it has been used chi-square as inferential statistic to find the association between those factors. Before using the Chi-square the researcher have test the normality, to see whether it is a normal distribution or not. And if yes then it will be Pearson Chi-Square and if no then it will be Spearman Chi Square test.

3.8.3 To access the association between using smartphone before bedtime and sleep quality of undergraduate students of Chulalongkorn University. The researcher has view as the binary data so it used chi-square as inferential statistic to find the association between those factors. Before using the Chi-square the researcher have to test normality, to see whether it is a normal distribution or not. And if yes then it will be Pearson Chi-Square and if no then it will be Spearman Chi Square test.

3.9 Ethical consideration

The research has been approved by the Ethics Review Committee for Research Involving Human Research Subject, Health Science Group, Chulalongkorn University with reference number 063.1/60. All the data will keep secretly with the research and the researcher will not present in any way that can lead to the participant. Moreover, all the data document will be destroyed within one year.

3.10 Limitation

There were quite a few number of the limitation in this research. First of all, the questionnaire contained a lot of questions that might cause missing data because the participant allows to leave the research if he/she didn't want to participant anymore.

Second, since it was self-reported questionnaire it was possible that the participant might not understand the question. Therefore, the participant might give the wrong answer or skip the question. Lastly, this study was convenience sampling so it is possible that there will be some bias because the population cannot cover the whole university.

3.11 Obstacle and Solution

The obstacle of this research was that during the period of data collecting it is the summer time for undergraduate students. Therefore, it is very hard to find a participant according to the population sample size. So, the researcher decides to collect the data from all undergraduate student they researcher found. And during the time of data collecting there are thunderstorm and flood so it is hard for research to reach to the area. The solution for this problem is that the research will go to dormitory and central library to seek for more participants.

3.13 Activity and Time

Table 2 Activity and Time

Activity	2016					2017						
	August	September	October	November	December	January	February	March	April	May	June	July
1. Literature Review	←————→											
2. Develop proposal	←————→											
3. Proposal examination						↔						
4. Ethical Consideration							←————→					
5. To respond to the comments from research ethics review							←————→					
6. Try-out the questionnaires								↔				
7. Set and train the team for collecting data									↔			
8. Data collection									←————→			

Table 2 (Continue)

Activity	2016					2017						
	August	September	October	November	December	January	February	March	April	May	June	July
9. Data entry and analysis										←	→	
10. Final examination										←	→	
11. Revise and publication											←	→

3.14 Activity and Budget

Table 3 Activity and Budget

Activities	Budget (Thai Baht)
1. Souvenir to the participants	20,000.00
2. Trip to collect the questionnaires form	20,000.00
3. Printing and photo copy cost	10,000.00
Total	50,000

CHAPTER IV

RESULTS

This research has employed a cross sectional study with the objective of investigating the association between demographic characteristic, covariate factor and smartphone use before bedtime with sleep quality among undergraduate student at Chulalongkorn University. The research detail covers the following items:

4.1 Demographic Characteristic

Researcher has been collecting the data from undergraduate student, freshmen-senior, of academic year 2016 by the approval of Ethic Review Committee for Research Involving Human Research Subject, Health Science Group, Chulalongkorn University. In this research, there are 423 participants, 202 males and 221 female students. The participant age range in this research conclude as 18-23 years old, the majority age groups are 19 and 20 years old. Each of the participant came from the different faculty. There are 18 faculty at Chulalongkorn University, most of the participant are from Faculty of Engineering (25.8%) of the student participate in this research where is 85% higher in number than what researcher has expected. Follow by Faculty of Law (13.9%) and the least number are Faculty of Fine and Applied Art (0.0%). The students are from Freshmen (53.1%), Sophomore (26.5%), Junior (16.1%) and Senior (4.3) year. Student grade or GPA also been collecting in this study. The research has divided the GPA score into 2 groups which are less than 3.0 (48.5%), and more than 3.0 (51.5%). The mean of student GPA is 2.95 with the Max of 3.90, Min of 1.30 and SD is 0.499. There were 21 participants refused to filling their GPA in the questionnaire.

Last variable in demographic is monthly allowance, researcher has group into 4 groups less than 5,000 Baht, 5,001-10,000 Baht, 10,001-15,000 Baht and above 15,001 Baht. Commonly, student will be in the first 2 groups which are less than 5,000 Baht (42.8%) and 5,001-10,000 Baht (40.4%) while 15.001 and above is the least group of only 1.9% of the student. [Table 4]

Table 4 The participants' demographic characteristics

Demographic Characteristic	n=423	Percent
Gender		
Male	202	47.8
Female	221	52.2
Age		
18 years old	17	4.0
19 years old	184	43.5
20 years old	126	29.8
21 years old	60	14.2
22 years old	26	6.1
23 years old	10	2.4
Mean 19.82 years old SD 1.080 years Max 23 Min 18		
Faculty		
Faculty of Engineering	109	25.8
Faculty of Arts	10	2.3
Faculty of Science	28	6.6
Faculty of Political Science	47	11.1
Faculty of Architecture	8	1.9
Faculty of Commerce and Accountancy	13	3.1
Faculty of Education	8	1.9
Faculty of Communication Arts	23	5.5
Faculty of Economic	22	5.2
Faculty of Medicine	6	1.4
Faculty of Veterinary Science	14	3.3
Faculty of Dentistry	10	2.4
Faculty of Pharmaceutical Sciences	5	1.2
Faculty of Law	59	13.9
Faculty of Fine and Applied Art	0	0.0
Faculty of Allied Health Sciences	37	8.8
Faculty of Psychology	9	2.1
Faculty of Sport Science	15	3.5

Table 4 (Continue)

Demographic Characteristic	n=423	Percent
Education Level		
Freshman	225	53.1
Sophomore	112	26.5
Junior	68	16.1
Senior	18	4.3
5 th year	0	0.0
6 th year	0	0.0
GPA		
Less than 3.0	195	48.5
More than 3.0	207	51.5
Mean 2.95 SD 0.499 Max 3.90 Min 1.30		
Monthly Allowance		
Less than 5,000 Baht	181	42.8
5,001-10,000 Baht	171	40.4
10,001-15,000 Baht	63	14.9
Above 15,001 Baht	8	1.9

4.2 Covariate Factor

In this research, there are 7 covariate factors that are included which are energy drink, caffeine drink, smoking, alcohol consumption, exercise, shifted work and stress. All the covariate factors result are shown in Table 5 below. As a result, there are only 86 students who use the energy drink and mostly they claim that they drink it at night (57%) follow by in the afternoon (24.4%). The average amount of energy drinks is 1.09 bottle, 1 bottle is 140 ml, while the highest is 2 bottles. The SD of the energy drink is 0.292. On the other hand, it seems like caffeine drink is a better choice for college students because up to 334 students said that they consume caffeine drink. In this research has categorized caffeine drink into 3 types which are coffee, soft drink and tea. The greatest number of caffeine drink among undergraduate student is soft drink with 61.1% from all the student. Coffee came at the 2nd rank with 59.6% and the least is tea

with 50.6%. (For the caffeine type question the participant are allow to answer more than one choice.) The SD is 0.450 and the mean for caffeine drink is 1.23 glasses, 1 glass is 237ml, with Max of 3 glasses and Min of 1 glass.

Cigarette smoking among undergraduate student is quite low, only 24 students who said they are smoking. Of 24 students, 75% of them answered that they only smoke 1-2 time with in the past one month. Besides, there were 16 students who said that they smoke one cigarette a week.

Meanwhile more than half of the student (53%) that consuming the alcohol. And of those who say that they drink alcohol 83.9% of them drink occasionally, 12.5% for sometimes and 3.6% often. The average drink of the student is 3.36 glasses, 1 glass is 30 ml, and the highest amount of alcohol drink is 15 glasses while lowest is 1 glass.

For exercise section, about 58.6% of the student have exercise and 64.5% of them said that once they exercise they will spend more than 30minutes per time. As for shifted work question only 13 students response that they are working after 5PM.

Last but not least, in the part of stress questionnaire there 5 questions and it is a Likert scale questionnaire 0-3, never-always, with the score of 0-15. Therefore, it was divided into 4 group which are Mild (score of 0-4), Moderate (score of 5-7), Severe (score of 8-9), and extremely severe (10-15). The five questions are asking about sleep problem, concentration lost, mood wing, boredom, and isolation. Surprisingly, all the answer from each question have the highest number of response at score of 1 (Sometimes). And most of the student (n=185) fall in moderate stress group, then mild stress (n= 142), and the least is extremely stress (n=45).

Table 5 The sleep covariate factors

Covariate factors	n=423	Percent
Energy drink		
No	337	79.7
Yes	86	20.3
Time - Morning	14	16.3
- Afternoon	21	24.4
- Evening	2	2.3
- Night	49	57.0
Drinking amount	Mean 1.09 SD 0.292 Max 2 Min 1	
Caffeine Drink		
No	89	21.0
Yes	334	79.0
Time - Morning	74	22.2
- Afternoon	157	47
- Evening	66	19.7
- Night	37	11.1
Type - Coffee	199	59.6
- Soft drink	204	61.1
- Tea	169	50.6
Amount of drink	Mean 1.23 SD 0.450 Max 3 Min 1	

*The type of caffeine drink can be selected more than one type.

Table 5 (Continue)

Covariate factors	n=423	Percent
Smoking		
No	399	94.3
Yes	24	5.7
How often in last months?		
- 1-2 times	18	75
- At least once a week	6	25
- Always but not everyday	0	0.0
- Everyday	0	0.0
How many cigarettes you smoke in one week?		
- None	6	25
- 1 cigarette	16	66.7
- 2-5 cigarettes	2	8.3
- 6-10 cigarettes	0	0.0
- 11-20 cigarettes	0	0.0
- over 20 cigarettes	0	0.0
Alcohol consumption		
No	199	47
Yes	224	53
When you drink?		
- Occasionally	188	83.9
- Sometime	28	12.5
- Often	8	3.6
- Always	0	0.0
Amount of drink		
Mean 3.36 SD 2.796 Max 15 Min 1		

Table 5 (Continue)

Covariate factors	n=423	Percent
Exercise		
No	175	41.4
Yes	248	58.6
How long for exercise in one time?		
- Less than 30 minutes per time	88	35.5
- More than 30 minutes per time	160	64.5
Shift Work		
No	368	87.0
Yes	55	13.0
Time - Day time	42	76.4
- Night time	13	23.6

Table 6 The stress of the participants by items

Sign or symptom that occur during the past 2-4 weeks	Never	Sometime	Often	Always
	Percent (n=423)	Percent (n=423)	Percent (n=423)	Percent (n=423)
1. Problem in sleep: Sleep too less/much	19.0 (81)	49.9 (211)	23.4 (99)	7.6 (32)
2. Lose concentration	10.8 (46)	58.2 (246)	26.0 (110)	5.0 (21)
3. Moody/ Anxious/ Distracted	17.3 (73)	58.6 (248)	19.8 (84)	4.3 (18)
4. Feeling bored	11.8 (50)	53.7 (227)	25.3 (107)	9.2 (39)
5. Don't want to meet anyone	34.3 (145)	47.8 (202)	15.1 (64)	2.8 (12)

Table 7 The stress outcome

Stress outcome	n=423	Percent
Mild Stress	142	36.6
Moderate Stress	185	43.7
Severe Stress	51	12.1
Extremely Severe Stress	45	10.6

4.3 Smartphone Use Behavior

There are four factors under smartphone use behavior which are using smartphone before bedtime, using smartphone before bedtime in bed, mode of smartphone and screen light adjustment which are presented in Table 8. Firstly, using smartphone before bedtime had 410 participants response to “Yes”. For the one who answer Yes, they have to answer the duration of use too. As a consequence, the average time of using is 1.27 hours with SD of 0.447 and Min 0.08 hours (5 minutes) and Max 8 hours. The duration had been divided into two groups which are less than one hour (n=297) and more than one hour (n=113) of using. Secondly, using smartphone before bedtime in bed. In this factor, there are 384 participants said that they were using their smartphone before bedtime in bed. Same as previous factor that it has also ask about the duration of use. The mean is 1.22 hours with SD of 0.413 and Min of 0.08 hour (5 minutes) and Max of 8 hours. The duration had been divided into two groups which are less than one hour (n=300) and more than one hour (n=84) of using. Thirdly, the mode of smartphone during sleep. There were three answer choices for this question and it was ranked according to the number of use so the highest number is Vibration Mode with 168 participants follow by Normal Mode with 144 participants and the least mode is Silent Mode with 111 participants. Lastly is the screen light adjustment. Positively, 77.1% of the participants answered that they did adjust their screen light when they stay in the dark environment.

Table 8 Smartphone use before bed behavior

Smartphone use before bed behavior	n=423	Percent
Duration of smartphone use before bedtime		
No	13	3.1
Yes	410	96.9
Time		
Less or equal to 1 hours	297	72.4
More than 1 hours	113	27.6
Mean 1.27 SD 0.447 Max 8 Min 0.08		
Duration of smartphone use before bedtime in bed		
No	39	9.2
Yes	384	90.8
Time		
Less than or equal to 1 hours	300	78.1
More than 1 hours	84	21.9
Mean 1.22 SD 0.413 Max 8 Min 0.08		
Mode of smartphone during sleep		
Vibration	168	39.7
Normal	144	34.0
Silent	111	26.3
Light adjustment		
Yes	326	77.1
No	97	22.9

4.4 Mobile Phone Problematic Use Scale

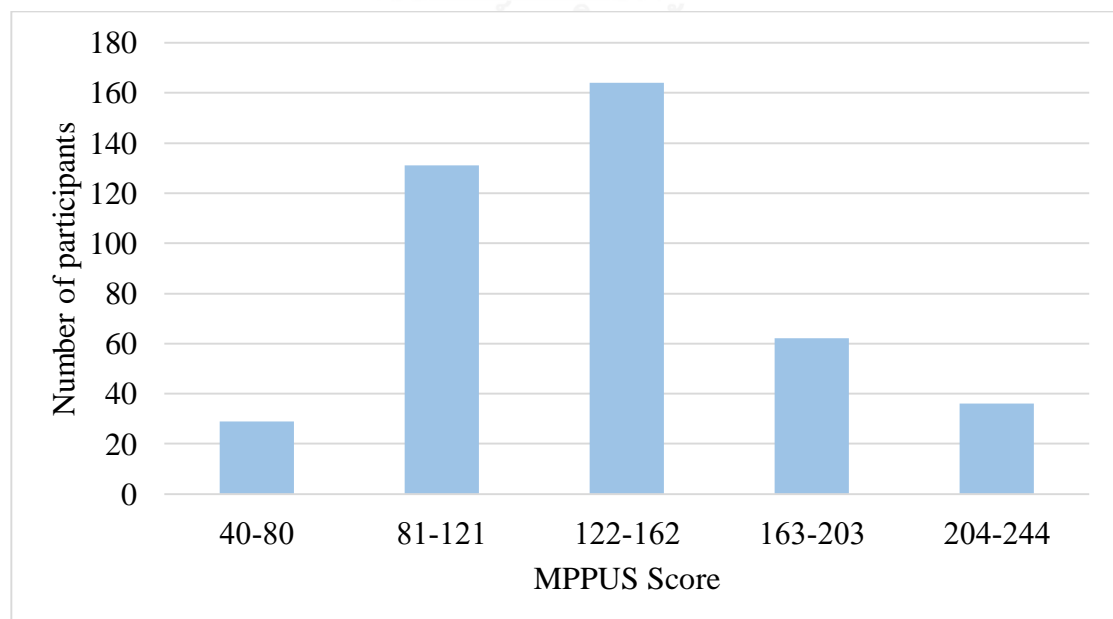
Mobile Phone Problematic Use scale is a Likert scale 1-10 scale (not true at all-extremely true). It is derived from the addiction literature to measure the how much a person depends on a mobile phone and by that behavior it can cause several problems such as car accident, personal behavior, and sleep problem. The score range start from 0-270. The higher score indicates how much impact of mobile phone use on the human life. Since there was no cut off point mention in the previous study, therefore the

research has divided the MPPUS result into 2 groups, Low Impact and High Impact, with the cut of point by the previous stud mean score of 65 by Bianchi and Phillips (Bianchi, 2005). Low Impact mean the one with score below 65 and High impact is the score above 65. The high impact group is as high as 96% while low impact got only 4% of the students as shown in Table 9. The average score of this study is 134 points with max of 241 and min 40. Moreover, the result showed that most of the participant up to 38.9% fall in group 122-162 score range. While 31.0% belong to the group of 81-121 points. The six ranges were developed by using SD for the score interval. However, the least group was 40-80 score ranges. The MPPUS score frequency are shown in Figure 6.

Table 9 Group of Mobile Phone Problematics Use

Group of Mobile Phone Problematic Use	n=423	Percent
MPPUS		
Low Impact	17	4
Hight Impact	406	96
Mean 134.43 SD 40.276 Max 241 Min 40		

Figure 6 MPPUS Score Frequency



4.5 Sleep Quality

To test for sleep quality the researcher has use the Pittsburg Sleep Quality Index (PSQI) Thai version questionnaire(Sitasuwan, 2014). PSQI has 7 components, each component has score of 0-3, by adding up all component in the end will get the true score to see the trend of sleep quality, so the score ranges from 0-21. It was mention that the one who has the score over 5 points is consider as poor sleeper. So, the researcher decides to set up only two group which is the good sleep quality (Score of less than 5) and poor sleep quality (Score of more than 5). Poor sleep quality has the number of 319 students with SD of 3.178. The mean of PSQI is 7 and Max is 16 whereas Min is 0. The PSQI result are shown below in Table 10. Beside after analyzed the data through its frequency, it showed that most of the student have score in the range of 5-7, which 5 and 7 points is the mode number for PSQI score outcome in this study as shown in Figure 8.

In additional, all the seven components of PQSI also has been analyzed and presented in Table 11. Each of the component were ranging score of 0-3. The first component is focusing on Subjective Sleep Quality, almost half of the participants responded to number 1 “Fairly Good” and the other 35.7% got score of 2 “Fairly Bad”. In this component the average score was 1.31 with SD of 0.720, which has the highest mean score among 7 components. Second component is Sleep Latency, 48.7% of the participants were in the Fairly Good group. By having mean score of 1.22 make component came in the 2nd for mean score among 7 components with SD of 0.895. Third component is Sleep duration, more than half of the participants was having a good duration of sleep with the total mean score of 1.0. There was 41.6% of the participant stated that they were having more than 7 hours of sleep during the past one month and another 26% said that they slept only 6-7 hours per night. The average sleep duration of the participant is 6.34 hours and SD of 1.581. The maximum duration of sleep is 11 hours and the Minimum is 1 hour. Fourth component is Habitual Sleep Efficiency, 55.6% of the participant were having a score of more than 85% for their sleep efficiency which mean that among those 55.6%, they were having a good sleep. Nevertheless, there were 15.8% of the participant were in the group of less than 65% for their sleep efficiency. So, it means that 15.8% of the students were facing a very

bad habitual sleep efficiency. In Habitual Sleep Efficiency were having the mean score of 0.91 which is the least mean score among 7 components. Fifth component is Sleep Disturbances as high as 74.5% of the participant were having trouble with sleep less than once a week. And around 21.3% are facing with the trouble twice a week. Sixth component is Use of Sleep Medication, 85.6% of the student were not using during the past month, but 11.1% claimed that they were using the sleep medication less than once a week. Last but not least is Daytime Dysfunction, half of the participants are in number 1 “Fairly Good” and 29.3% are in 2 “Fairly Bad”.

Table 10 Pittsburgh Sleep Quality Index Result

Pittsburgh Sleep Quality Index Result	N=423	Percent
Good (Less than to equal 5 score)	154	36.4
Poor (More than 5 Score)	269	63.6
Mean 7.00 SD 3.178 Max 16 Min 0		

Figure 7 PSQI Score Frequency

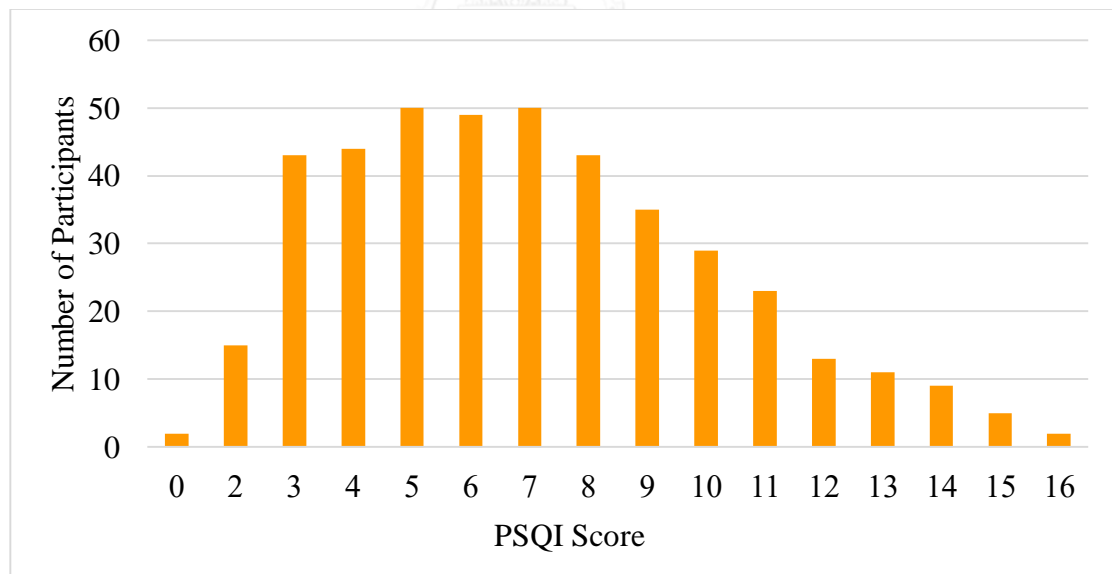


Table 11 Component of Pittsburgh Sleep Quality Index

Component of Pittsburgh Sleep Quality Index	N=423	Percent
Component 1: Subjective Sleep Quality		
Score 0	49	11.6
Score 1	208	49.2
Score 2	151	35.7
Score 3	15	3.5
Mean 1.31 SD 0.720 Max 3 Min 0		
Component 2: Sleep Latency		
Score 0	86	20.3
Score 1	206	48.7
Score 2	84	19.9
Score 3	47	11.1
Mean 1.22 SD 0.895 Max 3 Min 0		
Component 3: Sleep Duration		
Score 0	176	41.6
Score 1	110	26.0
Score 2	98	23.2
Score 3	39	9.2
Mean 1.00 SD 1.009 Max 3 Min 0		
Component 4: Habitual Sleep Efficiency		
Score 0	235	55.6
Score 1	58	13.7
Score 2	63	14.9
Score 3	67	15.8
Mean 1.091 SD 1.155 Max 3 Min 0		

Table 11 (Continue)

Component of Pittsburgh Sleep Quality Index	N=423	Percent
Component 5: Sleep Disturbances		
Score 0	16	3.8
Score 1	315	74.5
Score 2	90	21.3
Score 3	2	0.5
Mean 1.18 SD 0.486 Max 3 Min 0		
Component 6: Use of Sleeping Medication		
Score 0	362	85.6
Score 1	47	11.1
Score 2	14	3.3
Score 3	0	0
Mean 0.18 SD 0.451 Max 2 Min 0		
Component 7: Daytime Dysfunction		
Score 0	62	14.7
Score 1	225	53.2
Score 2	124	29.3
Score 3	12	2.8
Mean 1.20 SD 0.716 Max 3 Min 0		

4.6 Association between Demographic Characteristic and Sleep Quality

The researcher has compared all the variables of demographic with sleep quality and the result shown that there is an association between sleep quality with age, education level and monthly allowance. Age by year of the participant is significantly associate with sleep quality by having the p-value of 0.000. Poor sleep quality has high number in participant age of 19 and 20. In group of 19 years old there are 184 students and 112 of them are having poor sleep quality. For the group of 20 years old there are 126 students and 100 of them are having the poor sleep quality.

Education level also so the significant association with the sleep quality with p-value 0.015. In freshmen year there were 153 students facing with poor sleep quality

and it was the highest number among all the education level. Follow by Sophomore with 74 students who has poor sleep quality. And the least is Senior year only 8 students has poor sleep quality.

On the other hand, monthly allowance also showed the strong significant association with the p- value of 0.001. The one who has monthly allowance of less than 5,000 baht, 123 of them are having poor sleep quality. Similar outcome also shows in group of 5,001-10,000 baht, 111 of this group also facing with poor sleep quality. Meanwhile, the one who got monthly allowance above 15,001 baht seem to have a better score on sleep quality than the lower range of income [Table12].

Table 12 The association between demographic characteristic and sleep quality

Characteristics	All (n= 423)		Poor Sleep Quality (n=269)		Good Sleep Quality (n=154)		p-value
	n	(%)	n	(%)	n	(%)	
	Gender						
Male	202	47.8	121	45.0	81	52.6	0.131
Female	221	52.2	148	55.0	73	47.4	
Age (Years)							
18	17	4.0	7	2.6	10	6.5	0.000*
19	184	43.5	112	41.6	72	46.7	
20	126	29.8	100	37.2	26	16.9	
21	60	14.2	34	12.6	26	16.9	
22	26	6.1	12	4.5	14	9.1	
23	10	2.4	4	1.5	6	3.9	
Faculty							
Non-health	327	77.3	206	76.6	121	78.6	0.638
Health	96	22.7	63	23.4	33	21.4	
Education Level							
Freshman	225	53.1	153	56.9	72	46.7	0.015*
Sophomore	112	26.5	74	27.5	38	24.7	
Junior	68	16.1	34	12.6	34	22.1	
Senior	18	4.3	8	3.0	10	6.5	

Table 12 (Continue)

Characteristics	All (n= 423)		Poor Sleep Quality (n=269)		Good Sleep Quality (n=154)		p-value
	n	(%)	n	(%)	n	(%)	
	GPA						
Less than 3.0	195	48.5	127	49.6	68	46.6	0.558
More than 3.0	207	51.5	129	50.4	78	53.4	
Monthly Allowance							
Less than 5,000 Baht	181	42.8	123	45.7	58	37.7	0.001*
5,001-10,000 Baht	171	40.4	111	41.3	60	38.9	
10,001-15,000 Baht	63	14.9	35	13.0	28	18.2	
Above 15,001 Baht	8	1.9	0	0	8	5.2	

4.7 Association between covariate factors and Sleep Quality

In this part, the researcher has test the association between sleep quality with the covariate factors which are energy drink, caffeine drink, smoking, alcohol consumption, exercise, shifted work and stress. Among those seven factors only 2 factors that show the significantly association with the sleep quality which are caffeine drink and stress.

There are 334 participant that saying they consume the caffeine drink and among those number 227 participants were having poor sleep quality. The p-value of caffeine drink and sleep quality is 0.000 which show a very strong significant. Another factor that also show the positive association is stress. The pattern in the table can show that the more stress you have the more possible chance of having a poor sleep quality. The number of poor sleep quality in Mild is 60 students, Moderate is 136 students, Severe is 38 students and extremely severe group has 35 students. The p-value is 0.000 [Table 13].

Table 13 The association between sleep covariate factors and sleep quality

Covariate Factors	All (n= 423)		Poor Sleep Quality (n=269)		Good Sleep Quality (n=154)		p- value
	n	(%)	n	(%)	n	(%)	
Energy drink							
No	337	79.7	214	79.6	123	79.9	0.938
Yes	86	20.3	55	20.4	31	20.1	
Caffeine Drink							
No	89	21.0	42	15.6	47	30.5	0.000*
Yes	334	79.0	227	84.4	107	69.5	
Smoking							
No	399	94.3	253	94.1	146	94.8	0.747
Yes	24	5.7	16	5.9	8	5.2	
Alcohol consumption							
No	199	47	123	45.7	76	49.4	0.472
Yes	224	53	146	54.3	78	50.6	
Exercise							
No	175	41.4	116	43.1	59	38.3	0.334
Yes	248	58.6	153	56.9	95	61.7	
Shift Work							
No	368	87.0	231	85.9	137	89.0	0.364
Yes	55	13.0	38	14.1	17	11.0	
Stress							
Mild Stress	142	36.6	60	22.3	82	53.2	0.000*
Moderate Stress	185	43.7	136	50.6	49	31.8	
Severe Stress	51	12.1	38	14.1	13	8.4	
Extremely Severe Stress	45	10.6	35	13.0	10	6.6	

4.8 Association between Smartphone use behavior and Sleep Quality

There are four factors in this section. Almost every factor in this part are significant with sleep quality except using smartphone before bedtime. First one is the using smartphone before bedtime in bed, as state earlier that they were 384 students who said that they use their smartphone in bed. As a result, 251 of those who use smartphone on bed have the poor sleep quality. The p-value is 0.018. Second is the mode of smartphone during sleep with p-value of 0.030. No doubt that the highest number of poor sleep quality was in Normal group with 104 participants, followed by Vibration with 99 participants and the least is Silent mode with 66 participants with poor sleep quality. Third is light adjustment, even though 326 participants said that they adjust their screen light when use in the dark place, but the result show that 229 participants are having a poor sleep quality. Therefore, light adjustment is associate with sleep quality with p-value of 0.005.

Table 14 The smartphone use behavior

Smartphone use behavior	All (n= 423)		Poor Sleep Quality (n=269)		Good Sleep Quality (n=154)		p- value
	n	(%)	n	(%)	n	(%)	
Using Smartphone before bedtime							
No	13	3.1	8	3.0	5	3.2	0.876
Yes	410	96.9	269	97.0	149	96.8	
Using Smartphone use in bed before bedtime							
No	39	9.2	18	6.7	21	13.6	0.018*
Yes	384	90.8	251	93.3	133	86.4	
Mode of smartphone during sleep							
Vibration	168	39.7	99	36.8	69	44.8	0.030*
Normal	144	34.0	104	38.7	40	26.0	
Silent	111	26.3	66	24.5	45	29.2	
Light Adjustment							
Yes	326	77.1	219	81.4	107	69.5	0.005*
No	97	22.9	50	18.6	47	30.5	

4.9 Association between MPPUS and Sleep Quality

Mobile Phone Problematic Use Scale was divided into two group Low Impact with score of less than 65 and High Impact of score above 65 points. It displayed the significant association with p-value of 0.003. In Low Impact group, there were 5 participants that are poor sleep quality while High Impact group has as much participation as 264 who has poor sleep quality. Surprisingly, the Low Impact group has a higher number in Good Sleep Quality with 12 participants.

Table 15 Association between MPPUS and Sleep Quality

Mobile Phone Problematic Use Scale	All (n= 423)		Poor Sleep Quality (n=269)		Good Sleep Quality (n=154)		p-value
	n	(%)	n	(%)	n	(%)	
MPPUS							
Low Impact	17	4	5	1.9	12	7.8	0.003*
Hight Impact	406	96	264	98.1	142	92.2	

*Low impact means MPPUS \leq 65

**High impact means MPPUS $>$ 65

CHAPTER V

DISCUSSION, CONCLUSION & RECOMMENDATION

The objectives of this study are: to describe the demographic characteristic, sleep covariate factors, prevalence of smartphone use and poor sleep quality, to determine the association between demographic characteristic, sleep covariate factors and sleep quality of undergraduate students of Chulalongkorn University and to access the association between using smartphone before bedtime and sleep quality of undergraduate students of Chulalongkorn University.

Therefore, this study uses the random Convenience Sampling technique covering 423 participants, the student from Freshmen-Senior student whose academic year 2016 at Chulalongkorn University. This quantitative study questionnaire includes 4 parts which are demographic characteristic, stress, smartphone and PSQI.

5.1 General information of participant

The participant is undergraduate student from Chulalongkorn University. There are 202 Males and 221 Female and the average age of the participant is 19.82 years old (SD= 1.080). Each of the participant came from variety of faculty and different educational level. The majority was from Faculty of Engineering. For the education level, 53.1% of the participant is freshmen. In the questionnaire, the researcher has mention education level up to 5th and 6th year that because in Thailand Faculty of Medicine has to study 6 years to graduate. However, this this study the student from 5th and 6th doesn't show up. From the study, the researcher realized that they are several students that start their freshmen year quit late instead of 19 years old they start their freshmen at 20s. Next is the GPA (Grade Point Average) of the student. Most of the student are having the GPA of 2.5-3.5 out of 4.0. The average score of GPA is 2.95 with SD of 0.499. Lastly is the monthly allowance of the participant. One hundred eighty-one students are receiving their monthly allowance between less than 5,000 baht. While 171 students get 5,001-10,000 baht per month. Only 63 students are getting 10,001-15,000 baht per month and 8 people getting over 15,001. From having a

conversation with those students, they said that all the money came from their parents only not much of them are doing work.

5.2 Covariate Factor

In this study, the researcher has select 7 sleep covariate factors as will be discuss as follow:

1) Energy Drink

During the self-report, the researcher gets to talk with the participant mostly the one who drink at night claim that they drink because they want to be awake at night to study for their exam. However, the maximum bottle that the participant drink per day is 2 bottles, this might come from the sign of the energy drink that it should not drink more than 2 bottles per day. On the other hand, 337 people said that they don't consume the energy drink. Some said that they feel that it is too strong for them when they drink their heart beats faster. It is very odd that the one who consume energy drink is not associate with sleep quality, while caffeine drinks are.

2) Caffeine drink

The reason of caffeine is a better choice that because of the various type of caffeine drink, 3 types of the caffeine drink that include are coffee, soft drink and tea. Most preferable caffeine drink is soft drink followed by coffee and tea. Student prefer soft drink because of the freshness they got after drinking it, the example for soft drink are Coke, Pepsi and Sprite. Some mentioned about the taste of the drink too. While coffee they drink for the wakefulness. The mean of the caffeine drink is 1.23 glasses (SD=0.450) and max is 3 glasses. The time that they will drink the caffeine is during afternoon.

3) Smoking

Surprisingly, only 24 people responses that they are smoking. In the past month 18 of them smoke only 1-2 times and 6 said once a week. For the amount of cigarette is in the low rate, there are one question asking how many cigarettes you have smoke in one week, 6 of them answer none and 16 people answer 1 cigarette per week. So, the researcher asks the one who smoke the reason of their smoking some say they smoke 'occasionally' only when they are hanging out or very stress.

4) Alcohol Consumption

There 224 students who drink alcohol and 188 of them drink it occasionally, 28 people said that they drink sometime and 8 people said they drink often. The average amount that the student drink is 3.36 glasses, for the maximum drink is 15 glasses and the minimum of 1 glass. The one who drink occasionally said that they will drink when they are stress or happy moment like finish their exam. From the data, it showed the highest in percentage of drinker came from Faculty of Medicine with 100%, follow by Faculty of Art 80% and Faculty of Science 64%. Other the hand, Faculty of Dentistry didn't show any number of drinker.

5) Exercise

For exercise section, there are 248 students said they exercise and 64.5% of them said that once they exercise they will spend more than 30minutes per time and 35.5% will work out less than 30 minutes per time. The participant has a variety way of exercising so say they use the CU sport club, or they will jog or run and the national stadium near Chulalongkorn University. The one who exercise less than 30 minutes claim that sometimes it is too crowded at the sport center and they don't have enough time. And for the one who doesn't exercise it is because their laziness, but some say they prefer to eat healthy meal rather than work out.

6) Shift Work

There aren't many students who do work, only 55 participants work and they work as part time job. The number of the day time worker is 42 students and the rest are working at night. For day time worker, some of them will work as the coffee shop or the café and mostly they will work only weekend. There are many students who also work as a tutor some of them work at night and some work in the day time.

7) Stress

The first question asking about problem in sleep whether you sleep too much or lack of sleep 49.9% say this phenomenon used to happen with them sometimes and 23.4% often. The student mention that during the exam periods their sleep problem will be lack of sleep and when the exam period is over they will face with too much sleep problem. Second question is about whether you are losing you concentration or not, about 58.2% of the student answer "Sometimes" and 26.0% answer "Often". The reason that they lose concentration because of their smartphone, especially the social media

they always busy with checking in where they are and what they are up to. Third question is emotion (Moody/ Anxious/ Distracted) it happens “Sometimes” to 58.6% of the student. Some female participant refers about being moody during their menstruation period. While the male participant said that they will be moody when driving. For anxious usually happen during exam. Fourth question ask about boredom, 53.7% of them were bored “Sometimes” and 25.3% bored “Often”. Since most of the student is freshman student, many participants came from rural area so they said that by not get use to the area make them feel bored because they don’t know where to go. Lastly, the question about isolation “Don’t want to meet anyone” 47.8% of the student response to “Sometimes” and 34.3% say “Never”. The reason is due to the weather, too hot and sometime raining to hard. Some also mention about meeting someone will waste money so they prefer to not to meet anyone.

As a result, the stress questionnaire was divided into 4 group which are Mild (score of 0-4), Moderate (score of 5-7), Severe (score of 8-9), and Extremely Severe (10-15). Most of the student (n=185) fall in Moderate stress group, then Mild stress (n=142), and the least is extremely stress (n=45).

5.3 Smartphone use behavior

For the part of smartphone use behavior is looking for the student behavior toward using the smartphone. First behavior was the using of smartphone before bedtime. The response from participants showed that 96.9% of them were using their smartphone before bedtime. The researcher has divide time of use into two group which are less than 1 hours (n=297) and more than 1 hours (n=113). The typical time that the participants use the smartphone before bedtime is 1.27 hours. The longest time that have been record in this research is as high as 8 hours while the shortest time is 5 minutes and SD is 0.447. Some participant will use their smartphone for doing homework and some will use for relaxation such as playing game and social media.

Second, asking about using smartphone before bedtime in bed. The one who said that they are use their smartphone in their bed is as high as 90.8%. And of those who use their smartphone, 300 of them use less than 1 hours. The SD of this group is 0.413, Max is 8 hours and Min is 5 minutes. Most of the student will use their smartphone in

bed before their bedtime so these two factors likely to have the similar number of Max and Min.

Third, mode of smartphone during sleep time. There are 3 answer choice for this question and it is rank according to the number of use vibration mode (n=168), normal mode (n=144), and silent mode (n=111). The student who put on vibration mode the claim that they want to get to know all the notification from their phone, but they have to put it on vibration mode because they share their room with their roommates. While the one who leave it as normal mode want to be on time all the time, they afraid that thy will missed a text from their friends or didn't get to answer an important call. And last group is the silent mode, they totally don't want to be disturb during nighttime.

Last smartphone use behavior is the light adjustment the researcher wanted to know whether the participant adjust their screen light or not. Positively, 77.1% of the participants said that they adjust the screen light. Some student will set the light adjustment as auto so it will be dim automatically when it comes to darker room. For the one who doesn't adjust the light because they don't know that there is ability to do so. Moreover, they don't know the reason of why they should adjust the light.

5.4 MPPUS

Mobile Phone Problematic Use scale is a Likert scale 1-10 scale (not true at all- extremely true) with 27 questions. The score of this questionnaire range start from 27-270. It is stated that the higher the score you have the more mobile phone dependent you are. Therefore, the research has divide the score from undergraduate student response into 2 group range by use the previous study as the cutoff point 65 points. The first group is "Low Impact" < 65, and the "High Impact" > 65 points. The number in High Impact is very high almost every student facing with this problem. Therefore, using mobile phone will likely to effect in life. The SD of the MPPUS is 40.276 while the average score is 134.43 with Max of 241 and Min 40 points. Even if the student with low score in MPPUS but that still said that Smartphone is one of the item that they have to carry with them all the time. Some of the students request the research to calculate their score to show and present to them. Some of them are surprise with the score they got and some said that it is what they deserve. However, MPPUS can show the trend of how much the participant use the phone and how it effects in the daily life.

In this study, the researcher has done a comparison in MPPUS score of Bianchi & Phillips's study and this study. Surprisingly, the mean score of this study has doubling increase from 2005 to 2017. With the lowest score of 27 points in 2005 and 40 points in 2017. While highest score in 2005 was 210 and 241 in 2017. By comparing the score, it has showed the trend that time passed by the mobile phone has more impact on human. This result somehow can assume that in the near future the mobile phone will likely to impact more in human life.

5.5 PSQI

The Pittsburg Sleep Quality Index (PSQI) questionnaire has 7 components, which are Subject Sleep Quantity, Sleep Latency, Sleep Duration, Habitual Sleep efficiency, Sleep Disturbance, Use of Sleep medication and Daytime Dysfunction, each component has score of 0-3, by adding up all component in the end will get the final score to see the trend of your sleep quality, so the score ranges from 0-21. It was mention that the one who has the score over 5 points is consider as poor sleeper. So, the researcher decides to set up only two group which is the good sleep quality (Score of less than 5) and poor sleep quality (Score of more than 5). Poor sleep quality has the number of 269 students while SD of 3.178. The mean of PSQI score is 7 and Max is 16 whereas Min is 0. Meanwhile, 154 participants have good sleep quality.

In the PSQI questionnaire there are question asking about time that participant go to bed, wake up, and overall duration that the participant think they get to sleep in one night. The result shows some swing because some participants get to sleep for a long period according to their sleep and wake up time, but they thought they get to sleep far less than what they have been. For example, one said that he slept at midnight and wake up time is noon the total time of his sleep is 12 hours, but he said that he got to sleep only 8 hours. The average of sleep duration of the participant is 6.34 hours per night with max of 11 and min of 1 hours (SD=1.581).

5.6 Association between General Information and Sleep Quality

The researcher has compare all the variable of demographic with sleep quality and the result shown that there is an association between sleep quality with age and monthly allowance. Age by year of the participant is significantly associate with sleep

quality by having the p-value of 0.000. Poor sleep quality has high number in participant age of 19 and 20. In group of 19 years old there are 184 students and 112 of them are having poor sleep quality. For the group of 20 years old there are 126 students and 100 of them are having the poor sleep quality. The age is associated with sleep quality because the most of them are in the freshmen and sophomore year, they are having a lot of homework and also activities to join. Yet, some of them mentioned that they can't manage themselves. So, this might lead to the poor sleep habit. Young adult may suffer from lack of sleep simply by not sleeping an adequate number of hours, or they may lack good-quality sleep. With the typical school and after-school activities, homework and evening activities (e.g., TV watching and Internet involvement), a lot goes on in the young adult's life (Clinic, 2017).

On the other hand, monthly allowance also showed the strong significant association with the p-value of 0.001. The one who got monthly allowance of less than 5,000 baht, 123 of them are having poor sleep quality. Similar outcome also shows in group of 5,001-10,000 baht, 111 participants of this group also facing with poor sleep quality. Meanwhile, the one who got monthly allowance above 15,001 baht seem to have a better score on sleep quality. From the verbal conversation, the researcher has realized one of the factors that each of the participants in lower range of monthly allowance share in common is the stress. They said the money that they have got is not enough for their daily life. This result is similar with the previous study that low income is associated with poor sleep quality (Assari, 2013).

5.7 Association of Sleep Covariate Factors and Sleep Quality

The association between sleep quality with the covariate factors which are energy drink, caffeine drink, smoking, alcohol consumption, exercise, shifted work and stress. Among those seven factors only 2 factors that show the significant association with the sleep quality which are caffeine drink and stress.

There are 334 participants that say they consume the caffeine drink and among those number 227 participants were having poor sleep quality. The p-value of caffeine drink and sleep quality is 0.000. One study states that caffeine is a significant effect on sleep disruptive especially when drink it later in the day which linked with this research that most of the students consume in the afternoon (Nordt, 2012).

Another factor that also show the positive association is stress. The pattern in the table can show that the more stress you have the more possible chance of having a poor sleep quality. The number of poor sleep quality in Mild is 60 students, Moderate is 1536 students, Severe is 38 students and extremely severe group has 35 students. The p-value is 0.000. There is one question that directly ask about “Problem in sleep: Sleep too less/much”, almost half of them response to sometime, 23.4 % of the participant answer as often and 7.6% said always. The higher score you have can indicate the higher prevalence of poor sleep quality. Yet, when you stress your body will produce cortisol hormone. When our body have high level of cortisol hormone, melatonin production will decrease (Waldenlind, 1987). It can be concluded that if you are stress you will likely to have poor sleep quality.

5.8 Association of Smartphone Use Behavior and Sleep Quality

There are three factors of smartphone use behavior that are interesting in the researcher opinion which are using smartphone before bedtime in bed, mode of smartphone during sleep and screen light adjustment. Firstly, is using smartphone before bedtime in bed this has confirmed the researcher’s objective, the association between sleep quality and use the smartphone before bed time, in the study.

Secondly, the mode of smartphone during sleep. There were 168 students who said that vibration is the preferable choice of smartphone at night. From the data, it indicates that the one who put on vibration were likely having a roommate. It can be seen clearly that by putting on both vibration or normal can cause the sleep disturbances by producing the noise. Since all electronic devices contain the electromagnetics wave, it contains non-ionizing radiation which can possibly effect human health (Altpeter, 2006). One study mentioned that the most safest mode to put while sleeping is the Airplane mode so that all the wave will shut down and not be able to interrupt the brain activity (Champion, 2011).

Finally, the screen light adjustment of your smartphone. It is positively demonstrated that it is better to adjust the light of the screen according to the environment. Because in every smartphone contain the blue light, therefore those blue light will harm to yourself by hurting your eyes and decrease the melatonin level. The blue light is known as the light in the day time, so receiving a lot of blue light from the

smartphone will make your brain think that it is day time and the melatonin production will decrease (Mortazavi, 2016). As the result of this study also shown that the one who adjust their screen light have 10% better in having a good sleep quality.

5.9 Association of Mobile Phone Problematic Use Scale and Sleep Quality

As mentioned earlier that sleep quality and MPPUS is significant associated. The researcher intended to see the association between these two variables because in MPPUS it can predict whether the phone will cause the problem for participant or not, and will it link with participant's sleep quality. Question number 6 from MPPUS "I lose sleep due to the time I spend on my mobile phone" there is 58.4% of the participant who answer the scale of 5-10 points and the average score for this question is 5. So more than half of them seem to have a lack of sleep due to smartphone use. One study also show the significant association in MPPUS and Sleep Quality, but not the sleep length (White, 2011).

However, the researcher can assume from the result that mobile phone is having an impact on undergraduate student at Chulalongkorn University. In this study has only 4% of the participant who is in Low Impact group while the rest are in High Impact. Moreover, the poor sleep quality has a higher number when compare with good sleep quality. It can be see clearly that the one who are in Low Impact group have a better sleep quality by poor sleep quality of 30% while good sleep quality is 70%. On the other hand, the High Impact group show the higher number on poor sleep quality by having 65% of participant and only 35% of the participant fall in good sleep quality. Therefore, using mobile phone has an impact on sleep quality.

5.10 Conclusion

As a consequence, the outcome showed the significant association between sleep quality and smartphone use before bed. Even though there are some covariates factors that might be effect the sleep quality such as caffeine drink and stress so further study is needed. Moreover, using smartphone before bedtime in bed display the association ($p=0.018$) with sleep quality, the longer you are using your mobile in bed it can cause the higher chance of having poor sleep quality. Besides, mode of mobile is also related with sleep quality. Lastly, Screen light adjustment is another key feature to

the sleep quality. The brighter light of the smartphone you have the brighter blue light you will get; therefore, it will decrease the melatonin production and you will fall sleep harder. However, this research cannot be assumed to all the undergraduate students in Thailand since this research only conduct in Chulalongkorn University. In short, further study is needed because this research only covers on Smartphone using which are not include all other type of electronic device.

5.11 Recommendation

Overall, all the results have showed some gaps that the participant is lack of concern about the smartphone use before bedtime with the sleep quality, the raising of smartphone use it not only rise among undergraduate student, but in every age group. Therefore, this problem should be solved by creating a campaign to educate the people, so that they can be aware of. The campaign can first start at Chulalongkorn University, by promoting about how is the smartphone use before bed cause poor sleep quality. Yet, screen light adjustment also plays a big role in decreasing the melatonin production. One last important thing is that Chulalongkorn University should rise the concern of the stress among the student. The stress reason must be investigate.

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APPENDIX



จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

-APPENDIX I-**The questionnaires in “English version”****Part I: General Information Questionnaire**

1. Age: _____

Sex: a) Male b) Female

2. Are you a current student at Chulalongkorn University?

No Yes3. Year of study: a) Freshman b) Sophomore c) Junior d) Senior
e) Other

4. Your Faculty (e.g., Engineer, Science...)

5. Current GPA: _____

6. Money Allowance

 Less than 5,000 Baht 5,001 – 10,000 Baht 10,001-15,000 Baht 15,001 Baht or above

7. Do you own a Smartphone?

No Yes

8. Do you have vision or hearing loss?

No Yes

9. Do you take psychological pill?

No Yes

10. Do you take sleeping pill?

No Yes

11. Do you consume the energy drink (i.e. Redbull, M150)?

No Yes

11.1 At what time do you usually drink energy drink?

Morning Noon Evening Night

11.2 Your average drink _____per time (1 bottle = 140ml)

12. Do you consume caffeine drink (i.e. Coke, Coffee, Tea)

No Yes

12.1 At what time do you usually drink caffeine drink?

Morning Noon Evening Night

12.2 Your average drink _____per time (1 glass = 8oz (237ml))

12.3 What type of caffeine do you usually drink? Please be specific.

Coffee _____ Soft Drink _____

Tea _____

13. Do you smoke?

No Yes

13.1 Within pass 30 days how often do you smoke?

Smoke for 1-2days Smoke less than 1day per week

Smoke often but not every day Smoke everyday

13.2 In the past 7 days how many cigarettes do you smoke per day

None 1 2-5 6-10

11-20 more than 20

14. Do you drink alcohol?

Never Occasionally Sometimes Often Everyday

14.1 Your average drink _____per time (1 drink = 30ml)

15. Do you exercise?

No Yes

15.1 How long do you usually spend time on exercise?

Less than 30 minute/time More than 30 minute/time

16. Do you do work?

No Yes

16.1 Do you do Shifted work at night, if yes please mention what time?

No Yes _____

Part II: Stress

Direction: Evaluate yourself by giving score of 0-3 from the symptom or feeling that occur within the past 2-4 weeks

0 Rarely

1 Sometime

2 Often

3 Always

No.	The symptom or feeling that occur within the past 2-4 weeks	Score				For researcher
		0	1	2	3	
1.	Problem in Sleep: Sleep too less/much					
2.	Lose Concentration					
3.	Moody/ Anxious/ Distracted					
4.	Feeling Bored					
5.	Don't want to meet anyone					

Result

Score range of 0-4 Mild Stress

5-7 Moderate Stress

8-9 Severe Stress

10-15 Extremely Severe Stress

2) Smartphone Use base on participant's behavior

1. What brand is your smartphone, please specify the series (example Samsung, Note 4)

- | | |
|--|---------------------------------------|
| <input type="checkbox"/> Samsung _____ | <input type="checkbox"/> Apple _____ |
| <input type="checkbox"/> Oppo _____ | <input type="checkbox"/> Huawei _____ |
| <input type="checkbox"/> LG _____ | <input type="checkbox"/> Sony _____ |
| <input type="checkbox"/> Xiaomi _____ | <input type="checkbox"/> Other _____ |

2. For how long have you been using a smartphone?

- Less than a year
- 1 year to less than 2 years
- 2 years to less than 3 years
- 3 years to less than 4 years
- 4 years to less than 5 years
- 5 years or more

3. Do you have a mobile data plan that allows you to access the Internet via your smartphone?

- Yes No

4. Approximately how much time do you think you spend a day using your smartphone?

_____ minutes or hours

5. For which of the following purposes do you usually use your smartphone? (Please select all that apply.)

- | | |
|---|---|
| <input type="checkbox"/> Checking email | <input type="checkbox"/> Looking information up on the Internet |
| <input type="checkbox"/> Checking lecture notes | <input type="checkbox"/> Listening to music |
| <input type="checkbox"/> Checking social media | <input type="checkbox"/> Scheduling meetings and events |
| <input type="checkbox"/> Gaming | <input type="checkbox"/> Talking with family or friends |
| <input type="checkbox"/> Getting news | <input type="checkbox"/> Texting family or friends |
| <input type="checkbox"/> Killing time | <input type="checkbox"/> Other (please specify): _____ |

6. In which of the following contexts would you use your smartphone? (Please select all that apply.)

- | | |
|---|---|
| <input type="checkbox"/> At a dinner table | <input type="checkbox"/> When I'm bored |
| <input type="checkbox"/> Between classes | <input type="checkbox"/> While hanging out with friends |
| <input type="checkbox"/> During a class | <input type="checkbox"/> While talking to somebody |
| <input type="checkbox"/> In the restroom | <input type="checkbox"/> While waiting for someone or something |
| <input type="checkbox"/> On public transportation | <input type="checkbox"/> While walking |
| <input type="checkbox"/> While driving | <input type="checkbox"/> While watching TV or a movie |
| <input type="checkbox"/> When I'm alone | <input type="checkbox"/> Other (please specify): _____ |

7. Do you use your smartphone before bed, if yes for how long please specify the duration.

- Yes _____ No

8. Do you usually use your smartphone in bed, if yes for how long please specify the duration?

- Yes _____ No

9. Which mode do you put on your smartphone while you are sleeping?

- Normal Vibrate Silent Night mode (Do not disturb)

10. While you use your smartphone at night or dark room, did you adjust the screen light to make it darker?

- Yes No

11. Where did you place your smartphone while you are sleeping?

- Under your pillow
 Next to your bed
 With in the bedroom but far from yourself at least 5m
 Outside the bedroom

Part IV: Pittsburg Sleep Quality Index

Instructions:

The following questions relate to your usual sleep habits during the past month *only*. Your answers should indicate the most accurate reply for the *majority* of days and nights in the past month. Please answer all the questions.

1. During the past month, when have you usually gone to bed at night?
usual bed time _____
2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?
number of minutes _____
3. During the past month, when have you usually got up in the morning?
usual getting up time _____
4. During the past month, how many hours of *actual* sleep did you get at night? (This may be different than the number of hours you spend in bed).
hours of sleep per night _____

For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you.....
 - (a) Cannot get to sleep within 30 minutes

Not during the	Less than	Once or	three or more
past month_____	once a week_____	twice a week_____	times a week_____
 - (b) Wake up in the middle of the night or early morning

Not during the	Less than	Once or	Three or more
past month_____	once a week_____	twice a week_____	times a week_____
 - (c) Have to get up to use the bathroom

Not during the	Less than	Once or	three or more
past month_____	once a week_____	twice a week_____	times a week_____

(d) Cannot breathe comfortably

Not during the	Less than	Once or	three or more
past month_____	once a week_____	twice a week_____	times a week_____

(e) Cough or snore loudly

Not during the	Less than	Once or	three or more
past month_____	once a week_____	twice a week_____	times a week_____

(f) Feel too cold

Not during the	Less than	Once or	three or more
past month_____	once a week_____	twice a week_____	times a week_____

(g) Feel too hot

Not during the	Less than	Once or	three or more
past month_____	once a week_____	twice a week_____	times a week_____

(h) Had bad dreams

Not during the	Less than	Once or	three or more
past month_____	once a week_____	twice a week_____	times a week_____

(i) Have pain

Not during the	Less than	Once or	three or more
past month_____	once a week_____	twice a week_____	times a week_____

(j) Other reason(s), please describe _____

How often during the past month have you had trouble sleeping because of this?

Not during the	Less than	Once or	three or more
past month_____	once a week_____	twice a week_____	times a week_____

6. During the past month, how would you rate your sleep quality overall?

Very good_____

Fairly good_____

Fairly bad_____

Very bad_____

7. During the past month, how often have you taken medicine (prescribed or “over the counter”) to help you sleep?

Not during the	Less than	Once or	three or more
past month_____	once a week_____	twice a week_____	times a week_____

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during the	Less than	Once or	three or more
past month_____	once a week_____	twice a week_____	times a week_____

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

No problem at all_____

Only a very slight problem_____

Somewhat of a problem_____

A very big problem_____

10. Do you have a bed partner or roommate?

No bed partner or roommate _____

Partner/roommate in other room _____

Partner in same room, but not same bed_____

Partner in same bed _____

- (a) Loud Snoring

Not during the	Less than	Once or	three or more
past month_____	once a week_____	twice a week_____	times a week_____

- (b) Long pauses between breaths while asleep

Not during the	Less than	Once or	three or more
past month_____	once a week_____	twice a week_____	times a week_____

-APPENDIX II-

The questionnaires in “Thai version”

แบบสอบถามในโครงการวิจัยเรื่อง ผลของการใช้มือถือก่อนนอนต่อคุณภาพการนอนหลับ
ในนิสิตระดับปริญญาศึกษาของจุฬาลงกรณ์มหาวิทยาลัย

โดยแบบสอบถามนี้แบ่งออกเป็น 4 ส่วน ได้แก่

ส่วนที่ 1: ข้อมูลทั่วไป

คำชี้แจง โปรดทำเครื่องหมาย / ลงในช่อง ที่ตรงกับสภาพความเป็นจริงของท่าน และตอบ
คำถามลงในช่องว่าง

1. อายุ: _____
เพศ: ชาย หญิง
2. คุณยังคงสถานภาพนิสิตของจุฬาลงกรณ์มหาวิทยาลัยอยู่ใช่หรือไม่ ใช่ ไม่
3. คุณอยู่ชั้นปีที่เท่าไร 1 2 3 4 5 6
4. คุณเรียนอยู่คณะอะไร โปรดระบุ _____
5. เกรดเฉลี่ยของคุณ _____
6. เงินเดือนที่ท่านได้รับต่อเดือน
 น้อยกว่า 5,000 บาท 5,001 – 10,000 บาท
 10,001-15,000 บาท 15,001บาทหรือสูงกว่า
7. คุณมีสมาร์ตโฟนหรือไม่ มี ไม่มี
8. คุณเป็นผู้ที่บกพร่องทางสายตา หรือการได้ยินหรือไม่
 ใช่ โปรดระบุ _____ ไม่ใช่
9. คุณใช้ยาต้านจิตเวชอยู่หรือไม่ ใช่ ไม่ใช่
10. คุณใช้ยานอนหลับอยู่หรือไม่ ใช่ ไม่ใช่
11. คุณดื่มเครื่องดื่มชูกำลังหรือไม่ (เช่น กระทิงแดง, M150)
 ไม่ดื่ม ดื่ม (โปรดตอบข้อ 12.1&12.2)
- 11.1 คุณมักจะดื่มเครื่องดื่มชูกำลังช่วงเวลาใด
 เช้า บ่าย เย็น กลางคืน
- 11.2 ปริมาณในการดื่มต่อ 1 ครั้ง _____ (1 ขวด = 140ml)

12. คุณดื่มเครื่องดื่มผสมคาเฟอีนหรือไม่ (เช่น โคล่า, กาแฟ, ชา)
- ไม่ดื่ม ดื่ม (โปรดตอบข้อ 13.1 & 13.2 & 13.3)
- 12.1 คุณมักจะดื่มเครื่องดื่มผสมคาเฟอีนช่วงเวลาใด
- เช้า บ่าย เย็น กลางคืน
- 12.2 ปริมาณในการดื่มต่อ 1 ครั้ง _____ (1 แก้ว = 8oz (237ml))
- 12.3 คุณดื่มเครื่องดื่มผสมคาเฟอีนแบบใด โปรดระบุ (สามารถเลือกได้มากกว่า 1 ข้อ)
- กาแฟ _____ น้ำอัดลม _____
- ชา _____
13. คุณสูบบุหรี่หรือไม่
- ไม่สูบ สูบ (โปรดตอบข้อ 14.1 & 14.2)
- 13.1 ภายใน 30 วันที่ผ่านมาคุณสูบบุหรี่บ่อยแค่ไหน
- สูบ 1-2 วัน สูบน้อยกว่า 1 อาทิตย์
- สูบบ่อยแต่ไม่ทุกวัน สูบทุกวัน
- 13.2 ภายใน 7 วันที่ผ่านมา คุณสูบบุหรี่กี่มวนต่อวัน
- 0 1 มวน 2-5 มวน 6-10 มวน
- 11-20 มวน มากกว่า 20 มวน
14. คุณดื่มแอลกอฮอล์หรือไม่
- ไม่ดื่ม ดื่ม (โปรดตอบข้อ 15.1)
- ตามโอกาส บางครั้ง ดื่มน้อย ดื่มทุกวัน
- 14.1 ปริมาณในการดื่มต่อ 1 ครั้ง _____ (1 แก้ว = 30ml)
15. คุณออกกำลังกายหรือไม่
- ไม่ ใช่
- 15.1 คุณใช้เวลาออกกำลังกายเป็นเวลานานเท่าไรต่อ 1 ครั้ง
- น้อยกว่า 30 นาที/ครั้ง มากกว่า 30 นาที/ครั้ง
16. คุณทำงานหรือไม่
- ไม่ได้ทำ ทำ (โปรดตอบข้อ 16.1)
- 16.1 คุณได้ทำงานกะกลางคืนหรือไม่ ถ้าใช่โปรดระบุเวลายางาน
- ไม่ ใช่ _____

ส่วนที่ 2 : แบบสอบถามประเมินความเครียด

คำชี้แจง ขอให้ท่านลองประเมินตนเองจาก อาการหรือความรู้สึกที่เกิดในระยะ 2-4 สัปดาห์ โดยให้คะแนน 0-3 ที่ตรงกับความรู้สึกของท่านโดย

คะแนน 0 หมายถึง แทบไม่มี

คะแนน 1 หมายถึง เป็นบางครั้ง

คะแนน 2 หมายถึง บ่อยครั้ง

คะแนน 3 หมายถึง เป็นประจำ

อาการหรือความรู้สึกที่เกิดในระยะ 2-4 สัปดาห์	คะแนน				For researcher
	0	1	2	3	
1. มีปัญหาการนอน นอนไม่หลับหรือนอนมาก					
2. มีสมาธิน้อยลง					
3. หงุดหงิด/กระวนกระวาย/ว้าวุ่นใจ					
4. รู้สึกเบื่อ เซ็ง					
5. ไม่อยากพบปะผู้คน					

การแปลผล

คะแนน 0-4 เครียดน้อย

คะแนน 5-7 เครียดปานกลาง

คะแนน 8-9 เครียดมาก

คะแนน 10-15 เครียดมากที่สุด

ส่วนที่ 3.1: แบบสอบถามการใช้มือถือ MPPUS

คำชี้แจง ขอให้ท่านประเมินตนเองโดยวงกลมคะแนนที่ตรงกับความรู้สึกของท่านมากที่สุด ระดับคะแนนตั้งแต่ 0-10 คะแนน ซึ่ง 1 หมายถึง ไม่เห็นด้วยอย่างยิ่ง และ 10 หมายถึง เห็นด้วยอย่างยิ่ง

รายการ	ไม่เห็นด้วยอย่างยิ่ง => เห็นด้วย อย่างยิ่ง									
	1	2	3	4	5	6	7	8	9	10
1	ฉันรู้สึกว่ามีเวลาไม่พอในการใช้โทรศัพท์มือถือ									
2	ฉันเคยใช้โทรศัพท์มือถือในการทำให้ตัวเองรู้สึกดีขึ้นเมื่อรู้สึกแย่									
3	ฉันพบว่าตัวเองหมกมุ่นกับการใช้โทรศัพท์มือถือแทนที่จะทำอย่างอื่น และมันทำให้เกิดปัญหา									
4	เพื่อนของฉันทุกคนมีโทรศัพท์มือถือ									
5	ฉันเคยพยายามปิดบังความจริงว่าฉันใช้เวลาเล่นโทรศัพท์มือถือมากเท่าใด									
6	ฉันนอนไม่พอเนื่องจากการใช้โทรศัพท์มือถือ									
7	ค่าโทรศัพท์มือถือในแต่ละเดือน มากกว่ากำลังจ่ายของฉัน									
8	ฉันจะรู้กังวลว่าจะไม่ได้รับสายใครในเวลาที่ไม่มีโทรศัพท์มือถืออยู่ใกล้ตัว									
9	เวลาใช้โทรศัพท์มือถือ ฉันมักจะเสียสมาธิกับสิ่งที่กำลังทำในเวลาเดียวกัน									
10	ในระยะ 12 เดือนที่ผ่านมา ฉันใช้โทรศัพท์มือถือมากขึ้นกว่าเดิม									
11	ในเวลาที่ฉันเหงา ฉันจะใช้โทรศัพท์มือถือโทรหาคนอื่น									
12	ฉันไม่สามารถลดการใช้โทรศัพท์มือถือลงได้									
13	ฉันรู้สึกว่ามันยากที่จะต้องปิดโทรศัพท์มือถือ									
14	ฉันรู้สึกกังวลถ้าฉัน ไม่ได้เช็คข้อความในโทรศัพท์มือถือหรือจะต้องเปิดโทรศัพท์มือถือดูในบางครั้ง									

รายการ	ไม่เห็นด้วยอย่างยิ่ง => เห็นด้วย อย่างยิ่ง									
	1	2	3	4	5	6	7	8	9	10
15	ฉันมักจะฝันเกี่ยวกับโทรศัพท์มือถือ									
16	ครอบครัวและเพื่อนของฉันบ่นเรื่องการใช้โทรศัพท์มือถือของฉัน									
17	หากฉันไม่มีโทรศัพท์มือถือ เพื่อนๆของฉันจะติดต่อกันได้ยาก									
18	การใช้โทรศัพท์มือถือทำให้ประสิทธิภาพในการทำงานของฉันลดน้อยลง									
19	ฉันมีอาการปวดเมื่อย เนื่องจากการใช้โทรศัพท์มือถือ									
20	ฉันพบว่าตัวเองใช้โทรศัพท์มือถือนานกว่าที่ตั้งใจเอาไว้									
21	ฉันใช้โทรศัพท์มือถือเพื่อที่จะหลีกเลี่ยงจากกิจกรรมที่อาจทำให้เกิดความเครียด									
22	ฉันมักจะไปตามนัดสาย เพราะมัวแต่ยุ่งกับโทรศัพท์มือถือ									
23	ฉันจะรู้สึกหงุดหงิดถ้าฉันต้องปิดโทรศัพท์มือถือเวลาประชุม ทานอาหารเย็น หรือในโรงพยาบาล									
24	มีคนบอกฉันว่าฉันใช้เวลาไปกับโทรศัพท์มือถือมากเกินไป									
25	หลายครั้งฉันมีปัญหาเพราะว่าโทรศัพท์มือถือดังในเวลาที่ไม่สมควร เช่นในห้องประชุม ห้องเรียน หรือ โรงพยาบาล									
26	เพื่อนของฉันไม่ชอบเวลาที่ฉันปิดโทรศัพท์มือถือ									
27	ฉันรู้สึกแ่เวลาที่ไม่มีโทรศัพท์มือถือ									

ส่วนที่ 3.2 แบบสอบถามพฤติกรรมการใช้สมาร์ทโฟน

คำชี้แจง โปรดทำเครื่องหมาย / ลงในช่อง ที่ตรงกับสภาพเป็นจริงของท่าน และตอบคำถามลงในช่องว่าง

1. คุณใช้สมาร์ทโฟนยี่ห้ออะไร โปรดระบุรุ่นที่ใช้ (เช่น ยี่ห้อ Samsung รุ่น Note 4)

- | | |
|--|---------------------------------------|
| <input type="checkbox"/> Samsung _____ | <input type="checkbox"/> Apple _____ |
| <input type="checkbox"/> Oppo _____ | <input type="checkbox"/> Huawei _____ |
| <input type="checkbox"/> LG _____ | <input type="checkbox"/> Sony _____ |
| <input type="checkbox"/> Xiaomi _____ | <input type="checkbox"/> Other _____ |

2. คุณใช้สมาร์ทโฟนเครื่องนี้มาเป็นเวลานานเท่าใด

- | | | |
|--|-----------------------------------|---------------------------------------|
| <input type="checkbox"/> น้อยกว่า 1 ปี | <input type="checkbox"/> 1 – 2 ปี | <input type="checkbox"/> 2 – 3 ปี |
| <input type="checkbox"/> 3 – 4 ปี | <input type="checkbox"/> 4 – 5 ปี | <input type="checkbox"/> มากกว่า 5 ปี |

3. คุณมีแพ็คเกจอินเทอร์เน็ตบนสมาร์ทโฟนของคุณหรือไม่

- ไม่มี มี

4. คุณคิดว่าภายใน 1 วัน คุณใช้สมาร์ทโฟนเป็นเวลาเฉลี่ยนานเท่าใด

_____ นาที หรือ ชั่วโมง

5. เหตุผลที่คุณใช้สมาร์ทโฟนคืออะไร (เลือกคำตอบได้มากกว่า 1 ข้อ)

- | | |
|---|--|
| <input type="checkbox"/> เช็คอีเมลล์ | <input type="checkbox"/> ติดตามข่าวสารบนอินเทอร์เน็ต |
| <input type="checkbox"/> บันทึกบรรยายการเรียน | <input type="checkbox"/> ฟังเพลง |
| <input type="checkbox"/> เช็คโซเชียลมีเดีย | <input type="checkbox"/> จัดตารางนัดหมาย |
| <input type="checkbox"/> เล่นเกม | <input type="checkbox"/> ไว้โทรสื่อสารกับครอบครัว และเพื่อนๆ |
| <input type="checkbox"/> ค่อยรับข่าวสาร | <input type="checkbox"/> ไว้ส่งข้อความหาครอบครัวและเพื่อนๆ |
| <input type="checkbox"/> เล่นฆ่าเวลา | <input type="checkbox"/> อื่นๆ โปรดระบุ _____ |

6. คุณมักจะใช้สมาร์ทโฟนของคุณในช่วงเวลาใด (เลือกคำตอบได้มากกว่า 1 ข้อ)

- | | |
|---|---|
| <input type="checkbox"/> บนโต๊ะอาหาร | <input type="checkbox"/> เวลาเบื่อกๆ |
| <input type="checkbox"/> ระหว่างคาบเรียน | <input type="checkbox"/> เวลาออกไปเที่ยวกับเพื่อน |
| <input type="checkbox"/> ในห้องเรียน | <input type="checkbox"/> เวลาสนทนากับผู้คน |
| <input type="checkbox"/> ในห้องน้ำ | <input type="checkbox"/> เวลาต้องรอใคร หรือต้องรออะไรสักอย่าง |
| <input type="checkbox"/> บนรถขนส่งสาธารณะ | <input type="checkbox"/> ขณะเดิน |
| <input type="checkbox"/> ขณะขับรถ | <input type="checkbox"/> ขณะดูโทรทัศน์ |
| <input type="checkbox"/> เวลาอยู่คนเดียว | <input type="checkbox"/> อื่นๆ โปรดระบุ _____ |

7. คุณใช้สมาร์ตโฟนก่อนนอนหรือไม่ ถ้าใช่โปรดระบุว่าใช้เป็นเวลานานเท่าใด
 ใช่ _____ ไม่ใช่
8. คุณใช้สมาร์ตโฟนก่อนนอน “บนเตียงนอน” หรือไม่ ถ้าใช่โปรดระบุว่าใช้เป็นเวลานานเท่าใด
 ใช่ _____ ไม่ใช่
9. คุณเปิดโหมดใดของสมาร์ตโฟนเวลานอนหลับ
 ปกติ สั่น ปิดเสียง (Silent) โหมดโหมด (ห้ามรบกวน)
10. เวลาที่คุณใช้สมาร์ตโฟน คุณได้มีการปรับแสงหน้าจอให้มืดลงหรือไม่
 ปรับ ไม่ได้ปรับ
11. เวลานอนหลับ คุณจะเก็บสมาร์ตโฟนของคุณไว้ที่ใด
 ใต้หมอน ข้างๆเตียง
 ภายในห้องนอนแต่ห่างจากตัวประมาณ 5 เมตร
 เอาไว้นอกห้องนอน

ส่วนที่ 4 แบบประเมินคุณภาพการนอนหลับของพิตส์เบิร์กฉบับภาษาไทย

คำชี้แจง

คำถามต่อไปนี้เกี่ยวข้องกับพฤติกรรมการนอนของท่านในช่วงระยะเวลา 1 เดือนที่ผ่านมา คำตอบของท่านควรบ่งบอกสิ่งที่ใกล้เคียงกับความเป็นจริงมากที่สุดและเป็นสิ่งที่เกิดขึ้นกับตัวท่านเป็นส่วนใหญ่ ทั้งในเวลากลางวันและกลางคืน

โปรดตอบทุกคำถาม

- ในช่วงระยะเวลา 1 เดือนที่ผ่านมา ส่วนใหญ่ท่านมักเข้านอนเวลากี่โมง
เวลาเข้านอน _____
- ในช่วงระยะเวลา 1 เดือนที่ผ่านมา ส่วนใหญ่ท่านต้องใช้เวลาานานเท่าไร (นาที) จึงจะหลับ
จำนวนนาที _____
- ในช่วงระยะเวลา 1 เดือนที่ผ่านมา ส่วนใหญ่ท่านตื่นนอนตอนเช้ากี่โมง
เวลาที่ตื่นนอนตอนเช้า _____
- ในช่วงระยะเวลา 1 เดือนที่ผ่านมา ท่านนอนหลับได้จริงโดยเฉลี่ยเป็นเวลากี่ชั่วโมงต่อคืน (คำตอบอาจแตกต่างจากระยะเวลารวมทั้งหมดตั้งแต่เริ่มเข้านอนจนถึงตื่นนอน)
จำนวนชั่วโมงที่หลับได้จริงต่อคืน _____ ชั่วโมง

โปรดตอบคำถามข้างล่างต่อไปนี้ทุกข้อ โดยแต่ละข้อให้เลือกตอบเพียง 1 คำตอบ

5. ในช่วงระยะเวลา 1 เดือนที่ผ่านมา ท่านมีปัญหาการนอนหลับเนื่องจากเหตุผลต่อไปนี้บ่อยเพียงใด

5.1 นอนไม่หลับหลังจากเข้านอนไปแล้วนานกว่า 30 นาที

_____ ไม่เคยเลยในช่วงระยะเวลา 1 เดือนที่ผ่านมา

_____ น้อยกว่า 1 ครั้งต่อสัปดาห์

_____ 1 หรือ 2 ครั้งต่อสัปดาห์

_____ 3 ครั้งต่อสัปดาห์ขึ้นไป

5.2 รู้สึกตัวตื่นขึ้นระหว่างการนอนหลับกลางดึกหรือตื่นเช้ากว่าเวลาที่ตั้งใจไว้

_____ ไม่เคยเลยในช่วงระยะเวลา 1 เดือนที่ผ่านมา

_____ น้อยกว่า 1 ครั้งต่อสัปดาห์

_____ 1 หรือ 2 ครั้งต่อสัปดาห์

_____ 3 ครั้งต่อสัปดาห์ขึ้นไป

5.3 ตื่นเพื่อไปเข้าห้องน้ำ

_____ ไม่เคยเลยในช่วงระยะเวลา 1 เดือนที่ผ่านมา

_____ น้อยกว่า 1 ครั้งต่อสัปดาห์

_____ 1 หรือ 2 ครั้งต่อสัปดาห์

_____ 3 ครั้งต่อสัปดาห์ขึ้นไป

5.4 หายใจไม่สะดวก

_____ ไม่เคยเลยในช่วงระยะเวลา 1 เดือนที่ผ่านมา

_____ น้อยกว่า 1 ครั้งต่อสัปดาห์

_____ 1 หรือ 2 ครั้งต่อสัปดาห์

_____ 3 ครั้งต่อสัปดาห์ขึ้นไป

5.5 ไอ หรือ กรน เสียงดัง

_____ ไม่เคยเลยในช่วงระยะเวลา 1 เดือนที่ผ่านมา

_____ น้อยกว่า 1 ครั้งต่อสัปดาห์

_____ 1 หรือ 2 ครั้งต่อสัปดาห์

_____ 3 ครั้งต่อสัปดาห์ขึ้นไป

5.6 รู้สึกหนาวเกินไป

_____ ไม่เคยเลยในช่วงระยะเวลา 1 เดือนที่ผ่านมา

_____ น้อยกว่า 1 ครั้งต่อสัปดาห์

_____ 1 หรือ 2 ครั้งต่อสัปดาห์

_____ 3 ครั้งต่อสัปดาห์ขึ้นไป

5.7 รู้สึกร้อนเกินไป

_____ ไม่เคยเลยในช่วงระยะเวลา 1 เดือนที่ผ่านมา

_____ น้อยกว่า 1 ครั้งต่อสัปดาห์

_____ 1 หรือ 2 ครั้งต่อสัปดาห์

_____ 3 ครั้งต่อสัปดาห์ขึ้นไป

5.8 ผื่นร้าย

_____ ไม่เคยเลยในช่วงระยะเวลา 1 เดือนที่ผ่านมา

_____ น้อยกว่า 1 ครั้งต่อสัปดาห์

_____ 1 หรือ 2 ครั้งต่อสัปดาห์

_____ 3 ครั้งต่อสัปดาห์ขึ้นไป

5.9 รู้สึกปวด

_____ ไม่เคยเลยในช่วงระยะเวลา 1 เดือนที่ผ่านมา

_____ น้อยกว่า 1 ครั้งต่อสัปดาห์

_____ 1 หรือ 2 ครั้งต่อสัปดาห์

_____ 3 ครั้งต่อสัปดาห์ขึ้นไป

5.10 เหตุผลอื่น ถ้ามีกรณาระบุ _____

_____ ไม่เคยเลยในช่วงระยะเวลา 1 เดือนที่ผ่านมา

_____ น้อยกว่า 1 ครั้งต่อสัปดาห์

_____ 1 หรือ 2 ครั้งต่อสัปดาห์

_____ 3 ครั้งต่อสัปดาห์ขึ้นไป

6. ในช่วงระยะเวลา 1 เดือนที่ผ่านมา ท่านคิดว่าคุณภาพการนอนหลับโดยรวมของท่านเป็นอย่างไร

_____ ดีมาก

_____ ค่อนข้างดี

_____ ค่อนข้างแย่

_____ แย่มาก

7. ในช่วงระยะเวลา 1 เดือนที่ผ่านมา ท่านใช้ยาเพื่อช่วยในการนอนหลับบ่อยเพียงใด (ไม่ว่าจะตามใบสั่งแพทย์หรือหาซื้อเอง)

- _____ ไม่เคยเลยในช่วงระยะเวลา 1 เดือนที่ผ่านมา
 _____ น้อยกว่า 1 ครั้งต่อสัปดาห์
 _____ 1 หรือ 2 ครั้งต่อสัปดาห์
 _____ 3 ครั้งต่อสัปดาห์ขึ้นไป

8. ในช่วงระยะเวลา 1 เดือนที่ผ่านมา ท่านมีปัญหาทางวงนอนหรือเพลอหลับขณะขับจักรยานพาหนะขณะรับประทานอาหารหรือเข้าร่วมกิจกรรมสังคมต่างๆ บ่อยเพียงใด

- _____ ไม่เคยเลยในช่วงระยะเวลา 1 เดือนที่ผ่านมา
 _____ น้อยกว่า 1 ครั้งต่อสัปดาห์
 _____ 1 หรือ 2 ครั้งต่อสัปดาห์
 _____ 3 ครั้งต่อสัปดาห์ขึ้นไป

9. ในช่วงระยะเวลา 1 เดือนที่ผ่านมา ท่านมีปัญหาเกี่ยวกับการกระตือรือร้นในการทำงานให้สำเร็จมากน้อยเพียงใด

- _____ ไม่มีปัญหาเลยแม้แต่น้อย
 _____ มีปัญหาเพียงเล็กน้อย
 _____ ค่อนข้างที่จะเป็นปัญหา
 _____ เป็นปัญหาอย่างมาก

10. ท่านมีเพื่อนร่วมห้องหรือผู้อาศัยอยู่ในบ้านหลังเดียวกันหรือไม่

- _____ ไม่มีเลย
 _____ มี แต่นอนคนละห้อง
 _____ มี และนอนในห้องเดียวกัน แต่คนละเตียง
 _____ มี และนอนเตียงเดียวกัน

ข้อ 10.1 และ 10.2 ตอบได้เฉพาะที่มีเพื่อนร่วมห้องเดียวกันบอก

10.1 กรนเสียงดัง

- _____ ไม่เคยเลยในช่วงระยะเวลา 1 เดือนที่ผ่านมา
 _____ น้อยกว่า 1 ครั้งต่อสัปดาห์
 _____ 1 หรือ 2 ครั้งต่อสัปดาห์
 _____ 3 ครั้งต่อสัปดาห์ขึ้นไป

- 10.2 มีช่วงหยุดหายใจเป็นระยะเวลานานขณะหลับ
_____ ไม่เคยเลยในช่วงระยะเวลา 1 เดือนที่ผ่านมา
_____ น้อยกว่า 1 ครั้งต่อสัปดาห์
_____ 1 หรือ 2 ครั้งต่อสัปดาห์
_____ 3 ครั้งต่อสัปดาห์ขึ้นไป



VITA

Name: MISS MOOKRAWEE BUNYALUG

Date of Birth: 9 April 1992

Address: 43/450 Soi Akekachai 69 Samaedum Bangkunthein,

Bangkok, Thailand

Zip code 10150

E-mail Address: mbuny@outlook.com

Phone Number: 081-567-2327

Education Background

- Year 2008-2013

Degree: Bachelor of Biological Science

Concentration: Biomedical Science

Mahidol University International College



จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY