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Health Effects of Using Mobile Communication Devices: A case Study in Senior Citizens, Thailand

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ABSTRACT

The trend of using mobile devices amongst the elderly population is continuously increasing. Therefore, the aims of this study were to study the usage status of communication devices and applications amongst the elderly population and to determine factors associated with health effects related to mobile communication device usage among the elderly people in Thailand. A descriptive cross-sectional descriptive study was conducted in four main regions of Thailand. Four hundred and forty-eight elderly people who regularly use smartphone or tablet computers participated in the study. Face-to-face interviews were carried out and data was recorded in a prepared questionnaire. Participants whose age averaged 65.11 ±5.26 years old participated in this study. The average time spent on using devices was 2.70 hours/day. The positive health effects of using smartphone or tablet devices were reported to be as follows: an increased sense of self-value and confidence (90.6%) and an increased feeling of intimacy towards others (82.6%). The negative health effects were dim eyes (52.7%), shoulder or neck pain or muscle soreness (52.5%), an increase in social networking activity with strangers (39.5%), and changes in interaction with those around them (32.6%). Moreover, the results showed that the time spent on mobile

phones, the type of application used, the time of usage, and rest breaks between using devices were significantly associated with negative health effects ($p<0.05$). The findings show that Thai elderly people have been confronted by several health effects regarding mobile communication device and application usage. Consequently, practical intervention to reduce those negative health effects should be considered by providing knowledge about using mobile communication devices in proper ways.

Keywords: Health effects; Mobile communication devices; Senior citizens

1. Introduction

The current trend of using mobile communication devices among the general Thai population is increasing. Moreover, one user may have more than one device, such as smartphones, tablet computers, a desktop computer, as well as a portable computer. The average length of usage was recorded to be 7.2 hours per day (Electronic Transactions Development Agency, 2014). Smartphones are cellular telephones with built-in applications and internet access (Northern Lights College's Technology, 2011). Therefore, the use of smartphones has become an important public health issue, as there have been reported effects to physical, mental health and social health. The effects of the overuse of mobile phone devices amongst the general population has been studied and found to have several health symptoms such as headaches, sleep disturbances, musculoskeletal pain, and mental symptoms (Khan, 2008; Thomée *et al.,* 2011; Shariful Islam SM, 2014).

Concurrently, the number of elderly people in Thailand is also constantly increasing each year. From the total population in 2016, the number of elderly people in Thailand accounting for 9,934,309 (15.07 %) (Department of Older Persons, 2017). 5,816,966 Thai elderly people using mobile phones, with 639,911 or 6.4% specifically using smartphones in. Thailand (National Statistical Office, 2015). Some elderly users have used smartphones or tablet computers as much as other age groups (Electronic Transactions Development Agency, 2014). Nonetheless, there is a lack of definitive research in Thailand and worldwide on the health effects of using mobile communication devices amongst the elderly population. This study aims to study the usage status of mobile communication devices and applications amongst the elderly population in Thailand and to investigate the health effects, both positive and negative, regarding mobile communication devices and applications usage amongst this segment of the Thai population.

2. Materials and Methods

This study was a descriptive cross-sectional descriptive study. It was conducted in four main regions of Thailand with 448 elderly participants. The selection criteria were as follows: participants had to be elderly people, male or female, aged over 60 years who have a smartphone or a tablet computers and have been using either or both for a minimum of 6 months. People who have communication problems (deafness) were excluded. Afterwards, a snowball sampling technique was applied. It

starts with an interview of the first elderly of each region at the government such as provincial hospitals or universities. Data collection was conducted at provincial hospitals, district hospitals, and provincial public health offices.

A face to face interview by a trained interviewer was conducted with the participants. The questionnaire consisted of four parts including demographic characteristics, usage of mobile communication devices and applications, magnitude of health effects lasting three months during and after usage, and also, knowledge, attitudes, and practices regarding health effects of smartphones or tablet computer use. The validity of the questionnaire was evaluated by three experts in a related field and the validity and reliability were acceptable (IOC=0.85, Cronbach's alpha=0.75). The study protocol was approved by the Ethics Review Committee for Research Involving Human Research Subjects, Health Sciences Group I, Chulalongkorn University (RECCU No. 119.1/58).

Data was entered and analyzed with licensed SPSS version 17.0. The general characteristics and study variables were described by frequency, percentage, and mean. Logistic regression was applied to obtain factors associated with mobile communications devices and application usage and health effects.

3. Results and Discussion

3.1 The general characteristic of participants

The number of the participants in this study was 448 including 255 (56.9%) females and 193 (43.1%) males. The average age was 65.1 ± 5.3 years old. About 183 (40%) of them graduated with a Bachelor degree or higher and 133 (29.7%) completed primary school. Most of them (38.2%) had a poor level of knowledge regarding the health effects of smartphone or tablet computer use. However, 49.3% of them had attitudes regarding health effects of smartphone or tablet computer use score in moderate level and 58.3% of them had practices regarding health effects of smartphone or tablet computer use score in good level.

3.2 The use of mobile communication devices and applications

Three hundred and seventy-seven (84.2%) survey participants had used devices for less than a year. Particularly, 410 participants used smartphones (91.5%) and 76 (17.0%) of them used tablet computers. The average (±SD) time spent on devices was 2.7 (±1.5) hours/day. Remarkably, nine of them (2.0%) used mobile communication devices and applications for more than 10 hours/day. Of 194 (43.3%) participants used smartphones or tablet computers for the purpose of making a regular phone call as equally as for application use. Most popular applications used were reported to be for social networking 388 (86.6%). The elderly commonly used their device in their living room 350 people (78.1%) and bedroom 275 people (61.4%). About half of them (52.7%) always rested their eyes before continuing to use smartphones and tablet computers. However, 79 (17.6%) of them never rested their eyes during use (Table 1).

Table 1. The use of mobile communication devices (n=448).

The use of mobile communication devices	Number (n=448)	Percentage (%)
Period of time using devices (Years)		
<1	377	84.2
1-5	67	15.0
>5	4	0.8
Time consuming of device using (hours/day)		
0-5	408	91.0
6-10	31	6.9
11-15	5	1.1
>15	4	0.9
Purposes of device using		
Calling and application	194	43.3
Calling	181	40.4
Applications	73	16.3
Types of applications		
Social networking	388	86.6
Photo and video	316	70.5
Games	90	20.1
Music	73	16.3
Productivity	42	9.4
Places of using devices		
In the living room	350	78.1
In the bedroom	275	61.4
In the work place	125	27.9
In the backyard	99	22.1
In the restaurant	68	15.2
In the bathroom	38	8.5
Riding the bus, train, or in car as passenger (commute)	34	7.6
While driving	10	2.2
Experience of resting eyes before continuing		
Always rest	236	52.7
Sometimes	133	29.7
Never	79	17.6

3.3 Frequency of health effects from mobile communication devices and application usage

The participants reported physical health effects from smartphones and tablet computer usage over a three-month period. The top five symptoms were conjunctivitis or dim eyes 236 people (52.7%), shoulder or neck pain or sore muscle 235 people (52.5%), eye pain 228 people (50.9%), wrist pain 144 people (32.1%), dry eyes, red eyes, and eye irritation 135 people (30.1%).

The top five mental health effects from smartphones and tablet computers usage including an increased sense of not engaging with those around them 201 people (44.9%), moodiness 148 people (33.0%), lack of concentration 133 people (29.7%), anxiety, strain, tension or worry 127 people (28.3%), and feeling lonely 115 people (25.7%).

The top five negative social effects included strangers attempting to connect with participants through various applications 177 people (39.5%). 146 (32.6%) of them felt that less people interacted with them i.e. less social communication with each other and fewer activities together. Of 134 people (29.9%) experienced loss of concentration when working with others or alone. They sometimes had communication problems with others 123 people (27.5%) such as mistyping, that resulted in misunderstandings. 117 people (26.1%) reported that using devices resulted in lost or stolen smartphones or tablet computers (Figure 1).

3.4 Association between mobile communication devices and application usages and health effects

Twenty-eight factors were analyzed by a logistic regression analysis, and ten of these were found to have a statistically significant association with physical health effects, three of these were found to have a statistically significant association with mental health effects, and four of these were found to have a statistically significant association with social health effects in the final model ($p<0.05$).

Participants who used social networking applications had an increase in physical health problems (OR=2.10; 95%CI=1.15-3.84). Those who used photo and video applications displayed statistically increased (2.54 times) physical health problems compared to those who did not use them (OR=2.54; 95%CI=1.58-4.07). Participants who used game applications statistically increased in physical health problems (3.67 times more) compared to those who did not use such applications (OR=3.67; 95%CI=1.70-7.96). Participants who used work applications statistically decreased 0.45 times in physical health effects compared to those did not use them (OR=0.45; 95%CI=0.22-0.90). Differences in the time of mobile communication device usage were associated with physical health problems; participants who used their device late in the morning experienced a statistical decrease (0.59 times) in physical health issues compared to those who did not (OR=0.59; 95%CI=0.37-0.94), participants who used their devices at noon were statistically decreased (0.59 times) in physical health problems compared to those who did not use them at that time (OR=0.59; 95%CI=0.37-0.96). Participants who used their device more frequently in the afternoon showed a statistically decrease (0.48 times) in physical health effects compared to those who did not use them (OR=0.48;

95%CI=0.30-0.76), while participants who used their device in the evening were statistically decreased 0.53 times in physical health effects compared to those who did not use them (OR=0.53; 95%CI=0.33-0.84). Participants who have always rested their eyes before continuing experienced a statistical reduction (0.33 times) in physical health effects compared to those who did rest their eyes (OR=0.33; 95%CI=0.19-0.57) but those who never rested their eyes before continuing were statistically increased (1.71 times) in physical health problems compared to those who did rest them (OR=1.71; 95% CI=1.02-3.00). Participants who used social networking applications had statistically increased (2.24 times) mental health issues compared to those who did not use such applications (OR=2.24; 95%CI=1.15-4.38). Also, those who used photo and video applications were statistically increased (1.84 times) in mental health effects compared to those who did not use these applications (OR=1.84; 95%CI=1.06-3.19).Moreover, participants who used their devices at noon were statistically decreased 0.45 times in mental health effects compared to those who did not use them at this time (OR=0.45;95%-CI=0.26-0.79). Participants who used social networking applications were statistically increased (2.98 times) in social health effects compared to those who did not use them (OR=2.98; 95%CI=1.70-5.24). Participants who used their devices while riding the bus, train, or as a passenger in a car displayed statistically increased (5.55 times) social health issues compared to those who did not use their devise during travel as a passenger (OR=5.55; 95%CI=1.66-18.55). Participants who used their devices at noon were statistically decreased (0.42 times) in social health effects compared to that did not use them (OR=0.42; 95%CI=0.27-0.64). Also those who used their device in the evening were statistically decreased (0.44 times) in social health effects compared to those who did not use them (OR=0.44; 95%CI=0.29-0.67).

The average length of smartphone or tablet computer usage was 2.70 hours/day in this study while a survey of internet user behavior in Thailand found that the average length of time spent on the internet was 7.2 hours per day in 2014 (Electronic Transactions Development Agency, 2014). Places of using mobile communications devices and applications were in the bedroom, and in the living room 78.1% in the current study, which is similar to a previous study that showed that smartphones were mainly used at the mall and their home (Arwa *et al.,* 2012). Suggested ways to reduce the physical symptoms of mobile phone use is to limit usage to 20-minute sessions. Additionally, taking a short device-free break in between these sessions by taking 20 seconds to look 20 feet ahead could help (Halpenny *et al.,* 2012). Moreover, adjusting the brightness of devices and increasing of text size on the screen was advised for prevention eye symptoms (Justin, 2012).

The participants in the current study reported physical, mental, and social health problems due to mobile communication devices use that may relate with their level of knowledge, attitudes, and practices regarding health effects of device use. There were reported eye symptoms which were similar to symptoms of digital eye strain in previous studies that included eye redness or irritation, dry eyes, and blurred vision (Justin, 2012), nervous system symptoms, musculoskeletal symptoms, and others that were similar to other studies. Previous studies

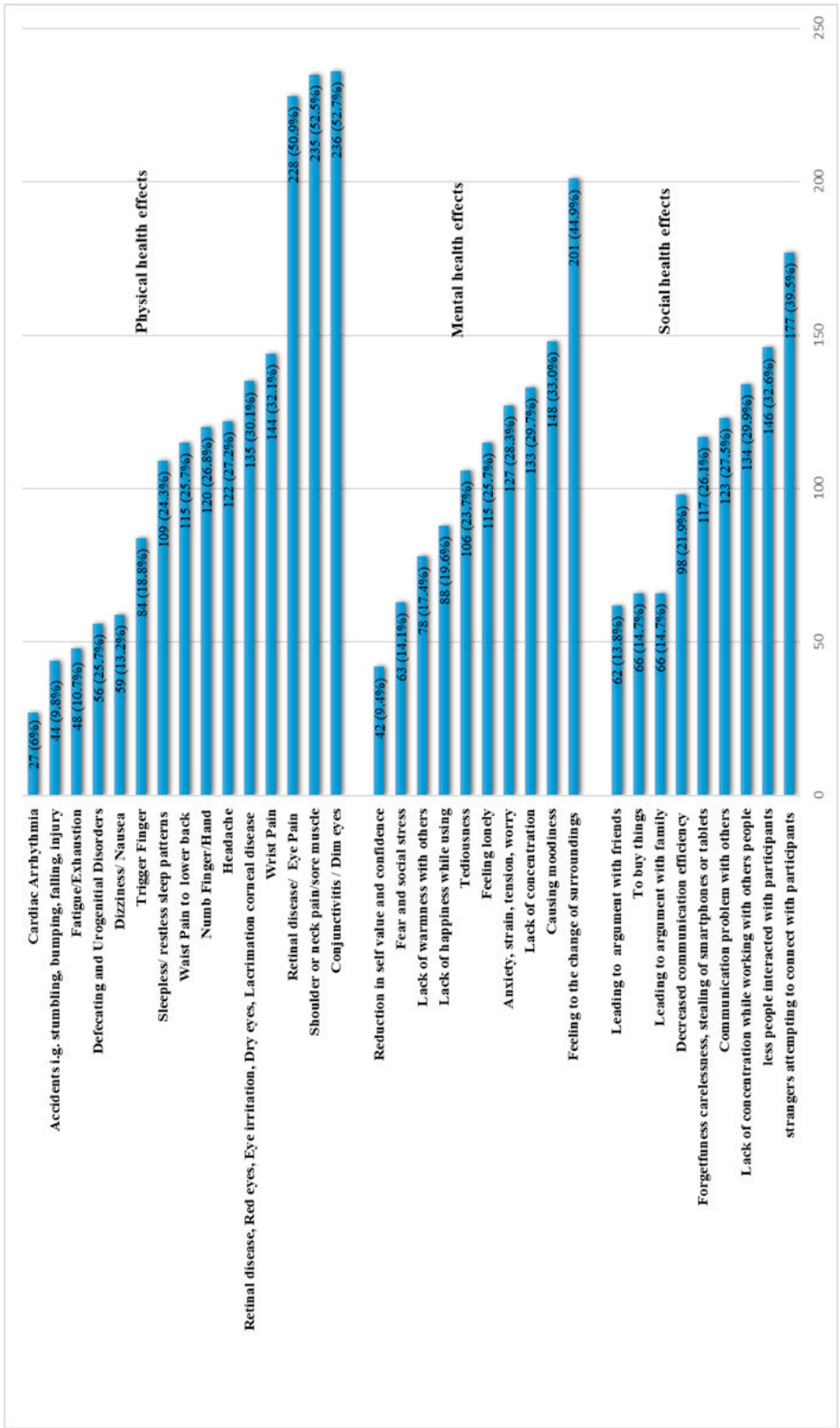

Figure 1. Frequency of health effects from mobile communication devices usages in senior citizens, Thailand (n=448)

found a relationship between smartphone use and subjective musculoskeletal symptoms in Korea where 42.1% of participants reported that they had experienced of eyes pain, neck pain (55.8%), shoulder pain (54.8%), and wrists pain (27.1%) (Kim, 2015). To minimize the bend in neck and to maintain optimal spinal posture, it was advised that users should maintain a device at chest, chin or eye level and avoid using the mobile device to one side of the body with the neck rotated or cradling the device between the ear and shoulder (Alwin *et al.,* 2016). To prevent and lessen some common conditions that affect the cornea such as eye pain, sensitivity to light, blurry vision, eye redness, headache, nausea, and fatigue (National Eye Institute, 2018) should adjusting the brightness of a device and increasing text size on the screen to better watch the content was advised (Justin, 2012). In a study in Saudi Arabia, 22.5% of the students who used smartphones had chronic headaches (Arwa *et al.,* 2012). Also in Maier et al. the study reported participants had headache (Maier et al., 2000). Moreover, in a study among 220 adults in Bangladesh, 47% of them had headache or dizziness (Sheikh and Shariful, 2014). Also, in 2005 a survey showed that mobile phones could cause headache and extreme irritation (Balikci et al., 2005) while Khan (2008) reported that their participants had headache (16.08%) and fatigue (24.48%). To reduce those effects, it was advised that users should try to avoid using devices when the signal is weak and also alternate between talking and communicating via text messaging. Additionally, charging phones in a bedroom when sleeping should be avoided (Khan, 2008).

The main mental health and social effects from smartphone and tablet computer usage found in the present study similar to previous studies that reported that 61.7% of participants had sleep disturbances (prolonged sleep and insomnia), 22.5% had permanent concentration problems and 36.7% sometimes had impaired concentration (Arwa *et al.,* 2012). Maier et al. (2000) reported that sleep disturbance, lack of concentration and impairment of short-term memory were related to use of mobile phones (Justin, 2012) and another survey showed that mobile phones could increase carelessness, forgetfulness, and poorer reflexes (Balikci *et al.,* 2005). Similarly, a study of the health effects of 4156 in Sweden showed that as a result of mobile phone usage, stress, sleep disturbance, and symptoms of depression were reported. Sleep and recovery are important. When needing to focus or rest such as at nighttime, individuals should turn off devices. In addition, one should not expect other people to be available to answer calls for non-urgent matters or to chat. The accessibility offered by mobile phones was perceived to be stressful and was a clear risk factor for mental health symptoms. Moreover, it should serve as a warning signal for taking measures to preclude constant accessibility and overuse (Thomée *et al.,* 2011).

The present study found statistically significant associations between physical health effects and the use of applications. Previous studies described how most mobile communication devices required users to hold their arms out in front of them to read. Thumb postures while text messaging could lead to pain in the neck and shoulders as well as fatigue (Maier *et al.,* 2000) and showed that thumb disorders have been associated with the use of hand held devices (Jonsson *et al.,* 2007). Moreover, the current study, similar to a previous study on the time spent in gaming on a mobile device was signifi-

cantly associated with hand pain. Smartphone users usually flex their neck downwards to stare at the lowered object and maintain the head in a forward position for long periods of time which may cause musculoskeletal disorders (Szeto *et al.,* 2002; Moore, 2004; Kang, 2012). Moreover, the current study showed that using such devices in the late morning, noon, afternoon, and evening resulted in a decrease in physical health effects. These are usually times when users should be physically active. Seated postures are significantly associated with symptoms during tablet computer use (Kim, 2015). In this study, participants who always rested their eyes before continuing experienced reduced health problems while participants who never rested their eyes before continuing experienced an increase in physical health problems. Previous studies have shown an association between time spent using a mobile device during the day, and neck and shoulder pain (Berolo *et al.,* 2011). Resulting from continuous use of smartphones, users may experience problems with their eyes caused by faster evaporation of the tear film (Korb *et al.,* 1994; Nakamori *et al.,* 1997; Freudenthaler *et al.,* 2003; Fenga *et al.,* 2014).

The current study showed that the use of social networking applications and photo and video applications resulted in an increase in mental health issues. Previous studies found a significant negative relationship between mobile phone addiction and mental health and the highest correlation was related to mental health and habitual behaviors (Zamani *et al.,* 2011; Zamani *et al.,* 2012; Zamani *et al.,* 2013). Results from a previous study indicate that there is a relationship between addiction to mobile phone and mental health in dimensions of behavioral problems, anxiety, depression, and psychosis (Koo and Park, 2010).

This study showed that overuse of social networking applications resulted in an increase in social health problems. Participants who use devices while riding the bus, train, or in a car as passengers experienced an increase in social health effects. Using devices at noon and in the evening showed a decrease in social health issues. However, overuse of smartphones resulted in a decrease in the amount of time spent in developing face to face social relationships and in engaging in social activity. These findings complement those of a previous study that showed how participants who used smartphones excessively had more depressive symptoms and had difficulty in expressing their emotions (Ha, 2008).

4. Conclusions

Worldwide, most mobile phone users cannot leave their smartphone devices alone and habitually check their phones through the day, displaying addictive tendencies. The findings in this study showed that the elderly people in Thailand have increased the length of time they spend on mobile phone devices resulting in them being at risk of several serious health conditions. The questionnaire in this study can be used as a practical intervention to educate elderly people across Thailand on the negative effects of excessive use of mobile phone devices. Raising awareness of mobile communication devices usage may lead to a decline in serious health problems among the elderly in the future.

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