

The Relationship between Smartphone Use and Neck Pain Among Construction Workers in Malaysia

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ABSTRACT

Introduction: Smartphone addiction has been discovered impacting human body, especially in neck area among construction workers.

Objective(s): The present study systematically investigated the association between smartphone addiction and neck pain among general construction workers in Malaysia.

Methodology: A cross-sectional study was conducted among the construction workers (n=136) in Selangor state. The questionnaire consists of 3 parts; sociodemographic data, Smartphone Addiction Scale (SAS) and Neck Disability Index (NDI).

Results: Majority of the respondents participated in this study were between ages 28-37 years old, male, and single. Respondents used their smartphones for 5-6 hours daily and mostly used to watch video, social networking (Facebook, Instagram, Twitter, WhatsApp), gaming, make phone calls and listen to music. Pearson correlation analysis showed that there was a strong and positive significant correlation between smartphone addiction scale among construction workers and neck disability index ($r = 0.802$, $p < 0.01$).

Conclusion: In summary, construction workers may suffer from neck pain if they do not manage their smartphone use wisely during working hours.

Keywords: musculoskeletal disorder, work-related health issue, construction worker, smartphone addiction

INTRODUCTION

Smartphone is a digital device that rapidly used in the world. The number of smartphone mobile network subscriptions worldwide reached almost 6.4 billion in 2022 and is forecasted to exceed 7.7 billion by 2028 (Statista Research Department, 2023). According to a survey conducted by the Malaysian Communications and Multimedia Commission MCMC, smartphones are the most popular form of communication technology in Malaysia. A smartphone is a mobile phone that can run software, for example operating system (OS) created by third parties and perform Internet-based services. It also functions as a device with an operating system that can download and run software (Malaysian Communications and Multimedia Commission, 2018). According to Parasuraman et al. (2017) the number of people using smartphones is constantly increasing every year, and the percentage of internet usage also increased globally up to 7-fold from 6.5% to 43% between 2000 and 2015. In

the past, mobile phones were primarily used for voice calls and text messaging, with limited functionality and basic features. Today, these devices have evolved into multipurpose smartphones that facilitate easy access to social media and various apps, driven by their growing popularity as essential communication tools.

In the modern era, smartphones and the internet have become integral parts of daily life, revolutionizing how people communicate, access information, and entertain themselves. In addition to the advantages that the Internet provides, smartphones provide qualitatively distinct services. While older people use their smartphones for games and video calls to their distant children, younger people use them to watch videos, express themselves, connect with friends, and look up information (Cha & Seo, 2018). According to a study by Al Abdulwahab et al. (2017), those who use smartphones may experience an unnecessary anterior curvature in the lower vertebrae

since they must stare down sharply at their device. To make sure kids can see the phone screen, they must also tilt their heads forward. On the other hand, to maintain balance during this repetitive movement, the upper thoracic vertebrae will develop a disproportionate posterior curve, putting strain on the cervical vertebrae and neck muscles. This phenomenon, marked by uncontrollable and widespread usage, shares similarities with other technological and behavioral addictions, such as internet and gaming addiction (Panova & Carbonell, 2018; Sohn et al., 2019; Yu & Sussman, 2020).

In Malaysia, the number of smartphone addicts has grown recently. One in two Malaysian adults, according to a 2014 TNS/Google Global Connected Consumer survey with 150,000 respondents from 56 countries, own a smartphone (Lee & Lee, 2015). The number of mobile internet users in Malaysia was forecast to continuously increase between 2024 and 2028 by in total 2.6 million users (+8 percent). After the fifteenth consecutive increasing year, the number of users is estimated to reach 35.09 million users and therefore a new peak in 2028. Remarkably, the number of mobile internet users has been on a consistent upward trajectory in recent years, reflecting the ever-growing reliance on smartphones for connectivity and digital engagement. According to the Hand Phone Users Survey 2014 (HPUS) conducted by the MCMC, 71.4% of the 2401 users of hand phones continue to check their phones even when they are not ringing. A study from Muhammed et al. 2017 showed that, technology has led to a decline in face-to-face communication with family members and friends. People have grown increasingly dependent on using technology to communicate with friends and family. Many of them feel that the quality of their conversations has diminished due to this reliance on technology. Smartphone addicts can be a concern for smartphone users. Smartphone addiction can cause maladaptive behavioral issues, such as pathological gambling or generalized impulse control disorders (Mok et al., 2014).

It can also be detrimental to users' physical health, causing blurred vision and pain in many body parts, including the neck and wrist (Mok et al., 2014). According to Van den Bulck's findings from 2003, adolescents' sleeping habits may be disturbed by excessive mobile phone use. A decrease in physical activity, such as walking, is another effect of smartphone addiction (Kim, Kim & Jee, 2015). It has negative health effects due to the rise in fat mass among smartphone users (Kim, Kim & Jee, 2015). Furthermore, another study conducted by Al-Hadidi et al. (2019) on neck pain among university students, found that there is a positive correlation amongst the time duration of mobile phone usages as well as severity of neck pain in those who are using the smartphone frequently. Another similar study conducted by Ismaeel (2019) in Tikrit university students, 31.54% of the respondents suffer

from neck pain due to smartphone usage. Thus, the aim of this study was to determine the relationship between smartphone addiction and neck pain among construction workers. Construction sites are hazardous environments where attention to detail and constant vigilance are crucial. Smartphone addiction can lead to distractions, increasing the risk of accidents and injuries. Therefore, due to the lack of study on smartphone addiction has been done among construction workers, the researcher aims to investigate this issue comprehensively to understand its prevalence and the impact on musculoskeletal disorder. This research will provide valuable insights that can inform the development of targeted interventions and policies to mitigate the negative effects of smartphone addiction in this critical workforce. The researchers hypothesized that the higher the number of smartphone addicts, the greater the impact on neck pain among the construction workers. The results of this study will also be very helpful in developing prevention and intervention plans for adult workers' neck pain and smartphone addiction.

METHODOLOGIES

Study Design

This study was a cross-sectional study design tailored to assess self-reported smartphone addiction and any irregular neck function signs and symptoms by using two questionnaires, the Smartphone Addiction Scale-Short Version (SAS-SV) and the Neck Impairment Index (NDI). The study was conducted among construction team workers in Selangor, Malaysia. Convenient sampling method was used to select the participants. The minimum required sample size for this study was found to be 136 participants and all of them were briefed and gave consent before the data collection was conducted.

Study population and criteria

The population include both male and female workers (aged 18 years old and above) and worked in the industry for at least one year. The population who had recent injury in the neck, had spine disorder and congenital neck problem was excluded in this study. After the survey was completed, the SAS-SV and Neck Disability Index questionnaire scores were collected.

Questionnaire Development

Sociodemographic data

The data was collected via Google Form, where a set of questionnaires consisting of 3 sections was disseminated through social network platforms. The data collection process was carried out during the period of September 2022 until October 2022. The questionnaire used in this study was adopted from Kwon et al., (2013), Vernon & Mior (1991). Participants were asked to answer several questions aimed at obtaining their demographic data,

such as age, gender, whether they have smartphones and duration of smartphone usage.

Smartphone Addiction Scale – Short Version (SAS-SV)

Primary research instruments used in this research consists of two questionnaires, that is the Smartphone Addiction Scale – Short Version (SAS-SV) and Neck Disability Index (NDI). The Smartphone Addiction Scale (SAS) is a self-assessment of smartphones addiction created on the basis of and Internet Addiction (K-scale) self-reporting scale in Korea (Kwon et al., 2013). SAS-SV is a revised and short version of the smartphone addiction scale, consisting of 6 factors which are daily-life disturbance, positive anticipation, withdrawal, cyberspace-orientated relationship, overuse and tolerance. These variables were measured using 10 items using a six-point Likert scale that fall into the following categories: strongly disagree (1), disagree (2), disagree (3), weakly disagree (4), weakly agree (5), and strongly agree (6). The overall score ranges from 10 to 60.

A higher score indicates high risk of smartphone addiction. The scale is valid and reliable to measure smartphone addiction. The participant should circle the statement that best sums up how they utilize their smartphone. The survey form was distributed via an online survey method using Google Forms with dual languages of English and Malay version.

Neck Disability Index

The Neck Disability Index Questionnaire includes 10-item, 50-point index questionnaire which measures the effects of neck pain and symptoms across a variety of functional activities (Vernon & Mior 1991). Out of 10 items, four items were related to the subjective symptoms (intensity of pain, headache, concentration, sleep), four items were related to day-to-day activities (lifting, work, driving, recreation), and two items were related to daily living and personal care activities. Each item was graded on a rating scale of 0 to 5, where zero means 'no pain' and 5 means 'the worst pain imaginable'. The test with a maximum score of 50, was viewed as a raw score. A higher NDI score shows greater incapacity in the neck. This questionnaire was the most widely used to measure self-rated impairment in patients dealing with neck pain in clinical and study environments, and the most highly validated instrument (Vernon, 2008).

Statistical Data Analysis

The data gathered were analyzed using the Statistical Package for Social Science (SPSS) Version 21.0. Descriptive statistic was used to present the prevalence for all data in socio demographic and smartphone addiction scale as well as Pearson correlation was used to examine the relationship between smartphone addiction and the neck disability index. The level of significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

Sociodemographic data of respondents

A total of 136 respondents who met the inclusion and exclusion criteria were chosen as respondents in the study, and the entire data collection component was completed. Among the 136 respondents, the majority were male (65%) aged 28-37 years old (35%) and most of them were single (52%). Majority of them also used smartphone between the duration of 5-6 hours per day (44%).

Purpose of Smartphone Used

The summary of purpose of smartphone use was shown in Table 2 showed that, the respondents used smartphone for social networking only (Facebook, Instagram, Twitter, Whatsapp) was 20 (15%), followed by used smartphone for social networking (Facebook, Instagram, Twitter, Whatsapp), and making phone call was 7 (5%), used smartphone for watching video and social networking (Facebook, Instagram, Twitter, Whatsapp) was 8 (6%), used smartphone for watching video, social networking (Facebook, Instagram, Twitter, Whatsapp), gaming and making phone call was 15 (11%), used smartphone for watching video, social networking (Facebook, Instagram, Twitter, Whatsapp), gaming, making phone call, and listening to music was 73 (54%), and lastly used smartphone for watching video, social networking (Facebook, Instagram, Twitter, Whatsapp), making phone call only was 13 (9%).

This study aims to determine the relationship between smartphone addiction and neck pain among construction team workers. Most respondents use the smartphones daily for five to six hours, which is similar to a several studies which reported that Malaysian young adults used their smartphone for five to eight hours of daily use (Hadi et al., 2019; Wan Ismail et al., 2020; Nasser et al., 2020). In contrast, adults in Brazil used the smartphones for average of 10.1 ± 4.73 hours a day (Abdon et al., 2020). Most respondents used smartphones for watching videos, social networking (Facebook, Instagram, Twitter, WhatsApp), gaming, making phone call, listening to music with a total of 73 (54.1%) and this finding was similar with study by Nasser et al. (2020) where the topmost reason for using smartphones across all courses was for social networking and communications (66.8%). Most of the respondents did not complain that they have neck pain due to smartphone addiction (Nasser et al., 2020).

Findings from Bernama (2017) indicate that employees in Malaysia often spend their free time texting on WhatsApp or browsing YouTube during work hours. Globally, 51% of workers use smartphones at their workplaces to gather information and share stories. Additionally, 86% of workers prefer to receive news through social media, compared to 45% who rely on print media, 54%

who watch television, and 15% who listen to the radio. In addition, the main device used was a smartphone which is 65%, computer 45% and a tablet 18% (Bernama, 2017). The high internet usage in Malaysia is attributed to the country's excellent internet infrastructure and penetration (Che Su Mustafa et al., 2018). Workers frequently use WhatsApp application due to its numerous benefits, including its ease and speed in connecting and sharing information. It serves as an efficient intermediary within organizations, allowing instructions or alerts to be sent at any time without time constraints, and it is cost-effective. Moreover, WhatsApp application is the most popular messaging platform in Malaysia and can be used on up to four smartphones simultaneously (Izwan Ismail, 2023). This feature greatly benefits users with multiple phones who wish to access the same WhatsApp account (Izwan Ismail, 2023). As a result, workers are spending more time on their smartphones, which negatively impacts their health, particularly affecting their neck and overall body (Izwan Ismail, 2023).

Smartphones Addiction Scale-Short Version

Table 3 shows the summary of prevalence of smartphone addiction scale-short version for all of the respondents in this study. For item no 1, the majority of respondents weakly disagree 48 (35%) with "missing planned work due to smartphone use". However for item no 2 until 10, majority of the respondents disagree with all the items, "having a hard time concentrating in class, while doing assignments, or while working due to smartphone use" 60 (44%), "feeling pain in the wrists or at the back of the neck while using a smartphone" 59 (43.3%), "won't be able to stand not having a smartphone 73 (53.7%), "feeling impatient and fretful when I am not holding my smartphone" 50 (36.8%), "having my smartphone in my mind even when I am not using it" 59 (43.3%), "I will never give up using my smartphone even when my daily life is already greatly affected by it" 53 (39%), "constantly checking my smartphone so as not to miss conversations between other people on Twitter or Facebook" 81 (60%), "using my smartphone longer than I had intended" 48 (35.3%) and "the people around me tell me that I use my smartphone too much" 50 (36.8%) respectively.

Neck Disability Index

Based on Table 4, the summary of pain intensity found the majority of respondents agreed with "I have no neck pain at the moment" with a total of 57 (42.2%) respondents, "the pain is fairly severe at the moment" with a total of 8 (5.9%) respondents, "the pain is moderate at the moment" with a total of 34 (25.2%) respondents and "the pain is very mild at the moment" with a total of 36 (26.7%) respondents. Pearson correlation coefficient is used to calculate the correlation between smartphone addiction among construction workers and neck disability index. Table 5 shows that there is a strong and positive significant correlation between smartphone addiction

scale-short version and neck disability index ($r = .802$, $p < .01$). The finding was supported by the study from Ojha, Sindhu & Sen (2022) which proved that using electronic equipment including computers and mobile phones for excessive hours contributes to the effects of pain on neck and shoulder. The way one holds digital tools when using them affects a person's neck posture (Ojha, Sindhu & Sen, 2022).

From a vertical head position to a bowed position, as long as the tool is working (not turned off because of the battery) the condition can still be seen in an incorrect position to the point of causing pain (Ojha, Sindhu & Sen, 2022). However, usually there are times when workers like to look at the digital screen with their neck bent (Derakhshanrad et al. 2021). Actually, the method affects the neck position and causes neck pain. The tilt of the neck between 45 and 60 degrees causes the user to put a weight load of between 22.2 - 27.2 kilograms (kg) on the neck and the effect is that the affected part feels painful (Derakhshanrad et al., 2021). A study from Miaraj and Bhat (2022) found that more than 50% of workers experience tension or neck pain when they use electronic equipment.

Most of them are comfortable bending their head at a position of 45 to 60 degrees when using the device (Miaraj and Bhat, 2022). The bending position becomes worse if the period of use is longer, for example, more than an hour. The effect is that the neck and shoulders experience tension and pain (Miaraj and Bhat, 2022). An investigation into the forces applied to the spine when the head is bowed forward and into a degenerating position has been carried out. The study's observations led to the conclusion that, to varied degrees, bending the head forward causes the spine to noticeably increase in weight. This results in the loss of the spine's natural curvature, which significantly raises the stress on the cervical spine (Hansraj, 2014).

However, the respondents also complained that they have suffered mild to moderate neck area due to smartphone use ($n=70$, 52%). It was reported that between 8.2% and 90% of musculoskeletal pain in different body parts was due to the use of smartphones (Zirek et al., 2020). In Canada, 84% of students who use smartphones experienced musculoskeletal pain, with the neck being the most reported body part to experience pain (Berolo, Wells & Amick, 2011). A total of 71% of patients in Saudi Arabia with musculoskeletal pain reported having neck and upper extremity pain (AlZarea & Patil, 2015) which is thought to be a comparatively higher percentage than that reported for other nations, such as Malaysia (20.1-58.2%), Thailand (19.7-32.5%), Nigeria (30-64%), and Sudan (30-64%) (Kalirathinam et al., 2017; Kamaruddin & Nawi, 2020; Namwongsa et al., 2018; Vate-U-Lan, 2015; Ayanniyi, Ukpai, & Adeniyi, 2010; Eltayeb et al., 2008).

Table 1: Sociodemographic data of respondents (N=136)

Variables	Percentage (%)	Frequency (n)
Age		
18-27	23	32
28-37	35	47
38-47	26	35
48-57	16	22
Gender		
Male	65	89
Female	35	47
Marital status		
Single	52	70
Married	44	59
Divorce	4	7
Duration of using smartphone per day		
3-4 hours	15	21
5-6 hours	44	59
More than 2 hours	2	2
More than 6 hours	40	54

Table 2: Distribution frequency of Smartphone usage among respondents (N=136)

Item	Frequency (n)	Percentage (%)
Social networking (Facebook, Instagram, Twitter, Whatsapp)	20	15
Social networking (Facebook, Instagram, Twitter, Whatsapp), making phone call	7	5
Watching video, Social networking (Facebook, Instagram, Twitter, Whatsapp)	8	6
Watching video, Social networking (Facebook, Instagram, Twitter, Whatsapp), Gaming, making phone call	15	11
Watching video, Social networking (Facebook, Instagram, Twitter, Whatsapp), Gaming, making phone call, listening to music	73	54
Watching video, Social networking (Facebook, Instagram, Twitter, Whatsapp), making phone call	13	9

Table 3: Prevalence of smartphones addiction among respondents (N=136)

No	Items	SD	D	WD	WA	A	SA
1	Missing planned work due to smartphone use.	27 (19.8%)	42 (30.8%)	48 (35%)	6 (4.4%)	8 (6%)	5 (4%)
2	Having a hard time concentrating in class, while doing assignments, or while working due to smartphone use.	27 (19.8%)	60 (44%)	30 (22%)	12 (8.8%)	7 (5%)	0
3	Feeling pain in the wrists or at the back of the neck while using a smartphone.	37 (27%)	59 (43.3%)	19 (14%)	9 (6.6%)	12 (8.8%)	0
4	Won't be able to stand not having a smartphone.	21 (15.4%)	73 (53.7%)	21 (15.4%)	10 (7.4%)	11 (8%)	0
5	Feeling impatient and fretful when I am not holding my smartphone.	37 (27%)	50 (36.8%)	30 (22%)	4 (3%)	9 (6.6%)	6 (4.4%)
6	Having my smartphone in my mind even when I am not using it.	38 (28%)	59 (43.3%)	20 (14.7%)	14 (10.2%)	6 (4.4%)	0
7	I will never give up using my smartphone even when my daily life is already greatly affected by it.	45 (33%)	53 (39%)	21 (15.4%)	6 (4.4%)	11 (8%)	0
8	Constantly checking my smartphone so as not to miss conversations between other people on Twitter or Facebook.	21 (15.4%)	81 (60%)	13 (9.6%)	11 (8%)	10 (7.4%)	0
9	Using my smartphone longer than I had intended.	27 (19.8%)	48 (35.3%)	40 (29%)	5 (4%)	12 (8.8%)	4 (3%)
10	The people around me tell me that I use my smartphone too much	27 (19.8%)	50 (36.8%)	38 (28%)	16 (11.8%)	5 (4%)	0

*SD (strongly disagree), D (disagree), WD (weakly disagree), WA (weakly agree), A (agree), SA (strongly agree)

Table 4: Distribution frequency of Neck Disability Index (N=136)

Pain Intensity	Frequency (n)	Percent (%)
I have no neck pain at the moment	57	42
The pain is fairly severe at the moment	8	6
The pain is moderate severe at the moment	35	25
The pain is very mild at the moment	36	27

Table 5: Correlation analysis between smartphone addiction and neck disability index among respondents.

	Neck disability index	
	r	p value
Smartphone addiction	0.802**	p<0.001

**Correlation is significant at the 0.01 level (2-tailed).

CONCLUSION

Smartphone addiction can have adverse effects on workers' health. Prolonged and improper use of smartphones can lead to physical issues, particularly neck injuries. The study highlighted that if workers do not address their smartphone addiction, they are at a higher risk of developing musculoskeletal problems. This underscores the importance of managing smartphone use to ensure it remains a tool for productivity rather than a source of health and performance issues. By fostering a balanced approach to smartphone usage, organizations can help mitigate these risks and promote a healthier, more efficient work environment. The results of this study could help identify smartphone usage linked to the severity and duration of neck and shoulder pain. Additionally, these findings might assist in creating preventive strategies to reduce the impact of smartphone addiction on the development and severity of neck and shoulder pain among the general workers.

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