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Effects of Smartphone Addiction on Cognitive Functions in Teaching Faculty

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ABSTRACT

BACKGROUND: Cognitive function is a broad term that refers to mental processes involved in the acquisition of knowledge, manipulation of information, and reasoning. Smartphone addiction or excess use has led to a range of negative consequences in personal life, academic achievement and the workplace. They also found that some activities related to screening media and brain structures are associated with worse cognitive performance, while others are associated with better cognitive performance. The cognitive challenges in teaching faculty are working memory, ability to learn new concepts, attention, decision making and reaction time.

AIM OF STUDY: "To investigate the effects of smartphone addiction on cognitive functions in teaching faculty."

METHODOLOGY: In this study, 132 teaching faculty were approached to participate. Each subject was screened for the study criteria and those who did not meet the inclusion criteria were excluded. Out of 132 subjects, 21 subjects did not fulfil the selection criteria, and 11 subjects were not willing to participate. 100 consenting teaching faculty were included based on the selection criteria. Their demographic information (i.e., age between 24 - 50 and gender) and levels of smartphone usage were collected using the Smartphone addiction Scale- Short Version (SAS-SV). The Cognitive functions were evaluated using the Montreal Cognitive Assessment (MoCA) Scale. The questionnaire and objective scale were personally given to the subjects, and the results were determined accordingly.

RESULTS: The impact of Smart phone Addiction on Cognitive function was analysed with linear regression. The p-value 0.040 is less than 0.05 denotes that there is an impact of smart phone addiction on the cognitive function of the teachers in the study samples. This study showed that teacher's cognitive function is being positively impacted by smartphone addiction.

CONCLUSION: In conclusion, the present study demonstrated that smartphone-addiction significantly impacted cognitive functions in teaching faculty. This study showed that teacher's cognitive function is being positively impacted by smartphone addiction.

KEYWORDS: Smartphone addiction, Cognitive function, Smartphone addiction scale, Montreal Cognitive assessment (MoCA) Scale.

INTRODUCTION

Smartphones are portable mobile devices with many convenient functions and software applications (email, social media, web browser, etc.) that can be accessed through an Internet connection. The first smartphone was produced in 1992, but the term "smartphone" was coined in 1995 when the functions of the smartphone evolved to include more than just communication. Today, smartphones offer entertainment, social media, health monitoring, productivity, useful features like day planners, text chat, photo editing and many more in one handheld device. Because of these many features built into smartphones, researchers have observed an increase in the number of smartphone users.[1]

Smartphones are characterized by rapid technological development and increasing popularity due to their functionality, portability and flexibility of use.[2]

Smartphones with advanced features such as messaging, internet, social networks, navigation, videos and music have attracted more and more users. According to a study done by Pew Research Center in 2015, it states that by 2017, 37% of the world's population will use smartphones. Smartphone users are projected to reach approximately 65.8% of the UK population, 63.5% in the US and 49% in China. Similarly, smartphone addiction has increased dramatically in recent years, leading to various negative consequences in personal life, academic performance and the workplace.[3]

In the current information age, with the rapid development and popularity of information and communication technology, technological devices (for example, smart phones) have become common everywhere. According to a recent study, there were 6.65 billion smartphone users in the world in 2021 (83.96% of the world's population).[4]

"Smartphone addiction" is a form of technological addiction. In general, it is similar to internet addiction. Smartphone addiction consists of four main components: compulsive behaviour, tolerance, withdrawal, and dysfunction.[1]

Smartphone addiction, like other behavioural addictions, is associated with social, physical and mental health problems.[1]

Cognitive function is an important aspect of health and adaptation that greatly affects people's quality of life and adaptation. Smartphones can also impair cognitive functions, especially working memory, which is a key part of it and has great importance in retaining and processing information in a short period of time. Many previous studies have shown that problematic smartphone use makes users more likely to be distracted by smartphone alerts and notifications, and even impairs cognitive functions, including logical thinking and working memory. Smartphone use can also weaken the working memory capacity of ordinary users.[4]

Neurophysiological report considers that overwhelming smartphone utilization is related with consideration, number preparing, and right prefrontal cortex sensitivity disabilities. Be that as it may, there were no critical contrasts in working memory or inhibitory control. Whereas there's no conclusive prove that smartphones hurt a child’s cognitive work, a few ponders have delivered disturbing results. Paulus et al. examined the affiliation between screen media movement conduct, brain structure, and cognitive work changes. They found a noteworthy association between changes within the auxiliary characteristics of the brain and time went through on screens, counting smartphones. They too found that a few exercises related to screening media and brain structures are related with more awful cognitive execution, whereas others are related with superior cognitive execution.[2]

The cognitive challenges in teaching faculty include self-regulation, misconceptions, ineffective learning strategies, transfer of learning, difficulty to learn new concepts, constraints of selective attention, constraints of mental effort and working memory, and communication abilities with colleagues and students.[5]

NEED OF THE STUDY

Teachers are the basis of knowledge. Teachers are primarily students in their own way in the academic world. There is always the possibility of learning new and advanced topics on a day-to-day basis. As in recent years the smartphone use has increased not only in attainment of knowledge, but also in transferring it through the new updated means.

As teachers are the primary source of knowledge, if their cognitive functions are affected by smartphones for better or for worse, it may affect their ability to transfer knowledge, communication, working memory and give undivided or selective attention to the students. It may affect their performance to distribute the knowledge to the students properly.

There has not been any literary evidence on how cognitive functions are affected by smartphone addiction on teaching faculty in any previous studies. Therefore, the need for this study arises. This study helps us relate how it affects the working memory, ability to learn new concepts, attention, decision making and reaction time in teaching faculty.

HYPOTHESIS

- **NULL HYPOTHESIS (H0):**
  There will be no significant effect of smartphone addiction on cognitive functions in teaching faculty.
- **ALTERNATE HYPOTHESIS (H1):**
  There will be significant effect of smartphone addiction on cognitive functions in teaching faculty.

METHODOLOGY:

STUDY DESIGN: Cross-Sectional Study
SAMPLE SIZE: 100
SAMPLING METHOD: Convenient Sampling Method

MATERIALS USED:

- Paper
- Pen

CRITERIA FOR SAMPLE SELECTION:

The participants are selected for the study based on following criteria:

INCLUSION CRITERIA:

- Both male and female teaching faculty.
- Age criteria - 23 to 50
- Teaching Faculty with smartphones.
- Participants with SAS-VS score of more than 33.

- Participants must be able to follow directions and perform the test.

EXCLUSION CRITERIA:

- Any present cognitive impairments.
- Unable or decreased hearing.
- Teaching faculty without smartphones.
- Subjects not willing to participate.

OUTCOME MEASURES:

- Smartphone Addiction Scale- SV
- Montreal Cognitive Assessment (MoCA) Scale

PROCEDURE

In the research study 132 participants were approached for participation. Each subject was screened for the study criteria and those who did not meet the inclusion criteria i.e. subjects with a SAS-SV score less than 33 were excluded. Out of 132 subjects, 21 subjects did not fulfil the inclusion criteria, and 11 subjects were not willing to participate. 100 consenting teaching faculty were selected for the study. Their demographic information (i.e., age and gender) and levels of smartphone use was collected. The Cognitive functions were evaluated using the Montreal Cognitive Assessment (MoCA) Scale. The questionnaire was personally given to the subjects. The MoCA scale has a total score of 30 points. A score of 26 or above is normal with no cognitive impairments. Any score below 26 has cognitive impairments. The results were then statistically analysed.

DATA ANALYSIS

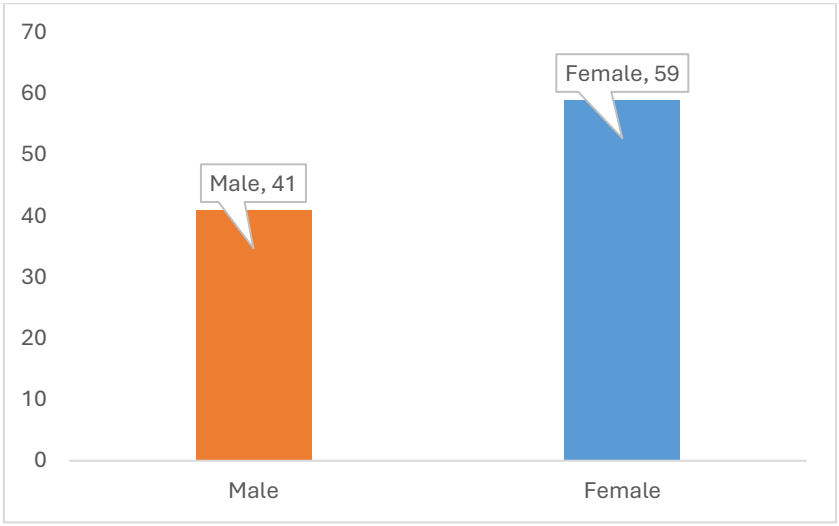
1. Gender of the respondent

Gender of the respondents is a crucial component for any study in life sciences. The responses are captured under two groups namely male and female. The frequencies are presented below.

Table 1 Gender of the Teachers

	Frequency	Percent
Male	41	41
Female	59	59
Total	100	100

Graph 1 Gender of the Teachers



From the table 1 and graph 1, it can be inferred that the female respondents are more actively participated in the survey. 59 percent of the total respondents are female, and the remaining 41 percent are male respondents in the study.

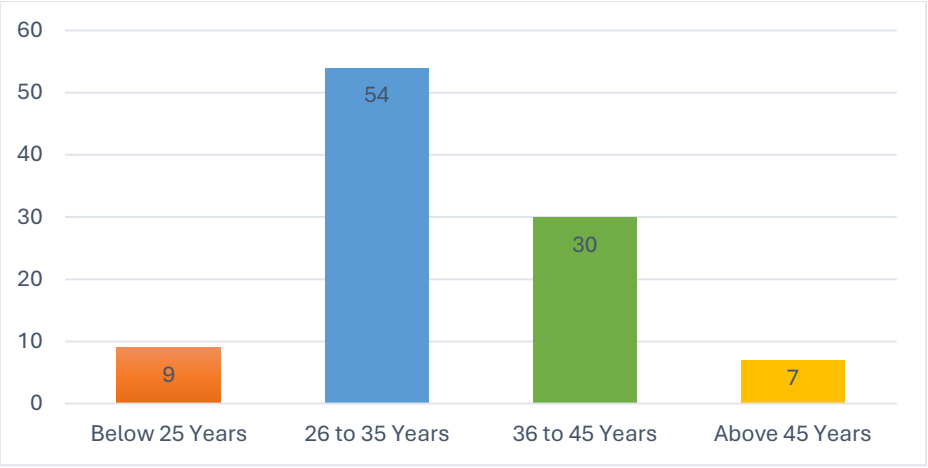
2. Age of the respondent

Age is also one of the key demographic factors which can influence the result patterns in the research. So, it is considered for the present study. The age of the respondents is captured under four class intervals and the responses are presented in the table below.

Table 2 Age of the Teachers

	Frequency	**Percent**
Below 25 Years	9	9.0
26 to 35 Years	54	54.0
36 to 45 Years	30	30.0
Above 45 Years	7	7.0
	100	**100.0**

Graph 2 Age of the Teachers



From the table 2 and graph 2, it can be inferred that 54 percent of respondents are in the age group of 26 to 35 years followed by 30 percent are in the age group of 36 to 45 years, 7 percent are above 45 years, and 9 percent are below 25 years.

3. Differences between male and female towards Smartphone Addiction

To find out the significant differences between male and female with respect to smart phone addiction, independent sample t-test has been applied and the results are presented below.

Table 3 Descriptives SAS-SV

	Gender	N	Mean	Std. Deviation	Std. Error Mean
SAS-SV	Male	41	41.0488	5.15243	0.80467
	Female	59	38.7797	4.1484	0.54008

Graph 3 SAS-SV

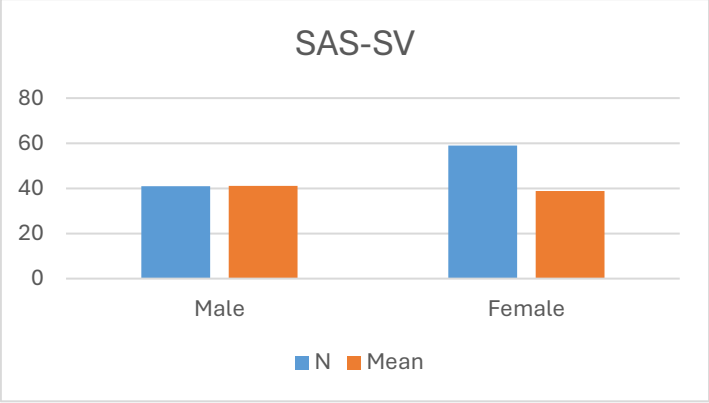


Table 4 Independent Sample t-test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
SAS	Equal variances assumed	3.034	0.085	2.434	98	0.017	2.26912	0.93219	0.41921	4.11903

	Equal variances not assumed			2.341	73.823	0.022	2.26912	0.96911	0.33804	4.2002

The results of the independent sample t-test are presented in the table 3 and 4. The mean value for the male respondents is about 41 and for the female is 38 with respect to the smart phone addiction. The p-value (equal variance assumed) is 0.017 is less than 0.05, states that there are significant differences between male and female respondents with respect to smart phone addiction. The results explains that male teachers are more prone to smart phone addiction.

4. Differences between male and female with respect to Cognitive function

To find out the significant differences between male and female with respect to smart phone addiction, independent sample t-test has been applied and the results are presented below.

Table 5 Descriptives MoCA

	Gender	N	Mean	Std. Deviation	Std. Error Mean
MoCA	Male	41	29.5854	0.66991	0.10462
	Female	59	29.3898	0.80979	0.10543

Figure 4 MoCA

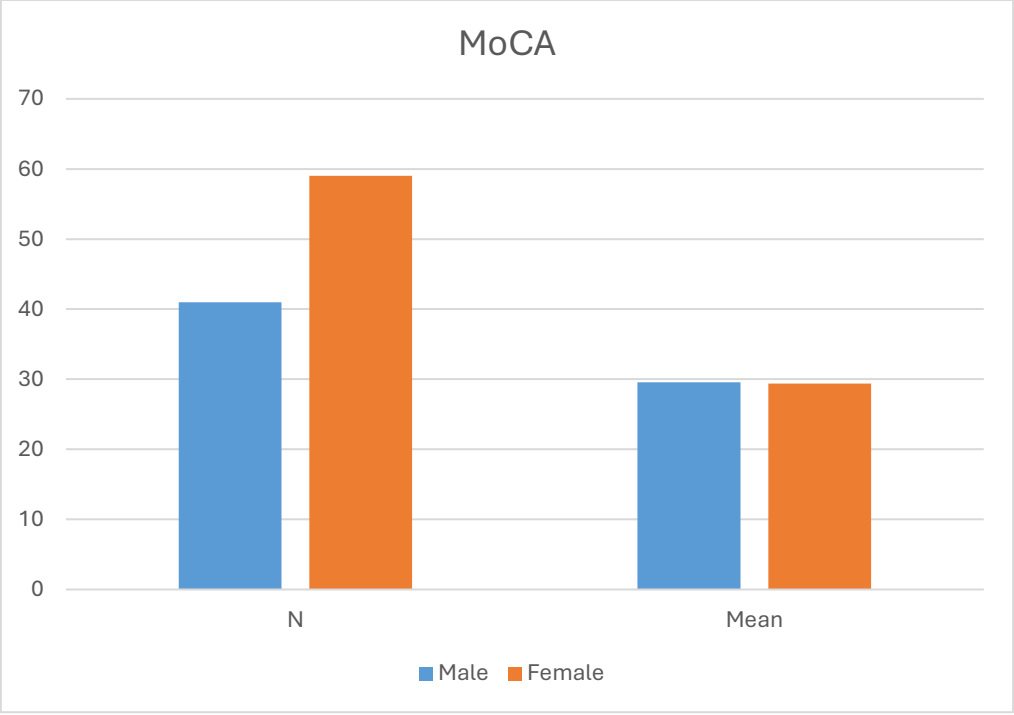


Table 6 Independent Sample t-test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
MoCA	Equal variances assumed	1.274	0.262	1.272	98	0.206	0.19554	0.15368	-0.10943	0.5005
	Equal variances not assumed			1.316	94.955	0.191	0.19554	0.14853	-0.09933	0.4904

The results of the independent sample t-test are presented in the table 5 and 6. The mean value for the male respondents is about 29 and for the female is 29 with respect to the cognitive function. The p-value (equal variance assumed) is 0.206 is not less than 0.05, states that there are no significant differences between male and female respondents with respect to cognitive function.

5. Differences among age groups with respect to Smart phone Addiction

To find out the significant differences among age groups with respect to smart phone addiction, one-way ANOVA test has been applied and the results are presented below.

Table 7 Descriptives SAS-SV

	N	Mean	Std. Deviation
Below 25 Years	9	40.0333	5.12925
26 to 35 Years	54	39.8889	4.40269
36 to 45 Years	30	39.4444	4.92725
Above 45 Years	7	37.2857	5.05682
Total	**100**	**39.7100**	**4.69751**

Table 8 ANOVA t-test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	46.639	3	15.546	12.698	.045
Within Groups	2137.951	96	22.270		
Total	2184.590	99			

The results of the one-way ANOVA test are presented in the table 7 and 8. The mean values across age groups presented in the table 7. The p-value is 0.045 is less than 0.05, states that there are significant differences among the age groups of the respondents with respect to smart phone addiction. The highest mean value among age groups i.e. 40.33 for the age group of below 25 years are more addicted to smartphones than others.

6. Differences among teacher age groups with respect to Cognitive function

To find out the significant differences among age groups with respect to cognitive function, one-way ANOVA test has been applied and the results are presented below.

Table 9 Descriptives MoCA

	N	Mean	Std. Deviation
Below 25 Years	9	29.7778	.44096
26 to 35 Years	54	32.3148	.84282
36 to 45 Years	30	29.6333	.61495
Above 45 Years	7	29.5714	.78680
Total	100	29.4700	.75819

Table 10 ANOVA test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.025	3	1.008	1.797	.043
Within Groups	53.885	96	.561		
Total	56.910	99			

The results of the one-way ANOVA test are presented in the table 9 and 10. The mean values across age groups presented in the table 9. The p-value is 0.043 is less than 0.05, states that there are significant differences among the age groups of the respondents with respect to cognitive function. The highest mean value among age groups i.e. 32.31 for the age group of 26 to 35 years are more affected than others.

7. Impact of Smart phone Addiction on Cognitive function

To measure the impact of smartphone addiction on the cognitive function of the teacher's simple linear regression analysis is applied the results are presented below.

Table 11 Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.635[a]	.518	.408	.75506
a. Predictors: (Constant), SAS				

Table 12 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	28.604	.646		44.284	.000
	SAS	.022	.016	.435	46.350	.040

a. Dependent Variable: MoCA

The r value explains the correlation between smart phone addiction to cognitive function. The result R value 0.635 is shows that there is healthy relationship between smart phone addiction and cognitive function. The p-value 0.040 is less than 0.05 denotes that there is an impact of smart phone addiction on the cognitive function of the teachers in the study samples.

RESULTS

The study aimed to investigate the effects of smartphone addiction on cognitive functions of teaching faculty. In this study, frequencies, mean, standard deviation, t-test, ANOVA and regression analysis were applied with the help of SPSS for the analysis and interpretation of data.

The gender distribution of participants in the study was 59 % of the total respondents are female and the remaining 41 % are male respondents, out of 100 respondents.

The age distribution can be inferred that 54 % of respondents are in the age group of 26 to 35 years, followed by 30 % are in the age group of 36 to 45 years, 7 % are above 45 years and 9 % are below 25 years.

The difference between smartphone addiction between male and female teaching faculty based on SAS-SV was analysed using independent t-test. The mean value for the male respondents is about 41 + 5.1 and for the female is 38 + 4.1 with respect to the smart phone addiction. The results explains that male teachers are more prone to smart phone addiction.

The differences between male and female with respect to Cognitive function based on MoCA scale was calculated using independent t-test. The mean value for the male respondents is about 29 + 0.6 and for the female is 29 + 0.8 with respect to the cognitive function. The results explains that no difference is found in case of cognitive function.

The differences among age groups with respect to Smart phone addiction based on SAS-SV was analysed using ANOVA. The highest mean value among age groups i.e. 40.33 + 5.1 for the age group of below 25 years are more addicted to smartphones than others.

The differences among teacher age groups with respect to Cognitive function based on MoCA Scale was calculated using ANOVA. The highest mean value among age groups i.e. 32.31 + 0.8 for the age group of 26 to 35 years have more scores on MoCA scale than others.

The impact of Smart phone Addiction on Cognitive function was analysed with linear regression. The p-value 0.040 is less than 0.05 denotes that there is an impact of smart phone addiction on the cognitive function of the teachers in the study samples.

This study showed that teacher's cognitive function is being positively impacted by smartphone addiction.

DISCUSSION

Concern over smartphone addiction is currently on the rise, especially considering people's increasing

time spent on screens. While smartphones are a valuable tool for communication and gathering information, it is important to maintain a balance. There have been various studies done to investigate the relationship between smartphone addiction and cognitive functions. Some studies state that it may improve cognitive functions or vice versa.

The current study aims to investigate the effects of smartphone addiction on cognitive functions in teaching faculty. This research study included 100 consenting teaching faculty. They were given Smartphone addiction scale-SV, and those who had a SAS-SV score of 33 or more were then given the MoCA scale for evaluation of cognitive functions.

In this study out of 100 respondents, 59% of the total respondents are female, and the remaining 41% are male respondents as seen in the Table 1. This line with the study done by Masalimova AR et al, which included 242 people for the study, out of which female respondents were in majority over males.[15]

For Smartphone addiction across the age groups is concerned, the results state that there are significant differences among the age groups of the respondents with respect to smart phone addiction. The highest mean value for the SAS-SV was 40.33 for the age group of below 25 years among all the age groups, which implies that teaching faculty below 25 years of age are more addicted to smartphones than others. This is seen in the Table 7. This in line with the study done by Parsuraman et al, the study showed majority of the participants (75%) who were found to be smartphone addicts according to SAS-VS were among the ages of 21 and 25. [16]

Where Smartphone addiction between male and female is concerned, the independent sample t-test results states that there are significant differences between male and female respondents with respect to smart phone addiction, as seen in Table 3. The result of this study explains that male teachers are more prone to smart phone addiction. This in line with the study done by Aljomaa SS, men have a greater tendency than women to use smartphones and to be more consumed with it.[17]

And where the cognitive function is concerned, results explain that there are no significant differences between male and female respondents, as seen in Table 5. This in line with the study done by Al-Momani MO, which states that there are no statistically significant differences in the cognitive competencies of male and female secondary school teachers that are attributed to the gender variable.[18]

Where the smartphone addiction and cognitive functions is concerned, the results from the study show the R value is 0.635 which shows that there is healthy relationship between smart phone addiction and cognitive function. The p-value 0.040 is less than 0.05 denotes that there is an impact of smart phone addiction on the cognitive function of the teachers in the study samples. This can be seen in Tables 7 & 8. The regression results denotes that there is an impact of smart phone addiction on the cognitive function of the teachers. This in line with the study done by Chen Q et al, which states a greater exposure of online activities on a smartphone was significantly associated with higher cognitive function.[19]

Smartphone addiction can improve cognitive function in many ways. It can help improve working memory, keeping track of things, improving quality of life, independent functioning of individuals, reaction time and attention. This in line with the study done by Chen Q et al, which states a greater exposure of online activities on a smartphone was significantly associated with higher cognitive function which involves multiple cognitive functions, including attention, decision-making, and working memory.[19] This in line with the study done by Scullin MK et al, that smartphone may improve quality of life, independent functioning, and prospective memory in everyday life.[20]

CONCLUSION

In conclusion, the present study demonstrated that smartphone-addiction significantly impacted cognitive functions in teaching faculty. A total of 100 teachers were approached and collected the data using convenience sampling. According to the findings, there were notable differences in smartphone addiction between male and female teachers, with male teachers being more addicted than females. Also, there was a significant difference between age groups stating that the young adults aged below 25 years are more addicted to smartphones. This study showed that teacher's cognitive function is being positively impacted by smartphone addiction.

LIMITATIONS

- This study did not focus on different aspects of mobile usage and factors making addiction; it studied only the effect of phone addiction of cognitive function of teachers.
- This study did not take in the different mobile internet environments, these associations may be different in teaching faculty.
- In this study, there is no detailed record of the amount of time spent on the smartphones.
- The study only used MoCA scale to measure the cognitive functions of participants.

RECOMMENDATIONS

- Different aspects of mobile usage and factors contributing to addiction can be further studied.
- Different mobile internet environments and their associations can be further studied.
- Other measures apart from MoCA scale can be used to measure the cognitive functions of participants in further studies.

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