

## ASSOCIATION OF SMARTPHONE USAGE AND HAND GRIP STRENGTH AMONG UNIVERSITY STUDENTS: A CORRELATION STUDY

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### ABSTRACT

**Objective:** To determine the frequency of smartphone usage and its association with hand grip strength among university students.

**Material & Methods:** Three hundred and twenty-two university students were recruited in a cross-sectional study in duration from July to October. Informed consent was taken. Demographics were recorded. Smartphone usage was assessed through the Smartphone addiction scale –short version. Hand grip strength was evaluated with Jamar handheld dynamometer.

**Results:** The mean age of 322 participants were 21±1.7 years with 212 (65.8%) females and 110 (24.2%) males. Result showed 87 (27.01%) frequent smartphone users out of 322 participants. However, the grip strength did not correlate smartphone usage ( $r = 0.06$ ;  $P < 0.91$ ).

**Conclusion:** It concludes that the smart phone usage is less frequent among university students and hand grip strength does not associate with smartphone usage.

**Key Words:** Cell phone, Dynamometer, Musculoskeletal, Physical fitness.

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### INTRODUCTION

The smartphone has been considered as one of the rapidly growing technologies used in present times. The amazing increase in population that own phone is shown in all ages and regions around the world, regardless of the financial differences.<sup>1</sup> The use of the mobile phone grew rapidly in Pakistan to reach 165 million subscriptions at the end of 2019.<sup>2</sup> The young people seems to use smartphone more, when compared with other age groups.<sup>3</sup> The smartphone is one of the modern information providers. It is a portable device which provides not only various utilities such as calling but also facilitates of playing games and social. Despite with these advantages, previous literature suggests that numerous people use smartphones as much as it affects their daily activities, health,

and safety and causes physical health-related disorders like musculoskeletal pain.<sup>4</sup> Moreover, the variations in attitude towards work or school and decrease of social interaction may also relate to smartphone overuse among university students.<sup>3</sup> The evaluated problematical smart phone use among students is 6.3%, 16%, 20% and 26% in Italy, Korea, Spain and Tunisian population.<sup>5</sup> However, 40% of medical undergraduate students at a medical college in India showed mobile phone addiction.<sup>6</sup> Recent statistics suggest that 60% of population in Pakistan comprises of youth who are excessive users of smartphones.<sup>7</sup> The movement repetition and bad hand and neck position or posture are related with the rapid increase in the use of smartphones, especially during texting or playing games. It significantly contributes to the basic musculoskeletal symptoms like pain or any

discomfort in the upper limbs.<sup>8</sup> The physical decline and functional limitation due to musculoskeletal symptoms can be predicted through decrease hand grip strength.<sup>6</sup> Hand grip strength is widely used to assess muscular strength component of muscular fitness.<sup>9,10</sup> The weak strength of hand grip is connected to a variety of health related outcomes.<sup>10,11</sup> The role of hand grip strength as a predictor of functional capacity or the abilities reflects the importance of identifying its correlation.<sup>9</sup> The proposed cut off value for weak grip strength is 16 kg among females and 27 kg among males.<sup>11</sup> The designed characteristics of smartphones give rise to its usage with increased screen duration and frequency. This is alarming, that impact upon mechanics of hand is rising.<sup>8</sup>

Despite the available study on relationship between smartphone use and hand functions<sup>4</sup> there is a gap in the knowledge on how frequent smartphone usage is and how it relates handgrip strength among young age group. Frequency of smartphone usage and its association with grip strength may be of unlimited significance among students because they are more prone to use phone for sending messages, browsing and gaming activities. So, this study aimed to determine the frequency of smartphone usage and its association with hand grip strength among university students.<sup>8-11</sup> The smartphone usage requires sustained contractions of small muscles of hand. It can produce hand related issues. Hand grip strength is suggested to predict those problems.

## **MATERIAL AND METHODS**

In this cross-sectional study, authors recruited 322 university students of IPM&R, Dow University of Health Sciences, Karachi from July to October 2019. The Institutional Review Board of same university reviewed and approved this study (IRB-1232/DUHS/Approval/2019/67). Authors took printed informed consent from all the participants before providing the questionnaire. It was a voluntary participation: it was informed that there is not any bond to participate. All responses were kept anonymous, and that participants were free to quit the study at any time. The non-probability purposive sampling was used. A sample size of 322 was extracted from hypothesized frequency (29.8%)

of smart phone users of previous study<sup>3</sup> with 95% confidence level, 5% confidence limit and design effect 1. The online open epi version<sup>12</sup> 3.01 software was used for sample size estimation. Students with age between 18-25 years were included in the study. However, students with any pathology affecting hand grip like forearm or wrist fracture, carpal tunnel syndrome, medial or lateral epicondylitis, scars, burns, any contracture, injury of neck and students those are using some other hand held device for more than 1 year were excluded from the study. After recording demographics and anthropometric characteristics, authors provided Smartphone Addiction Scale –Short Version (SAS-SV) to evaluate smart phone usage and used Jamar hand held dynamometer (by Sammons Preston, Rolyan Bolingbrook)<sup>14</sup> to evaluate hand grip strength of every participant. It has been reported a highly validated and reliable outcome measure tool.<sup>14</sup> The Kwon and colleagues in 2013 derived ten item scale, SAS-SV from original forty items scale, smart phone addiction scale. SAS-SV has 31 cut-off values in boys with 0.867 sensitivity and 0.875 specificity. It has 33 cut-off value in girls with 0.875 sensitivity and 0.886 specificity.<sup>15</sup> SAS-SV comprised questions with responses on liker scale, from 1 “strongly disagree” to score 6 “strongly agree”. The included questions are related to smartphone usage in home and during lecture in class, feelings without smartphone in hand, effects of smartphone on planned work and spending time on smartphone with Facebook or Twitter. The total score ranges from 10 to 60. Higher score means higher smart phone usage.<sup>16</sup> after filling the questionnaire, every participant was asked to hold and squeeze handle of handheld dynamometer with dominant hand in sitting. During this maneuver participant was asked to keep dominant shoulder abducted in neutrally rotated position, elbow flexed till 90-degree, forearm in mid pronation, and wrist from 0 to 30 degree of extension and 15 degrees of ulnar deviation. The mean value of 3 times recorded reading from handheld dynamometer was calculated to consider hand grip strength.<sup>8</sup> All the data was recorded under ethical constraints. The role and rights of every participant were informed. Data was kept confidential. SPSS version 21 was for used for analysis of data. The

categorical data was calculated with frequencies and percentages. The quantitative data was calculated for means and standard deviations. Due to non-symmetrical data, spearman’s correlation test was used to identify any significant relationship between continuous variables. The P-value < 0.05 was considered significant.

**RESULTS**

A total of 322 participants were included in which there were 212 (65.8%) females and 110 (24.2%) males with mean age 21±1.7 years. The mean and standard deviation of height and weight was 159.7±12.3 cm and 51.2±11.4 kg. The mean grip

strength of males was greater than females (p=0.000). However, the mean score of SAS-SV showed non-significant difference between females and males. **(Table 1)**

The frequency of frequent smartphone usage on the basis of SAS-SV cores cut-off value was 87(27.01%) among all participants. Among females and males, there were 55(25.95%) and 32(29.09%) frequent smartphone users respectively. The hand grip strength showed no relationship ( $r_s=0.06$ ,  $p=0.910$ ) with SAS-SV scores. **(Table 2)**

**Table 1: Mean and standard deviation of smartphone addiction scale- short version (SAS-SV) score and hand grip strength with gender difference**

Variables	Females (n=212) Mean ± SD	Males (n=110) Mean ± SD	P value
SAS-SV score	28.5±8.6	30±8.4	0.115
Grip strength (kg)	14.84±5.26	22.9±17.1	0.000

**Table 2: Relationship of hand grip strength with smartphone addiction scale- short version (SAS-SV) scores, height and weight**

Spearman’s correlation		SAS-SV <sup>†</sup> scores	Height	Weight
Grip strength	Correlation coefficient	0.06	-0.176	-0.161
	sig(2-tailed)(p-value)	0.910	0.002	0.004

## DISCUSSION

This study provides finding regarding frequency of frequent smartphone usage on the basis of SAS-SV cores cut-off value and its association with grip strength university students. Specifically, study found low frequency of frequent smartphone users and the smartphone usage does not influence or relate the grip strength.

A study was conducted by Kwon and colleagues to investigate the reliability and validity of SAS-SV. They concluded that SAS-SV as an excellent tool for evaluation of smartphone usage.<sup>15</sup> Furthermore, Khalily and colleagues concluded that the SAS-SV can be used for assessing smartphone addiction in Pakistan.<sup>16</sup> Current study used the same assessment tool with the same method as described by Kwon and colleagues.<sup>16</sup> A study found 29.8% prevalence of smartphone usage among university students.<sup>3</sup> Current study follows results of that study<sup>3</sup> with different characteristic population in Pakistan. A previous study among students of Spain assessed smartphone usage and conclude females use smartphone more frequently than males.<sup>17</sup> However, a study assessed smartphone usage with SAV-SV and concluded that both males and females use smartphone with more or less equal frequency.<sup>3</sup> Even though, more proportion of females than males in current study, the results showed males more frequent to use smartphone than females. The females may use smartphone less frequent due to cultural effects or different life style of Pakistani population. Inal and colleagues found moderate positive association of hand grip strength with duration of mobile usage.<sup>4</sup> Contrary to this, current study found no relationship between grip strength and smartphone usage. Instead of duration of smartphone usage, current study showed results on the basis of valid subjective outcome measure (SAS-SV) among asymptomatic individuals. However, study of Inal and colleagues also included the participants with pain with different methodology than current study.<sup>4</sup>

The sample from single study setting may limit the generalizability of the results and confounders were not controlled due available time period. However, the examiner was very careful to make all participants understand the questionnaire, SAS-SV and prevent any compensatory movement during hand grip strength test.

## CONCLUSION

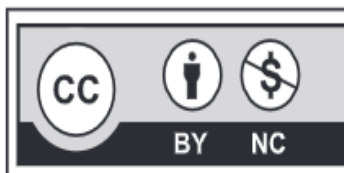
There is less frequent smartphone usage among university students. However, smartphone did not relate hand grip strength. So, frequent use of smartphone does not accompany decreased or increased hand grip strength. Results of this study could help to provide evidence to decide that

whether training and modification is required among youngsters to use smartphone. Furthermore, it could make evidence for future studies. Further research is recommended for association of more demographic and lifestyle factors with smartphone usage and grip strength.

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