ASSESSMENT OF HAND GRIP STRENGTH IN UNDER GRADS UNIVERSITY STUDENTS WITH RESPECT TO SMARTPHONE USE

Maryam Azam[*], Faiza Asghar[**], Abeeha Noor[**], Asim Raza[**], Farooq Islam[**]

[*] Department of Rehabilitation, THE UNIVERSITY OF LAHORE, Punjab, Pakistan
[**] Doctor of Physical Therapy, University Institute of Physical Therapy, Lahore Pakistan

Abstract-

Background: Past few years have seen a significant rise in mobile consumption, with these gadgets now being used for most everyday activities. Long-term consumption may therefore include poor posture, which may lead to weak strength in hand grips. Thus, using a dynamometer to assess the relationship between overuse of smartphones and hand grip strength is crucial, which may be quickly and accurately tested. Despite a few inconsistencies in the literature, hand power is supported as a marker of adverse outcomes, lethality, and loss of independence.

Objective: To determine excessive smartphone use' effects on hand grip strength in undergraduate university students.

Methodology: Data were gathered from students with smartphones from University of Lahore. Non-probability convenient sampling was used to collect data. Analytical cross-sectional study was conducted on 385 females. To check smartphone addiction, Smartphone Addiction Scale- Short Version of 10 items, CAMRY Hand-held Dynamometer for Hand Grip Strength was used.

Results: Frequency and percent of Gender of participants' i.e., male and female are 68 and 25.2 in male, and 202 and 74.8 in female, respectively. Frequency and percent of Phone use duration groups i.e., Less and 4 hours and >4 hours are 60 and 222 in Less and 4 hours and 210 and 77.8 in >4 hours, respectively. Frequency and percent of Phone use according to SAS-SV scales score i.e., Less and 25 (Non-addicted) and >25 (Addicted) is 31 and 11.5 in Less and 25(Non-addicted) and 239 and 88.5 in >25(Addicted) respectively. Frequency and percent of Age group of participants i.e., 17-21(years) and 22-26(years) are 50 and 18.5 in 17-21(years) and 220 and 81.5 in 22-26(years) respectively. Mean ± Std. Deviation. Mean HGS with dynamometer and standard deviation was 55.73 ± 23.205, mean SAS-SV and standard deviation was 35.92 ± 8.28.

Conclusion: The purpose of the current research was to ascertain how smartphone use affected undergraduate university students' hand grip strength. According to current study, students of UOL who have smartphones and use them for more than 4 hours have smartphone addiction and their HGS measured form a handheld dynamometer is less than the standard value.16

Index Terms- *Hand Grip Strength, Handheld Dynamometer, Smartphone Addiction Scale-Short-Version, students, UOL*

I. INTRODUCTION

The maximal discretionary force or torque that skeletal muscles may produce in a short amount of time to adapt to their environment is known as muscle strength. The respiratory, pelvic floor, and trunk muscles all produce force to bear on the environment, but the strength of the limb muscles is typically of importance. The muscles that produce grip force from limb muscles are most frequently measured.[1] The most accurate clinical measure of human strength, according to many experts, is grip strength. It is widely employed in adult fitness testing as a measure of strength and is therefore regarded as the one measurement that most accurately represents whole body strength.[2]

Particularly in older persons, grip strength as determined by dynamometry is a reliable predictor of muscular health. The goal of this study was to give a summary of recent research on practical relevance and predictive value of dynamometry. Most of the current research backs provision of grip strength dynamometry like a significant element for patients' physical examinations, especially if they are older adults. [1]The capability of holding items securely does seem to be essential like an indicator of overall well-being and that as an experiment for the health of the primary motor cortex and the motor component.[2] An unbiased criterion of the upper extremity's proper functioning is presented by grip power measures.[3]

It has been suggested that grip strength is a biomarker of aging. In that capacity, its value could serve as a prediction of future events and an explanation of the existing situation.[4]The ability to grip objects firmly has been identified as a constraint for hand lifting and carrying loads. It has a relationship to LBM (lean body mass).[5] Girls' grip strength is lower than boys' at all ages. By the age of 18, boys' mean grip strength is 60% greater than females. Grip strength is affected by "handedness," which is most pronounced in children over the age of 10.[2] As we age, our grip strength declines. Age and sex only marginally affect the ratio of dominant to non-dominant hands, making it a useful metric for assessing grip strength in pathological situations.[6]Grip strength starts to deteriorate after midlife and continues to do so through old age.[7]

Grip power is a straightforward indicator of muscular strength when "tested in standard conditions." Standard conditions, however, have yet to be established.[7] For many patients undergoing physical therapy, accurate muscular strength testing is a crucial and fundamental part of the evaluation process.[8] As a measure of strength and dexterity in university students, occupational therapists have looked into grip strength measurements. [2] There are probably multiple reasons why grip strength is frequently measured. First, despite the fact that the methods used to assess grip strength are not completely standardized, it is the most straightforward and straightforward instrumented muscular strength measure. Second, there is some, albeit sporadic, proof that grip strength is often a good indicator of total muscular strength. Grip strength has clinical and predictive importance in addition to these variables. This review focuses on these principles.[1]

Young people are increasingly using smartphones for activities except communicating, as for games and scrolling over the web. One of the primary issues brought on by more smartphones' consumption is the frailty of the hands and wrists. This weakness develops because of constant wrist, thumb, and finger flexion and extension, which causes a serious musculoskeletal pathology. The length of smartphone uses, and handgrip and pinch-grip strength have unknown relationships.[9] Concerning habitual evolution, excessive and impulsive smartphone behavior can be explained. Repeated actions under specific conditions help to create habits. A habit is described as "an automatic behavior prompted by situational signals, such as places, people, and preceding acts" in the field of cognitive psychology. Without self-instruction or conscious thought, habits are behavioral actions that can have both beneficial and harmful outcomes. Habits give people the ability to multitask, complete difficult activities, and maintain control of their conduct in unfamiliar circumstances. [10]

III. RESULTS

The results have been obtained from 385 participants. All results were calculated at 95% confidence level.

According to Table: 1 frequency and percent of all variables with respect to Phone use according to SAS-SV scale's score. Frequency and percent of Age group of participants i.e., 17-21(years) and 22-26(years) are 8 and 25.8 in 17-21(years), and 23 and 74.2 in 22-26(years) respectively with Less and 25(Non-addicted). And 42 and 17.6 in 17-21(years), and 197 and 82.4 in 22-26(years) respectively with >25(Addicted). Frequency and percent of Gender of participants i.e., Male and Female are 6 and 19.4 in Male, and 25 and 80.6 in Female respectively with Less and 25(Non-addicted). And 62 and 25.9 in Male, and 177 and 74.1 in Female respectively with >25(Addicted). Frequency and percent of Phone use duration groups i.e., Less and 4 hours and >4 hours are 19 and 61.3 in Less and 4 hours, and 12 and 38.7 in >4 hours respectively with Less and 25(Non-addicted). And 41 and 17.2 in Less and 4 hours, and 198 and 82.8 in >4 hours respectively with >25(Addicted).

Table:3 shows Mean ± Std. Deviation with respect to Phone use according to SAS-SV scale's score. It is the comparison of both the groups. Number of Less and 25(non-addicted) is 31 and number of >25(Addicted) is 239. Mean Age with Less and 25(Non-addicted) and standard deviation was 22.06 ± 1.093, Mean Age with >25(Addicted) and standard deviation was 22.29 ± 1.0023. With p-value of 0.247 and lower to upper value of 95% confidential interval (-0.61) -(0.16). Mean Daily phone usage in hours with Less and 25(Non-addicted) and standard deviation was 4.84 ± 2.622, Mean Daily phone usage in hours with >25(Addicted) and standard deviation was 9.38 ± 5.648. With p-value of 0 and lower to upper value of 95% confidential interval (-6.56) -(-2.51). Mean Smartphone addiction scale-short version with Less and 25(Non-addicted) and standard deviation was 21.87 ± 3.148, Mean Smartphone addiction scale-short version with >25(Addicted) and standard deviation was 37.74 ± 6.876. With p-value of 0.031 and lower to upper value of 95% confidential interval (0.89) -(18.21). Mean Hand grip strength with dynamometer with Less and 25(Non-addicted) and standard deviation was 64.18 ± 29.23, Mean Hand grip strength with dynamometer with >25(Addicted) and standard deviation was 54.63 ± 22.14. With p-value of 0 and lower to upper value of 95% confidential interval (-18.34) -(-13.41).

Excessive smartphones use as in for studying, communication or internet browsing is associated with the factors that results in reduced hand grip strength. This study will help analyzing the influence of smartphone's consumption on HGS. And provide awareness of effects on hand grip strength because of excessive consumption of phones in undergraduate university students.

II. METHODOLOGY

Data were gathered from students with smartphones from University of Lahore. Non-probability convenient sampling was used to collect data. Analytical cross-sectional study was conducted on 385 females. To check smartphone addiction, Smartphone Addiction Scale- Short Version of 10 items, CAMRY Hand-held Dynamometer for Hand Grip Strength was used.

DATA COLLECTION PROCEDURE AND TOOL:

A screening tool to check the smartphone addiction level was used which is called Smartphone Addiction Scale- Short version. This questionnaire contains 10 questions and is rated on 1-6 on the Likert scale. The score from this would range between 10-60. By this questionnaire Subjects meeting the predetermined inclusion and exclusion criteria were divided into two groups i.e., people achieving scores in SAS-SV scale of less and 25 in one group and they are classified as non-addicted. And second group contains the people who scored >25 in SAS-SV and are addicted to their phone's use. After taking SAS-SV questionnaire done, subjects were given Hand-held Dynamometer device to check their grip strength in the both the addicted and non-addicted participants.

Scores of the grip's strengths were then compared in both groups and results were made that either smartphone addicts have their grip affected or not.

Variable		Phone use according to SAS-SV scale's score	
		Less and 25(Non-addicted)	>25(Addicted)
		N (%)	
Age group of participants	17-21	8(25.8)	42(17.6)
	22-26	23(74.2)	197(82.4)
Gender of participants	Male	6(19.4)	62(25.9)
	Female	25(80.6)	177(74.1)
Phone use duration groups	Less and 4 hours	19(61.3)	41(17.2)
	>4 hours	12(38.7)	198(82.8)

Table 1: Comparison of both groups' according to frequency and percent

Variables	Phone use according to SAS-SV scale's score	
	Less and 25(Non-addicted)	>25(Addicted)
	N = 31	N = 239
	Mean ± S. D	
Age of participants in year	22.06 ± 1.093	22.29 ± 1.0023
Daily phone usage in hours	4.84 ± 2.622	9.38 ± 5.648
Smartphone addiction scale-short version	21.87 ± 3.148	37.74 ± 6.876

Table 2: Comparison of both group's statistical description

Table :2 shows Mean ± Std. Deviation with respect to Phone use according to SAS-SV scale's score. It is the comparison of both the groups. Number of Less and 25(non-addicted) is 31 and the number of >25(Addicted) is 239. Mean Age with Less and 25(Non-addicted) and standard deviation was 22.06 ± 1.093, Mean Age with >25(Addicted) and standard deviation was 22.29 ± 1.0023. Mean Daily phone usage in hours with Less and 25(Non-addicted) and standard deviation was 4.84 ± 2.622, Mean Daily phone usage in hours with >25(Addicted) and standard deviation was 9.38 ± 5.648. Mean Smartphone addiction scale-short version with Less and 25(Non-addicted) and standard deviation was 21.87 ± 3.148, Mean Smartphone addiction scale-short version with >25(Addicted) and standard deviation was 37.74 ± 6.876. Mean Hand grip strength with dynamometer with Less and 25(Non-addicted) and standard deviation was 64.18 ± 29.23, Mean Hand grip strength with dynamometer with >25(Addicted) and standard deviation was 54.63 ± 22.14.

Variable	Less and 25(Non-addicted)	>25(Addicted)	t-test for Equality of Means		
	N=31	N=239	t	p-value	95% Confidence interval of the difference
	Mean ± S.D				LL-UL
Age of participants in year	22.06 ± 1.094	22.29 ± 1.0023	-1.159	0.247	-0.61 to 0.16
Daily phone usage in hours	4.84 ± 2.622	9.377 ± 5.65	-4.407	0	-6.56 to -2.51
Hand grip strength with dynamometer	64.18 ± 29.23	54.63 ± 22.145	2.17	0.031	0.89 to 18.21
Smartphone addiction scale-short version	21.87 ± 3.149	37.74 ± 6.87	-12.667	0	-18.34 to -13.41

Table 3: Comparison of the variables according to independent t-test

IV. DISCUSSION

Current study concluded that students with smartphone use of more than 4 hours might experience a decline in hand grip strength. The research was done with the aim to determine the effects of smartphone use on Hand Grip Strength on 270 undergraduate university students in University of Lahore, Pakistan. The CAMRY Hand grip dynamometer was used to pattern the value of hand grip strength amongst students with smartphone addiction and non-addiction. A Smartphone addiction scale-short version scale was used to determine smartphone addiction level of students.

A study was conducted in 2021 to determine the interactions between smartphone use and young people's physical hand function and hand gripping power. Young individuals are much more likely to become addicted to smartphones, according to one study. It has been discovered that women bare more dependent on their smartphones. However, boys are more likely to have an upper-limb handicap. A normal and robust hand strength on the side of the dominant hand was seen when using a smartphone. The excessive usage of smartphones has a negative impact on hand performance and function. Additionally, a weakly positive connection between mobile phone dependence and disability in the upper extremities was found.[11] Present study is based on students in UOL with smartphone addiction. We found that students with more than 25 scores of SAS-SV had decreased Hand Grip Strength (P=0.031). We also concluded that more of the population is addicted to smartphone use. Out of 270 participants 88.5% were smartphone addicted, and 77.8 % participants out of 270 used smartphones for more than 4 hours. Difference in percentages is due to sample size. Our findings suggest that more than 4 hours of smartphone use increases the risk of lessening of hand grip strength.

In Sharjah, United Arab Emirates, a second study was carried out on 90 kids, ages 13 to 17, from nine completely distinct international schools. This study sought to determine how long-term smartphone use affected handgrip strength, forward neck translation and neck flexion angle over the span of eight weeks. The forward head position and the cervical spine's flexing ratio are both directly impacted by cell phones, according to our research. This was in line with previous studies that revealed important musculoskeletal anomalies and higher MSK movement rates that may eventually cause fatigue. Additionally, some have even demonstrated neurological abnormalities, an expanded median nerve, and hand pain.[12] Current study is based on the interaction between hand grip capability and smartphone intoxication in students. We found that students with less and 25 scores of SAS-SV were 31 of total students' population and students within more than 25 scores of SAS-SV were 239. We concluded that more of population is addicted to smartphones. Out of 270 participants 88.5% were smartphone addicted, and 77.8 % participants out of 270 uses smartphone for more than 4 hours with (p=0.00). Difference in percentages is due to sample size. Our findings suggest that more than 4 hours of smartphone use increases the risk of lessening of hand grip strength.

Based on the northwest Adelaide health study, a comprehensive longitudinal cohort study of persons who were initially 18 years of age and older was conducted. An Australian community-based sample's normative statistics for skeletal muscle mass were provided in this study. Secondary goals included examining the relationship between hand strength and body mass index (BMI) and contrasting Australian data with international hand grip strength norms. After 435 participants with hand pain and/or arthritis were removed, 1366 men and 1312 women participated in hand grip strength tests. The average BMI of the study's participants, who made up 41.5% of the sample, was 28.1 kg/m2 (SD 5.5). Between these ages, increased strength of hand grips was inversely correlated with greater BMI, but only marginally so in people under the age of 30 and over the age of 70. Within the exception of those from underweight populations, Australian norms from this group exhibited some of the lowest hand grip strengths among the internationally reported norms.[13] Current study shown assessment of hand grip strength measured by CAMRY handheld dynamometer within two groups divided as in group one of participants with HGS less and 25 with Mean ± Std. Deviation of 64.18 ± 29.23 and group two with HGS >25 with Mean ± Std. Deviation of 54.63 ± 22.145. Compared with the SAS-SV scores taken from the students who possess smartphones. They were divided in two groups one in which the participants use smartphones for less and 4 hours and their Mean ± Std. Deviation was 21.87 ± 3.149. Second group contained participants who use their smartphones for >4 hours and their Mean ± Std. Deviation was 37.74 ± 6.87 according to the SAS-SV score's groups.

LIMITATION:

The single study setting was the study's limitation. Data were collected from one district only. One of the study's faults is that the conclusions aren't applicable to the entire country of Pakistan because data was collected from single district. The lack of lab screening tests for vestibular dysfunction in the current study was a weakness of the study. Current study includes only convenient sampling technique.

V. CONCLUSION

The current study's goal was to ascertain how undergraduate university students' hand grasp ability was affected by smartphone use. According to current study, students of UOL who have smartphones and use them for more than 4 hours have smartphone addiction and their HGS measured form a handheld dynamometer is less than the standard value.

CONFLICT OF INTEREST:

There was no conflict of interest.

FINANCIAL STATEMENT:

No funding was given by any authorities, it was a project of thesis of Doctor of Physical Therapy.

REFERENCES

1 Bohannon RW. Muscle strength: clinical and prognostic value of hand-grip dynamometry. *Curr Opin Clin Nutr Metab Care* 2015; **18**: 465–470.

2 Newman DG, Pearn J, Barnes A, Young CM, Kehoe M, Newman J. Norms for hand grip strength. *Arch Dis Child* 1984; **59**: 453–459.

3 Incel NA, Ceceli E, Durukan B, Erdem R, Yorgancioglu R. Grip Strength: Effect of Hand Dominance. *Singapore Med J* 2002; **43**: 234–237.

4 Bohannon RW. Grip Strength: An Indispensable Biomarker For Older Adults. *Clin Interv Aging* 2019; **14**: 1681.

5 Leyk D, Gorges W, Ridder D, Wunderlich M, Rüther T, Sievert A *et al*. Hand-grip strength of young men,

women and highly trained female athletes. *Eur J Appl Physiol* 2007; **99**: 415–421.

6 Thorngren KG, Werner CO. Normal Grip Strength. *https://doi.org/103109/17453677908989765* 2009; **50**: 255–259.

7 Roberts HC, Denison HJ, Martin HJ, Patel HP, Syddall H, Cooper C *et al.* A review of the measurement of grip strength in clinical and epidemiological studies: towards a standardised approach. *Age Ageing* 2011; **40**: 423–429.

8 Wikholm JB, Bohannon RW. Hand-held Dynamometer Measurements: Tester Strength Makes a Difference. *https://doi.org/102519/jospt1991134191* 1991; **13**: 191–198.

9 Osailan A. The relationship between smartphone usage duration (using smartphone's ability to monitor screen time) with hand-grip and pinch-grip strength among young people: an observational study. *BMC Musculoskelet Disord* 2021; **22**: 1–8.

10 van Deursen AJAM, Bolle CL, Hegner SM, Kommers PAM. Modeling habitual and addictive smartphone behavior: The role of smartphone usage types, emotional intelligence, social stress, self-regulation, age, and gender. *Comput Human Behav* 2015; **45**: 411–420.

11 Bhamra JK, Naqvi WM, Arora SP. Effect of Smartphone on Hand Performance and Strength in the Healthy Population. *Cureus* 2021; **13**. doi:10.7759/CUREUS.15798.

12 Shousha TM, Hamada HA, Abo-Zaid NA, Abdelsamee MYA, Behiry MA. The effect of smartphone use on neck flexion angle and hand grip power among adolescents: Cross-sectional study. *Journal of Human Sport and Exercise* 2021; **16**: S883–S891.

13 Massy-Westropp NM, Gill TK, Taylor AW, Bohannon RW, Hill CL. Hand Grip Strength: Age and gender stratified normative data in a population-based study. *BMC Res Notes* 2011; **4**: 1–5.

AUTHORS

First Author – Maryam Azam
Student, University Institute of Physical Therapy, University of Lahore, Lahore, Punjab, Pakistan.
Maryamazamuol@gmail.com

Second Author – Faiza Asghar
BSPT, tDPT, lecturer, Department of rehabilitation Sciences, Allied Health Sciences, University of Chenab, Gujrat, Punjab, Pakistan.
Faiza.asghar@uipt.uol.edu.pk

Third Author – –Abeeha Noor
Student, University Institute of Physical Therapy, University of Lahore, Lahore, Punjab, Pakistan.
abeeha.jarral99@gmail.com

Fourth Author-Asim Raza
PhD (scholar), Assistant professor, Allied Health Sciences, University of Chenab, Gujrat, Punjab ,Pakistan.
asimrazathakur@gmail.com

Fifth Author-Farooq Islam
PhD scholar, Assistant professor, Department of rehabilitation Sciences, Allied Health Sciences, University of Chenab, Gujrat, Punjab, Pakistan.
farooq.islam@uipt.uol.edu.pk