Research Article

Correlation of mobile phone usage on grip strength, disabilities and posture in young adults

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ABSTRACT

Background: The musculoskeletal issues are now common in excessive use of mobile phone for communication, gamming and socialization on internet. The excessive use of mobile phone may decrease the muscle strength and lead to poor posture ultimately functional impairment related to upper extremity.

Objective: to determine correlation among duration of mobile phone usage, neck posture, disabilities and hand grip strength.

Methods: A correlational cross-sectional study was done at Riphah International University Lahore from March 2020 to February 2021. The target population was male and female young students of 18 to 24 years, used mobile phone more than 6 hours in a day. A total of n=400 subjects participated in the study in which n=235 were females and n=165 were males. The information was gathered using the DASH Questionnaire to identify upper limb problems, the photogrammetry method to determine the cervical angle, and a dynamometer to determine the strength of each hand's grasp. The pearson product-moment correlation coefficient was done by using SPSS version 21.

Result: The mean age of the study participant was 20.99±2.34 years. A total of n=165(41.25%) were male and remaining n=235 females participated in the study. Increase use of mobile had negative significant small correlation with degree of cervical angle (p=0.04), right hand grip strength (p=0.01) and positive significant small correlation with DASH score (0.01). While no significant correlation between daily use of mobile phone and left-hand grip strength

Conclusion: The study concluded that as the duration of mobile phone usage increased, the forward head posture and disabilities of the upper limb also increased. But the grip strength of right hand decreased as the mobile phone duration is increased.

Key words: Correlation, disabilities, female, grip strength, mobile phone, male, posture.

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INTRODUCTION

As they are used for email, internet surfing and gaming, smartphones now have a major role to play in the daily lives of people. More heavy dependence of users on the mobile phone may lead to musculoskeletal injuries [1, 2]. In the past two decades, the incidence of chronic neck and shoulder pain has enlarged dramatically between the age group of 20 to 34 years. While holding a handheld device with a flexed head and neck pose, gravitational stresses on the neck muscles are reported 3-5 times greater than seated neutral position because of maximum head and neck flexion angle throughout texting [3].

Many symptoms, including headache, hand tremor, and finger pain, are frequently reported by smartphone users. Researchers found that at least one area of the upper extremities, upper back, and spine where users of mobile devices report discomfort [4]. The use of smartphones frequently can be linked to health issues like wrist and neck discomfort and exposes hands to high pressures that can cause hand pain, thumb pain, and musculoskeletal disorders [5]. The females are more addicted to mobile phone usage. The study concluded that male subjects show more Upper limb disability [6].

Smartphone use is associated with poor neck posture (forward head posture), which might cause neck discomfort [7]. Long-term usage of a mobile device in such positions might cause or exacerbate "text neck" symptoms, which are pain symptoms on or around the neck [8]. It has been shown that issues with the spine, shoulder, and forearm/hands are significantly correlated with occupational exposure at work and psychosocial risk factors [9]. According to reports, university students use their cellphones for more than 3.5 hours every day on average to send texts, make phone calls, arrange meetings, and conduct online searches [10]. The most prevalent disease of muscle weakness and text collar, as well as a decreased cervical range of motion, have all been linked to smartphone use, according to other studies [11, 12, 13, 14].

Literature suggested the disabilities and posture in mobile users common but there is paucity in the literature on direct relationship with hand grip strength not the grip strength of both hands. So the current study was conducted to determine correlation among duration of mobile phone usage, neck posture, disabilities and hand grip strength.

METHODOLOGY

A correlational Cross-sectional study was conducted within 6 months after the approval of ethical committee of RCRS (REC/RCRS/20/2030) Riphah International University Lahore Campus Pakistan from October 2020 to March 2021. The non-probability convenient sampling technique was used to collect data. The sample size was n=400 which was calculated by using online Rao software by using previous study [15]. The young male and females between aged 18 to 24 years who uses mobile phones more than 6 hours per day were included in the study. All such individuals having any kind of injury in the arm, any deformity, having any other musculoskeletal problem in upper limb because of any other reason were excluded from the study.

Written informed consent was taken from the participants before the start of data collection. All participants were asked to fill demographics and DASH Score Questionnaire data sheet [16]. The grip strength of both hands was measured using handheld dynamometer. Grip strength of right and left hands were measured 3 times on both hands with resting pause of 1 minute between every trial. The average of every hand was calculated [6]. To find out cervical angle photogrammetry method was used [17]. The participants were asked to stand in neutrally position locate and mark C7 spinal process and took the picture of participants from lateral side and then analyze in photogrammetry software (Image J software) to calculate the degrees of craniovertebral angle. Digital video camera (Sony 16.1 M pixels) was used to take picture [18].

The demographic data was presented as mean, standard deviation, frequency, and percentages. The Pearson's product- Moment Correlation (r) was used to find association of excessive mobile use with hand grip strength, upper limb disability and posture individually for females and males. The SPSS version 21 was used for data analysis and level of significance was set at $p<0.05$.

RESULTS

A total of n=77 participants were female and remaining n=73 was male in the study. Most participants have age above the 20 years (n=135) and below 20 were n=15. A total n=127 were belong to middle, n=8 was from upper and remaining n=15 was from low socioeconomic status. The frequency distribution of the occupation, marital status, family system, diagnosis time, history of kidney transplant and patients on dialysis can be seen in table 1.

The mean age of the study participant was 20.99±2.34 years. A total of n=165(41.25%) were male and remaining n=235 were female participated in the study. The average use of mobile was 8.47±2.25 hours per day. The mean degree of cervical angle was 46.4 ± 5^{0}, the right hand grip strength was 25.31±10.65, left hand grip strength was 22.8±15.51 and mean total score of DASH was 16.81±15.67 which showed that mobile phone user have mild disability.

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The Pearson product-moment correlation coefficient showed that increase use of mobile had negative significant small correlation with degree of cervical angle (p=0.04), right hand grip strength (p=0.01) and positive significant small correlation with DASH score (0.01). While no significant correlation between daily use of mobile phone and left hand grip strength. (Table 1)

Table 1: Correlation between mobile phone usage on posture, grip strength and disabilities

		Cervical angle^{O}	Grip strength (Rt hand)	Grip strength (Lt hand)	DASH Score
Daily use of mobile (hrs)	r-value	-0.011	-0.128	0.039	0.256
	p-value	0.04*	0.01*	0.44	0.01*

Level of significance: p<0.05, p<0.01** * p<0.001****

DISCUSSION

The current study is conducted to determine the correlation of mobile phone usage on grip strength of right and left hands, disabilities of the upper extremity and to check cervical angle (forward head posture) in female and male students. This result implied that as the number of hours of mobile usage increase, the more probability of to have Disabilities of the Arm, Shoulder and Hand and cervical angle problem (forward head posture). Findings also revealed a negative connection and statistically significant that grip strength of right hand decreases as mobile phone usage increases in duration and there was a positive link between using a phone and the left hand's grip strength, with no statistically significant outcomes.

A researcher investigated the effects of mobile phone usage. In that research the effects of mobile phone on functional hand performance, handgrip strength, pinch strength and overall hand function were evaluated. The findings showed that handgrip strength, hand-pinch strength and DASH scores were substantially reduced using mobile phone. On the dominant side, grip strength and hand-pinch strength capabilities were weaker than the non-dominant side in the mobile phone-user high-frequency community. Such results suggested that overuse of mobile phones predominantly can affect the dominant hand because it is more involved in everyday activities [19] which is quiet similar to recent study.

According to a study the three main risk factors (1) posture, (2) muscle force and (3) muscle use were identified in studies which are responsible for upper-limb musculoskeletal disorders. Three bad postures are usually assumed by mobile phone users included the stretching or bending the shoulders greater than 20 degree, setting elbows greater than 100 degrees and bending wrists greater than 15 degree with ulnar variations and bending the forward neck and trunk 20 degree or greater [20].

Another research contrasted two young adult groups with a non-mobile phone user group that was a control group and a group that used mobile in excess , in which found that high-frequency mobile phone users have distended median nerve, further thumb pain, reduced pinch intensity and hand tasks compared to less-frequency mobile phone users[10].

A study revealed that there was an opposite relationship between prolonged use of mobile phones and handgrip and pinch-grip strength. The outcome showed that the weaker handgrip and weaker pinch-grip were associated with longer use of mobile phones. Young people should be conscious of the adverse effect of mobile phone [21].

Research to include information that could be used to help avoid musculoskeletal disorders caused or worsened by the use of smartphones. Repeated movements in a static pose can lead to a number of issues, such as shoulder and neck problems. The longer the display terminals are used, the greater the bending angles of the bone of the neck and the bone of the waist. According to research, the adoption of an incorrect pose for a long period of time can lead to a decline in the function of the waist muscles, causing waist pain. In this research, it was found that the most frequently encountered forms of pain were neck pain and shoulder pain. It was also shown that the bending angles of the neck and back bones increased considerably [22].

Some other demographic factor may contribute in the neck pain, disability and hand grip strength i.e gender base differences, position while using the mobile phone etc. these factor were not evaluated in the study.

CONCLUSION

It is concluded that increase in number of hours of mobile phone usage the probability of forward head posture, Disabilities of the Arm, Shoulder and Hand (DASH) increases and the probability of the grip strength of dominant hand was decreased.

Author's Contribution

UB: substantial contributions to the conception, design and statistical analysis of the study.
RN: acquisition of data for the study.

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MLA: interpretation of data for the study.
HS: analysis of the data for the study.
MTJ: Appraisal of result of the study.
ZH: drafted the work and revised it critically for important intellectual content.
UB, RN, HS, MLA, MTJ and ZH: final approval of the version to be published and agreement to be accountablefor all aspects of the work in ensuring that questions related to theaccuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was ethically approved by the ethical committee of RCRS (REC/RCRS/20/2030) Riphah International University Lahore Campus Pakistan.

Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Acknowledgments

None to declare.

Conflicts of Interest

The authors declare no conflict of interest. There is no funding source in the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; orin the decision to publish the results.

REFERENCES

1. Eitivipart AC, Viriyarojanakul S, Redhead L. Musculoskeletal disorder and pain associated with smartphone use: A systematic review of biomechanical evidence. Hong Kong Physiother J. 2018; 38(2):77-90. [CrossRef] [PubMed]
2. Damodaran KK, Sharma V, Purushothaman S. Relationship between the hand discomfort with the dimensions of hand and touch screen mobiles. Drug Invention Today. 2019;12(3).
3. Xie YF, Szeto G, Madeleine P, Tsang S. Spinal kinematics during smartphone texting - A comparison between young adults with and without chronic neck-shoulder pain. Appl Ergon. 2018;68: 160-168. [CrossRef] [PubMed]
4. Lee M, Hong Y, Lee S, Won J, Yang J, Park S, Chang KT, Hong Y. The effects of smartphone use on upper extremity muscle activity and pain threshold. J Phys Ther Sci. 2015;27(6):1743-5. [CrossRef] [PubMed]
5. Samaan MN, Elnegmy EH, Elnahhas AM, Hendawy A. Effect of prolonged smartphone use on cervical spine and hand grip strength in adolescence. Int J Multidiscip Res Dev. 2018;5(9):49-53.
6. Din ST, Hafeez N. Relationship of smartphone addiction with handgrip strength and upper limb disability. Int Surg Case Rep. 2021;6:1-7
7. Alzaid AN, Alshadokhi OA, Alnasyan AY, AlTowairqi MY, Alotaibi TM, Aldossary FH. The Prevalence of Neck Pain and The Relationship Between Prolonged Use of Electronic Devices and Neck Pain IN: A Saudi Arabia, Cross-Sectional Study in Saudi Arabia. Egypt. J. Hosp. Med. 2018;70(11):1992-9. [CrossRef].
8. Yoon W, Han H, Choi S, Shin G, editors. Neck muscle activation and head kinematics when using a smartphone while walking. Proceedings of the Human Factors and Ergonomics Society Annual Meeting; 2019: SAGE Publications Sage CA: Los Angeles, CA
9. So BCL, Cheng ASK, Szeto GPY. Cumulative IT Use Is Associated with Psychosocial Stress Factors and Musculoskeletal Symptoms. Int J Environ Res Public Health. 2017 8;14(12):1541. [CrossRef] [PubMed]
10. İnal EE, Demirci k, Çetintürk A, Akgönül M, Savaş S. Effects of smartphone overuse on hand function, pinch strength, and the median nerve. Muscle Nerve. 2015;52(2):183-8. [CrossRef]
11. Karkusha RN, Mosaad DM, Abdel Kader BS. Effect of Smartphone Addiction on Neck Function among Undergraduate Physical Therapist Students. Egypt. J. Hosp. Med. 2019;76(4):4034-8. [CrossRef]
12. Kaviyarasan R, Chandran A. Ergonomics in Musculoskeletal Disorders Due to Usage of Mobile Phones
13. Kataria J. Text Neck–Its Effects on Posture. IJCRT. 2018;6(1):817-9
14. Neupane S, Ali U, Mathew A. Text neck syndrome-systematic review. IJIR. 2017;3(7):141-8.
15. Gold JE, Driban JB, Thomas N, Chakravarty T, Channell V, Komaroff E. Postures, typing strategies, and gender differences in mobile device usage: an observational study. Appl Ergon. 2012;43(2):408-12. [CrossRef]
16. Gummesson C, Atroshi I, Ekdahl C. The disabilities of the arm, shoulder and hand (DASH) outcome questionnaire: longitudinal construct validity and measuring self-rated health change after surgery. BMC Musculoskelet Disord **4**, 11 (2003). [CrossRef]
17. Guan X, Fan G, Wu X, Zeng Y, Su H, Gu G, et al. Photographic measurement of head and cervical posture when viewing mobile phone: a pilot study. European Spine Journal. 2015;24(12):2892-8. [CrossRef]
18. Noor R, Olyaei G, Hadian MR, Talebian S, Bashir MS. A reliable and accurate system of joint position sense measurement. 2018
19. Radwan NL, Ibrahim MM, Mahmoud WSE. Evaluating hand performance and strength in children with high rates of smartphone usage: an observational study. J Phys Ther Sci. 2020;32(1):65-71. doi:10.1589/jpts.32.65
20. Namwongsa S, Puntumetakul R, Neubert MS, Chaiklieng S, Boucaut R. Ergonomic risk assessment of smartphone users using the Rapid Upper Limb Assessment (RULA) tool. PLoS One. 2018.30;13 (8):e0203394. [CrossRef] [PubMed]
21. 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. 2020. [CrossRef]
22. Kim HJ; DH; Kim JS. The relationship between smartphone use and subjective musculoskeletal symptoms and university students. J Phys Ther Sci. 2015; 27(3):575-9. [CrossRef][PubMed]

https://doi.org/10.52567/trj.v7i01.210