Journal Homepage: -www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI:10.21474/IJAR01/xxx
DOI URL: http://dx.doi.org/10.21474/IJAR01/xxx
ISSN NO. 2320-5407

RESEARCH ARTICLE

INFLUENCE OF SMARTPHONE ADDICTION ON GRIP AND PINCH STRENGTH IN COLLEGIATE POPULATION – AN OBSERVATIONAL STUDY.

Dr. Basavaraj Motimath[1], Melissa Luis[2] and Dr. Dhaval Chivate[3].

1. Associate professor mpt sports physiotherapy, k.l.e.u. Institute of physiotherapy, jn medical college, nehru nagar,belagavi, karnataka.
2. Bpt (mpt) mpt sports physiotherapy, k.l.e.u. Institute of physiotherapy, jn medical college, nehru nagar, belagavi, karnataka.
3. Lecturer mpt sports physiotherapy, k.l.e.u. Institute of physiotherapy, jn medical college, nehru nagar, belagavi, karnataka.

Manuscript Info

Manuscript History

Received: xxxxxxxxxxxxxxx
Final Accepted: xxxxxxxxxxx
Published: xxxxxxxxxxxxxxx

Keywords:-
sas-sv, dhi, grip strength, pinch strength, smartphone, collegiate students.

Abstract

Background: in the past decade there has been a rapid increase in the use of mobile devices, particularly smartphones for communication, gaming and internet browsing. The continued decrease in the price off these devices, suggest that the use of smartphones will also increase two-fold. Meanwhile, with the smartphone ownership rates skyrocketing and with rapid development of telecom technologies, mobile phones are becoming much smarter both in size and function in recent years.

Objective: the purpose of the study was to determine the influence of smartphone addiction on grip and pinch strength in collegiate population.

Methodology: 100 collegiate students (both males and females) were randomly included in the study. Demographic data (name, age, gender) was noted. Smartphone addiction and hand function was assessed by smartphone addiction scale and duruoz hand index respectively. Grip and pinch strength was assessed using a dynamometer and pinch gauge respectively.

Result: there was a significant correlation ship between low and high smart phone users with the duration and time (0.0001). There was significance with addiction and pain on activity. Also a positive correlation was seen between right and left chuck pinch (0.0163) and (0.0288) respectively, tip pinch of the left (0.0398). There was significant correlation between sas scores and right and left grip strength (0.003) and (0.0032)

Conclusion: smartphone addiction is related to grip and pinch strength where high smartphone users shower higher grip strength. . Grip and pinch strength was also influenced by duration and time of smartphone usage. Also tip and chuck pinch grip showed to be significant.

Copy Right, IJAR, 2017,. All rights reserved.

Corresponding Author:-Basavaraj motimath.
Address:- Associate professor mpt sports physiotherapy, k.l.e.u. Institute of physiotherapy, jn medical college, nehru nagar, belagavi, karnataka.

Introduction:-

In the past decade there has been a rapid increase in the use of mobile devices, particularly smart phones, for communication, gaming and internet browsing. The continued decrease in the price of these devices, suggests that the use of smart phones will also increase two-folds.[1] with each new generation of the mobile phone being manufactured, there are more built-in features and functions which lead to an increased exposure and use of the small built-in keypads. In younger persons, these exposures may be of great importance due to their developing musculoskeletal structure, their growing tendency to use their mobile phones for short message service (sms) messaging and gaming, has resulted in their likelihood of getting more exposure to new technologies.[2]

The global rapid adoption of text messaging has raised concerns that high volumes of these activities could lead to musculoskeletal disorders (msds).[3] there are growing number of case studies that have identified that, first carpometacarpal (cmc) arthritis, tendonitis and tenosynovitis has been developing among individuals sending a high volume of text message.

Given the nature of smart phones, users often hold the device with a single hand, which forces only the thumb to use the keys.[4] in addition, it has been reported that university students spend an average of >3.5 hours/day texting, emailing, scheduling and internet browsing on their mobile phones and are frequently said to have pain at the base of the thumb.[5] single hand-held smart phones, compels individuals to engage in repetitive flexion/extension of the wrist.[6,7] these repetitive wrist movements are involved in the etiopathogenesis of carpal tunnel syndrome (cts).[8,9] the human hand has unique features and functions like any other organ of the body in everyday life, and the functional impairment of the hand can affect everyday life and ultimately the quality of life.[10]

Hand grip and pinch grip is an important and basic function of the hand. Object manipulation with a stable handgrip is one of the most frequent movements performed in activities of daily living and occupational fields. A reduction in grip strength and control ability can be attributed to physical and psychosocial factors.[11]

Therefore, the objectives of this study were three-fold. First, since there is paucity in the literature regarding the relationship between smart phone addiction and its effects on the musculoskeletal system there is a need to investigate the relationship between variables of time and duration of smart phone use and grip strength. Second, the relationship obtained will be helpful in determining the correlations between smart phone addiction, duration and time of use, grip and pinch strength respectively. Third, to gain knowledge about the level of smart phone addiction in collegiate population.

Materials and methods used:-

Materials used:-

1. Data collection sheet
2. Informed consent form
3. Pen

Tools/instruments:-

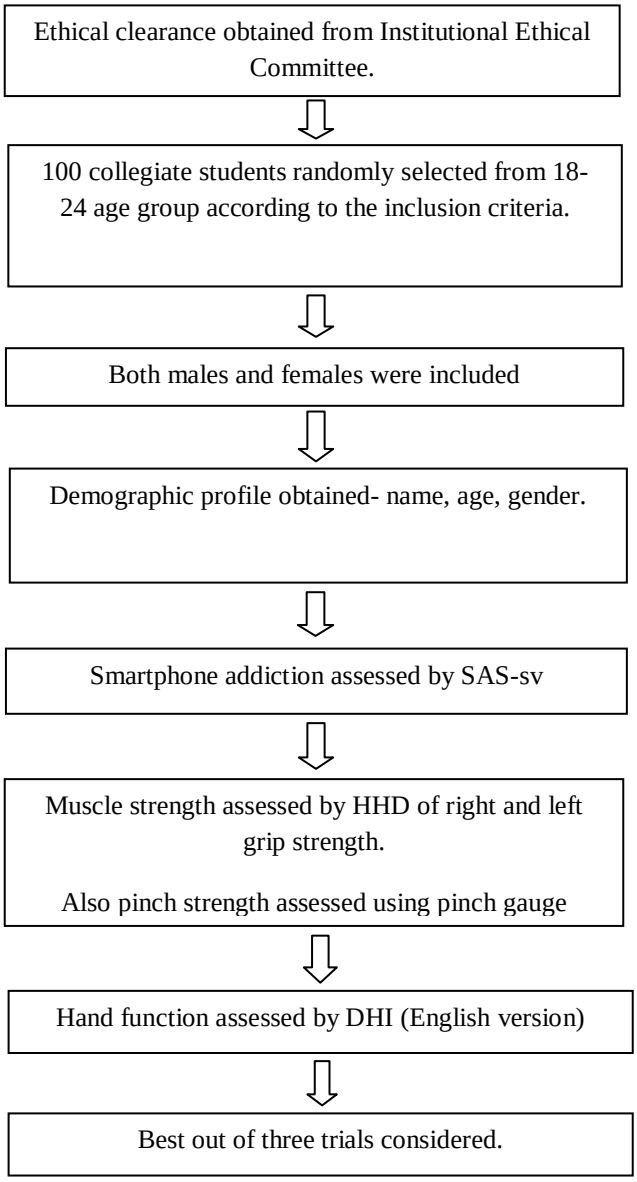
1. Hand dynamometer
2. Pinch gauge
3. Table
4. Stool
5. Visual analogue scale (vas)
6. Smartphone addiction scale-shorter version (sas-sv)
7. Duruöz hand index (dhi)

Methodology:-

A observational study was conducted on 100 students from constituent units of kle university-belagavi. The students were screened on 15th october 2016 between 2:00 pm to 5:00 pm for a duration of 1 week. The inclusion criteria was both males and females between the age group of 18 to 24 years, using a smartphone, symptomatic and asymptomatic collegiate students were considered in the study. Exclusion criteria ecluded individuals diagnosed with neuropathy, such as carpal tunnel syndrome, radiculopathy, previous contracture, tendon lesion, or lateral or medial epicondylitis in the upper extremities, fractures of the forearm, wrist affecting wrist and arm function and

tendon pathologies. Outcome measures used were, smartphone addiction scale-shorter version(sas-sv) to assess level of sddiction, english version of duruoz hand index (dhi) to know the level of hand function and verbal analogue scale (vas) to estimate the intensity of pain.

A written informed consent was taken from the subjects included in the study. For each subject baseline assessment was obtained before the test and brief demonstration about the test was explained and shown to the subjects. All the subjects were instructed to discontinue if they had any form of discomfort during the study period.



Statistical analysis:- statistical package of social sciences (spss) version 21 was used for statistical analysis. Probability values of less than 0.05 were considered statistically significant

Results:-

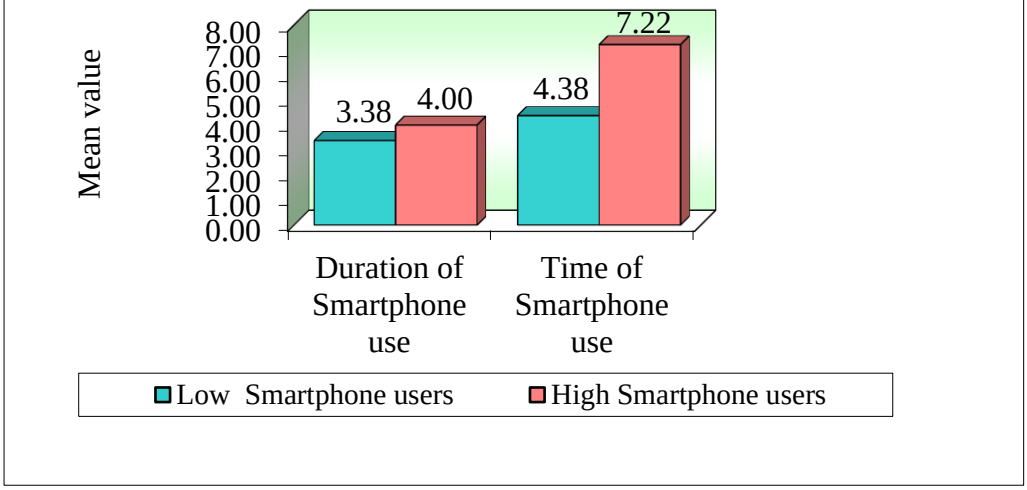
There were no significant differences in terms of age, gender, or dominant hand between the two groups. The vas pain in movement was found to be significantly higher with increased time spent using smart phone. All smart phone users held them in their dominant hands when using the device. Of the 100 subjects, none of the participants had tendinosis or tendinitis of the fpl or a joint disorder of the thumb.

The sas-sv scores correlated moderately with the vas pain in movement. The sas-sv scores also correlated positively with dhi scores. Sas-sv scores correlated positively with pinch strength, but the correlations were weak. The duration and time of smart phone use was found to be correlated moderately with grip strength. Pinch strength correlated strongly with grip strength ($p<0.001$). Dhi scores were found to be correlated moderately with vas pain in movement ($p<0.001$).

Duration and time of smartphone use:-

A] a significant correlation was noted between time of smart phone use among low and high smart phone users (table 1).

Figure:Comparison of low and high Smartphone users with respect to duration and time



B] a significant statistical relationship was also noted between sas-sv scores of smart phone users and the demographic and clinical features of the study participants. (table 2).

Variables	Correlations between sas scores of smartphone users with		
	R-value	T-value	P-value
Duration of smartphone use	0.2150	2.1791	0.0317*
Time of smartphone use	0.5347	6.2644	0.0001*
Vas active	0.3859	4.1414	0.0001*
Vas rest	0.1839	1.8525	0.0670
Dhi	0.2978	3.0881	0.0026*
Right grip strength	0.3508	3.7088	0.0003*
Left grip strength	0.2920	3.0221	0.0032*
Pinch grip tip right	-0.2136	-2.1648	0.0328*
Pinch grip chk right	-0.2644	-2.7137	0.0079*
Pinch grip lateral right	-0.1135	-1.1305	0.2610
Pinch grip tip left	-0.2262	-2.2987	0.0236*
Pinch grip chk left	-0.2521	-2.5793	0.0114*
Pinch grip lateral left	-0.1432	-1.4323	0.1553

*$p<0.05$

Discussion:-

As the results show, collegiate students both high and low smart phone users spent significant time with their smart phones. The data also suggests that frequent smart phone users may be more prone to experience pain the hand.[12] in addition, the grip strength and pinch strength was found to be positively correlated.

Consequently we may assume that, when the usage level of smart phones increased the vas of pain in the hand increased and the hand function decreased. However, grip and pinch strengths showed significant changes. Overall, the addiction severity also seemed to have a positive correlation between duration and time of smart phone use, grip and pinch strength respectively.

The use of smart phones and mobile devices has become widespread, particularly among youth, the possible impacts on hand function and structures have not been clarified. One recent study demonstrated smartphone overuse enlarges the median nerve, causes pain in the thumb, and decreases pinch strength and hand functions.[13]

Consistent with this result, we found that with increase in the time of using the smart phone the pain increased but however they seemed to have better grip strength and significant tip and chuck pinch grips respectively. Moreover, the participants in our study represent a relatively more homogeneous subject group than in the esra erkol inal et. Al.'s study,[14] because the participants in our study were all university students who have a habit of single-hand-held smart phone use. We also defined the smart phone use level according to a newly developed and more recently validated scale, the sas-sv (smart phone addiction scale – shorter version), rather than self-reported information from participants, as was done in the study cited above.[15]

The sas-sv led us to evaluate all kinds of smart phone use, such as texting, internet browsing, emailing, etc. Nevertheless, previous studies have demonstrated that pinch and tendon forces alter the trajectory of the tendons and add pressure to the carpal tunnel, which may also be an underlying mechanism for the enlarged median nerves. The participants in this study did not have any symptoms of cts. Smartphone users typically adapt their thumb and hand postures to the constraints of the phone design layout that may impact their performance in addition, extensive flexion/extension of the thumb and wrist occurs when an individual uses a smart phone, and placing thumbs and wrists in these static postures will likely lead to increased load on these joints and associated muscles and tendons. On the other hand, tendon injuries may be secondary to acute trauma (e.g., tendinitis)

Or repetitive loading (e.g., overuse injury). Occupational overuse has also been reported. Intensive work with the hand and thumb may result in pain. Activity pain was also found to be higher on the frequent texting side of mobile phone users. Similarly, we found vas pain in movement and rest to correlate with duration of smartphone use, as measured by the sas-sv. Vas pain in movement was also found to be significantly higher in the high smartphone-user group than in the low smartphone- user group. Vas pain in movement was higher in the non-users than in the low smartphone users, but the difference was not significant. The higher vas pain scores for movement in the Non-users may be due to other habits in which hands are used frequently, such as hobbies. Overall, pain in movement among smartphone users seemed to increase with greater use of the device. However, we found no tendon or joint pathologiesTo explain these relationships in the groups, unlike findings from another recent study.[16] the underlying Pathogenetic mechanisms of increased pain in high smartphone users are not clear. In addition, we found increased pinch strength and grip strength increased with the duration and time of smartphone use, and this may have been due to enlargement of tendons such as The fpl tendon as suggested in another study.

Conclusion:-

In this study we have demonstrated That increased time spent on smart phones are linked to higher addiction levels rather than duration of smart phone use. The data suggest that smart phone overuse/addiction may lead prone individuals to develop various musculoskeletal problems. However, the exact clinical relevance remains to be explored. Moreover, frequent use of smartphones may affect hand function possibly resulting in pain in the thumb. Individuals should be aware of the dangers that may arise from overuse/addiction of smartphones. Since this study also showed significance in grip and pinch strength with regards to smartphone use, one can make use smartphone in cases of early rehabilitation in cases of forearm, wrist and hand fractures.

Limitations:-

Since all were volunteers, there is a chance that some who thought they might do well would be more likely to participate than any who thought they might do poorly. This could cause a biased sample in favour of higher hand strength scores.

While testing tip pinch for this study, some subjects with long fingernails had difficulty assuming the recommended positioning, while others had difficulty maintaining the position as they were pinching (index finger or thumb would hyperextend and/or slip off the meter).

The estimated cumulative time of exposure was calculated according to each user's report.

Acknowledgement:-

We would like to express our indebtedness to kleu institute of physiotherapy. We would also like to thank all the participants in this study without whom this study would have been impossible.

Conflict of interest:-None.

Funding:- Self-funded.

References:-

1. Jonsson p, johnson pw, hagberg m, forsman m. Thumb joint movement and muscular activity during mobile phone texting—a methodologicalstudy. J electromyogr kinesiol 2011;21:363–370.
2. Gold je, driban jb, thomas n, chakravarty t, channell v, komaroff eg. Postures, typing strategies, and gender differences in mobile device usage: an observational study. Applied ergonomics. 2012 mar 31;43(2):408-12.
3. Gustafsson e, thomée s, grimby-ekman a, hagberg m. Texting on mobile phones and musculoskeletal disorders in young adults: a five-year cohort study. Applied ergonomics. 2017 jan 31;58:208-14.
4. Trudeau mb, young jg, jindrich dl, dennerlein jt. Thumb motor performance varies with thumb and wrist postures during single- handed mobile phone use. J biomech 2012;45:2349-2354
5. Berolo s, wells rp, amick bc iii. Musculoskeletal symptoms among mobile hand-held device users and their relationship to device use: a preliminary study in a canadian university population. Appl ergon 2011;42:371-378.
6. Trudeau mb, young jg, jindrich dl, dennerlein jt. Thumb motor performance varies with thumb and wrist postures during single- handed mobile phone use. J biomech 2012;45:2349-2354
7. Kwon m, lee jy, won wy, park jw, min ja, hahn c, et al. Development and validation of a smartphone addiction scale (sas). Plos one 2013;8:e56936
8. Weislander g, norback d, gothe cj, juhlin l. Carpal tunnel syndrome (cts) and exposure to vibration, repetitive wrist movements, and heavy manual work: a case-referent study. Br j ind med 1989;46:43-47
9. Harris-adamson c, eisen ea, kapellush j, garg a, hegmann kt, thiese ms, et al.biomechanical risk factors for carpal tunnel syndrome: a pooled study of 2474 workers. Occup environ med 2015;72:33-41.
10. T. H. Rho, e. H. Kwon, e. E. Park, h. E. Lee, "analysis of biomechanics for pinch strength due to elbow flexion degree", j korean soc phys med, vol. 4, pp. 275-280, 2009.
11. S. Ambike, f. Paclet, v. M. Zatsiorsky, m. L. Latash, "factors affecting grip force: anatomy, mechanics, and referent configurations", exp brain res, vol. 232, no.4, pp. 1219-1231, 2014.
12. Van deursen aj, bolle cl, hegner sm, kommers pa. Modeling habitual and addictive smartphone behavior: the role of smartphone usage types, emotional intelligence, social stress, self-regulation, age, and gender. Computers in human behavior. 2015 apr 30;45:411-20.
13. Ben-yehuda l, greenberg l, weinstein a. Internet addiction by using the smartphone-relationships between internet addiction, frequency of smartphone use and the state of mind of male and female students. Journal of reward deficiency syndrome & addiction science. 2016 jun 30;2(1):22-7
14. Inal ee, çetintürk a, akgönül m, savaş s. Effects of smartphone overuse on hand function, pinch strength, and the median nerve. Muscle & nerve. 2015 aug 1;52(2):183-8.
15. Min kwon, dai-jin kim, hyun cho, soo yang. "the smartphone addiction scale: development and validation of a short version for adolescents.
16. Harris-adamson c, eisen ea, kapellush j, garg a, hegmann kt, thiese ms, et al.biomechanical risk factors for carpal tunnel syndrome: a pooled study of 2474 workers. Occup environ med 2015;72:33-41.