

# Effects of Smartphone Addiction on Pinch Grip Strength

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## ABSTRACT

**Background:** The most widely distributed and used mobile communication device to date is the smartphone. The hand has unique features like any other organ of body in everyday life and functional impairment of hand can affect everyday life and ultimately quality of life. Prehension is defined as the act of seizing or grasping, whereas prehensile describes the adaptation of an organ for grasping or wrapping round hand object. In humans the hand is the only prehensile organ. Since there is a paucity in the literature regarding relationship between smartphone addiction and its effects on musculoskeletal system there is a need to investigate relation between smartphone use and grip strength.

**Method:** Smartphone users were assessed using smartphone addiction scale- short version. Then the individuals were allotted into 2 groups according to the score. The first group was group A which had smartphone addicts with score greater than 26 and the group B had non-addicts with score less than 26. After dividing the groups with 55 individuals in each group, pinch grip strength was assessed using pinch gauze dynamometer. Best of three trials were considered.

**Results:** Unpaired t-test was applied to compare pinch grip strength between addicts and non-addicts where the p value was more than 0.05. Hence the result was considered statistically non-significant.

**Conclusion:** The study concludes that there was no difference in pinch grip strength in between smartphone addicts and non addicts.

**Keywords:** Smartphone, Pinch grip

## INTRODUCTION

In our personal life, we may find that we are increasingly utilizing and relying on smartphones. With recent release of phones, primarily touch screen devices and others likely to follow thumb use for mobile touch screen application is likely to increase. <sup>[1]</sup> Mobile communication, a communication behaviour that enables the user to be mobile without the need for wired communication. The most widely distributed and used mobile communication device to date is the smartphone. The hand has unique features like any other organ of

body in everyday life and functional impairment of hand can affect everyday life and ultimately quality of life. The human hand is composed of thumb, index, middle, ring and little finger and palm, without including the thenar and hypothenar eminence. The finger consists of nineteen bones of distal phalanges, middle phalanges and proximal phalanges and metacarpal bones. The wrist contains 8 bones: hamate, pisiform, triquetrum, capitate, lunate, trapezoid, trapezium and scaphoid. In total, hand has 27 bones and 28 muscles. The hand grip and pinch grip is an important

and basic function for various movements. Object manipulation with stable hand grip is one of the most frequent movements performed in activities of daily living and occupational fields. A reduction in the grip strength and control ability can be attributed to physical and physiological factors. [2] Prehension is defined as the act of seizing or grasping, whereas prehensile describes the adaptation of an organ for grasping or wrapping round hand object. In humans the hand is the only prehensile organ. [3] Prehension grip tends to hold the object between the tips of fingers and thumb. It involves intrinsic and extrinsic. In a pinch grip the MCP and PIP of the fingers are flexed, the thumb is abducted and the distal joint of both are extended bringing the pad of the fingers and thumb together. In lateral prehension pad of the extended thumb presses an object against the radial side of the index fingers. A side to side grip requires adduction of fingers, usually index and middle finger. Individuals who more frequently uses smart phone are more likely to have an enlarged median nerve and to have impaired hand functions and pinch strength. [4] The continuous decrease in the price of the smartphones, the use has increased 2 folds with each new generation of mobile phone being manufactured. There are more inbuilt features and functions which lead to increase exposure and use of small inbuilt keypad. In young people this exposure may be of great importance due to their growing tendency to use mobile phones for short message service, gaming. Given the nature of smartphones, users often use the device single hand which forces the thumb to use keys. In a study it has been reported that student spend an average of 7.35 hours/day texting, mailing internet browsing on phone. Since there is a paucity in the literature regarding relationship between smartphone addiction and its effects on musculoskeletal system there is a need to investigate relation between smartphone use and grip strength.

The aim was to find the relationship between smartphone addicts and the pinch

grip strength. The objectives of the study were to investigate the relation between smartphone users and pinch grip strength using pinch-gauge dynamometer and to compare the pinch grip strength between smartphone addicts and non-addicts using pinch-gauge dynamometer.

## **MATERIALS AND METHODS**

The study was an observational study which was carried out in Dr. D.Y. Patil College of Physiotherapy. Study populations were smartphone addicts and non addicts with sample size of 110. The sampling method was purposive sampling with 1 year duration. Age group of 18-24 years both males and females, Smartphone addiction score short version whose score was more than 26 for addicts and Score of Smartphone addiction scale-short version whose score was less than 26 for non-addicts were included in the study. Individuals with any hand deformity, Nerve injury, Any recent upper limb fracture or trauma, Disorders like CTS, radiculopathy, tendinopathy, Individuals going to the gym, Individuals with intellectual disorder-MMSE score less than 24 and individuals who smoke or consume alcohol were excluded from the study. Materials used were Pinch gauge dynamometer, stool, Smartphone addiction scale- short version, Mini mental scale, and Consent form.

### **Procedure:**

Ethical clearance was obtained from the institute. 110 individuals were selected based on the inclusion criteria. Smartphone users were assessed using smartphone addiction scale- short version. Then the individuals were allotted into 2 groups according to the score. The first group was group A which had smartphone addicts with score greater than 26 and the group B had non-addicts with score less than 26. After dividing the groups with 55 individuals in each group, pinch grip strength was assessed using pinch gauze dynamometer. The subjects was seated with their shoulder adducted and neutrally rotated, elbow flexed

at 90°, forearm in neutral position and wrist between 0° and 30° extension and between 0° and 15° ulnar deviation. The subjects had to pinch the gauze and hold it for 2 seconds. Best of three trials were considered. Data was noted and filled in excel spread sheet. Comparison was done between the two groups. Appropriate data analysis was applied and results were noted.

**Statistical Analysis:**

**Table 1:-**

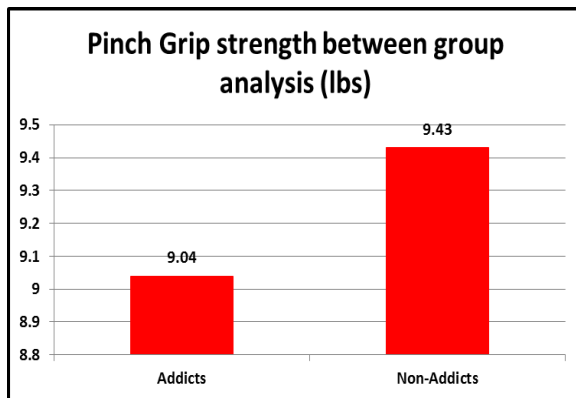
No. of participants	Addicts (A)	Non-Addicts
110	55	55

**Interpretation:**

Table 1 shows that out of 110 participants, 55 participants belonged to the Addict group and 55 participants belonged to the Non-addict group. Therefore there is equal distribution in both the groups.

**Table 2:-**

Pinch grip strength	Addicts	Non-Addicts
Mean	9.04	9.43
SD	2.23	2.25
t	0.914	
p	0.36	
Interpretation	Not significant	



**Graph 2:-**

**Interpretation:-**

In the above table 2 and graph 2, unpaired t-test was applied to compare pinch grip strength between addicts and non-addicts where the p value was more than 0.05. Hence the result was considered statistically non-significant.

**DISCUSSION**

The primary objective of this study was to assess and compare the pinch grip

strength among the smart phone addicts and non addicts. This study showed that there was statistically no difference in the grip strength of smartphone addicts and non addicts. The rationale for this may be small sample size. Also when means were compared it showed that smartphone addicts had reduced grip strength than non addicts. The reason for this may be over use of muscles leading to fatigue and pain. However in this study pain was not an outcome measure. 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. [5] Another study done by Esra Erkol Inal and Serpil Savas et.al in 2015 suggested that, Smartphone users typically adapt their thumb and hand postures to the constraints of the phone design layout that may impact their performance. Incorrect posture, such as prolonged flexion of the wrist and repetitive use of the thumb, may impact the median nerve and the structures in the hand. In addition, extensive flexion/extension of the thumb and wrist occurs when an individual uses a smartphone, and placing thumbs and wrists in these static postures will likely lead to increased load on these joints and associated muscles and tendons. [6] According to the statistical analysis of this study the pinch grip strength of addicts was less than the pinch grip strength of non-addicts. Consequently the unpaired t-test was applied where the p value was more than 0.05. Hence we may assume that, when the usage level of smart phones increases the pinch grip strength decreases initially. This result is controversial as a study done by Sumit Kalra in 2017 suggested that frequent use of smartphones may affect hand

function and pinch grip strength due to extensive flexion/extension of the thumb occurs when an individual uses a smart phone, and placing thumbs in these static postures will likely lead to increased load on these joints and associated muscles and tendons. [7] We found that the pinch grip strength of addicts was less than the pinch grip strength of non- addicts which is due to increase with the duration and time of smartphone use, there may have been enlargement of tendons such as the flexor pollicis longus tendon, enlargement of median nerve which are suggested in some studies.

### CONCLUSION

The study concludes that there was no difference in pinch grip strength in between smartphone addicts and non addicts. The current study used a convenience sample which included and tested only students from Dr. D.Y. Patil College of physiotherapy, so it is possible that study participants do not reflect the population as a whole. In addition, the current study included only 110 participants, may be a larger sample could of yield different results, which may reflect more appropriately the population. Also there was restriction of age criteria. Future studies might examine the hypotheses on young populations that don't belong necessarily to the academy or other academic institution with high level of smartphone use or internet addiction. Factors like pain, disability etc. can be included to study the

association. Similar studies can be done among smartphone used hand and non-used hand. Treatment to increase the pinch grip strength can be given.

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