



ORIGINAL RESEARCH PAPER

Physiotherapy

EFFECTS OF EXERCISES ON PINCH STRENGTH AMONG SMARTPHONE OVERUSERS

KEY WORDS: Smartphone addiction, Pinch Gauge, Resistive hand exercise and Hand Putty Exercise.

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ABSTRACT

A smart phone is a mobile personal computer with an advanced mobile operating system with features useful for mobile or handheld use. It enables use of many social networking services like such as twitter and facebook functions of calling and texting. Repetitive strain injury one of the musculoskeletal diseases, where RSI syndrome is associated with the hands with overly repetitive finger use, as of writing a text message. Smartphone addiction is defined as excessive use of smart phone that affects the daily lives of users and as various clinical features including salience, tolerance, and loss of control, mood modification, withdrawal symptoms and craving. Recent investigations have shown that smart phone users tend to report pain in the neck, shoulder and thumb and the severity of the symptoms. Pinch grip defined as the force exerted when using the index finger and thumb. It is measured by pinch dynamometer. The overuses of the smart phone may affect the flexor pollicis longus tendon and joint of the thumb. Methods and materials: Thirty individuals with the age group of 18-21 years. Irrespective to the gender. Hand putty and resistive hand exercise was given to the experimental group and hand putty exercise given to control group. Where the outcome measures was mentioned as Smartphone Addiction Scale and pinch gauge. RESULT: The result stated that by comparing the mean difference for two group. We concluded the pinch improvement for group A which is hand putty with resistive hand exercise when compared to group B which is hand putty exercise. This result found statistical significant at $p < 0.0001$ for both the groups..

INTRODUCTION

In the past decade there has been a rapid increase in the use of mobile devices particularly smartphones. A smartphone is a mobile personal computer with an advanced mobile operating system with features useful for mobile or handheld use. It enables use of many social networking services like such as Twitter and Facebook functions of calling and texting. It requires more concentration than a traditional mobile phone.

The use of smartphones is exposed to repetitive strain injury (RSI), one of the musculoskeletal diseases. Repetitive strain injury syndrome is a disease that may occur with when repeated use of specific parts of the body (nerves, ligaments, muscles, etc...) is damaged and then, the damage occur cumulative¹ Repetitive strain injury syndrome is associated with the hands with overly repetitive finger use, as of writing a text message. This fact is relevant enough in order that terms such as text message injury, blackberry thumb, I phone thumb are made².

Smartphone addiction is defined as excessive use of smartphones that affects the daily lives of users and has various clinical features including salience, tolerance, loss of control, mood modification, withdrawal symptoms and craving. Smartphone addiction sometimes colloquially known as 'Nomophobia' (fear of being without a mobile phone).

Recent investigations have shown that smartphone users tend to report pain in the neck, shoulder and thumb and the severity of the symptoms as the total time spent using the smartphone increases³. The prevalence of smartphone addiction among Indian adolescents was reported to range from 39% to 44%⁴. The overall prevalence of smartphone ownership among Asian adolescents from China, Hong kong, Japan, South Korea, Malaysia, Philippines was reported at 62%⁵. Chang Min seo et al. defined smartphone addiction as being immersed in smartphone use with no self control resulting in harmful consequence for self and others⁶.

Pinch grip is defined as the force exerted when using the index finger and the thumb. It is a test for determining maximum voluntary contractions force. It is measured by having a patient forcefully squeeze, grip or pinch dynamometers; results are expressed in either pounds or kilograms of pressure⁷. Pinch strength is one of the important characteristics of a normal hand. Grasping or pinching light objects becomes a problem when any items is held for long period of time. The pressure is holding the items can reduce blood flow and strain tendons, leading to hand

symptoms. Repetitive motion such as prolonged grasping can lead to tendonitis.

AIM OF THE STUDY

This study is aimed to show "the effects of exercise on pinch strength among smartphone overuser.

OBJECTIVE OF THE STUDY

- To find out the smartphone addicts by using 'Smartphone Addiction Scale'
- To know the effect of exercise on pinch strength among smartphone overusers.

NEED OF THE STUDY

Hence the purpose of the study is to prescribe appropriate hand exercise to improve pinch strength among smartphone addicts.

BACKGROUND OF THE STUDY

In previous study stated that using the phone with one hand and used only one thumb, implying increased repetitive movements in hand and fingers leading to stress maximally on thumb consequently repeated stress injury to tendon of thumb. The overuse of smartphones may affect the flexor pollicis longus tendon (FPL) and the joints of the thumb. To date, the possible adverse effects is less in mobile phone overuse on the hand and thumbs⁸

Hence the object of this study is to identify and prevent or reduce the pain in thumb and relate musculoskeletal problem in smartphones overusers by providing early intervention by assessing the pinch strength and to rule out the improvement of pinch strength after the exercises⁹.

METHODOLOGY

Study design: Experimental study
 Study Type: Comparative Study
 Sampling method: Convenient sampling
 Sampling size: 30
 Study duration: 3 weeks

Inclusion Criteria:-

- Age : 18-21 years
- Both the gender included.
- Subject with Smartphone Addiction Scale more than 99
- Subject with pinch gauge value Female- less than 4.8kg and Male- less than 5.6kg

Exclusion Criteria:-

- Hand fractures
- Subject with any kind of hand injury or wrist especially burns.
- Sensory deficits in hand
- Subjects not willing to participate in this study
- Subjects with any systemic or neurological problems.

MATERIALS USED:

- Water gel ball
- Therapeutic clay
- Pinch gauge

OUTCOME MEASURE:

- Smartphone Addiction Scale (SAS)
- Pinch Gauge

PROCEDURE

The subjects who fulfilled the inclusion and exclusion criteria were taken for the study and informed consent was obtained from each participant. Total 30 participants were taken for the study and divided into two groups. Pinch grip strength is measured by using pinch gauge. The participant positioned their arms based on American Society Of Hand Therapist recommendations while the subjects seated on the chair with straight back, without arm, feet resting flat on the floor, shoulder adducted and neutrally rotated, elbow flexed to 90 degree, forearm in neutral position and wrist between 0 degree and 30 degree extension. Procedure was demonstrated to the participant. The result were analyzed before and after the exercise program. Subjects followed exercise for 15 minutes 2 times per day for 3 weeks

Group A were given the following exercises:

- Resistive hand exercise
- Hand putty exercise
- Active ROM exercise were given for 15 minutes.

Group B were given the following exercises:

- Hand putty exercises
- Active ROM were given for 15 minutes.

Resistive Hand Exercise- 5 Minutes

S.NO	EXERCISES	REPETITIONS
1.	Thumb opposition	10 times, 3sec hold
2.	Thumb roll	10 times, 3 sec hold
3.	Thumb pinch	10 times, 3 sec hold
4.	Finger bend	10 times, 3 sec hold
5.	Thumb extend	10 times, 3sec hold

Hand Putty Exercise- 5 Minutes

S.NO	EXERCISES	REPETITIONS
1.	Thumb Press	10 Times, 3 sec Hold
2.	Thumb Squeeze	10 Times, 3 sec Hold
3.	Thumb Adduction	10 Times, 3 sec Hold
4.	Full Grip	10 Times, 3 sec Hold
5.	Finger Pinch	10 Times, 3 sec Hold

Active ROM Exercise For Fingers- 5Minutes

S.NO	EXERCISES	REPETITIONS
1.	Thumb Flexion, Extension	10 Times, 3 sec Hold
2.	Thumb Abduction, Adduction	10 Times, 3 sec Hold
3.	Roof Top Exercise	10 Times, 3 sec Hold
4.	Thumbs Up	10 Times, 3 sec Hold
5.	Thumb Press	10 Times, 3 sec Hold

DATA ANALYSIS:

TABLE 1 showing pre and post values of GROUP A

	MEAN	STANDARD DEVIATION	t-VALUE	p-VALUE
PRE	4.05	0.67	10.73	0.0001
POST	8.6	1.69		

TABLE 2 showing pre and post values of GROUP B

	MEAN	STANDARD DEVIATION	t-VALUE	p-VALUE
PRE	4.34	0.51	7.509	0.0001
POST	7.74	2.00		



Graph: Comparison of pre and post intervention scores for both the groups for dominant hand.

RESULT

They were significant difference with $p < 0.0001$ in group A and group B. group A was slightly increased when compared to group B.

Table 1 shows that there were significant difference in each treatment (resistive hand exercise, hand putty, active range of motion exercise) for the outcome measure pinch gauge were tested by using unpaired t test and were found statistically significant at $p < 0.0001$

Table 2 shows that there were significant difference in each treatment (hand putty, active range of motion exercise) for the outcome measure pinch gauge were tested by using unpaired t test and were found statistically significant at $p < 0.0001$

Mean difference between the two group for dominant hand Group A (8.6) Group B (7.74)

Mean difference between the two group for dominant hand Group A (S.D = 1.7) and Group B (S.D = 2)

By comparing the mean difference for two groups we concluded that pinch improvement for Group A when compared to Group B.

DISCUSSION

A number of case studies have identified musculoskeletal disorders (MSD's) in the forearm and thumb for example, tendonitis, tenosynovitis and first metacarpal (CMC) arthritis in relation to excessive testing on a mobile phones.

Pinch force refers to the amount of physical effort required to accomplish a task or motion. Performing forceful exertions may place excessive mechanical loads on the tissues (muscles, tendons and other tissues) that are used to exert or transfer force from the skeletal system to the work.

After the intervention our result showed a significant improvement in lateral pinch strength in both the groups. Mean difference between the two group for dominant hand Group A: 8.6 ± 1.69 , Group B: 7.74 ± 2.00 . Also, the difference between the two groups was significant at the level of ($p = < 0.0001$). On the basis of mean difference obtained for both the groups independent t test we concluded that even though there was improvement in pinch strength for both the groups. Lateral pinch strength of participants in Group A (resistive hand exercise, hand putty, active range of motion exercise) was improved more as compared to Group B.

Resistive hand exercise are ergonomically shaped and made to fit the contours of the hand, latex-free. Resistive hand exercise are the shape that feels great in the hand. It's designed to provide effective resistive therapy in a wide variety of exercises for the fingers, hand, wrist, and forearm. With regular use, there is improvement in grip strength, increase dexterity and mobility.

Hand putty can be formed into the various illustrated shapes it have different resistance.

The present study did not examined detailed about tip to tip and three jaw pinch, which may also reduce the pinch strength due to smartphone overusers and also study did not examine in detail

about any other habits, which may also produce increased pain due to overusers of arm and hand joints and tendons. Such habits may be the underlying cause of increased pain in among subjects in this study. In future studies will examine in details about these 3 pinch strength (tip to tip, 3 jaw pinch, lateral pinch) and examining the individuals in detail with regard to their hand use habits. According to the pain measures exercise will be given to reduce the pain and to increase the pinch strength.

LIMITATION OF THE STUDY

- The sample size of the study was 30.
- The duration of the study was 3 weeks.
- Absence of control group
- The study was conducted in asymptomatic subjects.

RECOMMENDATION FOR FUTURE RESEARCH

- The intervention can be given for a longer duration for more accurate results.
- Sample size should be higher for generalization
- Study can be performed in symptomatic subjects

CONCLUSION

The result of the study indicate that participant in both groups improved in pinch strength and also we found that the participants who underwent a resistive hand exercise in group A is better than the participants who underwent in group B in lateral pinch strength as measured by pinch guage.

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