International Journal of Yoga, Physiotherapy and Physical Education
www.sportsjournal.in
ISSN: 2456-5067
Received: 18-08-2022, Accepted: 04-09-2022, Published: 21-09-2022
Volume 7, Issue 5, 2022, Page No. 16-19

Association of pain, strength with disability in upper limb among physiotherapy students using smart phone

Fatima Shirgaonkar[1], Jyoti Parle[2], Shweta Phadke[1], Pranati Tilak[3]

[1] TMV'S Lokmanya Tilak College of Physiotherapy, Affiliated to MUHS, Kharghar, Navi Mumbai, Maharashtra, India

[2] Professor and HOD, Department of Community Physiotherapy, TMV'S Lokmanya Tilak College of Physiotherapy, Affiliated to MUHS, Kharghar, Navi Mumbai, Maharashtra, India

[3] Director, TMV'S Lokmanya Tilak College of Physiotherapy, Affiliated to MUHS, Kharghar, Navi Mumbai, Maharashtra, India

Abstract

Smart phone is a hand held portable device having a touch interface performing the function of a laptop and a handphone used for tasks such as internet browsing, gaming, texts, e- learning, social media and many more daily activities. Frequent usage may result in cumulative trauma disorders of the shoulder, elbow, wrist. Aim of this study was to find out the association of pain, strength with disability in upper limb among physiotherapy students using smartphone. This study will help to assess the influence of smartpohone usage leading to pain which eventually affects the hand grip strength leading to disability. Methodology-For this study 100 physiotherapy students in the age group of 18-25 experiencing pain in upper limb while using smartphone, using smartphone for minimum of 2 hours daily ans using smartphone from the past minimum 1 year. A questionnaire consisting of demographic details, NPRS, questions on usage of smartphone was administered. In students having pain hand pinch strength was carried out followed by administration of DASH questionnaire. Results indicated that out of the 100 participants 79% students were females and 21% were males, 97% students were right hand dominant and 3% students were left hand dominant, 73%students use their smartphone with both hands and 27% students use single handedly. Dast responses should that 20%students showed mild disability, 76% showed moderate disability, 4% showed no disability. Anova analysis showed that since p value<0.05 between the variables hence there is an association of pain, strength with disability in upper limb. Conclusion-It was concluded that smartphone usage in students showed reduced pinch strength with mild to moderate disability.

Keywords: smartphone, pinch strength, physiotherapy students, upper limb

Introduction

A smart phone is defined as a mobile phone that performs many functions of a computer, typically having a touch screen interface, internet access and an operating system capable of running downloaded apps [3].

The smart phone is a hand-held device that is capable of performing the function of a laptop and a hand phone. It is a portable device which can be held and used in one or both hands [3]. Even though it is compact and small, it can perform it can perform various tasks such as Internet browsing, Gaming, Phone calls, Texts, Mailing, Media players, E- learning, Shopping, social media and many more daily activities. Therefore, its usage has now become a great importance in everyday life and a universal practice, especially among students [4].

Frequent smart phone usage without taking regular rest periods may result in cumulative trauma disorders to the shoulder, hands and wrists due to improper position or overuse [1].

Smart phone designs require repeated finger motions such as clicking, scrolling, swiping, tapping, and pressing buttons. This affects the fingertip forces, tendon excursion and muscular effort [1].

Musculoskeletal disorders arise due to prolonged forceful, low amplitude and repetitive use of hand-held devices [3].

Also postures (sitting and standing) and the type of mobile phone task (holding the phone versus texting) have an effect on the muscle activity and thumb positions [3].

Smart phone users commonly assume three poor postures, including protracting and bending the shoulders more than 20 degrees, setting elbows at more than 100 degrees and bending wrist more than 15 degrees with ulnar deviations and forward neck [1].

Repetitive static motion of the hand may also decrease the blood supply and prevent nutrients from delivered to muscles, thus leading to pain and muscle fatigue [1].

The risk factors that could lead to upper limb dysfunction will be grasping, sustain gripping, repeated pushing movements and repetitive movement of wrist, thumb and fingers [1].

Musculoskeletal complaints in the upper limb have been associated with specific disorders such as Shoulder tendinitis, Adhesive capsulitis, Lateral epicondylitis, Carpal tunnel syndrome, De Quervain's tenosynovitis, firomyalgia etc [2].

Due to the widespread smart phone usage among college students they appear to be at a higher risk of developing upper limb pain and disability.

This study will help to assess the influence of smart phone usage leading to pain which will eventually affect the pinch strength leading to disability.

Methodology
Study Design: A cross sectional study
Sampling Method: Purposive sampling
Sample Size: 100 Physiotherapy students using smart phones.
Study Setup: Lokmanya Tilak College of Physiotherapy Kharghar

Sample Selection Criteria
Inclusion Criteria
1. Students experiencing pain in fingers, wrist, elbow, shoulder while using Smart phone.
2. Students in the Age group 18-25 years.
3. Students using smart phone for more than 2 hours in a day.
4. Students using smart phone for the past minimum one year.

Exclusion Criteria
1. Students with any injury in the arm.
2. Students having any physical deformity in the hand.

Materials Required
1. Pinch Guage
2. Chair
3. Pen

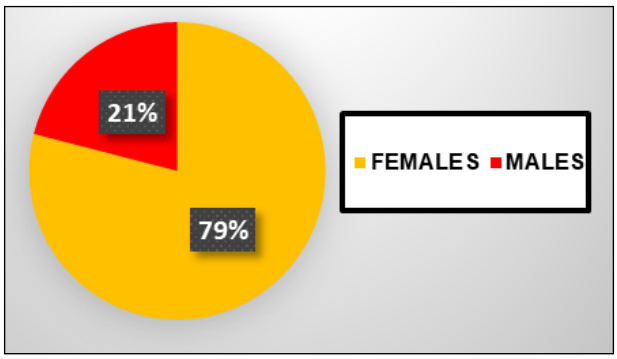
Outcome Measures
1. Questionnaire
2. Pinch Gauge
3. DASH questionnaire

Procedure
- Permission was obtained from the ethical committee of the Lokmanya Tilak College of Physiotherapy. Participants were included according to the inclusion and exclusion criteria.
- Participants were clearly and deeply informed about the procedure of the study, purpose of the study which includes informed consent, questionnaire and pinch strength assessment was obtained.
- Nature and purpose of study was explained and an informed written consent was taken from each and every subject.
- The questionnaire was distributed which will consist of demographic details (Name, Age, Gender), Hand dominance, Pain intensity by Numerical Pain Rating Scale, Hours of smart phone usage per day, Reasons for using smart phone, Number of years using smart phone. Participants were explained and requested to fill the same.
- The findings of the study were documented and data was analyzed using MS Excel.

Pinch Strength Assessment
Participants having pain were further tested with pinch guage to measure hand pinch strength in both hands. According to American Society of Hand Therapists participants will be seated with their shoulders adducted and neutrally rotated each participant based on the three trials.
Upper Extremity Functional Assessment was conducted using the Disability of Arm, Shoulder and Hand questionnaire.

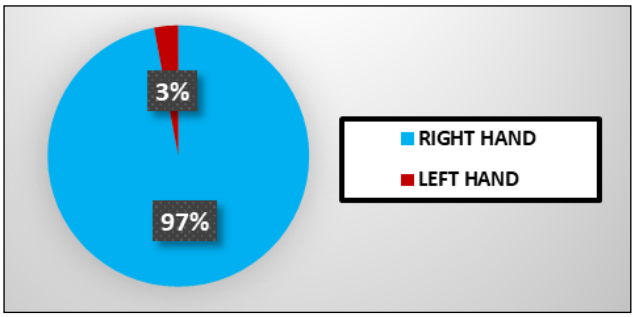
The DASH outcome measure is a 30 item, self-report questionnaire designed to assess the patients' health status during the previous week.
The following formula is used to calculate the score.
Dash Score= ([sum of n responses/n]-1) x 25, where n is total no of completed responses.
The score ranges from 0(No disability) to 100 (Most severe disability).

Statistical Data Analysis and Interpretation
Descriptive statistics will be used to summarize the data collected in simple numerical form using MS Excel.
After collection of data the statistical analysis of the questionnaire will be represented in the form of pie chart.
The hand pinch strength was compared to the normal values and represented in the form of bar diagram.
The DASH scores are represented in the form of a pie chart.
Anova Analysis was carried out to find the association of the 3 variables i.e pain, strength with disability.



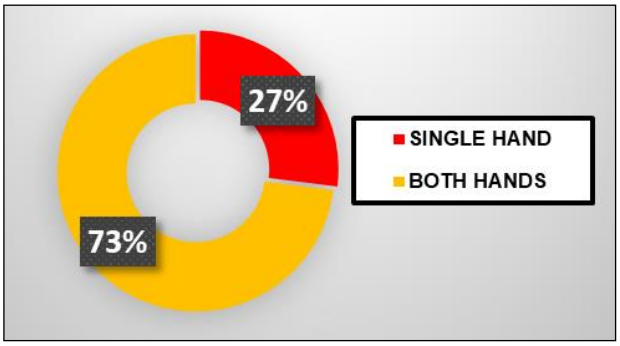
Graph 1: Gender

Interpretation-Out of the 100 participants 79% students were FEMALES and 21% students were MALES.



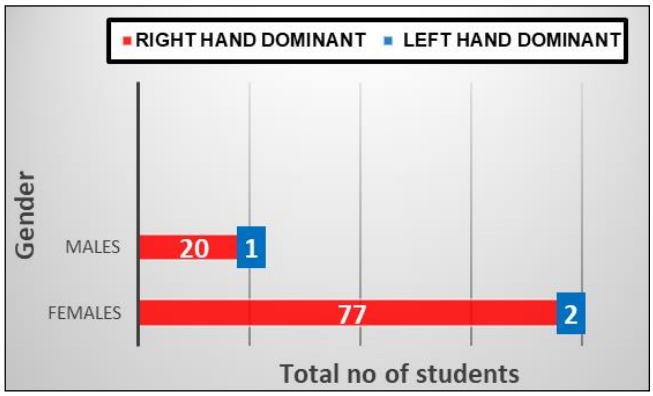
Graph 2: Dominance

Interpretation-Graph 2 shows that 97% students were RIGHT hand dominant and 3% students were LEFT hand dominant.



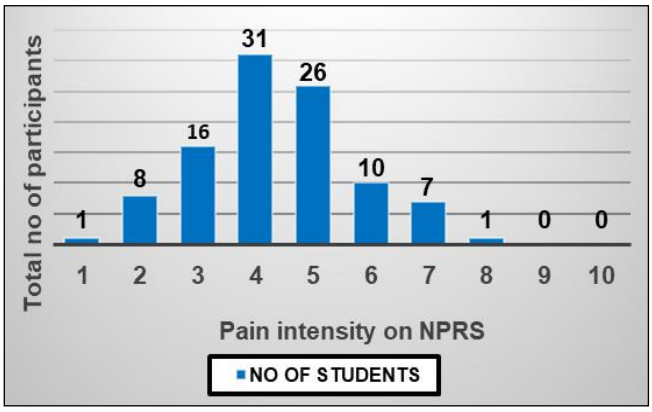
Graph 3: Smartphone Usage

Interpretation-Graph 3 shows that 73% students use smartphone with BOTH HANDS while 27% students use smartphone SINGLE HANDEDLY.



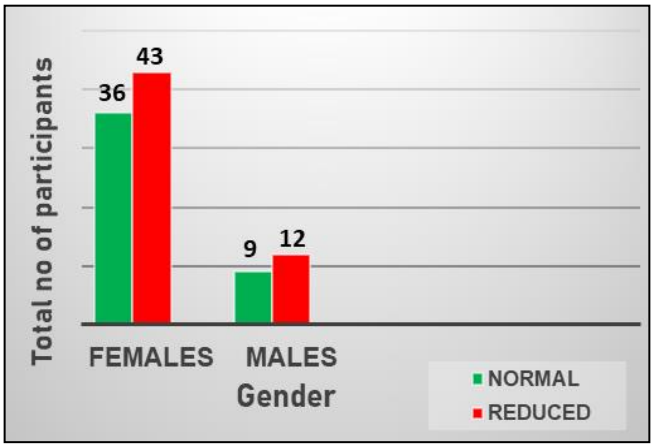
Graph 4: Hand Dominance

Interpretation-Graph 4 shows that out of the 79 FEMALE participants 77 were RIGHT HAND dominant and 2 were LEFT HAND dominant while out of the 21 MALE participants 20 were RIGHT HAND dominant and 1 was LEFT HAND dominant.



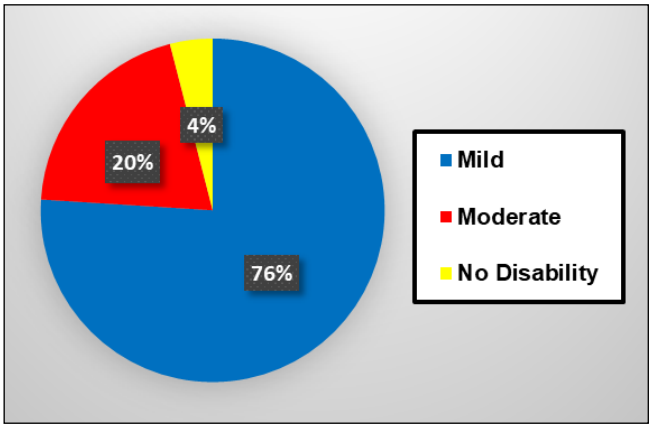
Graph 5: Pain Intensity

Interpretation-Graph 5 shows the pain intensity reported by the participants while using smartphone 31% students reported intensity 4, 26% students reported intensity 5, 16% students reported intensity 3,10% students reported intensity 6.



Graph 6: Pinch Strength

Interpretation-Graph 6 shows the pinch strength values in both males and females with 43 FEMALE students and 12 MALE students showing reduced pinch strength.



Graph 7: Percentage of disability using DASH SCALE

Interpretation-Graph 7 indicated the response of participants on the Disability of Arm, Shoulder and Hand out of which 20% students showed MODERATE disability, 76% students MILD disability and 4% showed no disability.

Table 1

Source of variation	SS	Df	MS	F	P value	F crit
Between groups	312.5	1	312.5	294.811	4.55E-41	3.88885
Within groups	209.8	198	1.06			
Total	522.3	199				

Interpretation-Table 1 represents the pain, strength and disability variables by the two-way ANOVA analysis showing that since the p value (4.55E-41) <0.05 hence there is an association of pain, strength with disability in upper limb among physiotherapy students using smartphone.

Discussion

The aim of the study was to find the association of pain, strength with disability in upper limb among smartphone users. Results indicated an association of pain strength with disability and 76% students showed mild disability in upper limb using DASH questionnaire.

Results show that smartphone usage significantly reduced pinch strength causing mild to moderate disability which may be the result of smart phone designs requiring repeated finger motions affecting fingertip forces, tendon excursion and muscular effort.

Some studies have shown that longer durations of smartphone usage may decrease blood flow, prevent oxygen and nutrients supplied to muscles leading to pain and fatigue.

Continuous static contraction of upper limb muscles with less resting time in between and weight of smartphone device results in fatigue and muscle weakness.

The three main risk factors responsible for upper limb musculoskeletal disorders are posture, muscle force, muscle use. Smartphone users commonly assume three poor postures including protracting and bending shoulders more than 20 degrees, setting elbows more than 100 degrees and bending wrist more than 15 degrees with ulnar deviation.

The more the posture deviates from neutral greater stress is placed on the joints, ligaments, muscles and nerves directly decreasing upper extremity function.

Previous studies have shown that majority of individuals tend to lie on their side of dominant hand hence there is a causal relationship between right shoulder pain as there was

a high proportion of right hand dominant participants as well as a high prevalence of right upper limb pain participants [3].

Significant prevalence of the upper extremity such as right hand, right elbow and lower arm on both supine and prone positions can be due to awkward posture, unsupported and static position which restrict the blood flow to the muscles hence damaging it and causes these symptoms [3].

It was found that high prevalence of musculoskeletal symptoms of the upper extremity occurred in adults who used the smartphone for a long duration exceeding 3 years which was relevant to result proposed as the participants were found to have been using a smartphone for an average of 3 years [3].

Clinical Importance

This study will help to inform smartphone users about the negative consequences of long-term smartphone usage. Preventive measures should be taken to reduce the prevalence of upper extremity symptoms among students. Simple lifestyle changes like maintain correct posture during smartphone use and avoiding long term use of smartphone could prevent the development of musculoskeletal symptoms.

Participants should be taught to adopt a good posture on smartphone usage such as sitting with back support with the addition of pillow to be placed in the lap to support the arms [3].

Participants can use laptops or computers to browse the internet if required to use it for a prolonged period of time as it will prevent fatigue and injury to a single muscle [3].

The usage of stylus can be encouraged when using smartphone for activities like texting which can greatly reduce stress experienced by muscles of the hand [3].

To live in accordance to the current advancements of the technology the use of smartphone in our daily life is crucial. However prolonged use of cell phone is known to cause symptoms of musculoskeletal disorders keeping this into consideration more study should be done in the future to create awareness among smartphone users [3].

Conclusion

Based on this study's results it can be concluded that high level of smart phone usage leads to pain in upper limb causing reduced pinch strength in dominant hand as compared to non-dominant hand.

Hence leading to mild to moderate disability in upper limb and having an association of pain, strength with disability in upper limb among physiotherapy students using smartphone.

Limitations

The sample size used in this study was small and was conducted in a single centre.

Male and female participants should be more equal in number to generate more accurate results as different gender may have different tolerance to symptoms.

The size of smartphone should be stated by participants to find out if there is any association of ergonomic factors of phone with prevalence of symptoms.

Future Scope of the Study

A larger sample size can be chosen if there is longer time frame for this study, and this study can be conducted in a multi center setting and from different geographical locations.

Samples from different professions which require high usage of hand-held device can be included.

Further study should be done to create awareness among smart phone usage regarding prolonged use and improper posture causing musculoskeletal disorders.

Further research can investigate the effectiveness of different prevention and intervention measures on upper limb disability.

References

1. Nadia L Radwan, Mawra M Ibrahim, Waleed Salah El-Mahmoud. Evaluating hand performance and strength in children with high rates of smart phone usage: An observational study. The Journal of Physical Therapy Science,2019:32(1):65-71.
2. Fidaa Almonani, Alia A Alghwiri, Ahmed H Alghadir, Amal Al-Momani. Prevalence of upper limb pain and disability and it's correlates with demographic and personal factors. Journal of Pain Research,2019:12:2691-2700.
3. Deviendran Kalinartharam, Manoj Abraham Manoharal, ChongLi Mei. Association between the usage of smartphone as the risk factors for the prevalence of upper extremity and neck symptoms among university students: A cross sectional survey-based study. Research journal of Pharmacy and Technology,2017:10(4):1184-1190.
4. Priyal P Shah, Megha S Sheth. Correlation of smart phone addiction with Text neck syndrome and SMS thumb in physiotherapy students. International Journal of Community Medicine and Public Health,2018:5(6):1-5.
5. Rajan Balakrishnan, Elanchezhian Chinnavan, Tan Feii. An extensive usage of hand-held devices will lead to musculoskeletal disorder of upper extremity among student in AMU: A survey method. International Journal of Physical Education, Sports and Health,2016:3(6):368-372.
6. Bismillah Sehar, Iqra Ashraf, Sidra Rasool, Anum Raza. Frequency of thumb pain among mobile phone user students. Journal of Sheikh Zayed Medical College,2018:9(2):1406-1408.
7. Hyo- Jeong Kim, Jin Soep Kim. The relationship between smartphone use and subjective musculoskeletal symptoms and university students. Journal of Physical therapy Science,2015:27(3):575-579.
8. Ewa Gustafsson, Sara Thomee, Ana Grimby Ekman. Texting on mobile phones and musculoskeletal disorders in young adults: A Five-year cohort study. Applied Ergonomics,2016:58:208-214.
9. Karen Walker Bone, Keith T Palmer, Isabel Reading. Prevalance and impact of musculoskeletal disorders of the upper limb in general population. Wiley Online library Arthritis Care and Research,2004:51(4):642-651.