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Latent Trigger Point Therapy for Smartphone Users

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Abstract

Multi-touch smartphones are used for a wide variety of tasks, including accessing the Internet, social media, etc. Trigger points (TrPs), causes referred pain in characteristic areas for hand and forearm muscles. Latent TrPs cause stiffness and limitation of ROM but no pain. Self Myofascial release (SMFR) is a simple and effective technique in which the therapy is done by the patient themselves often using a tool. Objectives: To find out the effectiveness of Self Myofascial Release therapy and Educational booklet among college students with latent trigger points. Methodology: 120 subjects, male and female having latent TrPs with mean age 22.3 (±2.36), fulfilling the selection criteria were included. Subjects were examined to find out latent trigger point PPT with help of Pressure Algometer on muscles of hand. Subjects were instructed SMFR therapy via tennis ball (2 mins, twice a day for 2 weeks) on the affected muscles. Post test examination of PPT was taken. Result: The mean age was calculated to be 22.3 (±2.36) were analyzed. Right hand Adductor Pollicis muscle and Left hand 1st dorsal interrosei muscle was found to be most affected ($p < .00001$) and Opponens pollicis on both sides were least affected. Educational booklet was given for creating awareness and was found to be helpful. Conclusion: Smartphones with greater dimensions promotes predominant usage of thumb while typing. SMFR and Educational booklet appears to be effective in reducing pain and addictive behaviour among Smartphone users.

Keywords: *Myofascial release; latent trigger points; pain pressure threshold (PPT).*

Introduction

Multi-touch smartphones have since the first generation of iPhone and Android devices changed the way we interact with mobile phones. In early 2000s, that is phones were mainly used for calls and texting. In contrast, we now use our smartphones for a wide variety of tasks, including accessing the Internet, social media and games[1].

The incidence of musculoskeletal and cummulative disorders of hand, wrist, forearm, arm and neck has been increasing all over the world due to prolonged, forceful, low amplitude, repetitive use of hand-held devices. [2] Knowing the pattern of these movements can give us scientific information about sources of above stated problems and perhaps, methods for controlling and eliminating them[3].

Texting thumb", "Playstation thumb" or "Blackberry thumb are some of the common repetitive strain injuries which occur as a result of extensive movements of finger while playing video games, browsing or texting in smartphone[2]. Sustained gripping and repetitive movements with thumb and fingers have identified as risk factors which may lead to disorders of thumb[3].

Myofascial pain is a chronic condition that affects the fascia. It may involve either a single muscle or a muscle group. In some cases, the area where a person experiences the pain may not be where the myofascial pain generator is located. Experts believe that the actual site of the injury or the strain prompts the development of a trigger point that, in turn, causes pain in other areas. This situation is known as referred pain[4].

A latent Myofascial trigger point (MTP) is defined as a focus of hyperirritability in a muscle taut band that is clinically associated with local twitch response and tenderness and/or referred pain upon manual examination. [5] Pressure pain thresholds (PPT), the minimal pressure when the sensation of pressure changes to pain. Pressure

algometers are designed to measure deep pressure pain thresholds or tenderness resistance. When a particular site of the body is pressed with a rubber disk having an area of 1 cm², the device displays the pressure[6].

Self Myofascial release (SMFR) is a simple and effective technique in which the therapy will be done by the patient themselves rather than a clinician doing for them, often using a tool. Following are the common SMR tools available such as Cylindrical foam rollers, Textured cylindrical foam rollers, Vibrating textured cylindrical rollers, Hand-held massage rollers, Massage balls (tennis ball, lacrose ball, squash ball) etc[7].

High level of addiction to the Smartphone is one of the main reasons for distractions from studies. Furthermore, touch screen is very simple and user friendly which will act as catalyst in the addiction scenario. Upper extremity musculoskeletal problems like repetitive strain injuries (RSI) especially the thumb have been lately stated for touch screen device users due to text messaging, browsing, gaming etc.

Treating latent MTPs will decrease pain sensitivity, improve motor functions and prevent latent MTPs from transforming into active MTPs, and hence, prevent the development of myofascial pain syndrome.

Methodology

Single group experimental pre and post test design. 120 target sample was identified based on selection criteria using cluster sampling method. College going students- 18- 25 years, both genders, Smartphone usage of minimum 6 months, Minimum 4 inch screen size and maximum 7 inch screen size, Presence of Latent trigger points were included in the study. Students indulged in fine movement activities, vascular disorders, connective tissue disorders, recent immobilization of upper limb were excluded from the study.

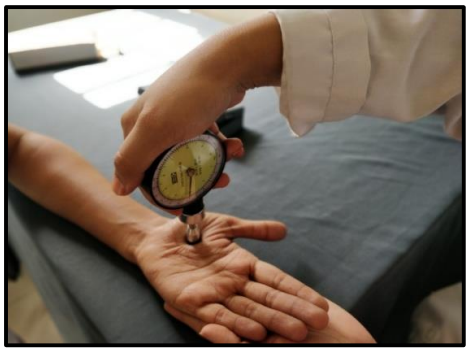
Test Procedure:

- Subject was in sitting position and the area to be tested was exposed. Procedure was explained to the subject and was asked verbally to indicate the onset of pain with a "Yes." Subject pointed to the specific area of discomfort. Researcher palpated the area with fingertip to identify the point of maximum sensitivity and the point was marked with a pen and its location was documented with reference to an anatomical landmark for future testing.

- Then the subject was remind to say "Yes" upon the onset of pain and the researcher placed the applicator tip (algometer) over the mark and applied force perpendicular to the skin's surface at a gradually increasing rate of 2 pounds per second. Researcher will remove the algometer when the patient says "Yes," and algometer will automatically record the result. In the same way contra-lateral side was tested.

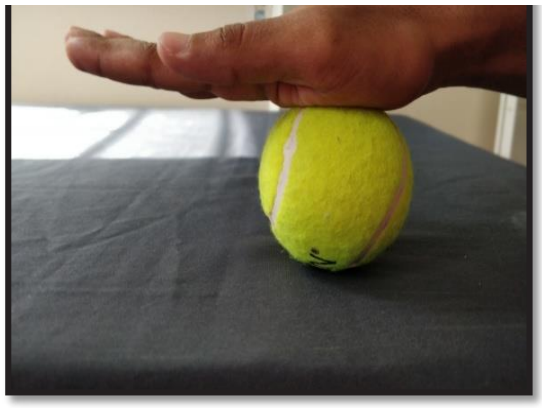
- The mean of 3 trials was calculated for each tested location and was used for the analysis. Thirty seconds of rest was given between each trial. Then the proforma was distributed to the respondents and was asked to fill it up in the presence of researcher.

Treatment protocol:



Adductor Pollicis

Figure-1: Presssure Pain Threshold measurement by Algometer



Adductor pollicis

Figure-2: Self Myofascial Release Therapy

- Participants was instructed to roll a tennis ball (keeping it over a table) on the thenar aspect on the affected muscles for 2 minutes, twice a day for 2 weeks. Participants was instructed to apply as much pressure as they can, pushing into discomfort but not pain, as greater pressures have shown to have better benefits on flexibility.
- The participants was organized together with a whatsapp group for follow up and to clarify queries; if any. After 2 weeks, again subjects were assembled in a group as in pre-assessment and post-assessment was done using pressure algometer.

Findings

Table-1: Distribution of subjects with Latent trigger points according to gender

S. No.	Gender	No. of subjects	Percentage
1.	Male	47	39%
2.	Female	73	61%

Table-1 Shows gender distribution of 120 subjects among smartphone users with latent trigger points, out of which 47(39%) were males and 73(61%) were females.

Table- 2: Mean ± S.D of baseline characteristics

S. No.	Variables	Mean	S.D
1.	Age (years)	22.3	±2.36

The table 2 presents the outcomes of baseline characteristics of 120 subjects who underwent self-myofascial release in which Mean and SD of Age (22.3 ±2.36years) was obtained among smartphone users with latent trigger points

Table-3: Range, Mean and SD of pre and post test PPT (Right extremity) of subjects with latent Trps.

S.no.	Muscles ffected	Self- Myofascial Release Therapy				Wilcoxon test	p-value
		Pre-test (PPT)		Post- test (PPT)			
		Right		Right			
		Range	Mean ± SD	Range	Mean ± SD		
1.	Adductor Pollicis	0-6.13	3.21±1.79	0-8.96	4.76±5.52	Z= -7.75	< .00001
2.	Opponens pollicis	0-6.56	2.79±2.26	0-8.6	3.44±2.71	Z=-6.42	< .00001
3.	1st dorsal interossei	0-6.6	3.54±1.21	0-6.5	4.37±1.34	Z=-7.76	< .00001

The above table shows the pre and post test outcome measure Pain pressure threshold (PPT) in subjects with latent trigger points. In Pre test, Adductor Pollicis muscle was most affected and ranging within 0-6.13 with mean and SD of 3.21±1.79. In Post test, it was found to be increased to the range 0-8.96 with mean and SD of 4.76±5.52.

The non-parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be statistically significant ($p<0.001$). It evidence that there is a significant increase of pain pressure threshold among the subjects with latent trigger points treated with Self- Myofascial Release Therapy.

Table-4: Range, Mean and SD of pre and post test PPT (Left extremity) scores of subjects with latent TrPs.

S.no.	Muscles affected	Self- Myofascial Release Therapy				Wilcoxon test	p-value
		Pre-test (PPT)		Post- test (PPT)			
		Left		Left			
		Range	Mean ± SD	Range	Mean ± SD		
1.	Adductor Pollicis	0-6	3.06±1.57	0-6.83	3.99±2.08	Z= -7.61	< .00001
2.	Opponens pollicis	0-6.06	2.72±2.35	0-8.46	3.22±2.76	Z=-5.16	< .00001
3.	1st dorsal interossei	0-6.9	3.46±1.35	0-7.06	4.22±1.44	Z=-6.63	< .00001

The above table shows the pre and post test outcome measure PPT in subjects with latent trigger points. In pre test, 1st dorsal interossei muscle was most affected and ranging within 0-6.9 with mean and SD of 3.46±1.35. In post test, it was found to be increased to the range 0-7.06 with mean and SD of 4.22±1.44.

The non-parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be statistically significant ($p<0.001$). It evidence that there is a significant increase of pain pressure threshold among the subjects with latent trigger points treated with Self- Myofascial Release Therapy.

Discussion

The present study was conducted in order to find out the effectiveness and behaviour of the muscles during texting and to examine whether self-myofascial release, using a tennis ball is effective in reducing MTrP sensitivity.

There has been a dramatically increased use of mobile phones for texting especially among young people. Due to intensive texting on mobile phones, there is a widespread musculoskeletal disorders of the hand and forearm[8].

While it is thought that latent MTrPs are precursors to active MTrPs, factors that facilitate the transformation remains difficult to identify. Prolonged postural activities, may contribute to the formation or propogation of MTrP[5].

Myofascial therapies cover a numerous and varied spectrum of techniques, including osteopathic soft-tissue techniques, structural integration (Rolfing), massage including connective tissue massage (CTM), instrument assisted fascial release, myofascial trigger point therapy, strain-counter strain and muscle energy technique (MET). Myofascial release (MFR) techniques have evolved as a result of current research[9]. Self Myofascial release (SMFR) is a simple and effective technique in which the therapy is done by the patient themselves rather than a clinician doing for them, often using a tool.

The current study revealed that Right hand Adductor Pollicis and Left hand 1st dorsal interrosei muscle was found to be most affected. [Pre-test PPT (3.21±1.79), Post test, (4.76±5.52), Pre-test PPT (3.46±1.35). Post test, (4.22±1.44)], respectively.

Deepak Sharan et al, in his study revealed that while texting in mobile, the thumb covers motions in all planes of extension, flexion, abduction-adduction and opposition which is one of the main triggering factor. The continous contraction of Adductor Pollicis, opponens pollicis and 1st dorsal interrosei during typing results in microscopic damage to the muscles[3]. Small buttons and flexion-extension orientation increase the muscle fatigue in 1st dorsal interossei, which is a prime muscle for thumb movements. This was reported by one of the study done by Xiong and Muraki (2014). Abductor Pollicis Brevis and 1st dorsal interossei were the two muscles measured with the use of EMG instruments for investigating smartphone operation and muscle fatigue. They revealed that touch key size and thumb moving orientation affect the thumb performance[10].

Eapen et al 2010, in his study revealed that Static loading by constant holding of the hand held devices and an overuse of the hand muscles are a possible cause for the development of myofascial pain syndrome of forearm muscles[11].

In current study, it was found that there is an elevation in PPT after a treatment of 2 weeks (Everyday rolling the ball for 2 mins, twice a day on affected muscles). A significant increase in PPT was detected between pre and post test for the affected muscles.

Ergonomic booklet was given to reduce the addictive behaviour and for following recommendations like to support the forearms, to use both thumbs, to avoid sitting with the head bent forward, to avoid texting with high velocity in order to prevent the formation of trigger points or preventing the latent to transform it into active trigger points when using mobile phones for texting[8].

35% of subjects found the educational booklet to be very helpful. 25% of subjects found it to be oftenly helpful and rest 40% of subjects did not reported only. From the result we can conclude that Ergonomic recommendations via educational booklet can help as an adjunct in decreasing the pain and development of trigger points.

Convenience does not mean that we should pay lots of attention on smartphone but try to find an appropriate way to make it as a useful tool. MTrPs because of smartphone usage are very common and are unavoidable. So, it can be prevented by Self- Myofascial Release therapy and educational awareness.

Limitations:

Gender equality not taken into account and no quantification of the pressure applied on the tennis ball was attempted.

Conclusion

Smartphones with greater dimensions that promotes the predominant usage of thumb while typing are associated with higher prevalence of myofascial trigger points.

Educational booklet has been shown to be effective in creating awareness for correct usage of mobile phones.

Hence, the users are advised to perform self-myofascial release which has proven to increase PPT and follow the guidelines of educational booklet.

Future Recommendations:

1. To find out the normative value of pain pressure threshold of hand using this as reference.

2. Recruitment of samples from professions which require high usage of hand held device.

Conflict of Interest: Manuscript title: "Latent Trigger Point Therapy For Smartphone Users "

I certify that there is NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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Review Board on Ethics for Research

Review Category: ***Exemption from Review*** ***Expedited Review*** ***Full Review***

We hereby declare that the project titled, "Latent Trigger Point Therapy For Smartphone Users"carried out by Dr. Namrata Mehta, of II Year M.P.T. has been brought forward for scrutiny to the board members.

Involvement of Special groups: No

Type of Study: Experimental Study AV Needs: Yes

After analyzing the objectives, subjects involved and the methodology of the study, the following conclusions were drawn. The study does not cause any mental or physical harm to the subjects involved and there are no risks involved in the study. The performance of the study procedure will not cause any injury to the subjects. The board has evaluated and confirmed that the experimenter is trained and qualified in measuring outcome. The informed consent form ensures that the experimenter explains the procedure of the study to the subjects, their voluntary participations is confirmed and the identification of subjects is maintained confidential.

More over the finding of the study will benefit similar subjects, the profession and the society. Hence the review board has no objections on the conduct of the study.

Chairman: Dr. C. Prabhu
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