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Effect of activation of deep neck flexor muscle exercise on neck pain due to smartphone addiction

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Abstract
Smartphone are generally used by adults for different purposes and are more prone to be addicted. Increased use of Smartphone has caused alterations in upper cervical posture. Objective of the study was to find out the activation of deep neck flexor muscle on neck pain due to smartphone addiction. The smartphone addiction scale was used to evaluate the addiction on 30 participants, then for those addicted and complaining of Neck pain while using smartphone Neck Disability Index was used. Then deep neck flexor activation exercise was performed for 3 weeks every alternate day 3 times a day for 15 repetitions. After 3 weeks again evaluation was done. The result showed there was significant improvement in neck disability and pain in participants. It was concluded that deep neck flexor activation is suitable to treat neck pain in smart phone addicted people for reducing pain and disability.

Keywords: smartphone, deep neck flexor exercise, neck disability index

1. Introduction
In today's generation the use of Smartphone is a basic essential need. The teenagers use Smartphone's more actively than adults, and are more prone to be addicted to Smartphone. Regarding the age-dependent prevalence of Smartphone addiction, previous studies have reported that teenagers are more likely to be absorbed in digital media, and have a higher addiction rate than adults. Additionally different national survey revealed that Smartphone addiction is twice more prevalent among teenagers than the adults. The number of cell phone users increase every year. Addiction of Smartphone's can be classified in two categories that is *psychological including*: sleep disorders, aggressive or depressive symptoms, dropping out of school, and antisocial personality disorder; and *physiological disorders*: including dry eyes, carpal tunnel syndrome, musculoskeletal disorders, and migraine headaches. According to Pew research center, the number of smartphone owners comprises 56 % of American adults in 2013 and their average daily use of the device is about 195 minutes. A study by, Barolo distinguished that mobile hand-held device users complain of discomfort on one area of upper extremities, back or neck. Long-term usage of the device leads to additional tension on tendons, muscles, and parametric tissue, which could result in visual display terminal (VDT) syndrome. The excessive use of visual display terminals such as smartphones for prolonged time can cause improper posture such as forward head posture following increases in cervical lordosis and thoracic or lumbar kyphosis cause round shoulders and decreases in vital capacity and thoracic cavity. In one of the study on working with desktop, the scientists recommend regular rest periods, stretching, and exercises to relief the fatigue and pain. In research conducted by a group of Korean scientists from In jr University an effect of cell phone on hand-held device users was "a significant association between the total times spent using a mobile device each day and pain in the right shoulder, and between times spent internet browsing and pain at the base of the right thumb." Various studies show the correlation between cell phone usage and physical state of the users disturbing health which could be related to musculoskeletal symptoms, including muscular fatigue and Tenderness as well as a decreased cervical range of motion [1]. Most of the studies state that users usually complain about headache, hand tremor and finger discomfort. They are not ergonomically supported and severe usage increases tension in muscles such as upper trapezius, extensor policies long us and abductor policies. The increased use of smartphones have caused alteration in upper cervical posture and is also known that misalignment of the upper cervical posture which can provoke alterations in muscular tone, musculoskeletal dysfunction and pain, even resulting in structural damage to the head and shoulders. Smartphones, contrasting computers, feature a small screen that is likely to induce a more slouched posture toward a line of sight below eye level. When used for a long time, a video terminal such as a smartphone formulate an improper posture for example, forward head posture (FHP) or slouched posture [12].
Various methods such as joint mobilization, stretching, isometric strengthening exercises, endurance exercises, and proprioceptive exercises are useful depending on the method and theory used by the therapist or the patient's condition. A study conducted by Having JL said that the chin tuck exercise to strengthen deep craniovertebral flexors and the head bending exercise improves the muscular endurance of cervical flexors and reduce the pain in patients with chronic cervical pain and improve their muscular functions. The aim of this study was to investigate the effect of activation of deep neck flexor muscle on neck pain due to smartphone addiction.

2. Materials and Methodology
The study received approval from Institutional Ethical

Committee (PIMS/CPT/IEC/2017/204) of Dr. APJ Abdul Kalam College of Physiotherapy, Pravara Institute of Medical Sciences; Loni. Participants were selected who were eligible in inclusion and exclusion criteria. To evaluate smartphone addiction among students the smartphone addiction scale was used. This scale consists of 15 questions. The smart phone addiction score was taken where 31 is cut off for boys and 33 for girls according to smartphone addiction scale [1]. Participants addicted to smart phone according to smart phone addiction scale and complaining of neck pain while using smartphone there neck disability index were taken which consist of 10 question.Than participants was explained about type of studies, benefits and hazards. A informed written consent was taken from each participants. The participants were explained about deep neck flexor activation exercise (demonstrate chin tuck in front of them and ask them to repeat and were corrected if performed wrong) which will be performed for 3 weeks every alternate day three times a day for 15 repetition. Each session will last for 20 to 30 minutes. After 3 weeks again neck disability index was evaluated to see the effect of treatment.

3. Data Analysis and Result

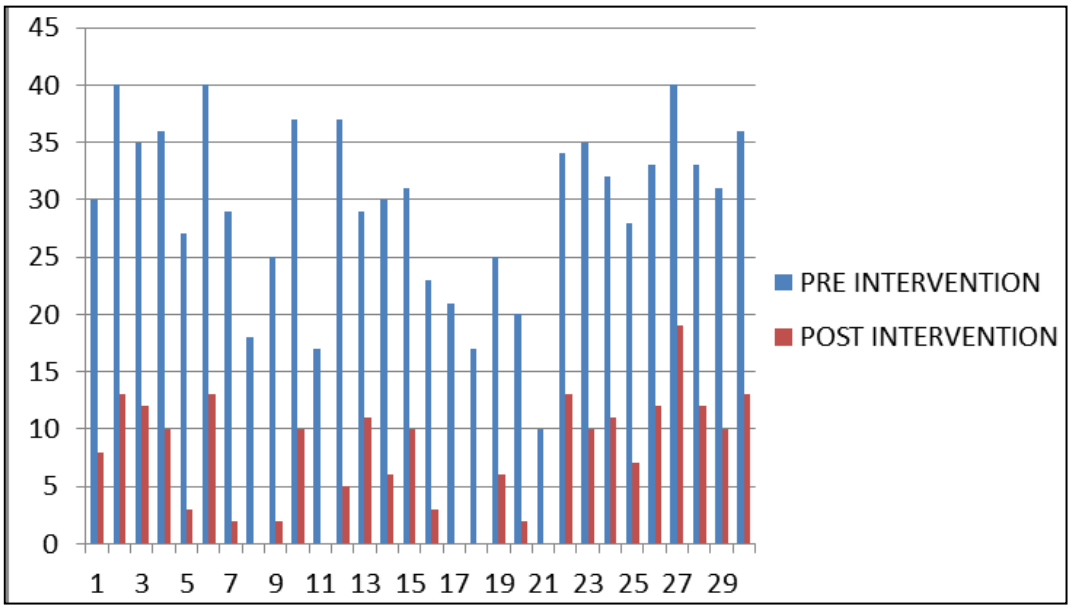

Fig 1: NDT score in participant's pre and post intervention of the treatment:

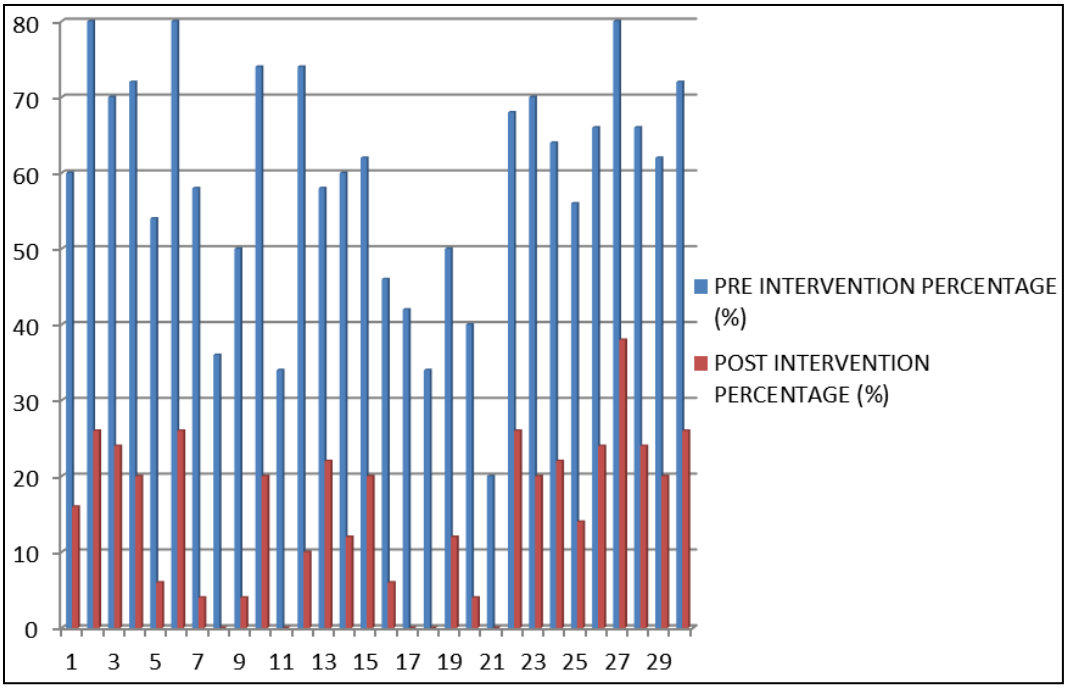

Fig 2: NDT % in the participant's pre and post intervention

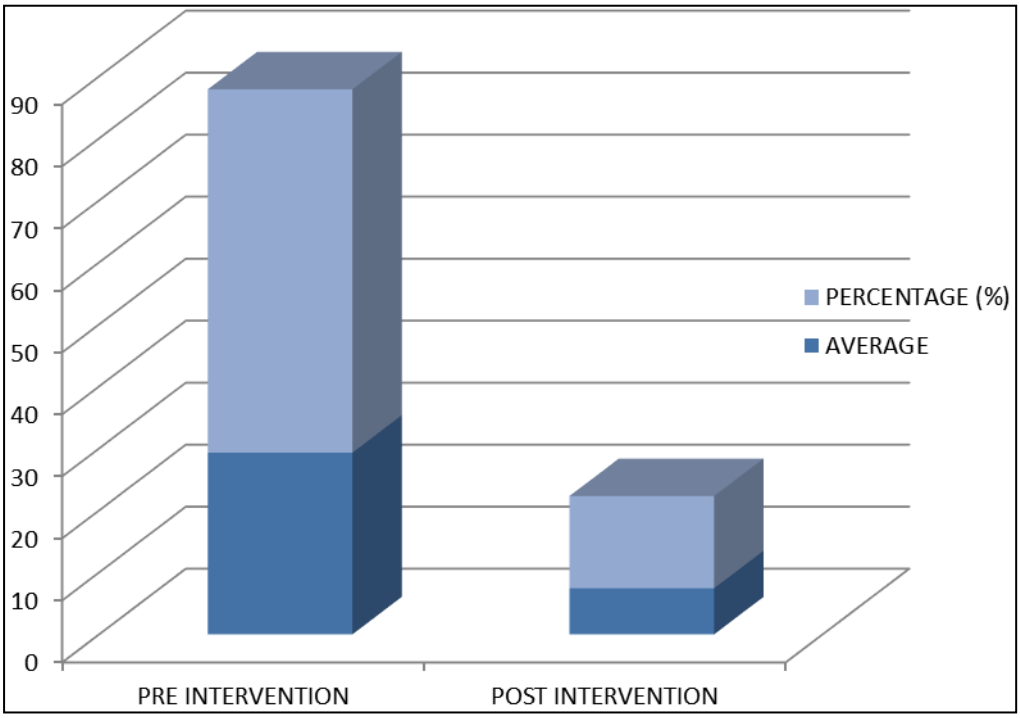

Fig 3: NDT Score average and percentage pre and post intervention comparison

4. Result and Discussion

The Result showed the difference in neck disability scale scoring before and after exercise (chins tuck), which showed significant improvement in neck disability and pain in patient selected. The average percentage score of NDI in patient before treatment was 58.6% and after treatment was 14.87%. Thus the study show the experimental group showed increase in functional status and decrease in disability.

5. Discussion

NDI was used to measure the functional status pre and post intervention. The average baseline value for NDI was 29.3 that is 58.6% and after intervention the average value of pain among participants was 7.43 that is 14.87%. The participants showed increase in functional status and decrease in disability. Research to study the effect of neck exercise on sitting posture in patients with chronic neck pain showed the flexor training group showed a significant improvement in the ability to maintain an upright position of cervical spine. As sustained forward flexion posture of the spine has been associated with compressive loading of the cervical tissues, improved cervical posture during sitting may have an additional long term benefit of the reducing recurrent episodes of neck pain [6]. Changes in pain reported in groups of craniocervical flexion coordination exercise group and cervical flexion endurance exercise group were consistent with reduction in tenderness to cervical palpation and reductions in tenderness to cervical palpations and reductions in pain during active neck movement that are often reported clinically by patients immediately after therapeutic exercises intervention [7]. The craniocervical flexion training was effective at improving neck function, compared with self-exercise in participants with chronic nonspecific neck pain [10]. The cervical flexors activation using the biofeedback unit is beneficial to strengthen the weakened muscles and thereby improving the muscle performance [9]. Crania-cervical flexion targets the deep cervical flexor muscles and retraining these muscles was shown to reduce the neck symptoms and improve the ability in maintaining an upright posture of the cervical spine, thus improving the functional status and deceasing disability [8]. The participants showed reduction of pain after the three week of intervention. The reduction of pain participants can be attributed to low load training craniocervical flexors change the strength and fatigability of the superficial flexor muscles. It decreases the relative activity of the superficial muscles during performance of the exercise tasks. As heightened magnitude of superficial cervical flexor activity during craniocervical flexion test is associated with heightened pain activity. Thus reorganization of neuromuscular control in chronic neck pain may reflect compensatory neural strategies, redistributing loads between muscles to sustain motor and force.

6. Conclusion

The study concluded that deep neck flexor activation is suitable to treat neck pain in smart phone addicted people in reducing pain, reducing the disability. Ultimately, it might be feasible to include this intervention to the management protocols for neck pain in frequent smartphone users.

7. References

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