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EFFECT OF SMART PHONE ON CERVICAL MUSCLE ENDURANCE, DISABILITY AND RANGE OF MOTION.

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ABSTRACT The smartphone has become a necessity for most people accompanied by questions about its impact, both positive and negative, on consumers and on broader society. This study is designed to analyze the profile of the craniocervical area in teenagers by using the smart phone addiction proneness scale (SAPS).

In this study, endurance, disability level and R.O.M were measured in high users compared to low users smart phone group. There was a significant difference between the two groups in regards to the deep cervical muscle endurance and level of disability and R.O.M of cervical region. Based on the result, this study shows that heavy smartphone use may produce considerable stresses on the cervical spine, thus changing the cervical muscle endurance and disability level around the neck. Therefore, individuals should make an effort to look at their phones with a neutral spine and to avoid spending hours hunched over their screens.

KEYWORDS :

INTRODUCTION

The mobile phone has rapidly become an established part of daily life. While this new information and communication technology is convenient and popular, during its adoption, various social issues have arisen, including excessive use or even dependence.[11] The smartphone has become a necessity for most people. Smartphones are used for both communication and entertainment purposes, such as messages, music, media, internet access, photos, and games[1]

One recurring concern involves Internet and mobile phone "addicts", whose use of the technologies has become excessive and out-of-control and severely disrupts their lives.[6] The use of cellular phones has skyrocketed in recent years, with more than 929.37 million subscribers in India as of May, 2012.[11] Smartphone represent a more sophisticated version of the overarching category of mobile phone.[6] Among many technology related addictions, smartphone addiction is newer and more serious today.[5,11]

Neck pain is a significant health problem not only for adults but also for the young. The use of visual display terminals such as Smartphone for long hours can cause improper postures such as forward head posture and the subsequent increases in cervical lor-dosis and thoracic or lumbar kyphosis cause round shoulders and decreases in vital capacity and thoracic cavity. [7]

Patients with acute cervical pain mostly show changes in the cervical Range Of Motion (ROM), muscle endurance, and proprioception[7]

Many previous studies have focused on psychological problems, such as subjective symptoms of physical problems or stress. Few studies have focused on muscle fatigue according to the cervical flexion angle.[4] Therefore this study intend to compare the endurance , neck disability index(NDI) and range of motion (ROM) of individuals according to the time spent using smart phones.

The purpose of this study is, therefore, to define the effect of smart phone addiction on cervical function. This study is designed to analyze the profile of the craniocervical area and measure the cervical range of motion using goniometer method after identifying smart phone addiction in teenagers using the smart phone addiction proneness scale (SAPS). Teenagers are found to be most affected by smartphone addiction.

METHODOLOGY

A total number of 90 subjects were selected from different communities in and around Dehradun.

This Cross sectional study was done with convenient sampling.

INCLUSION CRITERIA:

- Age group between 15 to 30
- Individuals using smart phones from 2 years or more
- Individuals spending more than 4 hours per day using smart phones.
- Individuals having pain indicated by VAS

EXCLUSION CRITERIA

- Abnormal neurological findings
- Congenital abnormalities
- History of severe surgeries
- Any open wound around neck

OUT COME MEASURE[2,8,12]

- Cranio cevical flexion test (CCFT) value
- Neck disability (NDI) Score
- ROM scores

After collecting the written consent forms information regarding the demographic data was collected and subjects filled the Smart phone addiction scale (SAPS). A questionnaire on Smartphone addiction status was used to evaluate the subjects. The participants were divided into either the heavy user group or the control group according to their responses on the of Smart phone addiction scale (SAPS). The questionnaire consists of a total of 15 questions. After calculating the total score the patients were categorised in high user group and low user group. After that Subjects were taught how to perform the CCFT by the proper demonstration.

The cervical spine was supported in a neutral, which was determined visually by maintaining a horizontal plane between the forehead and the chin. The pressure biofeedback unit was placed between the plinth and the posterior aspect of neck just below the occiput and inflated to a base line of 20mmhg. Each subject was instructed to perform the neck cranio flexion movement flexion movement at 5 different pressure levels (22, 24, 26, 28, and 30mmHg) and to hold each level for 10 seconds. A 30 second rest period was provided between each level. The testing procedure ended when the subjects could not hold a specific pressure level for 10 seconds or the maximum level of 30 mmHg was achieved.

DATAANALYSIS

Data analysis was done using SPSS version 22. Descriptive analysis was done to check the mean for SAPS, CCFT score and NDI, ROM score. Paired t test was used to compare the CCFT, NDI and SAPS values of high user group and low user group.

Table 1: Comparisons of SAPS, CCFT and NDI values of high user group and low user group.

variables	High user group		Low user group		p value
	mean	S.D	Mean	S.D	
SAPS	42.5	2.2	34.1	4.0	0.00
CCFT	23.2	1.1	27.9	1.5	0.00
NDI	18.5	4.1	8.6	2.7	0.0

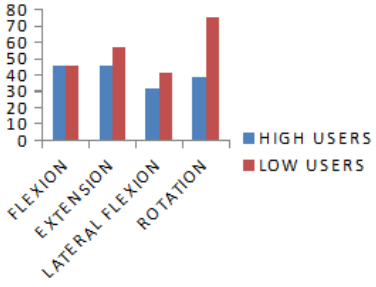

Table 2: Comparison of flexion, extension, lateral flexion and rotation

Variables	High user group		Low user group		p value
	mean	S.D	Mean	S.D	
Flexion	45.3	2.1	46.0	4.1	0.2
Extension	45.2	3.8	56.6	1.5	0.0
Lateral flexion	31.5	3.3	41.2	2.7	0.0
Rotation	38.7	6.1	75.4	4.2	0.0

DISCUSSION

The number of smartphone users has sharply increased from 5 million in 2010 to more than 40.12 million in 2014, indicating an extremely high penetration rate.[9] It is possible that a high school student may spend an extra 5,000 hours in poor posture.[10]

Young and Rodgers (1998), who described Internet addiction as an impulse-control disorder that does not involve intoxication.[3] It was hypothesised that the smart phone addicted subjects may suffer from significant disability, deep cervical flexor endurance may be significantly affected and may also have limited R.O.M.

The result of the present study proved that there was a significant level of disability and significant decreased endurance level and decreased R.O.M. in high users group as compared to low users group.

The abnormal posture, together with the changes in the mechanism of contraction places pressure on the facet joint and disks, causing headaches and neck pain. To reduce such fatigue of the neck muscles, the cervical flexion angle should be maintained at 30° rather than 50° or 0°.[4]

According to **Junhyuk Park** 55% of normal subjects range their deep cervical neck flexor endurance level calculated CCFT more than 26(either 28 mmHg or 30mmHg) where as in our study the mean value for CCFT in high group users was found to be 23.3±1. This proved that endurance level is low in high users group. The probable reason behind this can be staring at a smartphone display, which is located below a comfortable height for eyesight, for extended periods of time makes the head tilt forward. Extended smartphone use can cause FHP, myofascial syndrome of the hand, forearm, shoulder, and neck muscles, and depression. In addition, the weight supported by the spine dramatically increases when the head is flexed forward at varying degrees. Therefore, heavy smartphone users lose the natural curve of the cervical spine and instead place increased amounts of stress on the cervical spine.[1] The use of smart phone is also closely related to increased fatigue of the neck and the arm muscles, and musculoskeletal problems. According to a previous study by **Kenneth et al**, when flexing the head forward at varying degrees, the forces experienced by the cervical spine considerably increase and lead to cervical curve loss, which may cause neck pain.[10] This suggest that poor cervical postures keep the deep cervical short flexors in a biomechanically disadvantageous position, which lead to lesser endurance in them.[7]

When we calculated the NDI for present study it was found to be 18.5 in high user and 8.6 in low users group. In a study by Um, 18.8% of subjects experienced pain due to musculoskeletal system-related diseases caused by smart phone use. In addition, those with "more usage" (SMS and data) and a longer "using time" experienced more physical abnormalities.[4] The size of the smartphone is relatively small when comparing to the computer. The cervical load increases from about 10 pounds in the neutral position to 60 pounds at 60 degrees. Therefore, the excessive cervical load of a more flexed posture might cause considerable damage to the tissues that support the head and neck.[9] We can assume that various ergonomical factors are responsible for disability. In addition to that decreased endurance can also lead to increase in pain and disability.

Assessment of ROM in smart phone addicted participants showed dramatic decrease in score in present study. The result for ROM in the present study showed that ranges are decreased in high users group as compared to low user group.

Smartphones provide various conveniences, such as sending and receiving e-mail, accessing the internet, and engaging in entertainment. The number of smartphone users has increased dramatically in recent years because of these conveniences. This is particularly relevant for teenagers, because the adolescents' dependence on mobile phone is a problem that is not only new, but also on the rise. It is necessary to continue to study the conditions that foster this dependence, to develop prevention and treatment programs, and to make available assessment and diagnostic instruments that enable effective intervention.

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