



Correlation of Neck Posture with Hand Function in Computer Professionals

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Abstract

Background: Computer professionals often present with altered neck posture and hand/arm disorders. It has been found that 70% of computer professionals have neck/shoulder disorders and 64% have hand/arm disorders.

Objective: The study aims to correlate neck posture with hand function in computer professionals.

Subjects: A random sample of 60 subjects was taken.

Study Design: Correlational design.

Method: Subjects underwent assessment of their neck posture using photographic method by UTHSCSA image tool 0.3 software and hand functions by Jebsen-Taylor Hand Function Kit.

Results: After statistically analysing the data collected it was found at $p < 0.01$ that there is strong negative correlation between neck posture and hand functions in computer professionals.

Conclusion: The study concluded that as the cranio-vertebral angle decreases there is increase in the elapsed time (in seconds) taken to perform a task for hand functions. In later stages, it can result into decreased hand grip strength and daily hand functions.

Keywords: Computer professionals, neck posture, hand functions.

Introduction

Computers have become an epitome of modern life, being used in every aspect. India has been in the forefront in cyber world with IT industry developing into a major service provider. Approximately six-computers/1000 population was registered with an installation of 18 million Personal Computers (PCs) and still counting¹.

India being the forerunner in the cyber world, the occupational health personals are slowly awakening to this group of modern occupational diseases, which are slowly taking its roots among the information technology (IT) professionals. These problems if ignored can prove debilitating and can cause crippling injuries forcing one to change one's profession².

The high rate of acute and fatal injuries observed in most countries at the beginning of the 20th century has been replaced by a sharp increase in the incidence of work related disorders such as back and neck pain³. Work related diseases are defined as multifactorial that include damage of tendons, tendon sheaths, and synovial lubrication of tendon sheaths, and related to bones, muscles, nerves of hands, wrists, elbows, shoulders, neck and back⁴.

Richa Talwar et al (2009) conducted a study on computer professionals of Delhi, NCR which revealed a prevalence rate of musculoskeletal problems as 76.5% (153/200) and visual problems as 76% (152/200). Nearly three fourths of the

computer professionals had some computer-related health problems⁵.

High perceived exertion in the neck, shoulder and arm/hand during computer work is strongly associated with an increased risk of developing work related symptoms in the corresponding body region. Moreover, low perceived comfort is similarly, an early sign associated with an increased risk of neck pain but not of pain in the shoulder and hand/ arm region⁶.

Fredric Gerr et al (2002) computed that 70% of computer professionals have neck/shoulder disorders and 64% have hand/arm disorders. Common neck/shoulder disorders can be neck radicular pain syndrome, somatic pain syndrome, rotator cuff tendonitis, bicipital tendonitis and hand/arm disorders can be flexor carpi radialis tendonitis, flexor carpi ulnaris tendonitis, extensor tendonitis, intersectional syndrome, De Quervain's tendonitis, carpal tunnel syndrome, ulnar neuritis⁷. The incidence rate of symptoms from the neck, shoulders and arm/hands were 50, 24 and 34 cases per 100 persons per year, respectively⁶.

It has been found that Work Related Musculoskeletal Diseases (WRMSD) associated with numerous risk factors such as age, gender, BMI, duration of computer work, psychosocial stressors and individual factors, are also known to be important predictive variables.^(8,9,10)

Computer work typically involves, remaining for a long time in a fixed position which increases the forward head posture during work.¹¹The normal function of the cervical spine is to counter balance the head against the force of gravity. Poor head posture is considered to be insufficient, increasing the antigravity load on cervical structures, resulting in pain.¹² It involves an excessive anterior position of the head in relation to the theoretical plumb line perpendicular to the body's center of gravity, and can be considered similar to a protracted position of the cervical spine in which the lower cervical vertebrae are flexed in a forward glide and the upper cervical vertebrae are extended. Neck postural changes can lead to neck

pain via associated changes in cervical movement patterns. Reductions in the cervical range of motion (ROM) have implications for the safety and efficiency of functional activities and lead to a loss of corrective or protective reactions, which contribute to a loss of balance in the soft tissue extensibility around a joint¹¹. The neck pain affects adversely on health related quality of life and in turn leads to various problems which hamper one's daily activities of life.¹³ Although it is not life threatening, it can cause a sense of being unwell and substantial level of disability due to pain and neck stiffness.¹⁴

Thus, individuals with neck pain may display altered postural behavior when performing prolonged sitting tasks such as working on computer. Hence, need of the study is to find out the presence of altered postural behaviour (i.e. forward head posture) and whether it has effect on hand functions and vestibular functions in computer professionals.

Methodology

A sample of purpose of 60 computer professionals was recruited from Tata Power Delhi Distribution Limited, Moti Nagar. Right hand dominant^{15,16} computer professionals⁴ in the age group 30-45 years¹ working for ≥ 8 hours¹ per day for more than 5 years¹ and VAS Score ≤ 4 cm¹⁷ with BMI in the range 18.5-27 kg/m².^{8,18,19,20} were included in the study. Subjects were excluded if they had been diagnosed with any musculoskeletal disorder, neurological disorders, cardio-pulmonary disorders, any surgery involving upper limb and eye and hearing impairments.²¹

All the computer professionals fulfilling inclusion criteria were recruited. Entire procedure was explained and informed consent was obtained from the subjects. Neck posture (cranio-vertebral angle: angle formed by the intersection of a line from the spinous process of C7 and the tragus of the ear to the horizontal plane) was assessed by Photographic method using UTHSCSA image tool 0.3 software.^{22,23,24,25} Hand functions were assessed using Jebsen-Taylor Hand Function

Kit^{26,27} which consists of seven subtest items (writing, card turning, small common objects, simulated feeding, checkers, large light objects, large heavy objects).



Illustration 3.1: Shows instruments (tripod stand, camera, markers) for measuring the cranio-vertebral angle



Illustration 3.2: Jebsen Taylor Hand Function Kit



Illustration 3.3: Shows placement of markers on tragus of ear and C₇ vertebrae for measuring the cranio-vertebral angle.



Illustration 3.4: Shows Card Turning task of Jebsen Hand Function Kit

Results

The present study included 60 computer professionals with the mean age of 32.71 years, mean duration of working hours per day 8 hours, and the mean duration of working experience 7.73 years.

After statistically analysing, it was found at $p < 0.01$ there is strong significant negative correlation between craniovertebral angle and seven hand function tasks for both dominant and non-dominant hand which means that if cranio-vertebral angle decreases; time taken to complete a task increased which represents the reduction in the hand functions.

Discussion

Computers are revolutionizing daily lives, being used in every aspect of life from calculating grocery bills, telecommunications, banking operations, finance, transport, utilities, education and even medical care. Hence IT has found its place everywhere making every one tech-savvy and giving them a sedentary life style. However along with all the benefits, it has also ushered in a new genre of computer related occupational health problems.

Table 1: Shows correlation of results of CVA and Hand Function Tasks for Dominant

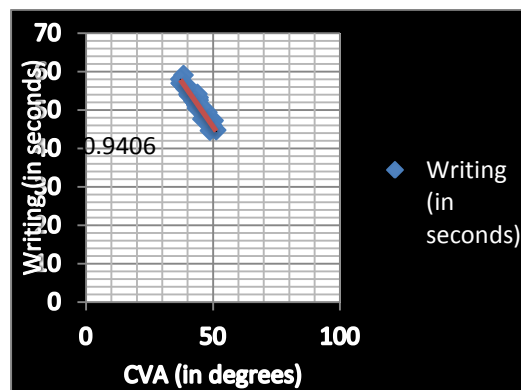
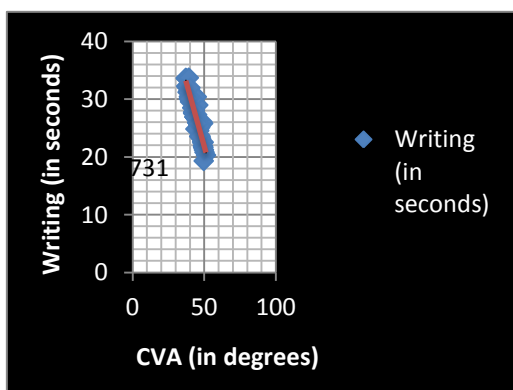
	CVA	HAND FUNCTIONS (Dominant Hand)						
		Writing	Card Turning	Small common Objects	Simulated feeding	Checkers	Large Light Objects	Large Heavy Objects
Mean	44.59	26.68	5.84	7.46	8.22	4.85	4.63	4.72
± Standard Deviation	± 3.83	± 3.62	± 0.72	± 0.84	± 1.04	± 0.72	± 0.80	± 0.74
	r-Value	-0.93	-0.92	-0.88	-0.90	-0.87	-0.90	-0.94
	p-Value	0.00**	0.00**	0.00**	0.00**	0.00**	0.00**	0.00**

**Significant (p<0.01)

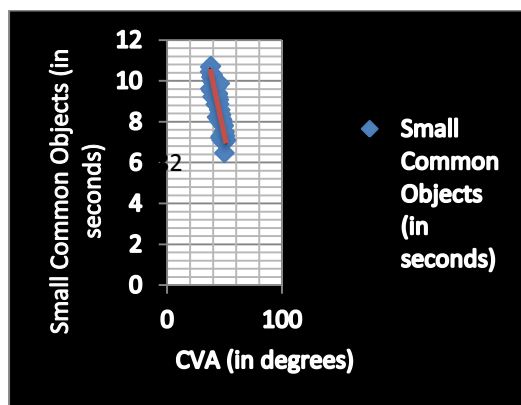
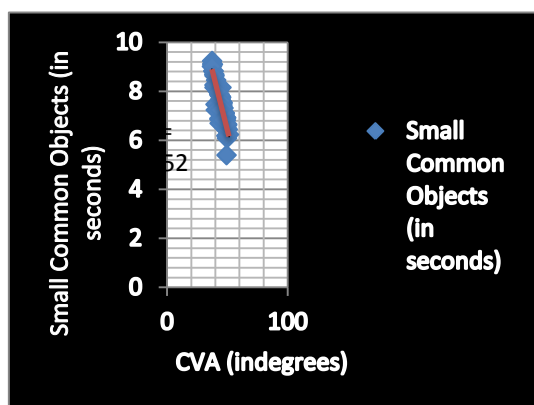
Table 2: Shows correlation of results of CVA and Hand Function Tasks for Non-Dominant

	CVA	HAND FUNCTIONS (Non-Dominant Hand)						
		Writing	Card Turning	Small common Objects	Simulated feeding	Checkers	Large Light Objects	Large Heavy Objects
Mean	44.59	50.84	6.17	8.68	9.52	5.21	5.12	4.94
± Standard Deviation	± 3.83	± 3.75	± 0.79	± 1.10	± 1.48	± 0.84	± 0.84	± 0.73
	r-Value	-0.97	-0.94	-0.90	-0.59	-0.94	-0.94	-0.97
	p-Value	0.00**	0.00**	0.00**	0.00**	0.00**	0.00**	0.00**

**Significant (p<0.01)



Shows correlation of results of CVA and small common objects task for dominant and non-dominant hand



Shows correlation of results of CVA and writing task for dominant and non-dominant hand

It was found that complaints of Arms, Neck, Shoulder (known as CANS) is common among computer office workers worldwide. Priyanga Ranasinghe (2011) concluded that prevalence of CANS in 2500 computer office workers over 1 year was 56.9%, commonest region of complaint being forearm/hand (42.6%), followed by neck (36.7) and shoulder/arm (32.0%).²⁸

Many studies also stated that one of the most common postural problems in computer professionals is the forward head posture (FHP). Won-gyu Yoo (2013) stated that with repetitive use of computers, users adopt a Forward Head Posture and create a long moment arm for cervical extensor (CE) muscles counteracting the load of head which results in a low muscular requirement of CE, while increasing the activation of the upper trapezius leading to weakness of CE.²⁹

It was also found that work related activities that involve abnormal repetitive movement or sustained static postures of the upper extremity, head and neck that are maintained for extended periods of time can negatively affect the nerves and other soft tissue structures in the upper quadrant resulting in arm and hand dysfunctions.³⁰

Thus the main purpose of the current study was to find out correlation between the neck posture and hand function in computer professionals with work experience over a period of 5 or more years. The study found a significant strong negative correlation between neck posture (cranio-vertebral angle) and hand functions (writing, card turning, small common objects, simulating feeding, checkers, large light objects, large heavy objects) at $p < 0.01$ for both dominant and non-dominant hand i.e. as the cranio-vertebral angle decreases (increasing forward head posture) there is increase in the elapsed time (in seconds) taken to perform a task for hand functions. The results showed that neck posture alterations can lead to the alterations in hand functions.

This fact is supported by many studies which reported that cervical stability and movement control are crucial for arm and hand functions. The cervical proprioceptors have central and

reflex connections to the vestibular and visual systems which is highly important for goal directed hand movements.³¹ This explanation make sense and agrees with Julia Treleaven (2008) who stated that the receptors in cervical spine have important connections to visual apparatus and dysfunction of these receptors can alter afferent input changing the integration of sensorimotor control which can further alter the oculomotor control³²; utmost important for the eye-hand coordination.³³ Similarly Ron Schenk (2006) found an important relationship between neck proprioceptors of the upper and lower cervical spine dorsal roots and vestibular nuclei in eye-hand coordination.³⁴

Additionally at later stages forward head posture can lead to cervical pain and radiculopathy which can further reduce hand functions. This is in agreement with study conducted by Christine B. Novak (2014) who stated that prolonged positioning away from the ideal posture will affect neural and other soft tissues leading to deviations like forward head posture with a loss of cervical lordosis, abduction of the scapulae, and internal rotation of the shoulders which can cause increased discomfort in the cervicospinal region and tingling/numbness into the upper extremity due to the nerve entrapment.³⁰ This concept is further supported by Mohamed Faisal C.K (2012) who investigated ill effect of cervical radiculopathy in upper limb, by measuring the hand grip strength by hand dynamometer and hand functions by Jebsen – Taylor hand function kit and found significant reduction in hand grip strength and hand functions when compared with the unaffected side.³⁵

In summary, this study correlates neck posture with hand functioning in computer professionals and the results revealed that there is significant correlation between them.

The scope of future research can be the other population area and gender- based studies can be performed.

Conclusion

The study thus concluded that with forward head posture (i.e. cranio-vertebral angle decreases) there can be alterations in hand functions which can be resulted into decreased hand grip strength and daily hand functions in later stages.

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