

Reducing Symptoms of Carpal Tunnel Syndrome in Software Professionals

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ABSTRACT Computer work requires a certain posture which poses a considerable amount of strain on the worker's body. Repeated and forceful motions of the fingers, holding arms in static positions, and keeping hands in uncomfortable positions lead to the symptoms of Carpal Tunnel Syndrome (CTS). The symptoms get the leverage when enough rest is not taken throughout the workday. The symptoms of CTS get even worse in the night leading to disturbed sleep and discomfort. If not attended in time, the symptoms may increase and the movement of the hand gets restricted. The objectives of the study were to analyze the pain symptoms in fingers and wrists in software professionals and design a fitness program as an intervention to reduce pain. The findings of the study reveal that the symptoms of carpal tunnel syndrome reduce if regular stretching of wrists and fingers is done.

INTRODUCTION

Carpal Tunnel Syndrome is a common musculoskeletal disorder in workers in computer workstations which is a consequence of pressure on the median nerve due to prolonged static work. The nature of computer work is such that it requires awkward and constrained postures which result in musculoskeletal stress on different body regions of seated workers. Repetitive motions from typing and working with mouse can lead to discomfort and pain in forearms, wrists and fingers. CTS can occur at any age. Most of the workers who suffer from CTS are between the ages of 20 and 40 years. The symptoms often first appear as painful tingling in the thumb, index and ring fingers in one or both hands during the night, fingers become swollen and then reduced ability to squeeze things follow. Initially the symptoms do not remain persistent and usually are affected by excessive use of the hand although there may be no symptoms when the hand is at rest. In extreme conditions it may lead to bone fractures and arthritis of the wrist. Occupational exposure to excess vibration, increased hand force and repetition increase the risk of developing CTS. Workplace strategies to avoid overexposure to these risk factors should be implemented. The study intended to analyze the incidence of CTS in software professionals and developing an intervention to reduce the symptoms of CTS.

Literature Review

Studies suggest that CTS is most often seen among those whose work involves repetitive movement of the hands. Roquelaure et al. (1997) reported occupational factors such as length of the shortest elementary operation <10 s; lack of change in tasks; lack of breaks for >15% of the day and lack of job rotation to be associated with the incidence of CTS. Kohler (1994) concluded that a typical RSI patient first becomes aware of odd sensations or pain in hands and wrists at night not during the day at work. By this time, pain is noticeably present throughout the day; so much damage may have occurred that the worker never completely recovers. And, as if the unpredictable and intractable nature of RSIs isn't bad enough, these conditions may get worse when assessment and treatment are delayed. Garfinkel et al. (1998) developed a yoga based regimen for carpal tunnel syndrome patients and found out that it was effective than wrist splinting or no treatment in relieving some symptoms and signs of CTS.

The results of stress on the wrists can be tingling, numbness and eventually disabling pain. CTS is the most common and costly cumulative trauma disorder and accounts for 1/3 of the cases. Half of all of the workers afflicted by the problem lose many days from the workplace (Stafford; www.ctsplace.com). There is a positive association between exposure to a combi-

nation of risk factors (for example, force and repetition, force and posture) and CTS. Exposure to such factors increases the risk of CTS (www.cdc.gov).

Seradge (1996) designed an on-the-job exercise program and reported that two out of three patients with mild to moderate carpal tunnel symptoms were able to avoid surgery by using the exercises.

MATERIAL AND METHODS

Study Location: A survey was conducted in a number of software companies in Jaipur, Rajasthan, to get an insight into the incidence of CTS among software professionals. The fitness program was implemented in selected software development companies in Jaipur viz. Decurtis Software Solutions (p) Limited, and Intecons Computers (p) Limited.

Selection of Study Population: The respondents were software development professionals. Sixty male subjects (30 in the control group, and 30 in the experimental group) were chosen for the study. Subjects were in the age group of 25–35 years, and had at least one-year experience in a similar kind of work. Information regarding age, work experience, vision acuity, workstation compatibility, and working technique was gathered.

Pre test Data Collection: The body map technique was used to collect data regarding intensity of perceived pain in wrists and fingers. The respondents were supposed to mark the point in the body map where they felt the pain and indicate the intensity of pain on a 5 point scale of very mild, mild, moderate, severe and unbearably severe.

Designing an on-the-Job Fitness Program: A set of exercises and stretches for wrists and fingers that could be done at work was designed on the basis of literature available on the subject. The fitness program comprised stretches and exercises each lasting 10–20 seconds. The fitness program was evaluated on its appropriateness by a panel of 21 experts from the fields of physiotherapy, physical education and orthopaedic doctors. The fitness program was modified as per the suggestions of the experts. The fitness program was designed with various stretches involving tightening and relaxing of wrists, fists and fingers.

Implementation of the on-the-Job Fitness Program: The experimental group of 30 subjects was exposed to the fitness program for a period of three months while the control group was not offered any training. A session of about 30 minutes per work day was planned for the experimental group for three months in which the subjects performed the exercises under the supervision of the expert. The session was scheduled every work day after four hours of work. Studies suggest that regular exercises have positive impact on the muscles in helping the muscles to regain their potential. The fitness program comprised a number of stretches of the hands, some with a bottle or a ball in the hand and some without any prop.

Post test Data Collection: After three months, the data regarding intensity of pain was collected again using the body map technique on a 5 point scale.

FINDINGS OF THE STUDY

Pain Symptoms in Wrists and Fingers

Wrists: Data in Table 1 reveals that a considerable number of respondents (73.33%) experienced pain of moderate intensity in wrists whereas 16.67% respondents reported mild pain in the wrists and remaining 10% respondents felt severe pain in wrists. Injuries to the wrist for VDT workers are the commonest of all as the wrists have to bear continuous pressure while working with mouse or keyboarding. The work risk factors have a positive relationship with neck and upper limb musculoskeletal disorders with combinations of repetition, force and postural work factors for elbow musculoskeletal disorders and hand/wrist tendinitis (NIOSH 1997).

Fingers: Fingers and forearm muscles are used with a lot of force when keying, mousing and handling files or books. A computer workstation is a hub of such activities which are supposed to induce pain the fingers, wrists and hands. It is stated in Table 1 that 53.33% respondents reported mild pain in fingers while remaining 46.67% respondents reported moderate pain in fingers. Studies suggest that perceived increased workload demands are positively associated with hand-wrist symptoms. The symptoms of CTS appear as pain, tingling or numbness in the thumb, index, middle or ring fingers or tingling in the entire hand.

Table 1: Percentage and frequency distribution of respondents by intensity of perceived pain in wrists and fingers

Body Part	Intensity of pain				
	Very mild	Mild	Moderate	Severe	Unbearably severe
Wrist n(%)	Nil	10(16.67)	44(73.33)	06(10)	Nil
Fingersn(%)	Nil	32(53.33)	28(46.67)	Nil	Nil

Impact of Fitness Program

Wrists: The computer work demands have always been associated with hand-wrist symptoms. Table 2 summarises the statistical details of the pain symptoms in wrists. The statistical summary shows that the mean of the scores for pain in wrist reduced from 1.7 to 1.4 after the implementation of the fitness program. The CV does not indicate a considerable difference in the data of pre test and post test.

Table 2: Statistical summary of pain symptoms in wrist of experimental group (n=30)

	Range	Mean	S.E.	S.D.	C.V.%
PrT _{exp}	1-3	1.7	0.11	0.6	35.29
PT _{exp}	1-2	1.4	0.09	0.5	35.71

PrT_{exp} - Pre test data for experimental group
PT_{exp} - Post test data for experimental group

Table 3 shows that there is a significant difference between the scores of the pre test and post test of the experimental group which indicates that the fitness program helped to bring about a considerable decrease in the pain symptoms of the respondents in wrist. The t value of post test of experimental group and control group also reveals a significant difference in the pain symptoms. Hansford (1986) reported reductions in wrist disorders as CTS with the introduction of on-the-job exercise programs..

Table 3: Paired t test before and after training for pain symptoms in wrist (n=30)

	Mean difference	t _{cal}
PrT _{exp} vs PT _{exp}	0.4	2.48**
PT _{exp} vs PT _{con}	0.6	4.87**

**Significant at 1%

PT_{con} - Post test data for control group

Fingers: It is evident from Table 4 that the mean of the scores of pain symptoms in fingers

of the experimental group reduced as a result of the fitness program. Also, there has been no difference in C.V. which is 33.33% in both pre and post test data of the experimental group.

Table 4: Statistical summary of pain symptoms in fingers of experimental group (n=30)

	Range	Mean	S.E.	S.D.	C.V.%
PrT _{exp}	1-2	1.5	0.09	0.5	33.33
PT _{exp}	1-2	1.2	0.07	0.4	33.33

In Table 5, the t value indicates a significant difference between the scores of pre test and post test for experimental group at 1% significance level, which indicates that the fitness program led to decrease in the pain symptoms in fingers after three months of training. The t value for post test of the experimental group and that of the control group is found to provide a strong evidence of reduction of pain symptoms in fingers.

Table 5: Paired t test before and after training for pain symptoms in fingers (n=30)

	Mean difference	t _{cal}
PrT _{exp} vs PT _{exp}	0.3	3.01**
PT _{exp} vs PT _{con}	0.5	4.78**

**Significant at 1%

You et al. (2004) suggested that work related CTS is associated with use of high pinch grip and very high repetitive motions at work. It is not always important that work conditions are the only cause of CTS. Nathan et al. (1992) confirmed the relationship between CTS, slower nerve conduction, and age and the non-relatedness of occupational factors, which led to the conclusion that the health of the median nerve is linked to the rest of the body and the median neuropathy is closely related to lifestyle and only peripherally to work activities. CTS is associated with forceful and repetitive work alone or in combination with other factors. CTS is a non-specific health outcome but needs to be given attention to sustain work efficiency.

Studies suggest that on-the-job fitness programs lead to decline in pain symptoms. Such interventions are considered to be helpful in reducing the exposure to potential workplace risk factors and developments of MSDs (Smith et al. 1999).

CONCLUSION

A highly efficient workforce is the need of the day. Work related MSDs have been a major cause of decline in performance, increased absenteeism and lower efficiency at work. CTS has been one of the major MSDs at computer workplaces due to continuous exposure of hand to repetitive forceful task. The findings of the study reveal that CTS can be prevented by on-the-job stretching of wrists and fingers at regular intervals. As the pain symptoms reduce, the workers can be expected to perform better as the hindrances like pain and fatigue at work are reduced and the effort in the work is minimized. The approach expands the value of fitness programs to improve health and the value of programs to improve health and reduce lifestyle risks to health by quantifying their combined effect on medical costs, absences, work performance and turnover. The employers are suggested to provide their employees such wellness programs in order to get a healthier and efficient workforce.

REFERENCES

- DHHS (NIOSH) Critical Review of Epidemiologic Evidence for Work-Related Musculoskeletal Disorders of the Neck, Upper Extremity and Low Back. Publication Number 97-141 From<<http://www.cdc.gov/niosh/docs/97-141/ergotxt7.html>> (Retrieved on Feb 28, 2007).
- Garfinkel M, Singhal A, Warren KA, Allan DA, Reshetar R, Schumacher RH 1998. Yoga-based intervention for Carpal Tunnel Syndrome. *The Journal of the American Medical Association*, 280(18): 1601-1603.
- Hansford T, Blood H, Kent B, Lutz G 1986. Blood flow changes at the wrist in manual workers after preventive interventions. *The Journal of Hand Surgery*, 11A(4): 503-508.
- Kohler G 1994. Work-Oriented Solutions to Office Safety. Occupational Hazards. From<<http://www.tifaq.org/archive/office-safety.txt>> (Retrieved on Feb 2, 2007).
- Nathan PA, Keniston RC, Myers LD, Meadows KD 1992. Longitudinal study of median nerve sensory conduction in industry: Relationship to age, gender, hand dominance, occupational hand use and clinical diagnosis. *The Journal of Hand Surgery*, 17A: 850-857.
- NIOSH 1997. *Musculoskeletal Disorders and Workplace Factors: A Critical Review of Epidemiologic Evidence for Work-Related Musculoskeletal Disorders of the Neck, Upper Extremity, and Low Back*. No. 97-141, DHHS, Cincinnati: NIOSH Publication
- Roqueleau Y, Mechali S, Dano C, Fanello S, Benetti F, Bureau D, Mariel M, Martin H, Derriennic F, Penneau-Fontbonne D 1997. Occupational and personal risk factors for carpal tunnel syndrome. *Scandinavian Journal of Work Environment and Health*, 23: 264-269.
- Seradge H 1996. Poster Exhibit, Annual Meeting, American Academy of Orthopedic Surgeons From< <http://www.eatonhand.com/hw/ctexercise.htm>> (Retrieved on 18th June 2010).
- Smith MJ, Karsh BT, Moro FB 1999. A Review of Research on Interventions to Control Musculoskeletal Disorders. *Work-Related Musculoskeletal Disorders*. Washington, DC: National Research Council, pp. 200-229.
- Stafford L 2006. Carpal Tunnel Syndrome: Prevention is Key. American Forces Press Service. From<http://www.ctsplace.com/article_6.php> (Retrieved on March 21, 2007).
- You H, Simons Z, Frievalds A, Kothari M, Naidu S, Young R 2004. The development of risk assessment models for carpal tunnel syndrome: A case referent study. *Ergonomics*, 47(6): 688-709.