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Article

Reducing back pain and increasing performance in software professionals

Namrata Arora Charpe

Banasthali University, Banasthali, Raj, India. E-mail: namrata_arora9@yahoo.com. Tel: +919929063974.

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It is obvious that in today's competitive world every individual has to work very hard to survive and to develop. The nature of today's work world is a very large portion of work that is done on computers. The presence of computer in the workplace leads to a set of peculiar characteristics of the workstation which require the workers to stay in a static posture for long periods. All these work conditions lead to back pain among software professionals. Interventions like ergonomics and fitness programs can prove to be beneficial in reducing the problem and increase the performance of the workers. Thus a comprehensive fitness program was designed for the workforce to ensure that both worker's efficiency and productivity could be sustained. The findings of the study reveal that fitness program helps to reduce the symptoms of back pain in software professionals and increase the performance. Employers with personnel who are required to sit for long periods of time to perform their job duties should take preventive measures that may reduce the risk of back pain.

Key words: Low back pain, fitness program, performance effectiveness.

INTRODUCTION

The presence of computer in the workplace leads to a set of peculiar characteristics of the workstation which require the workers to stay in a static posture for long periods. Back pain usually occurs due to sprains and strains in the back as an outcome of static or awkward posture. Sedentary workers often complain of back pain. Bad and awkward postures cause the pain. Injuries occur due to inactivity and static postures. The symptoms are not always readily apparent. It is a common workplace complaint and accounts for 33% of all workers' compensation costs.

Usually these disorders do not last, but in a few cases they may become persistent or even disabling. These are widespread problems with people who use computers extensively. The consequences are lost productivity and decreased efficiency. The pain interferes with concentration and creativity, fatigue curtails the effective time of the workers. It affects on-the-job attitude, perceived job satisfaction and general life quality. The perceptions of intensified workload, monotonous work, limited job control, low job clarity and low social support are associated with various work related musculoskeletal disorders. These limitations are very much prevalent in VDT work. The present study intended to identify back pain in software professionals and recognize the importance of fitness program in reducing them.

REVIEW OF LITERATURE

Back pain is number one leading impairment in occupational injuries and a leading cause of disability between the ages of 19 - 45. It is second most common cause of missed workdays (www.worksupport.com).

Studies suggest an association between back disorders and perceptions of intensified workload as measured by indices of both perceived time pressure and workload. According to literature in www.cdc.gov, there is strong evidence that awkward posture and static work posture lead to low back pain.

90% of people afflicted by low back pain will recover completely within about six weeks, for the 10% patients who do not recover within a few weeks, Back pain can be a painful, prolonged, costly and a frustrating experience (www.spine-health.com). It is believed that the direct costs due to compensated work-related musculoskeletal disorders are only a relatively low proportion (30 – 50%) of the total costs (Hagberg et al., 1995). According to Hedge (1999), the capability of muscle to perform static work typically is less than 1 min, and to perform heavy,

Table 1. Percentage and frequency distribution of respondents according to perception of pain in back.

Body part	Intensity of pain				
	Very mild	Mild	Moderate	Severe	Unbearably severe
Upper back	Nil	30(50)	28(46.67)	02(3.33)	nil
Mid back	Nil	07(11.67)	44(73.3)	09(15)	nil
Lower back	Nil	19(31.67)	36(60)	05(8.33)	Nil
Buttocks	Nil	30(50)	29(48.33)	01(1.67)	Nil

Data in parenthesis denote percentage.

dynamic work the duration typically is less than 30 min. Exercise may be a useful preventive measure and an effective tool after an injury has occurred, or when recovering employee returns to work (HLCD, 2002).

MATERIALS AND METHODS

Locale of the study

The need assessment survey and implementation of fitness program was done in selected software development companies in Rajasthan (India).

Sample and its selection

The sample consisted of computer professionals into software development, 60 male subjects, 30 in the control group and the other 30 in the experimental group. The background information of the subjects was gathered regarding age, work experience, vision acuity, workstation compatibility and working technique. The subjects were selected under the age group of 25 - 35 years with at least one year experience in the similar kind of work.

Development of tool

A set of questionnaires was developed to collect data about performance effectiveness of the software professionals. The body map technique was used to assess the perceived musculoskeletal problems of the software professionals.

Designing on-the-job fitness program

A set of exercises and stretches for back that could be performed on the job was designed for software professionals. The length of the fitness program was approximately 30 min with each stretch and exercise of 10 - 20 s.

Implementation of on-the-job fitness program

The experimental group of 30 subjects was exposed to the fitness program, while the control group worked as usual and was not offered any form of training. A session of about 30 min per workday was planned for the subjects of experimental group.

FINDINGS OF THE STUDY

The major findings of the study are as under:

Perceived pain

Back pain may be intermittent or constant; superficial or deep; or dull and aching, throbbing, or sharp and stabbing, depending on the cause and type of pain. Table 1 shows that 50% respondents reported mild pain in upper back. The remaining 46.67% felt moderate pain and 3.33% felt severe pain.

Local pain occurs in specific areas of the back. Sudden pain felt when the injury occurs. Local pain can often be relieved by changes in position or by light activity followed by stretching.

The common causes of mid back pain are poor posture, computer work at improperly set up work-station and low back misalignment. Ribs and mid-back vertebrae often go out of position from over-exertion.

Table 1 suggests that 73.33% respondents reported mild pain in the mid back, 11.67% reported moderate pain and the remaining 15% respondents reported that they felt severe pain in the mid back. Mid back pain may result of inappropriate posture for long time in a static activity like one on computers.

Mid back pain is always aggravated by certain movements and postures and is relieved by making them more relaxed in certain postures.

Table 1 describes that 60% respondents experienced moderate pain in the lower back, 31.67% felt mild pain and 8.33% reported severe pain in the lower back. Studies suggest that low back pain is the commonest problem faced in static and awkward working positions. This problem is likely to occur in sedentary work which is a major characteristic of computer work.

Poor body mechanics has been associated with lower back pain. Cholewicki and McGill (1995) stated that even light burdens could be a risk factor for sudden low back pain because of the risk of buckling in the relaxed state.

Documented risk factors for work related low back pain are heavy physical work, lifting and/or carrying heavy weights, forceful movements, awkward working postures (frequent bending and twisting) and whole body vibrations (Bernard 1997; NRC Corporation, 2001).

IMPACT OF FITNESS PROGRAM

Upper back

Back pain has been one of the leading causes of decline

Table 2. Statistical summary of pain symptoms in upper back of experimental group

	Range	Mean	S.E.	S.D.	C.V.%
PrT_{exp}	1-3	1.5	0.10	0.6	40
PT_{exp}	1-2	1.1	0.06	0.3	27.27

PrT_{exp} - Pre test data for experimental group.
PT_{exp} – Post test data for experimental group.
PT_{con}- Post test data for control group.

Table 3. Paired t test before and after training for pain symptoms in upper back.

	Mean difference	t_{cal}
PrT_{exp} vs PT_{exp}	0.4	3.53**
PT_{exp} vs PT_{con}	0.6	5.83**

**Significant at 1%.

Table 4. Statistical summary of pain symptoms in mid back of experimental group.

	Range	Mean	S.E.	S.D.	C.V.%
PrT_{exp}	2-3	2.2	0.07	0.4	18.18
PT_{exp}	1-2	1.2	0.07	0.4	33.33

Table 5. Paired t test before and after training for pain symptoms in mid back.

	Mean difference	t_{cal}
PrT_{exp} vs PT_{exp}	1.0	10.43**
PT_{exp} vs PT_{con}	0.6	4.57**

**Significant at 1%

in productivity of computer professionals. This can be attributed to the awkward postures while working on a VDT. The following table reveals the statistical summary of pain symptoms in upper back.

The statistical summary in Table 2 suggests that the range of scores in the post test scores of the experimental group (1 - 2) was lower than the range in the pre test, that is, 1 - 3. The mean reduced from 1.5 in the pre test to 1.1 in the post test. The reduction in C.V. from 40% in the need assessment and 27.27% in the post test shows lower variability in the scores of the post test as com pared to the pre test.

The t value in the table 3 shows that there was a significant difference between need assessment and post test scores of the experimental group. This reveals strong evidence that the fitness program brought about a positive change in the incidence of pain in the upper back. The t value for post test of experimental and control group depicts that there was a significant difference (at 1% level) between the values of pain symptoms in upper back.

Exercises are a convenient solution to back pain. But as it is wisely said that excess of anything is harmful, exercises too should be done within a limit. Exercises release a hormone called endorphin that gives a natural relief from pain.

Mid back

All our postures and movements are dependent on the functioning of the musculoskeletal system. Being physically active is beneficial for the musculoskeletal system, but an overload of physically strenuous tasks may pose a threat to it. Awkward postures, repetitive work or handling heavy materials may damage the system, leading to musculoskeletal fatigue, pain or disorders. MSDs are caused when the physical capacity of the muscles, joints, ligaments etc. is not in balance with the external forces that act upon the body.

It is evident from Table 4 that the pain symptoms in mid back in the experimental group decreased after one month of training. The mean value shows a decrease from 2.2 in the pre test to 1.2 in the post test. The C.V. increased from 18.18% to 33.33%.

In Table 5 the calculated t (10.43) shows a very high degree of change in the pain symptoms in mid back in the experimental group. The comparison between the scores of post test of the experimental group and the control group also showed a significant difference at 1% level in the pain symptoms in mid back.

Lower back

Documented risk factors for work related low back pain (LBP) are heavy physical work, lifting and/or carrying heavy weights, forceful movements, awkward working postures (frequent bending and twisting) and whole body vibrations.

Bigos (1994) reported that low back problems affect virtually everyone at some time, 50% of the working adults report low back pain and 15 - 20% seek medical help. Low back problems are among the highest ranking reasons for physician office visits and are costly in terms of medical treatment, lost productivity and non-monetary costs such as diminished ability to perform or enjoy usual activities. And further, for persons under age 45, low back problems are the most common cause of disability.

Even light burdens could be a risk factor for sudden low back pain because of the risk of buckling in the relaxed state. Chaffin (1999) reported that 40% of the VDT workers report low back pain.

The statistical summary in Table 6 depicts that the mean of the scores fell from 1.8 in the pre test to 1.2 in the post test. The C.V. showed no change, that is, the degree of variation remains the same in need assessment and post test.

Table 6. Statistical summary of pain symptoms in lower back of experimental group.

	Range	Mean	S.E.	S.D.	C.V.%
PrT_{exp}	1-3	1.8	0.11	0.6	33.33
PT_{exp}	1-2	1.2	0.07	0.4	33.33

Table 7. Paired t test before and after training for pain symptoms in lower back.

	Mean difference	t_{cal}
PrT_{exp} vs PT_{exp}	0.6	4.54**
PT_{exp} vs PT_{con}	0.6	3.20**

**Significant at 1%

Table 8. Paired t test before and after training for performance effectiveness.

	Mean difference	t_{cal}
PrT_{exp} vs PT_{exp}	20.25	21.93**
PT_{exp} vs PT_{con}	17.03	11.46**

**Significant at 1%

Shaw (2002) suggests that a number of psychological variables have shown to mediate the functional limitations of MSDs, especially chronic low back pain. These include pain avoidance beliefs, pain coping, psychological distress and problem solving orientation.

The following table depicts the comparison between pain symptoms in the lower back before and after the implementation of the fitness program.

In Table 7 the paired t test results (4.54) show that there is strong evidence that fitness program can lead to a decrease in the symptoms of low back pain. The comparison between the scores of post test in the experimental and the control group also depicted a significant difference between the pain symptoms in low back.

The improper and overuse of body leads to pain in the lower back. Sedentary workers often complain of low back pain. Bad and awkward postures cause the pain. These postural problems manifest usually during sitting, standing or sleeping. The greatest problems seem to be sitting upright or forward and not changing position. Both static postures and constant activity can cause initially microscopic and then macroscopic damage to tissues. If allowed to progress, it can develop into permanent disability. Repetition of activities, static posture leads to local pain in a specific area of the lower back. Intense physical activity or inactivity tends to make it worse. It may be constant or aching or, at times, can be intermittent and sharp. Local pain resolves gradually over days to weeks hence is generally ignored. When the muscles, bones and tendons fall into disuse, they start to grumble and groan especially in areas that are as complex as the back.

Low back pain is a common workplace complaint. Many people experience increased levels of anxiety or depression before they develop symptoms of low back pain.

Performance effectiveness

The paired t test results in Table 8 depict a significant difference in the Performance Effectiveness of the respondents before and after the commencement of the fitness program. Also there lies a strong evidence that the performance effectiveness in the post test varied to great extent in the experimental and control group.

Wattles (2003) suggest that higher levels of independent components of fitness may positively influence employees' productivity, job satisfaction and absenteeism. Interventions like ergonomics and fitness programs help to improve the working conditions for the software professionals. Improved wellness and morale can contribute to cost savings from lower health care premiums, lower absenteeism and increased productivity.

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