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RISK FACTORS, CLINICAL FEATURES AND OUTCOME OF TREATMENT OF WORK RELATED MUSCULOSKELETAL DISORDERS IN ON-SITE CLINICS IN INDIAN IT COMPANIESSharan D, Ajeesh PS, Rameshkumar RDept. of Orthopaedics & Rehabilitation, Bangalore Children's Hospital & Research Centre
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BACKGROUND: Work related musculoskeletal disorders is a constellation of disorders common in computer users which involves muscle, fascia, tendon and/or neurovascular structures of neck and upper limb; but any part of the body may be affected. The treatment involves physical therapy, workstation assessment and modifications, postural correction and periodic follow-up.

METHOD: The prospective study covered 3000 consecutive IT Professionals who attended on-site clinics in various companies in Bangalore and Hyderabad over a 3 year period. Risk factors based on assessment by a Rehabilitation Physician, Physical Therapist and Ergonomist, clinical features, diagnosis, treatment and eventual outcome of WRMSD's were recorded.

RESULT: The median age of patients was 26 years and males outnumbered females 4:1. The commonest ergonomic risk factors were lack of appropriate breaks, poor office ergonomics and high organisational stress. The commonest personal risk factors included hypermobile joints, hypothyroidism, hyperuricemia, inflammatory arthritis and Osteoporosis. Common clinical features were persistent discomfort or stiffness of neck and shoulder, fatigue or pain, swelling, skin discolouration, temperature changes, catching or snapping with movement, loss of grip strength or clumsiness of hand, numbness, burning or tingling. Common diagnoses were Myofascial Pain Syndrome (80%), Thoracic Outlet Syndrome (50%), Fibromyalgia (30%), Wrist Tendinitis (8%), Cubital Tunnel Syndrome (5%) and Complex Regional Pain Syndrome (5%). 95% of employees recovered completely, while 5% recovered partially and still had mild discomfort and pain.

CONCLUSION: The advantages of on-site clinics include: 1. Convenience of employees, saving time and greater compliance, 2. Promoting earlier reporting of symptoms and hence a quicker and easier recovery, 3. Better follow up regarding recovery, work modifications and return to original work, 4. Allows on-site workstation assessment and modifications, 5. Maintenance of recovery by monitoring posture, breaks and exercises, 6. More effective coordination with members of Human Resources, Facilities, Health and Safety team, etc., 7. Improved awareness levels regarding Ergonomics among Management and Employees.

Keywords: work related musculoskeletal disorders, ergonomics, on-site employee health clinics

**RECOGNITION AND CONTROL OF ERGONOMIC RISK
FACTORS AMONG COMPUTER OPERATORS**

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Abstract

Video display terminals (VDTs) form a major portion of modern work lives. A VDT in the workplace leads to set of peculiar working conditions. The professionals sitting in front of VDTs form a major portion of workforce today. Such a work requires the workers to sit in a static posture for prolonged periods of time.

The conditions lead to musculoskeletal disorders which aggravate when the worker is not able to stretch the body for prolonged hours. The conditions worsen when there are improper rest schedules. The ergonomic stressors and psychosocial aspect of the VDT workplace lead to MSDs like Carpal Tunnel Syndrome, Computer Vision Syndrome and Low Back Pain.

The present study intended to identify the musculoskeletal problems of computer operators and an attempt was made to reduce the incidence of MSDs by providing a set of stretches to the operators. The subjects were required to perform the stretches at regular intervals for a period of one month while being on-the-job.

A pre and post test study was conducted to see the impact of exercise break on the incidence of MSDs among software professionals. The statistical analysis of the data showed a significant decrease in the incidence of pain in various body parts and increase in performance after the implementation of the program.

Keywords: Fitness Program, Performance Effectiveness, Musculoskeletal Disorders

S I-A- 3

**OCCUPATIONAL SAFETY AND USE OF PPES IN CASTING AND FORGING SMES:
AN EXPLORATORY STUDY**

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Abstract

The present study explores the occupational safety and use of PPEs small and medium scale casting and forging units of northern India. In this cross-sectional study a sample of 572 male workers of casting and forging units were involved for assessing the level of occupational safety and ergonomics practices in different processes. A comprehensive questionnaire was used to collect the qualitative data regarding; work schedule, posture, musculoskeletal complaints and use of personal protective equipments (PPE). The results of the study revealed that 78% of the workers are not properly using PPEs; hence the workers are exposed to high noise, temperature and dust. Occupational safety and ergonomics practices are almost missing in most of the processes. Majority of the workers reported musculoskeletal disorders, NIHL and overall health weakness. The study concluded that, occupational health and safety is being ignored in these SMEs and recommended that occupational health and safety practice should be implemented and maintained.

Keywords: Occupational Safety in SMEs, personal protective equipments

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INDIRECT ESTIMATION OF BODY FAT PERCENTAGE FROM BMI OF THE WORKERS IN SERVICE SECTORSanchita Ghosh^{*1}, Rauf Iqbal^{*2}, Debamalya Banerjee^{*3} and Amitabha De^{*3}^{*1}. Research Fellow, TIFAC CORE NITIE, Mumbai 400 087^{*2}. Assistant Professor, National Institute of Industrial Engineering (NITIE), Mumbai 400 087^{*3}. Reader, Production Engineering Department, Jadavpur University, Kolkata- 700 032^{*4}. Professor, National Institute of Industrial Engineering (NITIE), Mumbai 400 087

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Abstract

A study was conducted to establish the relationship between BMI and Body fat percentage. The study was conducted in two different Phases.

In the Phase-I, Body Mass Index (BMI) and body fat percentage of 136 adult males working in service sector in the age group of 40-50 years (experimental group) were measured by anthropometric method. Mean (\pm SD) of age, height and weight of the experimental group are 46.7 (\pm 8.10) yrs, 164.4 (\pm 6.36) cms, 63.1 (\pm 11.54) kgs respectively. A prediction equation for body fat percentage was developed by using BMI (Fat%= 1.02*BMI+1.36). The correlation coefficient of predicted fat% is 0.68 and the mean square error is 18.05.

In the Phase-II, 61 new subjects in the same age group (43.9 \pm 7.66 yrs, 164.7 \pm 5.58 cms, 62.1 \pm 9.69 kgs) were selected at random from service sector (Validation group) and body fat percentage was measured by anthropometric method. Body fat percentage was also predicted by using the prediction equation developed in the Phase-1. The test – retest correlation shows high correlation coefficient ($r = 0.78$) with mean square error is 3.47. This proves the accuracy of the prediction equation.

Therefore, the prediction equation developed in the present study can be effectively used to determine the body fat percentage from the BMI of the adult male working in service sector in the age group of 40-50 years.

Keywords: BMI, body fat percentage, prediction equation, service sector

S I-A- 5

MUSCULO-SKELETAL PROBLEMS OF THE ARCHITECTURE STUDENTSVrushali Datar and Veena Gandotra¹Lecturer and ²Ex-Dean, Head of The Dept.

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Abstract

Man is the only primate who has habitual bipedalism. Basically human were not created to sit; human were created to walk, stand, jog, run, hunt, fish and to be in motion; when they wanted to rest, they laid down on the ground (Grimsrud, 1990). But the modern man spends major fraction of his time sitting down either at work, at home or elsewhere. "When standing up the joints of the feet, knees and hips are held in position by static muscular activity. When sitting, this muscular effort ceases and energy consumption is reduced. When standing the blood and tissue fluids tend to accumulate in the legs and this static pressure in the viens of the legs offset resistance to the return of blood to the heart" (Grandjean and Hunting, 1977). The students of architecture profession spend five years working on the drawing boards. They need to work on the drawing boards for hours together in a standing position. The furniture provided in the college not necessarily fit to the stature of all the students, which many a times has led to many postural disorders and so eventually the students are facing many muscular and skeletal problems.

This situation of the students led the investigator to carry an experiment on the architecture students with an objective to identify the musculo skeletal problems experienced by the students while working on the static drawing boards provided in the college and to measure the stress of painful muscles. A modified 5-point Borg's scale and an Electromyography were used to specify the muscular problems and stress in the muscles respectively. This data was presented in the form of case studies. The students were selected purposely. For the experiment the students were asked to work on the static drawing board with the height of 70 cm with an inclination of 5 degree for 3 hours continuously. From the overall data it was concluded that almost all the students experienced severe pain in the right shoulder, cervical and lumbar region. The pain experienced by the respondents was also because of their bad posture and improper dimensions of the furniture (drawing board). Based on the results the respondents were given suggestions for correct postures and dimensions of the furniture that would fit their stature.

Keywords: Musculo Sceletal Problems, Electromyograph

ANALYSIS OF BUS DRIVERS FOR ERGONOMICS AN OCCUPATIONAL HEALTH ISSUES

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Abstract

Bus drivers spend their work hours in their workspace which consists of the driver seat and the surrounding driving aids. The present study aims to analyze the ergonomic and occupational health related issues concerned with bus drivers. The target group is the bus drivers of Kerala operating the 'ordinary' and 'limited stop' buses of private and KSTC (Kerala State Road Transport Corporation) service.

A questionnaire survey for a sample space for 95% confidence level and 3% acceptable error is under progress. The data is to be analyzed using statistical techniques for different variables. The questionnaire includes questions related to Human factors, usability and work related musculoskeletal disorders.

The working posture analysis using OWAS, RULA and REBA methods are undertaken by observing the driver postures for different operations during driving by using video recording.

The working posture analysis of a typical private and KSTC bus was

Conducted using OWAS. The operations were categorized as follows: gear change and horn sounding in category 1, the braking action in category 2, and clutch depression in category 3 for the private bus that was analyzed.

The RULA assessment returned the result with 'Gear changing, steering while taking a turn and applying horn' getting Final score of 6, 4, and 3 respectively. The REBA assessment returned the result with 'Braking and Applying clutch operation' receiving 5 and 6 REBA score which shows there is 'medium' risk. The questionnaire survey is prepared based on previous research in the areas of ergonomics and 'work related musculo-skeletal disorders' (WMSD). The survey is presently under progress for the sample consisting of private and KSRTC buses Separately.

Keywords: bus drivers, postures, OWAS, RULA, WMSD

S I-A-7

MUSCULOSKELETAL DISORDERS IN CAREGIVERS OF CHILDREN WITH CEREBRAL PALSY FOLLOWING MULTILEVEL SURGERY

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Abstract

Caregivers of children with cerebral palsy undergoing multilevel surgery are predisposed to various musculoskeletal disorders (MSD) because of the significant physical and psychological effort required of them while caring for the child. Post surgically, parents/caregivers had to transfer the child from bed to wheel chair, carry to the rehabilitation centre, on the staircase and at home till he/she was able to walk independently. The purpose of this study was to estimate the prevalence and risk factors of MSD in caregivers during the postoperative rehabilitation (non-ambulatory phase) of the child.

Hundred consecutive parents or care givers of children with spastic hemiplegia, diplegia, or spastic/athetoid quadriplegia who underwent multi level surgery, completed a questionnaire comprising of ten questions. Care givers who were found to have Musculoskeletal Symptoms were subsequently assessed by an Orthopaedic and Rehabilitation Specialist and treated. The control group consisted of a hundred care givers of children with other orthopaedic problems which were independently ambulant and did not need to be lifted or carried.

90% of the care givers in the study group reported pain or discomfort, of which 72% had low back pain, 60% had neck pain and 35% had pain in the upper extremity. Excessive mental stress was documented in 85% of the care givers and sleep disturbance in 58%. It was found that lifting and carrying the child during the non-ambulatory phase was the chief cause of pain in symptomatic carers. The child's body mass index and carer's lack of knowledge of safe lifting techniques were found to be the major risk factors. The commonest Musculoskeletal Disorders identified were Myofascial Pain Syndrome (95%), Fibromyalgia (60%) and Thoracic Outlet Syndrome (55%).

In view of the high prevalence of MSD in carers, we recommend routine training in safe transferring, lifting and carrying techniques to all parents and care givers during the preoperative period. In addition, psychological counselling, stress management and training regarding sleep hygiene are recommended.

Keywords: musculoskeletal disorder, manual handling, caregiver

S I-A- 8

**INVESTIGATION OF WORK-RELATED MUSCULO SKELETAL DISORDER AMONG
BPO WORKERS AND ITS RISK FACTORS**

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Abstract

Of late Peoples have a mind set that it is very privileged to work at BPO as well as it heightened it concern in either ways .As the frontline of BPO is framed by youngsters it was those who achieve or suffer the most.

Any body position can cause discomfort and fatigue if it is maintained for long periods of time holding the neck and the shoulders in a fixed position to perform any controlled movement with the arm, muscles in the shoulder and the neck contract and stay contracted for as long as the task requires.

This paper is to investigate the problem associated with the BPO workers especially occupational illness. It concentrates on Work-related Musculoskeletal Disorder (WMSD).Work Related Upper Limb Disorder (WRULD) and Repetitive Strain Injury (RSI) while using computer on job and its risk factors imposed on the workers by checklist analysis and diagnosis of individual workers to certain ratio.

Keywords: Business process Outsourcing (BPO), Risk, WMSD, WRULD, RSI

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RISK OF DISORDERS USING COMPUTER MOUSE- AN EXPERIMENTAL INVESTIGATION

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Abstract

There are mainly two types of disorders- visual disorders and musculoskeletal disorders reported in HCI environment. These disorders lead to injuries, errors, and absenteeism and finally reduction in productivity. Each year millions and millions of money is spent on the workplace related injuries around the globe. Workplace injuries are mainly due to poor workplace design and bad postures. A large number of studies are been done by ergonomists on HCI environment and they are trying to find the cause of injuries, modifying the past designs and trying to give the designs that are best suited to the human body structure.

Several studies in past have reported that fully adjustable workstation could maintain work posture suitable for the sustained VDTs task as compared for fixed workstations. Back pain could mostly controlled using the ergonomically designed chair. Although wrist, forearm, elbow and neck related disorders are mostly due to the heavy use of mouse. The present study was designed to find the comfortable and most productive position of mouse pad in x-direction, y-direction and z-direction for users on VDT workstations.

The performance for a colour filling task was evaluated in terms of perceived discomfort score on 100mm visual analogue scale, Borg's rating and error committed to fill the right colours in the given blocks. The results of the analyses showed that that the most comfortable and suited positions for mouse users is when $x=13\text{cm}$, $y=5\text{cm}$ and $z=0$. Hence to avoid discomfort and fatigue for right-handed computer mouse users should place their mouse at a height same as that of keyboard at a distance of 13cm from the midpoint of the right edge of the keyboard and a little distance away along y-direction (around 5cm).

Keywords: musculoskeletal disorder, HCI, VDT, Borg scale

COMPUTER AIDED RAPID ENTIRE BODY ASSESSMENT (CAREBA)

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Abstract

Rapid Entire Body Assessment (REBA) is a tool used in occupational ergonomics to assess the risk factor associated with carrying out a particular task. The risk factor is determined from analyzing the various demands on the musculoskeletal system whilst performing the task.

In this paper, REBA has been computerized to calculate the final REBA score based on the user selecting various postures and entering load/force and coupling score in a user friendly interface. The steps involved in writing the computer program are explained. Several industry workers in Coimbatore were analyzed using this software and four important results are presented.

The task is observed thoroughly and the postures were assessed using CAREBA. Three of these workers perform tasks with low to high risk levels and one worker does a task which results in a high risk level requiring immediate remedial action.

Suggestions are made on how the risk level may be reduced by applying ergonomic principles to correct posture and minimize work stressors to reduce discomfort. CAREBA provides a quick and simple means to assess the risk level of industrial worker in any given industry.

Keywords: Occupational ergonomics, Posture, REBA, Computer Aided Analysis