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Health Problems Associated With Display Screen Equipment Use

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Abstract
Workers are often vulnerable to some unhealthy conditions that are inherent in their work processes and work environment. The emergence of computer technology created new jobs, but also introduced fresh health concerns for the users. Workers whose job requires constant use of Display Screen Equipment (DSE) are at particular risk of certain health problems including Musculoskeletal Disorders (MSDs) which are diseases that affect the muscular and skeletal systems, headaches, eye problems and stress. The paper discusses these health problems, their signs and symptoms, preventive measures and management. It identifies that employers and employees can play reasonable roles towards preventing and reducing the occurrence of DSE-related health problems among workers through organizational and administrative interventions, ergonomic interventions, personal interventions and behavioural interventions. The paper finally suggests among others that while employers should implement interventions aimed at preventing and reducing DSE-related health problems, the government should develop policies and regulations that protects workers who use these equipments just as is obtained in developed nations.
Key words: *display screen equipment, health problems, musculoskeletal disorders.*

Introduction

There has been a continuous and rapid increase in the use of computers in workplaces in Nigeria. Different terminologies are used to describe them such as visual display units (VDUs), visual display terminals (VDTs), monitors and display screen equipment (DSE) (Trade Union Congress - TUC, 2013). The term display screen equipment or DSE for short will be used in this paper to describe such equipment.

Display screen equipments are technological innovations that have not only created easier and faster ways of achieving results, but have also created new job descriptions. However, this has not been without consequences for workers' health and work productivity. DSE is a device or equipment that has an alphanumeric or graphic display screen, regardless of the display process involved; it includes both conventional display screens and those used in emerging technologies such as laptops, touch-screens and other similar devices (Health and Safety Executives – HSE, 20013). Concern about the health effects of DSE use are more for some industries/sectors than for others. For instance, TUC (2013) reported that DSE was second of the top five health concerns in banking industry, insurance and finance (73 per cent) and central government (56 per cent), with 38 per cent concerned in energy and water, 27 per cent in other services and 17 per cent in agriculture, listing it as their fifth concern. Although there may not be available data, but it is a common observation that most top businesses in Nigeria are heavily dependent on DSEs to boost their business. In fact, no occupation is left out in the use of DSE: banking, telecommunication, entertainment, education, and most worthy of note are business centers scattered all over the cities where the major equipment for business are DSEs. Many DSE users suffer in silence especially in Nigeria where there is no legislation covering them. This paper, intends to provide useful information that may help those whose job involves the use of DSE to properly understand the nature of their job, the inherent hazard, adopt adequate safety measures in order to prevent the onset of these health problems and as well build their capacity to manage the problems if they occur.

DSE was defined by Occupational Safety and Health Council – OSHC (2009) as display screen which shows letters, numbers, characters, or graphics regardless of the display process involved. The Birmingham City Council (2015) described DSE as a screen that is used for displaying information such as text, numbers or graphics. It however noted some exceptions which were not covered by regulations on DSE to include: screens whose main use is the display of films or videos; screens in drivers' cabs or on vehicles; portable equipment not in prolonged use; calculators, cash register etc with small displays; and display screens intended for use mainly by the public. Although this implies that DSE officially does not include such equipment that are in private and public use, the information that this paper provides will equally be beneficial to private users of DSE. Generally, DSE users are persons to whom most if not all of the following apply:

1. They are dependent on the equipment to do their normal job and alternative means of doing the job are not readily available;

2. They have no discretion as to whether to use or not to use the equipment;
3. They need significant training in the use of the equipment;
4. They use the equipment for continuous spells of one hour or more;
5. They use the equipment on a more or less daily basis; transfer of data between the user and the screen is required; and High levels of accuracy are essential and errors would be critical (Birmingham City Council, 2015).

DSE users include word processing worker, secretary/typist, data input operator, news sub-editor, journalist, customer complaint/account enquiry/directory enquiry operator, television editing technician, security control room operative, air control operator, graphic designer and librarian; while moderate users include: scientists/researchers, client manager, bank customer support officer, airline check in clerk, and receptionist (HSE, 2008).

Health Problems Associated with the Use of DSE

A variety of ill health symptoms have been associated with work with DSE including musculoskeletal disorders; mental stress; and eye problems. Birmingham city council (2015) identified upper limb disorder (ULD) (including pains in the neck, arms, elbows, wrists, hands, fingers) especially after long periods of use; temporary eyestrain (but not eye damage) and headaches; fatigue and stress. A survey found high prevalence in DSE users of self-reported symptoms, such as headaches (52%), eye discomfort (58%), neck pain (47%); back (37%) and shoulder (39%) (HSE, 2013). Symptoms were found among those who spent more time at their computer at work and among those who worked for longer without break. A study by HSE carried out in 2007 found that 73 per cent of all respondents reported one or more musculo-skeletal symptom; over the previous 12 months, 47 per cent had suffered neck symptoms, and 12 per cent elbow and forearm problems. Symptoms affecting the back, shoulder and neck were frequently reported together and slightly over half reported symptoms affecting the head and/or eyes (TUC, 2013). They noted that Symptoms were more frequently reported by women than men, and symptoms were more common among those spending more time at their computer, and especially those who worked for more than an hour without a break.

Musculoskeletal Disorders - MSDs

Virtually all human activities involve the use of the muscles and the bones, but as long as their use remains within normal range no harm is caused. The muscular system and the skeletal system make up the musculoskeletal system. The skeletal system is made up of bones and joints while the muscular system is made up of muscles, tendons and ligaments. These organs work together to provide the leverage for major body movements. While the joints act as the pivot, the bones provide attachments by means of tendons and ligaments to the muscles which produce the force that cause movement to take place. However, in the course of doing work, these organs can be subjected to over-use, poor usage or exposure to external forces or agents that can cause injury or damage to them. Conditions resulting from injuries or damages to these organs are called Musculoskeletal Disorders.

MSDs can interfere with activities at work and can lead to reduced productivity, sickness absence and chronic occupational disability (European Agency for Safety and Health at Work, 2008). In these times of emerging technological, a particular rise in MSDs is being witnessed among growing users of Display Screen Equipments.

Musculoskeletal disorders (MSDs) are conditions that affect the nerves, tendons, muscles and supporting structures, such as the discs in the back (IOSH, 2013). They result from one or more of these tissues having to work harder than they're designed to. Most work-related MSDs develop over time and are caused either by the work itself or by the employees' working environment. Health problems of MSDs range from discomfort, minor aches and pains, to more serious medical conditions. Cherney (2013) submitted that MSDs are regarded as common, noting that low back pain is the most common and that increased risk has been associated with age, occupation, level of activity and lifestyle. MSD resulting from DSE use affect different parts of the body including: neck, shoulders, wrists, fingers, and back (upper and lower).

Repetitive strain injuries (RSI)

Repetitive strain injuries are a major MSD for users of display screen equipment. RSI is the collective name used to describe a range of muscle and tendon conditions of the neck, shoulders, elbows, wrists, hands and fingers caused by continuous, repetitive or pressurised finger, hand or arm movements such as typing (TUC, 2013). RSI equally referred to as ‘cumulative trauma disorder’ or ‘occupational overuse syndrome’ is also used as an umbrella term for non-specific conditions popularly referred to as Blackberry thumb, iPod finger, gamer's thumb (a slight swelling of the thumb caused by excessive use of a gamepad), Rubik's wrist or "cuber's thumb" (tendinitis, carpal tunnel syndrome, or other ailments associated with repetitive use of a Rubik's Cube for speed cubing),

Trigger finger, Stylus Finger" (swelling of the hand caused by repetitive use of mobile devices and mobile device testing), Raver's Wrist, caused by repeated rotation of the hands for many hours, and others (Wikipedia, 2013).

Using a computer mouse concentrates activity on one hand and arm, and one or two fingers. This makes aches and pains in the fingers, hands, wrists, arms and shoulders more likely. A study which monitored healthy computer operators and examined the risk of their suffering injuries clearly demonstrates that doing a lot of computer work leads to strain in the neck, shoulders, arms and back (TUC, 2013). It also shows that psycho-social factors influence prevalence judging from the findings that workers whose job was stressful, with high demands and little control, were at much greater risk of suffering neck and shoulder pain than the reference group who had low demands made of them and more control over their work. In 2005 and 2006 an estimated 374 000 people in Great Britain suffered from an RSI caused or made worse by their work (HSE, 2013). With the steady emergence of more sophisticated DSEs in the market, the figure will certainly continue to rise. According to TUC (2013), symptoms of RSI include: pain in the fingers, wrists, arms or shoulders; tenderness; feeling of heaviness in the arms/wrists; swelling; tingling sensation at the fingertips; numbness; and joint restriction.

Carpal tunnel syndrome

People whose job involves repeated flexing of their wrist as in typing may develop tingling and/or pain in their thumb, index and middle fingers along with weakness of movements of the thumb, especially, grasping an object (Wikipedia, 2013).

Low Back Pain

Low back pain is common and can be extremely painful. It can be difficult to cope with the severe pain. Low back pain occurs in users of DSE usually from poor sitting or standing, and sitting or standing in a position for a long period (Wikipedia, 2013). Low back pain can be prevented or reduced by adjusting workstation such as making adjustments in heights of worktops, and adopting good working positions.

Risk factors for MSD

Some factors put DSE users at more risk than others for developing MSD. Middlesworth (2015) categorised the risk factors into two: work-related/ergonomic risk factors and individual-related risk factors. Ergonomic risk factors are those that result from the nature of the work itself, example, task that is repetitive in nature. A job is considered highly repetitive if the cycle time is 30 seconds or less (Middlesworth, 2015). The use of DSE involves high task repetition, and when combined with other factors such as awkward posture contributes to MSD. Awkward postures place excessive force on joints and overload the muscles and tendons around the affected joint. Joints of the body are most efficient when they operate closest to the mid-range motion of the joint. Risk of MSD is increased when joints are worked outside of this mid-range repetitively or for sustained periods of time without adequate recovery time. According to Middlesworth (2013), Individual risk factors include:

i. P**oor work practices.** Workers who use poor work practices, body mechanics and lifting techniques are introducing unnecessary risk factors that can contribute to MSDs. These poor practices create unnecessary stress on their bodies that increases fatigue and decreases their body's ability to properly recover.
ii. **Poor overall health habits.** Workers who smoke, drink excessively, are obese, or exhibit numerous other poor health habits are putting themselves at risk for not only musculoskeletal disorders, but also for other chronic diseases that will shorten their life and health span.
iii. **Poor rest and recovery.** MSDs develop when fatigue outruns the workers recovery system, causing a musculoskeletal imbalance. Workers who do not get adequate rest and recovery put themselves at higher risk.
iv. **Poor nutrition, fitness and hydration.** Many people are malnourished, dehydrated and at such a poor level of physical fitness that climbing one flight of stairs puts such people out of breath. Workers who do not take care of their bodies are putting themselves at a higher risk of developing musculoskeletal and chronic health problems.

Other risk factors include poorly designed work environment.

Stress

Many DSE workers complain about suffering from very high levels of stress, and mental as well as physical fatigue, when they are involved in work on DSE. Persistent stress may result in psychological health problems, and is also associated with serious physical health problems such as muscular tension, back problems, high blood pressure, stomach disorders and coronary heart disease (TUC, 2013).

HSE Guidance to the Health and Safety (Display Screen Equipment) Regulations (as amended in 2002) linked the following factors with stress in DSE work:

1. workers having little control over their work and working methods (including shift patterns);

2. tasks requiring high attention and concentration in conditions where the worker has little control over their allocation of effort;
3. workers being unable to make full use of their skills;
4. workers not being involved in making decisions which affect them;
5. being expected to carry out repetitive, monotonous tasks all the time;
6. work being system-paced (especially if work rates are being monitored inappropriately);
7. demands of the work being perceived as excessive;
8. payment systems that encourage working too quickly or with insufficient breaks;
9. opportunities for social interaction being limited by work systems; and
10. high levels of effort not being balanced by sufficient reward (pay, resources, self-esteem, status).

Eyesight problems

DSE work is visually very demanding. HSE (2013) says that extensive research has found no evidence that DSE can cause permanent damage to the eyes or eyesight although his is disputed by some. However, it goes on to say that some workers may experience temporary visual fatigue, leading to a range of symptoms such as impaired visual performance (for example, blurred vision), red or sore eyes and headaches, or the adoption of awkward posture which can cause further bodily discomfort. Uncorrected, or imperfectly corrected visual defects, can become troublesome when a person becomes a DSE user. Workers with these pre-existing vision defects may become more aware of them. And since eye defects become worse with age, this problem crops up more and more in older workers. Problems with eyesight are made worse by badly designed workstations, bad positioning of equipment and documents, poor lighting, poorly designed screens, glare, long periods spent at the screen, lack of adequate maintenance and uncorrected eye defects; and dry heat can also pose a problem for the wearers of contact lenses (TUC, 2013).

Reproductive hazards

Over the years, there has been concern over reports that there may be links between computer usage and reproductive hazards. However, there is no consensus about whether there is any direct causal link between DSE use and miscarriages or birth defects. Miscarriage and birth defects have been linked with electromagnetic radiation from DSE. However, HSE (2013) stated that there is substantial evidence that these concerns are unfounded, noting that the levels of ionising and non-ionising electromagnetic radiation which are likely to be generated by DSE are well below those set out in international recommendations and the National Radiological Protection Board does not consider such levels to pose a significant risk to health. The TUC (2013) believes that a large number of cases need to be studied over a long period of time before any firm conclusions can be drawn. Yet there may be a combination of factors at play which helps to explain the lack of evidence implicating any one factor as a reproductive hazard. In the meantime, it is better to adopt a precautionary approach.

Employer's and employees' roles in the Prevention of DSE-Related Health Problems

In preventing and reducing the incidence of MSDs, the employer needs to make a lot of changes and adaptations in the environment and in work processes. There is strong evidence that technical ergonomic measures can reduce the workload on the back and upper limbs without the loss of productivity and moderate evidence that these measures can also reduce the occurrence of MSDs (European Agency for Safety and Health at Work, 2008)

Modifications of posture and body use can help to prevent and reduce occupational musculoskeletal diseases (Wikipedia, 2012). Adaptive technology ranging from special keyboards, mouse replacements to pen tablet interfaces might help improve comfort. There is also some evidence that a participative approach which includes the workers in the process of change has a positive effect on the success of an intervention (Health and Safety Executive, 2013). HSE, (2013) provided the following useful guide for preventing DSE-related health risks:

Getting comfortable

1. Forearms should be approximately horizontal and the user's eyes should be the same height as the top of the screen.
2. Make sure there is enough work space to accommodate all documents or other equipment. A document holder may help avoid awkward neck and eye movements.
3. Arrange the desk and screen to avoid glare, or bright reflections. This is often easiest if the screen is not directly facing windows or bright lights.
4. Adjust curtains or blinds to prevent intrusive light.
5. Make sure there is space under the desk to move legs.
6. Avoid excess pressure from the edge of seats on the backs of legs and knees. A footrest may be helpful, particularly for smaller users.

Well-designed workstations

Workstation means an assembly comprising DSE, any chair, desk, work surface, printer, document holder or other item peripheral to the DSE, and the immediate working environment around the DSE, e.g., lighting and noise (OSHC, 2009).

Keyboards and keying in (typing)

1. A space in front of the keyboard can help you rest your hands and wrists when not keying.
2. Try to keep wrists straight when keying.
3. Good keyboard technique is important – you can do this by keeping a soft touch on the keys and not overstretching the fingers.

Using a mouse

1. Position the mouse within easy reach, so it can be used with a straight wrist.
2. Sit upright and close to the desk to reduce working with the mouse arm stretched.
3. Move the keyboard out of the way if it is not being used.
4. Support the forearm on the desk, and don't grip the mouse too tightly.
5. Rest fingers lightly on the buttons and do not press them hard.

Reading the screen

1. Make sure individual characters on the screen are sharp, in focus and don't flicker or move. If they do, the DSE may need servicing or adjustment.
2. Adjust the brightness and contrast controls on the screen to suit lighting conditions in the room.
3. Make sure the screen surface is clean.
4. When setting up software, choose text that is large enough to read easily on screen when sitting in a normal comfortable working position.
5. Select colours that are easy on the eye (avoid red text on a blue background, or vice versa).

Changes in activity

Breaking up long spells of DSE work helps prevent fatigue, eye strain, upper limb problems and backache. The employer needs to plan, so users can interrupt prolonged use of DSE with changes of activity. Organised or scheduled rest breaks may sometimes be a solution. The following may help users:

1. Stretch and change position.
2. Look into the distance from time to time, and blink often.
3. Change activity before users get tired, rather than to recover.
4. Short, frequent breaks are better than longer, infrequent ones.

Physical exercises

The risk of back pain increases if there is a discrepancy between the workload and the physical capacity of the person doing the work. This mismatch can also be reduced by improving the physical capacity of workers. Therefore, actions to promote health and physical activity is advocated. Thus there is moderate evidence that physical exercise is beneficial in the prevention of low back disorders, and can reduce the recurrence of back pain and neck-shoulder pain (Hayden, Van Tulder , Malmivaara, & Koes, 2005).

Summary and Conclusions

Musculoskeletal disorders are the major health problems associated with users of DSE. Other health problems include eye strain, stress and reproductive health hazards. These problems may start slowly and if ignored develop into more incapacitating conditions. The employer and employee can do a lot in checking the development as well as alleviating the effects of these health problems through identified personal and organizational efforts. This paper, therefore, concludes that the widespread use of DSE in businesses in Nigeria today is a sign that DSE-related health problems are indeed here with us and that there is need to start now to address it before it consumes us.

Suggestions

Based on the above conclusions the following suggestions are made:

1. There is need for researches to ascertain and document the prevalence of DSE-related health problems and the concomitant risk factors.
2. Employers should realize that the workforce not machinery drives work productivity and so invest in interventions that would protect employees from health problems associated with the use of DSE as well as put programmes in place to assist those already affected.
3. Manufacturers of DSEs should be mandated to include in their packages leaflets explaining risks associated with the use or improper use of their products.

4. Industrial unions should be conscious of the devastating effects of untreated DSE-related health problems and work towards ensuring that workers receive the needed protection from their employers.
5. Government should put legislations in place that will protect workers from unnecessary exposure to DSE-related health risks and enforce them.

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