
**IDENTIFICATION, EFFECTS AND PREVENTION OF ERGONOMIC HAZARDS AMONG
CONSTRUCTION TECHNOLOGY STUDENTS IN NIGERIA**

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Abstract

Ergonomic hazards are silently reducing the effectiveness of thousands of workers in the construction industry. The need to nib the problem from the bud has become very necessary by focusing attention at the training stage of future workers of the construction industry. This is to expose hazards they may likely face. The paper identified some common ergonomic hazards such as ones that affect students when handling task manually, hazards that affect upper limbs and those that are caused as a result of vibration. Furthermore, the paper also exposed the effects of the hazards on workers and students. Solutions to the hazards were proffered. Finally recommendations were made; among which is the need to put in place an effective risk assessment plan in workshops and laboratories.

Introduction

The industrial technology programmes in institutions in Nigeria are reservoirs where the industrial sector is steadily fed with the required manpower to provide products and services for the growth of the national economy. Wodi and Dakubo (2003) noted that school and on the job training have a profound impact on the quality of workers, products and services produced; hence the need to prepare students properly so that they can fit into the labour market and function to the required standard.

One of the areas that need adequate attention is safety. This preparation demands exposing students to types of accidents and their causes, hazardous condition, materials and the use of safety equipment. According to John, Nwankwor and Tika (2010) the construction industry is a busy workplace with numerous hazardous materials and conditions which the workers do not apparently notice until later in life. Typical examples of these hazards are Cumulative Trauma Disorders (CTDs) and Ergonomic hazards. According to Charles and James (1999), CTDs are made up of several hazardous conditions such as tendonitis thoracic outlet syndrome, tennis elbow, rotator cuff tendonitis and Reynard's syndrome. Others are Trigger finger, Ganglion cyst, Golfer's elbows or Carpenters elbow and Carpal tunnel syndrome.

The focus of this paper is on the ergonomic hazards as they affect the construction technology students. The paper seeks to identify the ergonomic hazards, their effects on students as they are being prepared to face greater safety challenges in the construction industry and proffer preventive measures which will in due course help them in preventing greater hazards on the job (working on sites) or training others in institutions of learning.

Ergonomic Hazards

Ergonomics is a new field in the construction industry only in the recent years has the construction industry become interested in the field, (Charles and James, 1999). Due to the uniqueness of the construction industry and lack of information which accurately describe the incidence of injuries and illness related to ergonomic factors, Charles and James noted that only small steps have been taken to address ergonomic hazards on construction sites.

Various scholars defined ergonomic from different perspectives. Hughes and Ferrett (2009) broadly defined it as the study of the interaction between workers and their work. They also gave a more specific definition of ergonomic as the study of the relationship between the worker, the machine and the environment in which he operates and attempts to optimize the whole work system, including the job, to the capabilities of the worker so that maximum output is achieved for minimum effort and discomfort by the worker.

Hedge (2009) defined ergonomic as the study of workplace design. It includes how a workplace and the equipment used in the workplace can best be designed for comfort, efficiency, safety and productivity.

As a worker or student interact with machines and his environment there is the tendency that the physical, psychological and environmental demands exceed the capacity of the worker, thereby leading physical, psychological and physiological stress which may eventually lead to hazardous conditions. Ergonomic hazards form part of the hazardous conditions. The National Safety Council (1993) in the United States included all disorders caused by repetitive motions as a result of use of tools such as chain saw, power hammer and other hand tools as ergonomic hazards. Hughes and Ferrent (2009)

defined ergonomic hazards as those hazards to health resulting from poor ergonomic design.

The Occupational Safety and Health Administration (OSHA) pointed out that hazards that can be a harm to a worker or student from external source such as loud noise from equipment, radiation due to exposure to welding flash, chemical burns due to contact with acid or caustics. All these form part of ergonomic hazards. Others are injuries from the use of tools and lifting of loads on site; bending, vibrations, pulling and pushing of materials on sites (OSHA, 1997). Ergonomic hazards are broadly classified into two namely manual handling and mechanical handling hazards.

Manual Handling Hazards

According to Hughes and Ferrett (2009) the term Manual Handling is the movement of a load by human effort alone. This effort may be applied directly or indirectly using a rope or a lever. They noted that over 25% reported accidents are caused by improper manual handling.

Some of the ergonomic hazards of manual handling include:

- (i) Lifting a load which is too heavy or too cumbersome resulting in back injury.
- (ii) Poor posture during lifting or lifting technique resulting in back injury.
- (iii) Dropping a load resulting in foot injury.
- (iv) Lifting sharp-edged or hot loads resulting in hand injury. (Hughes and Ferrett, 2009 p, 216).

Effects of ergonomic hazards manual handling

According to Nicki (2007) and Hedge (2009) most of the common effect of manual handling ergonomic hazards are musculoskeletal in nature and they include:

- i. Muscular Sprains and Strains:
This is because when a muscular tissue is stretched beyond normal capability leading to a weakening, brushing and painful inflammation of the area such injuries normally occur in the back or in the arms and wrists of a worker or student.
- ii. Back Injuries:
This effect the disc situated between the spinal vertebrae and can lead to a very painful prolapsed disc lesion commonly known as a *slipped* disc. It can further develop into conditions known as Lumbago and Sciatica (where pain travels down the legs).
- iii. Hernia
This is a rupture of the body cavity wall in the lower abdomen causing protrusion of part of the lifting of loads.
- iv. Cuts, Brushing and Abrasions

These effects are caused by handling loads with unprotected sharp corners or edges.

v. Rheumatism

This is a chronic disorder involving severe pain in the joints, one of the common causes is the muscular strain induced by poor manual handling and lifting techniques.

Prevention of effects of manual ergonomic hazards

Health and safety Gunide (1997) summarized the magnitude of effects of ergonomic hazard on the body as a result of improper manual handling. Their study showed that 45% of back, 13% of arm, 16% of finger, 6% of arm and 6% of lower limbs injuries are caused by improper manual handling. These injuries can be reduced or prevented by

(a) Employing Mechanical Assistant

OSHA (1997) recommended the use of mechanical aids to assist the manual handling operations such as hand-powered hydraulic hoist, trolleys and roller conveyors.

(b) Making the Load Manageable

The load should be examined to see whether it could be made lighter, smaller or easier to grasp for effective management. This can be achieved by splitting the load, positioning of handholds or a sling or ensuring that the centre of gravity is brought closer to the holder's body.

(c) Improving Working Environment:

This is another way of improving effects of ergonomic hazards. The working environment can be improved in many ways. This includes the removal or space constraints repairs of damaged floors and regular cleaning of the floor. Adequate lighting should be provided in workplace or workshop. Attention should be given to the need for suitable temperatures and ventilation in the workplace or workshop.

(d) The Capability of the Individual:

This is an area where control measures, can be applied to reduce the injury due to ergonomic factors. The state of health of an employee or student and medical records provide necessary information on whether the individual is capable of undertaking the assign task. This will reduce aggravating existing condition.

Work-related upper limb hazards:

Work-related upper limb hazards describes group of illnesses which can affect the neck, shoulders, arms, elbows wrist hand fingers. According to Puts-Anderson (1998) these hazards are caused by repetitive movements of the fingers, hand or arms which involve pulling, pushing, twisting, lifting, squeezing or hammering.

Work-related upper limb ergonomic hazards affect workers or students in many ways. The main symptoms of the hazards are aching pain to the back, neck and shoulders, swollen joints and muscles and fatigue accompanied by tingling soft tissue swelling similar to bruising and a restriction in joint movement. The sense of touch and movement of fingers may be affected (Puts-Anderson 1988, Charles and James, 1999).

Prevention of work-related upper limb ergonomic hazards

Upper-limb ergonomic hazards among students need to be prevented through taking appropriate measures. The following will go a long way in taking care of the hazards:-

- 1) Supply of tools recently designed with ergonomic factors taken care of such as designing tools that are well balanced and make the most efficient use of the operators input force without increasing the other risk factors. A hammer drill is a typically improved tool.
- 2) Awkward posture also forms part of the ergonomic hazards of the upper-limb. This hazard can be reduced by designing tools that allow the body to adapt to the work cycle as possible. The ergonomic rake is a good example of an ergonomically modified tool. The bent handles of the tool reduces the need for severe bending of the back. In the same vein, if a hand tool requires constant bending of the wrist it is possible to design a tool that is bent.
- 3) Static postures contribute to work related ergonomic hazard. Static posture (body parts held in one position for long time) can be reduced by designing tools that reduce holding and positioning demands. Recently, tool designers have developed a wide variety of holding and clamping devices, these allow the worker or student to stop using one hand as a clamp.
- 4) Force demands also contribute to work related ergonomic hazards. This factor can be reduced by reducing gripping and holding force by reducing the weight of the tool. This will go along way in reducing the hazards caused by force-demand factor.
- 5) Handle diameter is crucial in ergonomic hazards prevention; ergonomically designed tools are available in the market. The tools have been improved upon what was in existence. For example tools with interchangeable handles allow each worker or student to select the diameter that gives maximum efficiency of grip force, thereby reducing ergonomic hazards. Ergonomically designed tools also have long handles to prevent undue pressure upon soft tissue of the hand and other susceptible body parts. Further slip-resistant handle materials reduce the grip force needed to

stabilize the tool. Thereby reducing the attendant hazards. (OSHA 1997, Hedge, 2009).

Vibration Related Ergonomic Hazards

Vibration related ergonomic hazards have put thousands of workers out of work. According to National Safety Council (1993) an estimated 1.45 million workers in United State of America who use vibrating tools experience injuries in their fingers and hands. It noted that the injuries depend on the following factors:

- i. The amount of vibration the tool causes.
- ii. The length of time a worker student uses the tools per day as well on the cumulative amount of time per month or year.
- iii. The environmental conditions (cold or hot water).
- iv. The workers/students vibration (tolerance).
- v. Whether the worker/student uses tobacco, alcohol and drugs.

According to Charles and James (1999) the symptoms of vibration induced ergonomic hazard include: numbness, pain, whiteness of fingers and loss of coordination.

This hazard leads to one of the cumulative trauma disorder called Raynauds syndrome.

Prevention of Vibration Related Ergonomic Hazards

Vibration in workplace or training facilities causes enormous hazards to workers and students, despite the hazards some common preventive measures abound. Hughes and Ferrett (2007) outline them as follows:-

- (a) Eliminate vibration task by performing the job in a different way.
- (b) Ensure that the correct equipment is always used and should be properly adjusted to serve the purpose.
- (c) Introduce job rotation so that workers/students have a reduced time exposure to the hazard.
- (d) During the design of the job ensure that poor postures are avoided.
- (e) Keep up-to-date with advice from equipment manufacturers, trade associations and health safety sources.

Research shows that more and lower vibration equipment is becoming available. Hazards prevention may appear simple or complex what matters most is effective implementation to protect students and employees from the attendant effects of the hazards (John, Nwankwor and Tika, 2010).

The various preventive measures against ergonomic hazards presented, if effectively observed will go a long way in preventing their effects on industrial technology students and staff. The measures will expose them to appropriate safety training as they get set to join the industry where hazards are at their peak.

Conclusion and Recommendations

Nigeria is in desperate need to develop technologically. The content of vision 2020:20 speaks loud about the need. As Nigeria strives toward achieving this vision, the safety of the workforce should occupy the centre stage because a technology without safety conscious workforce is disastrous. This paper identified some ergonomic hazards, their effect on construction technology students/workers. Some appropriate preventive measures were pointed out. It is hoped that policy makers, administrators and other stakeholders will see the need to focus attention on this silent destroyer of trained workers and students under training. It is in view of the importance of this need that the following recommendations are made.

- (1) Management of concerned institutions should put in place a functional plan for undertaking risk assessment in the workshops site and laboratories.
- (2) Management of concerned institutions should develop and introduce a programme on health and safety surveillance in construction technology and other industrial technology programmes.
- (3) Management should ensure that students and employees are given adequate information on hazards and develop suitable training programme.
- (4) Management should put in place a programme of preventive maintenance and include regular inspection of items.
- (5) Management should purchase equipment and tools that are ergonomically up-to-date for students' use.
- (6) Management of concerned institutions should mount a course on safety education weighing three credits units so that students can appreciate the value of safety in human life.

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