Decree of Safe Postures in Manual Lifting Tasks among Some Groups of Construction Workers in Southwestern Nigeria

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Abstract

This study appraised working postures adopted by two groups of construction workers in Southwestern Nigeria. The objective was to measure and compare the level of safe postures in manual lifting tasks among the workers. Using Ovako Working Postures Analyzing System (OWAS), 844 working postures involving 250 healthy Bricklayers (BL) and Bricklayers' Assistants (BA), were analyzed. 36% of the total postures observed were classified as Action Group 1 (AG-1) - not harmful, while the rest postures call for ergonomics interventions. AG-3 and AG-4 (harmful) occupied more than 49% of the total recorded postures. The higher percentage among the safe postures (58%) was recorded in lifting task performed by BA. The study revealed that the degree of safe postures among the groups of workers is comparatively low. Necessary ergonomics measure is required to improve on AG-1 postures among the workers. Such control will reduce the unsafe conditions characterizing manual lifting activities in construction tasks.

Keywords: Safe, Harmful Working Postures, Construction, OWAS.

1. INTRODUCTION

Safe posture is paramount for good ergonomics. Good postures at work involves training body to stand in positions where the least strain is placed on supporting muscles and ligaments during weight bearing activities. It is the position in which body is held upright against gravity [1]. Lifting and transfer operations typically entail some risk factors that cannot be totally eliminated. In fact no manual handling activity is completely safe [2]. Construction workers however often lift, hold or carry heavy objects, putting them at risk for strains, sprains and soft tissues injuries [3]. To help

prevent manual injuries in the workplace, manual lifting should be avoided as much as possible for use of mechanical lifting devices (like a fork lift, hoist, crane, or block and tackle). Where it is not possible, redesigning of work methods leading to adopting proper posture in construction tasks as stated by [4] becomes a necessity. Good postures during lifting tasks can prevents strain or overuse problems, backache and muscle pains [5].

Keeping arms fully extended when lifting heavy load will strain the forearm muscles at their attachment to the elbow and holding objects at arms length can increase the load on the lower spine by 15 times the original weight. It is therefore safer to hold the object as close to body as possible to reduce the strain on arms and back [6]. In like manner, lifting above shoulder is hard on arms and back. Improper shoulder posture can put unwanted strain on neck and back, causing chronic pain. Lifting from floor level or above shoulder height, especially heavy loads should be avoided and the amount of weight being lifted reduced. For a long lift such as floor to shoulder height, using ladder to get closer to the target area Instead of lifting above shoulders can be considered [7].

Although human spine is quite strong and flexible, it may get damaged when pressure is exerted on it in a wrong way especially when heavy objects are lifted. Therefore all site material lifting needs to be planned before the job starts as proper lifting and handling help protect against injury and make job easier [8]. Body should be positioned properly, with the back in straight position maintaining its natural curve. Material to be lifted should be properly stored where there is space to lift them safely and without reaching or twisting [9]. The arms and elbow should be closed to body to prevent too much of the weight being placed on shoulders. To reduce the strain on arms and back, objects carrying should be closed to body as much as possible [6]. As stated by OSHA [10], If a material to be lifted looks like more than can be handled, it is better to get help from another person. However if a heavy load must be lifted, the back should be kept straight [11]. Figure 1 demonstrates the areas around the body within which loads may be lifted without risk for 95% of the male and 95% of the female population as reported by Manual Handling Operation Regulation [12]. It was mentioned that figures up to twice the levels stated may be acceptable with some control measures. However weight to be lifted may be reduced below the guideline values if it involves twisting or bending.

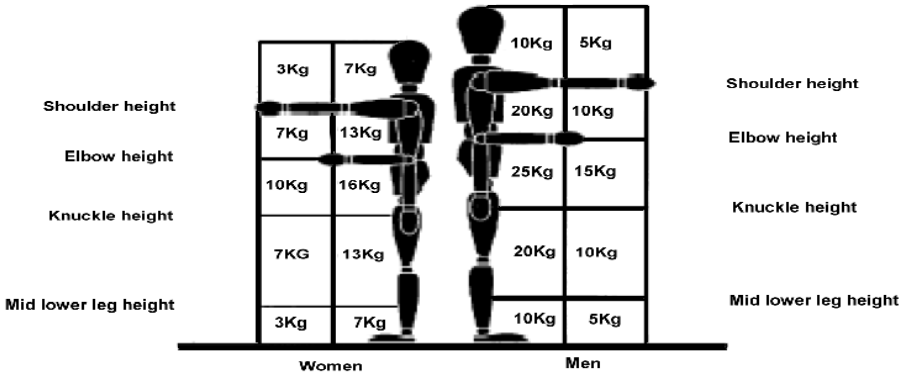

FIGURE 1: Demonstrating the areas around the body within which loads may be lifted (12).

There are several posture based ergonomics tools developed for posture analysis, such as Posturegram, Ovako Working Posture Analyzing System (OWAS), Rapid Entire Body Assessment (REBA) to evaluate whole body postural Musculoskeletal Disorders (MSDs) and risk associated with job tasks, Posture Targeting and Quick Exposure Check for Work-related MSDs (WMSDs) risks (QEC). Some special tools are equally designed for specific parts of the human body. Rapid Upper Limb Assessment (RULA) is designed for assessing the severity of postural loading for the upper extremity. The similar systems include HAMA (Hand-Arm-Movement

Analysis), PLIBEL (method for the identification of musculoskeletal stress factors that may have injurious effects) and (MFA) for muscle fatigue analysis (13).

REBA was used by (14) in the Study and Justification of body postures of workers working in small scale industry, evaluation of postures gives a Very High Risk level and showed that there is need for corrective action. Trevelyen and Haslam (15) investigated MSDs in a handmade brick factory. Posture and force analysis found poor standing posture and undesirable wrist positions. Variety of different handling techniques within 131 employees in one brick manufacturing plant was observed by (16) of which some of the techniques were considered potentially harmful, necessitating frequent bending and twisting. In the survey of some occupations reported as an annex to "WMSDs– Facts and figures", construction industry was reported as having the highest percentage shares of workers working in awkward positions and the highest exposure rates (17). In the construction tasks analysis conducted in Southwestern Nigeria by [18], result obtained indicated that most of the stresses related complaints in construction works are engineered by poor work methods. The involvement of ergonomics in the jobs is very low with a wide gaps in information related to the prevention of construction site injuries and illnesses.

A good posture however should keep the body free from pain, allow it stay flexible and provide the strength and motion necessary to perform task without undue stress on any component of the body [19]. It takes training and practice to do it right [8]. Workers need exposures to training on the proper techniques for lifting, bending and carrying. It is also advised that stretching and strengthening exercise before lifting heavy objects with hands could be helpful [20]. Employers need look at the risk of the task and put sensible health and safety measures in place to prevent and avoid related injury [1, 12]. A lifting plan/safe working method should be in place with regular material handling and lifting inspections. This according to [21], should be included in the project health and safety plans.

Most of the available studies reported various harmful postures among workers. This present work aims at evaluating the extent of safe working postures obtainable in manual lifting tasks among two groups of construction workers. The objective is to ascertain the contribution of working postures to the level of safety in manual material lifting task.

2. MATERIALS AND METHODS

Two hundred and fifty (250) healthy male workers drawn from five different construction sites in the Southwestern Nigeria participated in this study. An urgent observation of how the workers perform their jobs and the working postures maintained at the various lifting task were made with video recordings which were played indoors and observed by some ergonomics experts drawn from academics. The data was analyzed with the use of WinOWAS software. OWAS method is based on a simple and systematic classification of work postures combined with observations of work tasks. The observation, as used in this study, is expressed in 4 number code (****), where the first number is the back posture, second number is the arms posture, third number is the legs posture and fourth number is the load. The observation interval was within 30 seconds at the workers' agreed time during working period.

Eight hundred and forty-four (844) working postures were recorded and analyzed. Four hundred and twenty two (422) working postures were recorded during Bricklayers' jobs performance and the rest recorded in Bricklayers Assistants' tasks. As adopted in this study, Action Group 1 (AG-1) are grouped postures that required no actions (safe postures). Action Group 2 (AG-2) are grouped postures that required actions in the nearest future (not completely safe), Action Group 3 (AG-3) are grouped postures that required remedial actions very soon (not safe), and Action Group 4 (AG-4) are grouped postures that required immediate remedial actions (not safe).

Back	Arms	Legs	Load/Use of Force
1 = straight 2 = bent forward or backward 3 = twisted or bent sideways 4 = bent and twisted or bent forward and sideways	1= both arms below shoulder level 2= one arm at or above shoulder level 3 = both arms at or above shoulder level.	1 = Sitting 2 = Standing on two legs 3 = Standing on one leg 4 = Standing on two bent knees 5 = Standing on one bent knee 6=Kneeling 7=Walking	1= weight needed is 10kg or less 2=weight needed exceeds 10kg but is less than 20kg 3 = weight needed exceeds 20kg.

Percentages of postures considered to be safe among the analysed postures were compared with the other groups of postures considered not safe in the manual lifting tasks.

3. RESULTS AND DISCUSSIONS

Table 1 shows the total 844 different postures recorded during manual material lifting task for the two studied groups of workers as presented in OWAS software. The highest frequency (303) of postures was recorded for Category 1 (AG-1) while the least (124) were recorded for Category 2 (AG-2). The OWAS reported 36%, 15%, 34% and 15% for AG-1, AG-2, AG-3 and AG-4 respectively (Figure 2).

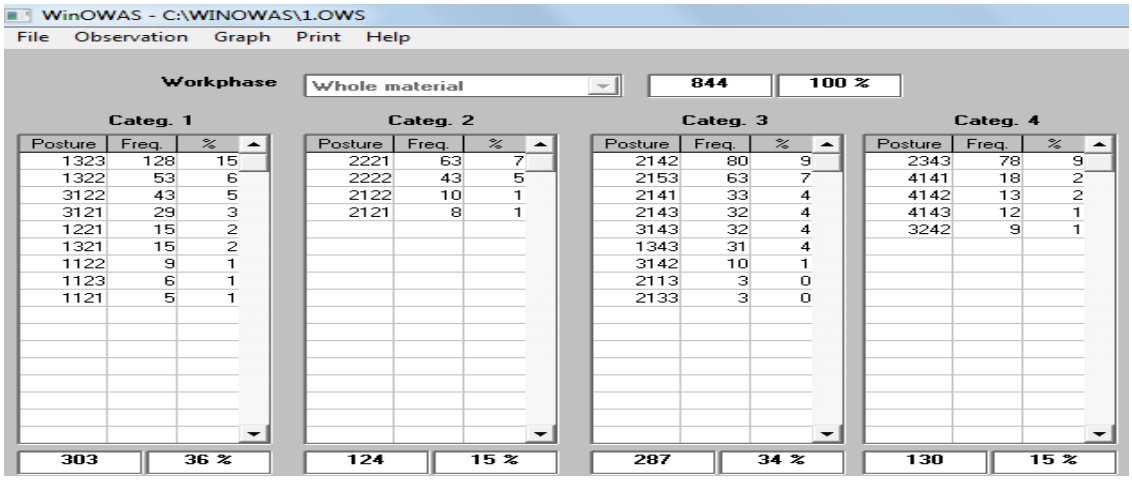

TABLE 2: Showing OWAS description of all categories, frequency and percentages of recorded postures.

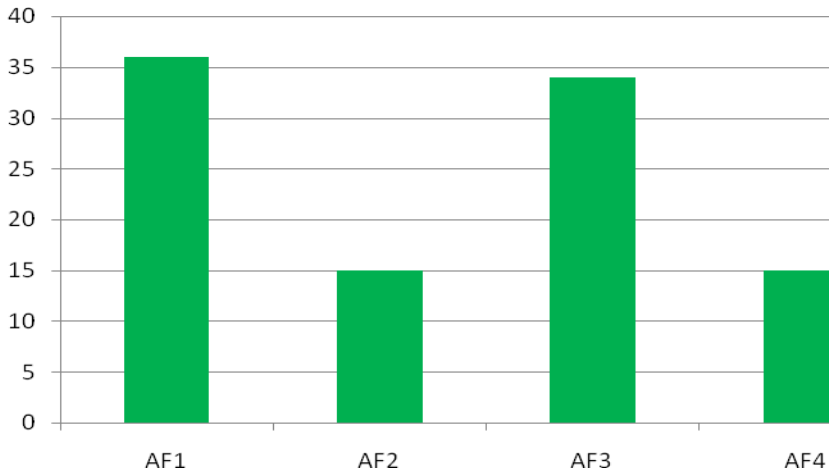

FIGURE 2: Percentages of AF1, AF2, AF3 and AF4 categories of all recorded postures for the group of workers.

Figure 3 shows the OWAS recommendations for actions for all the postures recorded. The length of the bar in the graph shows the action group. Only 31% of all back positions during the lifting task were recorded as 'straight' which could be described as safe back position as stated by Scott [11]. The remaining 69% were either bent, twisted or both of which could contribute to back injuries. It is also recorded that 48% of all Arms position were found below shoulder level. A level within which heavy loads may be lifted without risk for 95% of the workers [12]. The remaining 52% were above the shoulder level. In the category of weight of material lifted by the workers, only 22% of the total load are reported to be less than 10kg, while more than 46% of the load are reported having some membership with heavy load and which is capable of contributing to body pains and other lifting related injuries [14].

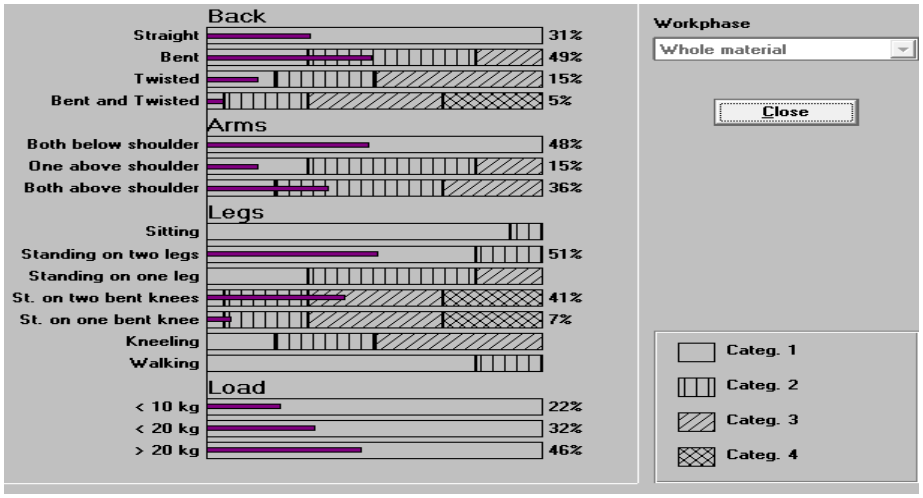

FIGURE 3: Showing the OWAS' Recommendations for Action.

In OWAS definition AG-1 are grouped postures that do not require ergonomics action and while AG-2 are those that required actions in the nearest future. Table 3 shows the recorded postures for these two categories. Only 35.9% of the total postures recorded fall into category AG-1 which included 15.2% of BL total postures and 20.7% of BA total postures. For AG-2, 14.7% of the total postures are recorded for this category. This included 9.6% of BL total postures and 5.1% of BA total postures.

Four hundred and twenty two (422) different postures were recorded for each category of the workers. 128 postures, representing 30.3% in the BL group fall into AG-1 family while 19.2% fall into AG-2 family. In the group of BA, 175 postures, representing 41.5% of the postures fall into AG-1 family and 43 postures, representing 10.2% in AG-2 family (Figure 4). Within the group of BL, 209 different postures representing 49.5% of the total postures fall into AG-1 and AG-2 while in the BA category 218 postures representing 51.7% of the total recorded postures within the group fall into AG-1 and AG-2 (Figure 4).

AG-1 POSTURES				AG-2 POSTURES			
BRICKLAYERS		BRICKLAYER ASSISTANTS		BRICKLAYERS		BRICKLAYER ASSISTANTS	
CODE	FREQ.	CODE	FREQ.	CODE	FREQ.	CODE	FREQ.
3122	43	1322	43	2122	10	2222	43
3121	29	1221	9	2121	8		
1321	15	1323	108	2221	63		
1323	20	1123	4				
1221	6	1122	7				
1322	10	1121	4				
1123	2						
1122	2						
1121	1						
TOTAL	128		175		81		43

TABLE 3: Showing OWAS Report for AG-1 and AG-2 Postures.

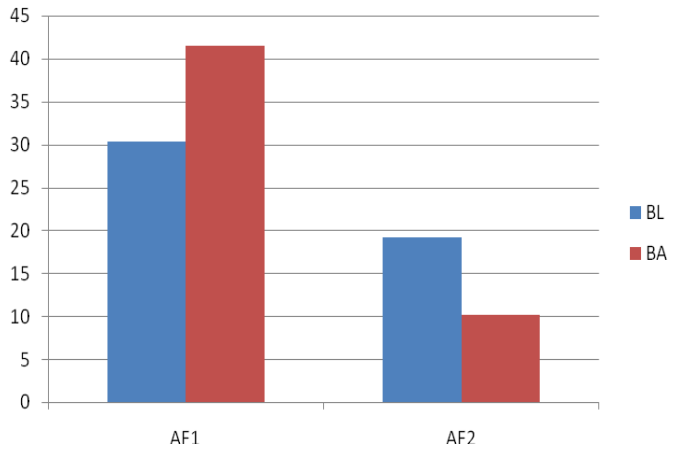

FIGURE 4: Percentages of AF1 and AF2 categories within each group of the workers' postures.

Considering safe postures scenario that requires no ergonomics action now (AG-1), 128 postures (15.2%) and 175 postures (20.7%) in the category of BL and BA respectively were observed (Figure 5).

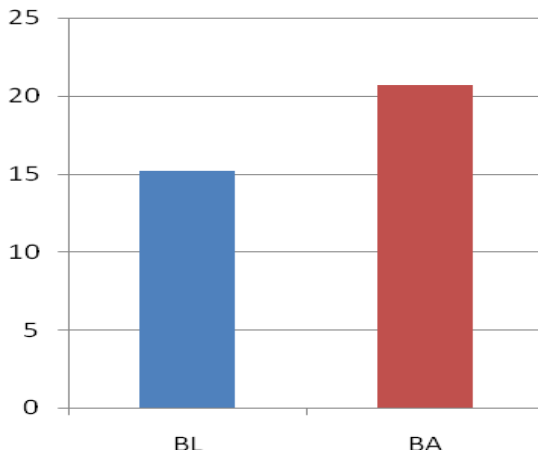

FIGURE 5: Overall percentages of Safe Postures recorded for each category of workers

It was reported that most workers performing manual lifting job in construction trade will be at an increased risk of a work-related injury [4]. As observed in this study, AG-1 postures are considered safe since AG-2 postures will still required ergonomics action latter, it is not completely safe. The degree of AG-1 among all the postures recorded is comparatively low (36%) to the unsafe postures, most especially to AG-3 and AG-4, which take more than 49% of the total recorded postures. Bricklayer Assistants however has the highest of about 21% among the safe postures. The AG-2 postures are closed to safe category if the gaps of information relating to ergonomics methods of lifting among the workers are closed.

4. CONCLUSION

The degree of safe postures (AG-1) recorded during manual material lifting tasks in the construction sites studied is very low (36%) compared with the harmful postures. AG-3 and AG-4 take more than 49% of the total recorded postures. Among the group of workers studied, the highest safe postures were recorded among Bricklayer Assistances.

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