

Working Postures of Employees and its Ergonomic Implications in a University Setting

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ABSTRACT This study assessed the risk of back and neck pain and its ergonomic implications on workers in a University setting in South Africa. The designs for this study were both cross-sectional descriptive survey and observational study. A total of 53 academic and administrative employees participated in this study. The mean age \pm SD of participants was 46.45 ± 8.31 . The minimum age was 32 and maximum was 64 years old. About 71% of the female participants were at a high risk of sustaining back injuries. There was however no significant association between gender of participant and risk of sustaining back injury ($p = 0.87$). Administrators recorded the highest level of high risk of sustaining back injury, while lectures reported the highest level of medium risk of sustaining back pain at work. About 53% of respondent fall within the medium level of risk, another 26% were within the high level of risk. Administrators presented within the highest risk level of 41.2% in sustaining back injury. There was also no significant relationship between jobs and risk of sustaining back injuries ($p = 0.382$). More females presented with medium to high risk of sustaining back injuries. Overall, the risk of sustaining back and neck pain amongst university employees was found to be medium to high. Gender was found to have no significant influence on the risk of sustaining back and neck injuries. Low back pain was also found to be common across the jobs, with administrators presenting higher risk by disciplines.

INTRODUCTION

Posture at work has been known to affect production and output. Working Ergonomics is the study of the relation between the employee and the physical work environment aimed at creating a safe and a comfortable environment and enhancing productivity. The principles of ergonomics dictate that imbalances between the person and his or her environment must be eliminated, and the balance maintained. This is known as the person-environment (P-E) fit (Nel et al. 2008). So many factors could affect the person-environment-fit and result in imbalance and therefore affects productivity at work. In industrial workstation design, the primary concern has usually been the improvement of the performance of the equipment alone. Little consideration is given towards matching the abilities of the operator with the task requirement. Consequently, many industrial workstations are poorly designed, resulting in lost worker productivity and unnecessary injury at workplace (Das and Sengupta 1996). One of such problems that are seldom evaluated is the posture assumed during working.

Those whose vocation involves sustained long postures either in sitting, standing or leaning could present with back pain. Academics and

administrators in Higher Education spend a lot of their time in sitting position to prepare lectures and reports; hence they are referred to as sedentary workers. This hypo kinesis behaviour leads to painful neck and back and therefore increases in days off from work.

Rapid Entire Body Assessment and Rapid Upper Limb Assessment (RULA) tool is used to assess the risk of back pain (McAtmney and Corlett 1993). Musculoskeletal injuries of the spine resulting from poor posture had been documented by different authors (Jacobs and Baker 2002; Watson et al. 2002; Oyewole et al. 2010). The position that is mostly implicated in carrying out daily task is the sitting posture. Sitting puts a lot of burden on the ligaments of the back and if sustained for a long time in a poor posture could result in pain.

Schoberth (1962) defines sitting as a position in which the weight of the body is transferred to a supporting area, mainly the ischial tuberosities of the pelvis and their surrounding soft tissues. According to Jacobs and Baker (2002), correct sitting posture in which the individual is positioned at 90-degree knee flexion, and 90-degree elbow flexion, with an erect back and erect head, is a myth that may have caused some harm. According to Cardon (2004), pro-

longed sitting increases disc pressures, resulting in decreased nutrition to the disc. Moreover, the increase in the disc pressure can enhance micro trauma to the spine. The pressure exerted on the vertebrae and the vertebral disks is considerably higher than in standing position and this is a dangerous factor that can lead to the development of spinal complaints (Cranz 2000). Until recently, the design of sitting furniture has received little or no interest (Oyewole et al. 2010).

Mirka (2005) opines that industry-specific ergonomics guidelines are an important component in the four-prong approach in work ergonomics. Without a specific rule or regulation related to ergonomic, settlement agreement after injuries at work will be difficult. Skilled workers in the mechanical and electrical building and construction trades have been reported to experience high rates of disabling work-related musculoskeletal disorders (Albers et al. 2005). A step by step approach has been reported by Vink et al. (1995) which is aimed to better work, reduce mental and physical workload in the office.

Academics spend a lot of time seating with relatively high incidence of back pain, specific risk factors responsible for this are partially understood.

There is anecdotal evidence of pain amongst staff at the University, however the risk and causes of this is yet to be investigated.

According to Hignett and McAtamney (2000), postural analysis can be a powerful technique for assessing work activities. The risk of musculoskeletal injury associated with the recorded posture(s), in the context of a full ergonomic workplace assessment, can be a major factor for implementing change, so the availability of task-sensitive field techniques is of great assistance for the ergonomics practitioner. Poor posture can result in back and neck pain therefore hampering productivity. Guideline in preventing this pain should be provided to all categories of workers: both skilled and unskilled.

The incidence of neck and back pain has been found to be common amongst different categories of workers. Posture assumed during the different tasks had been implicated to be responsible for this pain. Experience has revealed that academics and other categories of employees spend a lot of their working hours in a sustained sitting position. Workers whose duties are linked to mechanical, maintenance and cleaning will also perform tasks in sustained positions for pro-

longed periods. The long hours of sitting to prepare for lectures, administration, marking of scripts in poorly designed chairs and standing to deliver lectures might be responsible for work-related back and neck pain. There is, however, limited empirical evidence linking long sitting positions of the university employee to the risk of back and neck pain. It is hoped that this study shall attempt to link neck and back pain to poor working postures.

This study attempted to assess the risk of back and neck pain and its ergonomic implications on workers in a University setting.

RESEARCH METHODOLOGY

Research Design

The designs for this study were both cross-sectional descriptive survey and observational study. The cross-sectional design was used to collect data across the different categories of employees. Babbie (2008) describes cross-sectional design as observations of a sample or cross-section of a population or phenomena that are made at one point in time. This study was cross-sectional because employees from different categories/ sections of the university such as academics and administration participated in this study. While observational method was used to characterize posture in dynamic work situations, simple observational checklist was used for assessment. According to Hicks (1999), observation simply means that a researcher can collect information through direct recording of relevant event. The recording in this study was still pictures of participants in positions that they usually sit or perform tasks longest. These pictures were then be subjected to analysis according to Hignett and McAtamney (2000) to determine the level of risk of injuries to their neck and/or back as a result of poor posture.

Population

The population for this study were employees of a University setting.

Participants: Data collected from the Human Resources Unit of the University revealed that there are a total of 215 academic staff and 298 non academic staff, referred to as support staff, comprising of a total employee size of 513.

Sampling Techniques

The sampling technique was purposive. This is a type of probability sampling in which the unit to be observed are selected on the basis of the researcher's judgement about which ones will be most useful or representative (Babbie 2008).

Sampling Size

This was calculated from the overall population of employees obtained from the Human Resource Department of the University. From the overall staffing of 513 employees, the ideal sample would have been 220 (for a larger and generalizable sample size) calculated from both Raosoft sample size calculator and the Krejcie and Morgan (1970) table. However, since this is a preliminary study, the sample size was 53.

Method of Data Collection

On site documentation of posture and activities was done using the Rapid Entire Body Assessment (REBA) tool (Hignett and McAtamney 2000) through analysis of still picture that must have been taken Appendix A. REBA provides a mechanism for recording postures of all parts of the body, excluding the position of the foot and ankle.

Validity and Reliability

The validity and reliability of this tool has been documented. The reliability of this tool is 0.75 (McAtamney and Corlette 1993; Hignett and McAtamney 2000).

Ethical Consideration

Permission was sought from participants prior to conducting this study. Anonymity and con-

fidentiality was maintained throughout this study. The identity of participants was not revealed at any stage of data collection. The data collected was kept in a locked drawer that will only be accessed by the researcher. The researcher ensured that photographs of participants will not be published.

Prior to participation, participants completed informed consent. Participants had the freedom to withdraw from participation in this study at any stage without any obligation.

All other ethical standards were adhered to.

Data Analysis

Data in this study was analysed using the Statistical Package for Social Sciences version 20. Descriptive statistics of mean, percentages and graphs were used to describe the demographic information of participants. Chi-square statistics was used to evaluate the influence of gender, job level and the risk of back pain amongst employees. The level of significance was set at 0.05.

RESULTS

A total of 53 employees participated in this study. The mean age \pm SD was 46.45 \pm 8.31. The minimum age was 32 and maximum was 64 years old, while the median and modal ages were 46 and 44 and 46 (bi-modal) years respectively. Forty-four and 46 had frequencies of frequency of 5 each.

Gender of Participants

Thirty-seven (69.8%) of the participants were females (Table 1). About 71% of the female participants were at a high risk of sustaining back injuries. There was however no significant asso-

Table 1: Gender of participants and its risk level of sustaining back injury (p=0.87)

<i>Sex of participants</i>		<i>Risk level</i>				
		<i>Negligible</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>	<i>Total</i>
<i>Male</i>	Count	1	2	9	4	16
	% within risk level	50.0%	22.2%	32.1%	28.6%	30.2%
<i>Female</i>	Count	1	7	19	10	37
	% within risk level	50.0%	77.8%	67.9%	71.4%	69.8%
<i>Total</i>	Count	2	9	28	14	53
	% within risk level	100.0%	100.0%	100.0%	100.0%	100.0%

Table 2: Job title of participants

<i>Jobs titles</i>	<i>Frequency</i>	<i>Percent</i>	<i>Valid percent</i>	<i>Cumulative percent</i>
Lecturers	26	49.1	49.1	49.1
Senior Lecturer	8	15.1	15.1	64.2
Professors	2	3.8	3.8	67.9
Administrator	17	32.1	32.1	100.0
Total	53	100.0	100.0	

ciation between gender of participant and risk of sustaining back injury ($p=0.87$).

Job Titles of Participants

The total number of academic staff that participated in this study was 36 (68%). Twenty-six of the participants (49%) were lecturers, while only 2 participants were professors. Seventeen participants (32%) were administrators who were non-academic staff (Table 2). The different categorizations were used to differentiate job descriptions and tasks and back pain. It is expected that professors would spend more desk hours which might result in back and neck pain.

Administrators recorded the highest level of high risk of sustaining back injury, while lectures

reported the highest level of medium risk of sustaining back pain at work (Fig. 1).

The overall risks level of sustaining back injury is presented in Table 3. About 53% of respondent fall within the medium level of risk, another 26% are within the high level of risk. The risk by job is presented in Table 4. Administrators fell within the high risk level of 41.2% in sustaining back injury. All the professors (2) fell within the medium risk level. This was closely followed by lecturers with 61.5% of them at medium risk of sustaining back injury. There was no significant association between jobs and the level of risk of sustaining back injury ($p=0.382$). The different parts of the spine where pain is commonly complained of is presented in Table 5. There was however no significant association

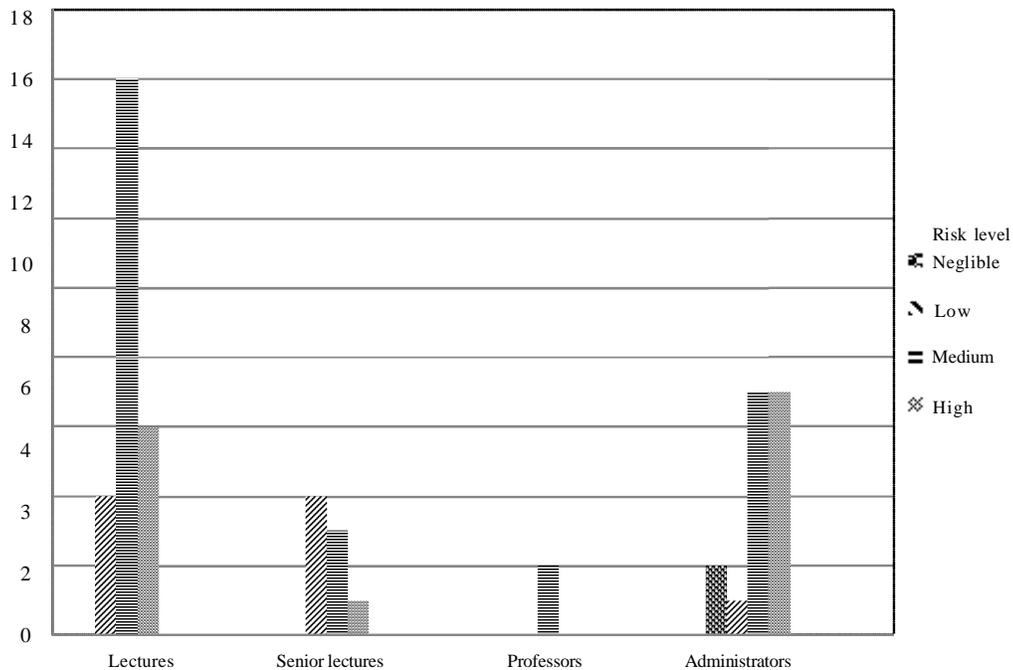


Fig. 1: Levels of risk of back injury by job

Table 3: Overall risk levels of sustaining back injury by participants

<i>Levels of risk</i>	<i>Frequency</i>	<i>Percent</i>	<i>Valid percent</i>	<i>Cumulative percent</i>
Negligible	2	3.8	3.8	3.8
Low	9	17.0	17.0	20.8
Medium	28	52.8	52.8	73.6
High	14	26.4	26.4	100.0
Total	53	100.0	100.0	

Table 4: The level of risk of back injury by job (Pearson Chi-square: P= 0.382)

<i>Job titles participants</i>		<i>Risk level</i>				
		<i>Negligible</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>	<i>Total</i>
<i>Lecturers</i>	Count	0	4	16	6	26
	% within job title of participants	.0%	15.4%	61.5%	23.1%	100.0%
<i>Senior Lecturer</i>	Count	0	4	3	1	8
	% within job title of participants	.0%	50.0%	37.5%	12.5%	100.0%
<i>Professors</i>	Count	0	0	2	0	2
	% within job title of participants	.0%	.0%	100.0%	.0%	100.0%
<i>Administrator</i>	Count	2	1	7	7	17
	% within job title of participants	11.8%	5.9%	41.2%	41.2%	100.0%
Total	Count	2	9	28	14	53
	% within job title of participants	3.8%	17.0%	52.8%	26.4%	100.0%

between the job titles and part where pain is commonly complained of ($p=0.075$).

DISCUSSION

This project sought to assess the risk of back and neck pain amongst university worker and compare it across job categories. The association between gender and the risk of pain along the spine was also investigated.

Demography and Back Pain

Age: The age range of participants in this study was between 32 and 64 years of age, with

a mean age of 46 years. The mean age falls within the age when chronic low back pain is common among the working population. Age has been documented as a predictive variable as a risk of developing low back pain (Diamond and Borenstein 2006). According to Shannon et al. (1997), age is positively related to injury rate. They also reported contradictory result of negative relationship between age and injury. The reason for this are linked to possible training in ergonomics and wellness programmes that might be useful in minimizing injuries at work. Though this study was not aimed at investigating age and the risk of back pain, it will be interesting to investigate this further.

Table 5: Part of the spine where pain is common by job (Pearson Chi-square: P= 0.075)

<i>Job titles participants</i>		<i>Risk level</i>				
		<i>Negligible</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>	<i>Total</i>
<i>Lecturers</i>	Count	4	6	4	12	26
	% within job title of participants	15.4%	23.1%	15.4%	46.2%	100.0%
<i>Senior Lecturer</i>	Count	3	1	0	4	8
	% within job title of participants	37.5%	12.5%	.0%	50.0%	100.0%
<i>Professors</i>	Count	0	1	0	1	2
	% within job title of participants	.0%	50.0%	.0%	50.0%	100.0%
<i>Administrator</i>	Count	0	4	4	9	17
	% within job title of participants	.0%	23.5%	23.5%	52.9%	100.0%
Total	Count	7	12	8	26	53
	% within job title of participants	13.2%	22.6%	15.1%	49.1%	100.0%

According to Laflamme and Menckel (1995), age is a factor of importance in assessing variability in manpower, for it introduces differences not only between individuals at different ages but also within individuals over time. They further stressed that even when job content is controlled for, age in itself might not be adequate as an indicator of work-related effect of aging. In fact it might be the case that the relation ought to be understood in a more complex manner, taking into account not only age-related restriction on individual capacities but also the gains in work performance. The outcome in this study falls within the range of the report by Diamond and Borenstein (2006). According to Diamond and Borenstein (2006), approximately 80% of the world's population will develop low back pain in their adult life and it is the fifth most common reason for physical impairment in people aged between 45 -64 years.

Other factors that are closely linked high incidence of risk of injuries at work are previous history of back pain, job dissatisfaction and depression. Investigation of other predictive factors are however not within the scope of this study.

Gender: More women presented with medium to high risk of developing back pain, the study however revealed that gender had no significant impact on the risk of back pain ($p=0.87$). This outcome agrees with those of Foppa and Noack (1996), who reported 44.1% of back pain amongst women. Similar to this outcome were those of Diamond and Borenstein (2006) who reported that women are more commonly afflicted with spine impairments in general. Though the similarities were linked to the incidences, there might be variations if risk of back pain and not actual incidences are investigated. It is possible that factors such as body mass index, obesity, social factors and relative difference in physical activities might also influence the risk. These factors were however not investigated in this study. Further study is therefore recommended to investigate these factors

Risk of back Pain Amongst Employees

The overall risk level was rated as medium with about 53% of the participants, while 26% of the participants had a risk level of high. Only 2 (3.8%) had a negligible risk level. This indicates that employees in the University are susceptible

to medium to high risk levels of the possibility of developing back pain. This is most likely related to the nature of their jobs which is often sedentary and involves long hours of sustaining a posture most times in sitting position to prepare lecture and conduct administrative tasks. It might be necessary to conduct this study using a larger sample size before the outcome can be generalised to a larger population. It is also possible that other methods of obtaining data apart from the REBA score for the triangulation purposes. Examples of these are the Ovako Working Posture Analysis System (OWAS) and the National Institute for Occupational Safety and Health (NIOSH) (Hignett and McAtamney 2000). Though these have a wide range of use, the results can be low in details. The simplicity of the REBA will serve as an advantage

Risk Levels and Job Titles

Risk levels by job titles revealed that all the professors (2) fell under the medium risk followed by lecturers who recorded 61.5% medium risk. The highest risk was however recorded by the administrative staff. The reason for this might be related to the fact administrative staff spend more time in their desk compared to academic staff. It worth mentioning that because of the relatively sample sizes in the different risks categories it will limit the generalisation to a larger group. A larger sample size for further studies is therefore recommended. There was however, no significant association between jobs and the risk levels of back pain ($p=0.382$).

Body Parts Affected by Job

Low back pain was the most affected body part. This finding agrees with those of Igumbor et al. (2003). This was closely followed by the neck region. The least affected body part was the mid neck region. This might be related to the fact that movement and therefore wear and tear processes along the spine commonly affect the low back and the neck region of the spine. The sedentary jobs of the academics and the administrators might put a lot of strain in this region of the spine and subject it to medium and higher risks of developing pain. There was however no significant association between the type of job and the part of the body that is at risk of pain ($p=0.075$).

CONCLUSION

This study attempted to assess the risk of sustaining back and neck injuries amongst university employees and their working environment within the ergonomics context of investigating the relationship between the working environment and the employee.

More females presented with medium to high risk of sustaining back injuries. Overall, the risk of sustaining back and neck pain amongst university employees was found to be medium to high. Gender was found to have no significant influence on the risk of sustaining back and neck injuries. Low back pain was also found to be common across the jobs, with administrators presenting higher risk across disciplines.

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