



**EFFECT OF EDUCATIONAL-INTERVENTION PROGRAMME ON
PREDISPOSING FACTORS INVOLVED IN ADHERENCE TO ERGONOMIC
PRINCIPLES AMONG JANITORIAL STAFF OF TERTIARY EDUCATIONAL
INSTITUTIONS IN OGUN STATE, NIGERIA**

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ABSTRACT: *Adherence to workplace ergonomic principles protects against musculoskeletal disorders (MSDs). Musculoskeletal disorders (MSDs) are a leading cause of debility and early retirement of workers. They are a major contributor to the global burden of disease. The effects of MSDs are observed at the individual, organizational and societal levels and have implications on personal-level dispositions of workers involved. Due to the gradual and imperceptibility of onset of MSDs, early detection or diagnosis is impossible; therefore, ergonomic-based health educational programs offer the best mitigation (Khan, Rehman, & Ali, 2012). Janitorial occupation is fraught with recognized MSDs risk factors. This study evaluated the effect of an innovative theory-grounded health educational intervention program on the predisposing factors involved in adherence to ergonomic principles by the janitorial staff of selected universities in Ogun State, Nigeria. The study was a quasi-experimental intervention design that utilized a 42-item validated six-sections questionnaire with Cronbach's alpha internal consistency coefficient ranging from 0.782 to 0.934 using a multistage sampling technique to derive participants. The study was for twelve weeks in which baseline and 12th week follow-up data was collected regarding information on predisposing factors of knowledge, attitudinal dispositions and perceptions involved in adherence to ergonomic principles from sixty janitorial workers who consented to participate in the study. Participants were categorized into a control group (CG) and an intervention group (IG). The mean age of participants in CG was 43.2 ± 9.35 while for IG was 39.83 ± 11.11 . Data was analyzed using descriptive (mean, standard deviation, frequency, percentage) and inferential (paired t-test, effect size) statistics at 5% confidence level. The results show that educational intervention programs improved the predisposing factors of knowledge, perceptions and attitudinal dispositions.*

KEYWORDS: Educational Intervention Program, Ergonomics, Janitorial Staff, Musculoskeletal Disorders, Workplace Ergonomic Principles.



INTRODUCTION

Musculoskeletal disorders (MSDs), as dysfunctions of the body's locomotor apparatus, typically result in weakness, restricted range of motion, pain, swellings, poor performance, low quality of life, absence from work, low productivity, and disability (Li & Niu, 2020). The severity of MSDs is a function of degree and duration of exposure to the causative factors. A sizable fraction of the global workforce is exposed to factors that either cause or aggravate MSDs. This raises a big concern for both health and productivity because the workplace exerts a major influence on the worker's health, and worker's productivity is influenced by the triad of occupational quality, workplace environment, and the worker's health (Sohrabi & Babamiri, 2022).

According to the World Health Organization (WHO, 2021), MSDs are a major contributor to the global burden of disease, affecting 1.71 billion persons worldwide. MSDs also affect 45 million workers within Europe (Samadi, Rostami, Bakhshi, Garosi & Kalantari, 2018). Musculoskeletal disorders constituted 44% of all work-related injuries and all disease-related costs in the workplace globally in 2019 (Moradi, Tavafian & Kazemi, 2022). Because of the gradual and imperceptibility of onset, early detection is impossible. Therefore, prevention through ergonomic-based health education proffers the best. Because janitors make up a sizeable portion of the university workforce exposed to well-recognized MSDs risk factors (Shakya & Shrestha, 2008; Takala, 2020), it becomes expedient to educate them on ergonomically appropriate methods of performing their duties with minimal risks of developing MSDs.

The basic underpinning dynamics of the problem phenomenon considered in this study focused on designing a theory-grounded health educational intervention program that would arouse conscious awareness and awaken desire to take necessary health-related action. The Health Belief Model (HBM) provided the constructs necessary to explain the dynamics in identifying predisposing factors of knowledge, perception sub-domains, and personality variables, including attitudinal dispositions involved in adherence to ergonomic principles among the at-risk population, and this guided the design and implementation of the study. Importantly, personal-level dispositions of the workers towards MSDs essential to arouse consciousness of risks involved and understanding of benefits in adhering to appropriate ergonomic principles in the workplace environment were considered for modification through the intervention program on their knowledge, perceptions of, and attitudinal dispositions towards MSDs. It was conceived that a theory-guided ergonomic educational intervention program tailored to arousing psycho-cognitive disposition of the at-risk population would awaken understanding of health consequences of poor ergonomics in the workplace towards personal health and quality of life later in life. This study therefore evaluated the effects of an educational intervention program on personal-level disposition of the workers selected.



MATERIALS AND METHOD

Study Design and Population

This was a quasi-experimental educational intervention study involving the janitorial staff of selected universities in Ogun State, Nigeria, whose jobs required ergonomic positioning while cleaning, sweeping, clearing, and mopping, among others.

Study Area and Study Location

Ogun State is in the South-west of Nigeria created in 1976. To the South is Lagos State, Oyo and Osun State to the North and Ondo and Benin republic to the west. It has a land mass of 16,980 square kilometers with a population of 3,751,140.

There are sixteen universities in Ogun State which include one federal, three state-owned and twelve privately owned universities. Babcock University, located in Ikenne Local Government Area and owned by the global Seventh-day Adventist Church, hosted the intervention while Federal University of Agriculture, Abeokuta (FUNAAB) served as the control. There are 315 janitorial staff in Babcock University of which 115 and 200 are males and females respectively; FUNAAB has 176 janitorial staff made up of 90 and 86 males and females respectively.

Sampling Technique

The study adopted a multistage sampling technique as follows:

Stage I: A purposive sampling of two (BU and FUNAAB) out of the sixteen universities in the state, based on known high population of janitorial staff.

Stage II: A purposive sampling or selection of one (the janitorial department) from both universities, based on the high frequency of hospital visitation of staff members.

Stage III: A systematic sampling or selection of participants.

- Serially numbered cards were distributed at random to the junior staff of the janitorial department of the university by a trained research assistant.
- Participants were required to indicate their names and genders on the cards before retrieval by the research assistant. This was necessary to know who to invite for the study.
- Systematically, and using the already calculated sample size, thirty participants were recruited for the study.

Instrument for Data Collection

The pre-tested and validated instrument which also had a pidgin English version, was administered at baseline by the research assistant. This was followed by the intervention, which was made up of three sessions, spaced-out over three weeks. There was also an in-depth interview with the supervisors followed by reinforcers in the form of posters, hand bill and verbal reminders. The same instrument was re-administered at the end of the twelfth week from baseline. The study which was carried out between December 2022 and February 2023 was used to collect information on predisposing factors such as knowledge, perceptions, and attitudinal dispositions regarding adherence to workplace ergonomics.



Ethical Issues and Confidentiality

Ethical approvals were sought and obtained from the Babcock University Health Research Ethics committee (BUHREC) and from Federal University of Agriculture, Abeokuta Ethics Review Committee. In addition, only those workers who voluntarily gave their informed consent were recruited for the study. The study also followed all confidentiality protocols.

Data Processing and Analysis

Data collected were processed in two stages of conduct of frequency distribution and transformation of the data into weighted aggregate scores to derive summaries of descriptive statistics such as means, standard error, standard deviation and inferential statistics of independent sample t-test and paired student t-test, and effect size which quantified the magnitude of the changes observed. IBM SPSS version 29 was used in conducting all data analyses and all hypotheses were tested at 5% level of significance.

RESULTS

Sociodemographic Characteristics

The results from this study showed that the mean age of participants was 43.2 ± 9.35 , with the majority (56.7%) being females and 73.3% having attained secondary education. The dominant ethnic group was Yoruba (90%) while the dominant region was Christianity (86.7%), and the majority (66.7%) were of normal body weight (*see Table 1*).

Evaluation of Outcomes for Control and Experimental Groups

The results of the study outcomes were reported for control and experimental groups at both baseline and 12th week follow up. Mean scores with their respective standard deviations were developed as weighted-aggregate scores for predisposing factors of knowledge regarding ergonomic principles, perceptions of consequences of poor adherence to ergonomic principles and attitudinal dispositions towards adherence to ergonomic principles in the workplace environment, and evaluated for magnitude of changes observed as Cohen's effect size.

Results at baseline revealed no significant differences in mean scores for most variables, except that the control and experimental groups had similar scores for all predisposing factors at baseline, with no significant *p*-values, except in the case of knowledge, 6.77 (CG) and 3.37 (IG), with a significant *p*-value. This indicates that there was no difference between the two groups at baseline. However, the control group appeared to be more knowledgeable regarding MSDs than the intervention group at baseline.

**Table 1: Demographic characteristics of the participants in the study for each arm of the intervention at baseline**

VARIABLES	Control N=30		Experimental N=30		Total
	Frequency N (%)		Frequency N (%)		
Age	43.2 ± 9.35		39.83 ± 11.11		
Gender:					
Male	13	43.3	13	43.3	26
Female	17	56.7	17	56.7	34
Educational attainment:					
Primary	02	6.70	02	6.70	04
Secondary	07	23.3	22	73.3	29
Tertiary	21	70.0	06	20.0	27
Ethnicity					
Yoruba	27	90.0	17	56.7	44
Igbo	02	6.70	06	20.0	08
Hausa	01	3.30	01	3.30	02
Others	0	0.00	06	20.0	06
Religion					
Christianity	17	56.7	26	86.7	43
Islam	11	36.7	03	10.0	14
ATR	02	0.60	01	3.30	03
BMI					
Normal/health group	13	43.3	20	66.7	33
Overweight	04	13.3	07	23.3	11
Obese	13	43.3	03	10.0	16

**Comparing certain demographic characteristics to demonstrate matched groups at baseline.*



Table 2: Summaries of descriptive statistics for predisposing variables involved in prevention of occupational-induced MSD at baseline for control and experimental groups

Variables	Max scores on Scale of Measure	CONTROL GROUP N=30		EXPERIMENTAL GROUP N=30		p-value*
		X(SE)	±SD	X(SE)	±SD	
Knowledge	24	6.77(0.35)	1.92	3.73(0.34)	1.87	0.001*
Perception	36	15.47(0.48)	2.65	17.37(0.96)	5.24	0.084
Seriousness	9	4.07(0.25)	1.89	4.47(0.32)	1.74	0.328
Susceptibility	9	3.20(0.27)	1.47	3.87(0.35)	1.91	0.135
Benefits	9	3.07(0.20)	1.08	3.87(0.34)	1.90	0.052
Self-Efficacy	9	5.13(0.22)	1.20	5.10(0.24)	1.31	0.980
Attitudinal Dispositions	21	9.60(0.33)	1.83	10.03(0.44)	2.41	0.437

* Test of significance for an independent sample t-test.

Table 3 below shows that the educational intervention program improved all the predisposing factors for adherence to workplace ergonomic principles measured in this study. The large effect sizes recorded for each of the parameters and the significant *p*-values show that the intervention was indeed effective. Although the *p*-value for knowledge appears not significant in this table, a careful consideration of the baseline value for the experimental group reveals that it actually improved from 3.73 ± 0.34 to 6.70 ± 0.40 with an ES of 1.470 (0.790 to 2.143) and $p=0.001$.

Evaluation of Control and Experimental Groups at 12th Week Follow-up

Table 3: Summaries of descriptive statistics for predisposing variables involved in prevention of occupational-induced MSD at 12th week follow-up for control and experimental groups

Variables	Maximum Points on Scale of Measure	CONTROL GROUP N=30		EXPERIMENTAL GROUP N=30		*ES (95%CI)	p-value*
		X(SE)	±SD	X(SE)	±SD		
Knowledge	24	6.70(0.40)	2.17	6.70(0.40)	2.17	0.00(-0.51 to 0.56)	1.00
Perception	36	15.47(0.49)	2.69	21.40(0.54)	2.93	2.11(1.47 to 2.74)	0.001
Seriousness	9	4.03(0.26)	1.43	5.83(0.33)	1.82	1.10(0.55 to 1.64)	0.001
Susceptibility	9	2.97(0.25)	1.35	7.23(0.20)	1.07	3.50(2.68 to 4.30)	0.001
Benefits	9	2.93(0.18)	0.98	6.63(0.31)	1.69	2.68(1.97 to 3.37)	0.001
Self-Efficacy	9	5.53(0.18)	1.01	1.70(0.22)	1.21	3.45(-4.25 to -2.64)	0.001
Attitudinal Dispositions	21	9.17(0.37)	2.00	12.87(0.40)	2.19	1.76(1.16 to 2.36)	0.001

* Test of significance for an independent sample t-test.



Evaluation of Experimental Group for Baseline and 12th Week Follow-up

A careful perusal of Table 4 reveals that a huge difference exists in all predisposing factors measured, between baseline and 12th week outcome measure. There are large effect sizes with significant p -values in each case. This eloquently demonstrates that the educational intervention program significantly improved the predisposing factors of knowledge, perceptions and attitudinal dispositions related to adherence to workplace ergonomic principles.

Table 4: Evaluation of predisposing variables involved in the prevention of occupational-induced MSDs for experimental group comparing baseline sample scores with follow up

Variables	Maximum Points on Scale of Measure	Baseline N=50		Follow-up Post-Intervention N=50		*ES (95%CI)	p-value
		$\bar{X}(SE)$	$\pm SD$	$\bar{X}(SE)$	$\pm SD$		
Knowledge	24	3.73(0.34)	1.87	6.70(0.40)	2.17	1.470(0.790 to 2.143)	0.001
Perception	36	17.37(0.96)	5.24	21.40(0.54)	2.93	0.951(0.360 to 1.541)	0.001
Seriousness	9	4.47(0.32)	1.74	5.83(0.33)	1.82	0.768 (0.156 to 1.381)	0.005
Susceptibility	9	3.87(0.35)	1.91	7.23(0.20)	1.07	2.155(1.393 to 2.918)	0.001
Benefits	9	3.87(0.34)	1.90	6.63(0.31)	1.69	1.536(0.826 to 2.246)	0.001
Self-Efficacy	9	5.10(0.24)	1.31	1.70(0.22)	1.21	2.729(1.840 to 3.618)	0.001
Attitudinal Dispositions	21	10.03(0.44)	2.41	12.87(0.40)	2.19	1.229(0.605 to 1.853)	0.001

*ES: Effect size of the experimental group between baseline and follow-up evaluation computed from Cohen's D , the corresponding 95% CI; and p -value is level of significance.

DISCUSSION

The primary goal of the study was to evaluate the effectiveness of an educational intervention program on the predisposing factors involved in adherence to workplace ergonomic principles among janitorial staff of selected universities in Ogun State, Nigeria. The didactic intercourse implored were aimed at arousing participants' consciousness towards the adherence to workplace ergonomic rules while performing their tasks. This produced significant improvements in the psycho-cognitive dispositions of the participants towards adherence to workplace ergonomic principles as shown by the large effect size which illustrates the magnitude of the impact of the intervention among the participants. This result corresponds with the findings of Mani, Ingrid and Emily (2016) in which 89% of the participants in an ergonomic educational intervention program were able to identify MSDs risk factors in addition to improved knowledge of ergonomics, posture and attitudinal dispositions. The main focus of ergonomics is the prevention of harm to the workers' health and productivity (Gupta,



2011). Thus, Vural and Sutsunbuloglu (2016) opine that knowledge and application of ergonomic rules prevent the onset and progression of MSDs. Furthermore, ergonomics education has been viewed as a tool that removes the obstacle in many workplaces which restricts workers from performing at their best, in addition to injury prevention (Uche & Fanny, 2015). Knowledge of ergonomic concepts enhances adherence to ergonomic principles and reduces the incidence of MSDs. This was illustrated by Moghadam, Mohamadyan, Emkani and Zarei (2018) who showed an inverse relationship between physiotherapists' ergonomics knowledge and frequency of MSDs. Also, Sealetsa, Setlathanyo, and Moalosi (2016) have demonstrated improved knowledge, attitude and adherence to ergonomics principles after an on-site ergonomics instructional program. Furthermore, Moazzami et al. (2016) has used the trans theoretical model to demonstrate how ergonomic educational interventions help workers make changes to their physical motions from the contemplation and preparation stages to the action stage for the adoption of proper body postures.

CONCLUSION

The result of the study shows significant differences in the scores for all predisposing factors measured in this study among the participants between the baseline and the 12th week outcome measure. This is true between the groups, and within the experimental group, showing that after the intervention, the participants improved psycho-cognitively towards adherence to workplace ergonomics principles. This demonstrates clearly that any desire to change risk-behaviors in a population will of necessity target antecedent variables to the risk behavior as illustrated by the theoretical framework applied in this study. This study demonstrates a proof of concept in the pathway of preventing MSDs in the workplace environment.

Further studies are required to address these antecedent variables of poor adherence to workplace ergonomic principles.

CONFLICT OF INTEREST

None

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