

Influence of Educational-Intervention Program on Adherence to Workplace-Ergonomic Principles among Catering Staff of Selected Universities in Ogun State, Nigeria

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Abstract

Objective: Adherence to workplace-ergonomics principles preserves worker's health, and productivity, negligence results in musculoskeletal disorders (MSDs). This study evaluated the influence of an educational intervention program on Adherence to ergonomic principles among Catering Staff of selected Universities in Nigeria.

Methods: This was a quasi-experimental study. The study population was 423 catering staff of two purposively selected universities. Sixty consenting Staff were systematically derived by selecting every 7th person, using the normal distribution power formula for intervention studies and enrolled in an experimental group (EG: n=30) and a control group (CG n: =30). EG received the ergonomics-based educational intervention, one-hour/day/week for three weeks. CG received lectures on infection control. The study lasted twelve weeks. A validated, structured, pre-tested questionnaire with Cronbach's alpha coefficients ranging from 0.78 to 0.93 was self-administered by respondents. EG and CG had a 100% response rate. Descriptive and inferential statistics were used to analyze baseline and 12th-week follow-up data at 5% significance level

Results: The mean age of respondents was 41.52 ± 10.23. CG and EG showed a significant difference in adherence to ergonomics principles at the 12th-week follow-up (3.30 ± 0.37 and 9.97 ± 0.30; p < 0.05). EG showed a significant difference in adherence to ergonomics principles between baseline and 12th-week follow-up. (7.53 ± 0.32 and 9.97 ± 0.03; ES 1.407(0.783 to 2.031) p - 0.001 respectively.

Conclusion: The educational intervention program improved adherence to ergonomic principles. The study recommends routine training of university catering staff in ergonomics to sustain adherence.

Keywords: Adherence, Attitudinal disposition, Educational-intervention, Ergonomics, Musculoskeletal disorders

Plain English Summary

Work-related musculoskeletal disorders are a plague with devastating effects on the worker, the institution and the society at large. Their onset is generally insidious, but preventable by adherence to ergonomics principles. Prevalence of Musculoskeletal disorders and exposure to musculoskeletal risk factors have been studied among various professions in the academic context in Nigeria, including faculty and administrative staff. However, no such studies have been undertaken among the catering staff of Nigerian universities. The reason for this is that whereas members of these elitist professions recognize the risks associated with

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their jobs and can advocate for themselves, catering staff of the universities who are mostly illiterates are not able to do so. Also, unlike the professionals who generally enjoy welfare packages including healthcare coverage, and therefore seek medical attention early, most catering staff work on a casual basis which requires a cash payment for every medical treatment, which their meager earnings cannot sustain. Consequently, they delay presentation until musculoskeletal disorders become established.

Health education improves adherence to workplace ergonomics principles. We also established this fact in our work where catering staff who received health education for three weeks improved on their adherence to workplace ergonomics principles. University administrators should therefore engage catering staff in routine ergonomics-based health education to sustain adherence.

Introduction

Ergonomics, the scientific study of how individuals interact with one another and with other system elements was first accepted in 1950, although the fundamental principles had existed from antiquity (1). Ergonomics has been extensively studied among different occupational groups and is recognized as the panacea for work-related musculoskeletal disorders (WRMSDs) (2, 3, 4). The primary concern of ergonomics is to prevent harm to the worker's productivity and health by adapting the job to his/her physical and psychological features instead of the other way around (5). Ergonomics not only prevents injury in the workplace but also eliminates the obstacle which hinders employees from performing at their best (6). However, adherence to its principles remains poor globally, especially in low- and middle-income countries (7). This is so even as a significant proportion of the world's working population is daily exposed to WRMSD risk factors which include an assumption of awkward postures, pushing, pulling, lifting, bending, etc. As a result, musculoskeletal disorders have remained a global public health challenge, according to the World Health Organization (8) which states that WRMSDs affect 1.71 persons globally and about 45 million persons within Europe (9). Additionally, WRMSDs constituted 44% of all work-related injuries and all disease-related costs in the workplace globally in 2019 (10).

The onset of musculoskeletal disorders is gradual and imperceptible, making early detection impossible. Moreso, there is no known permanent cure for most MSDs once they become established (11). Therefore, prevention through an ergonomic-based educational intervention program proffers the best mitigation (12, 13), although the literature review fails to confirm that this strategy has been explored. Strict adherence to workplace ergonomics principles preserves the worker's health and efficiency by minimizing exposure to Musculoskeletal Disorders (MSD) risk factors in the workplace (14). Diligent adherence to ergonomics principles in the workplace is a win-win situation as it benefits the worker by alleviating his pains and

aches, preventing involvement in work-site accidents, improving his quality of life and earning power for the family (15). It further improves the worker's performance, efficiency and productivity with reduced medical costs, and lost man-hours with improved profitability to the establishment (16). Similarly, accruable benefits to society include an increased workforce, reduced spending on social welfare packages and improved receivable tax. On the other hand, negligence results in musculoskeletal disorders with physical impairment and accidents (17).

Catering staff of universities are among the most vulnerable to work-related musculoskeletal disorders by the demands of their occupation (18). This is because the Catering occupation because associated activities and methods of operations are fraught with risks of developing MSDs if principles of ergonomics are neglected (19, 20). Consequently, (21) posit that the catering profession is fraught with known MSD risk factors, and that caterers frequently engage in activities laced with these risk factors such as repetitive manual tasks, heavy lifting, physical exertion and uncomfortable postures. This view is supported by (22) who listed repetitive manual jobs, forceful motions, awkward postures and lifting, squatting, bending and prolonged standing as the factors that most prone caterers to MSD. However, no matter the specific task assigned, caterers make excessive use of the muscles of the neck, back, waist, shoulders and hands/wrist in carrying, lifting, bending, pushing and pulling, etc. In a systematic review of the incidence and prevalence of WRMSDs in 21st Century Europe, (23) found that catering staff were the most impacted by MSDs in the nine anatomical body parts most affected by MSDs. This may explain why caterers have the highest prevalence of MSDs among all other support staff in the school system (24). In addition, (19) found an association between significant lower back pain and large meal (> 150 Vs < 150 per day) preparations. Even within the hospitality industry, caterers have a higher prevalence of MSDs than their other counterparts as evidenced by the fact that male kitchen staff have a 1.9 times higher

prevalence of MSDs when compared to their other counterparts who work in hotel rooms (25).

Caterers make up a sizeable proportion of the university workforce exposed to well-recognized MSD risk factors (26), and because of the invaluable services they render to the university community, it becomes morally expedient to routinely educate and re-educate them on ergonomically appropriate methods of performing their duties with minimal exposure to the risk of developing MSDs. It is against this backdrop that this theory-grounded, ergonomics-based health educational intervention program with the capacity to arouse ergonomic adherence consciousness and positive health-seeking behaviour was developed to evaluate what impact an educational intervention program would have on adherence to workplace ergonomics principles among catering staff of selected universities in Ogun state, Nigeria.

Materials and Methods

Study Design and Population

This was a quasi-experimental educational intervention study. The population of study was 423 catering staff of two universities in Ogun state, Nigeria, selected based on their known high population of catering staff who, in the course of discharging their occupational duties engage in cooking, boiling, frying, baking, serving and the likes-activities that involve prolonged standing, bending, squatting and other awkward postures. The study didactically provided information on the vulnerability of the participants to, and the seriousness of the repercussions or consequences of musculoskeletal disorders. Furthermore, the benefits of adopting ergonomics methods and techniques in the discharge of their occupational duties were communicated. In addition, the perception of self-efficacy among the participants was awakened.

Study Area and Location

There are six states in South-west Nigeria, and Ogun State is one of them, created in 1976. Ogun State is bordered on the south by Lagos State, while Oyo and Osun states are her northern neighbours, and Ondo State and Benin Republic are on the west. It has a land mass of 16980 square kilometres with a population of 3, 751, 140.

There are sixteen universities in Ogun state which includes one federal, three state-owned and twelve privately owned universities. Babcock University, located in the Ikenne Local Government Area of the state, owned and operated by the global Seventh-day Adventist church hosted the intervention while

the Federal University of Agriculture, Abeokuta (FUNAAB) served as the control.

Sample Size Determination

The study assumed normal distribution, homogenous variances, equal sample sizes and a 2-sided test, the threshold of significance was set at 95%, and power of 80%. Power to detect a difference = 1, false positive rate = $1-\beta$. Therefore $N = (Z\alpha + Z\beta)^2 \times 2 \times P(1-P) / (d^2)$
 $N = (1.96 + .84)^2 \times 2 \times (0.5 \times 0.5) / (0.3)(0.3)$
43.56 or 44 which was approximated to 60 for convenience.

Sampling technique

The study adopted a multistage sampling procedure as follows:

Stage I: a Purposive sampling of two universities, BU and FUNAAB out of the sixteen universities in the state, based on the known high population of catering staff,

Stage II: a purposive sampling or selection of one, catering department, from both universities, based on

the high frequency of hospital attendance of staff members,

Stage III: a systematic sampling or selection of participants. Systematically, and using the already calculated sample size, sixty participants were recruited by selecting every 7th person using the

normal distribution power formula for intervention studies and assigned to an experimental group (EG) and a control group (CG).

The intervention lasted one hour per day per week for three weeks, while the study was conducted over twelve weeks.

Instrument and Data Collection

A validated, structured and pre-tested questionnaire with Cronbach's alpha coefficient ranging from 0.78 to 0.93 which also had a pidgin English version, was self-administered by the respondents at baseline. The same instrument was re-administered at the end of the twelfth-week follow-up period. Both the CG and the EG had a 100% response rate. Data were collected at baseline and 12th-week follow-up and analyzed using descriptive statistics and inferential statistics (paired t-test, effect size) at a 5% level of significance. The study which was held between December 2022 and February 2023 was used to collect data on the level of adherence of the participants to ergonomics rules and principles in the workplace.

Data Processing and Analysis

Primarily, the data analysis aimed to determine the effectiveness of an educational intervention program on adherence to workplace ergonomic principles involved in musculoskeletal disorders prevention in the workplace environment among the catering staff of selected universities in Ogun state, Nigeria. The rigorous experiment was aimed at reinforcing the participants' knowledge and perception of, and attitudinal dispositions towards adherence to ergonomic principles in the workplace. The response items were transformed into weighted-aggregate scores to generate a measure for the variable of interest towards work-related MSDs and how to prevent them.

Data collected were processed in two stages by using frequency distribution and their transformation 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 Cohen's D Effect Size which quantified the magnitude of the changes observed. IBM SPSS version 29 was used in conducting all data analysis and all hypotheses were tested at a 5% level of significance.

Results

Sociodemographic Characteristics

The results from this study showed that the mean age of participants in the control group was 43.2 ± 9.35, and the experimental group was 39.83 ± 11.11 with the majority (56.7%) being females, and 73.3% having attained secondary education. The dominant ethnic group was Yoruba (90%) while the dominant religion was Christianity (86.7%), and the majority (66.7%) were of normal body weight. (See Table 1)

Table 1 Demographic Characteristics of the participants in the study for each arm of the intervention at baseline

Variables	Control N=30		Experiment al N=30		Total
	Frequency N	(%)	Frequency N	(%)	
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
African Traditional Religion (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

certain demographic characteristics to demonstrate matched groups at baseline

Evaluation of Outcomes for Control and Experimental Groups

The results of the study outcomes were reported for control and experimental groups at both baseline (9.80 ± 0.27 vs 7.35 ± 0.32 at p < 0.05

respectively) and 12th-week follow-up (3.30 ± 0.37 vs 9.97 ± 0.30 p < 0.05 respectively). Mean scores with their respective standard deviations and p-values are reported, showing that at the 12th-week follow-up, there was a statistically significant

difference in the level of adherence between the control and experimental groups with a large Cohen's D Effect Size (table 2). Similarly, the result shows that among the experimental group, there was also a statistically significant difference in adherence level between the baseline and the 12th-

week outcome measure (Table 3). Cohen's D Effect Size was computed for each group to evaluate and quantify the magnitude of changes that have occurred in the respective groups due to the intervention.

Table 2. Summaries of descriptive statistics for variables involved in the prevention of occupational-induced MSD at Baseline for control and experimental groups

Variables	Maximum Points on the Scale of Measure	Control Group N=30		Experimental Group N=30		p-value
		$\bar{X}(SE)$	$\pm SD$	$\bar{X}(SE)$	$\pm SD$	
Knowledge	22	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
Support Factors	21	13.17(0.38)	2.07	10.57(0.48)	2.64	0.001*
Adherence to Ergonomic Practices	15	9.80(0.27)	1.47	7.53(0.32)	1.74	0.001*

* Test of significance for an independent sample t-test

Table 3. Summaries of descriptive statistics for reinforcing and attitudinal variables involved in adherence to occupational-induced MSD prevention at 12th-week Follow-up for control and experimental groups

Variables	Maximum Points on the Scale of Measure	CONTROL GROUP N=30		EXPERIMENTAL GROUP N=30		*ES (95%CI)	p-value*
		$\bar{X}(SE)$	$\pm SD$	$\bar{X}(SE)$	$\pm SD$		
Adherence to ergonomics principles	15	3.30(0.37)	2.00	9.97(0.30)	1.63	3.65(2.81 – 4.48)	p- 0.001

* Test of significance for an independent sample t-test

Table 4. Evaluation of the effect of the intervention on reinforcing and attitudinal variables involved in adherence to occupational-induced MSD at 12th-week Follow-up for control comparing baseline sample mean scores with follow-up scores

VARIABLES	Maximum Points on the Scale of Measure	Baseline N=30		Follow-up post-intervention N=30		*ES (95%CI)	p-value
		$\bar{X}(SE)$	$\pm SD$	$\bar{X}(SE)$	$\pm SD$		
Adherence to ergonomics principles	15	9.80(0.27)	1.47	3.30(0.37)	2.00	3.66(2.59-4.74)	P- 0.001

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

Table 5. Evaluation of adherence to ergonomics for experimental group comparing baseline sample scores with follow-up

Variable	Maximum Points on the Scale of Measure	Baseline N=50		Follow-up post-intervention N=50		*ES (95%CI)	p-value
		$\bar{X}(SE)$	$\pm SD$	$\bar{X}(SE)$	$\pm SD$		
Adherence to ergonomics principles	15	7.53(0.32)	1.74	9.97(0.30)	1.63	1.407(0.783-2.031)	P = 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

Primarily, the study sought to evaluate how effective an educational intervention program would be in influencing the adherence to workplace-ergonomic principles among the catering staff of selected universities in Ogun state, Nigeria, as a means of preventing musculoskeletal disorders. Musculoskeletal disorders are a plague with devastating effects on the individual worker and family, the establishment and the society at large.

Consequently, there was a vibrant stimulation of psycho-cognitive disposition among the participants as signified by the large effect sizes among the experimental group, and between the experimental and control groups at the beginning and end of the intervention in each case. Earlier researchers had found similar results. In 2016, (3) stated that 89% of participants in an educational intervention program showed significant improvement in ergonomic knowledge and adherence to ergonomic principles as well as the inability to recognize ergonomic risk factors. In another development, educational intervention programs reinforced knowledge, attitude and adherence to ergonomic principles among participants (27). This study's findings also agree with the findings of (2, 4) who showed that the inclusion of ergonomics education in the curriculum reduced the risk of Dentists developing MSDs during practice. Similarly, this study's findings corroborate the result of (9) who reduced the prevalence of MSDs among assembly line workers from 78.7% to 46.7% following the ergonomics education intervention program. However, the result of this study does not support the findings of (28) who could not find a significant relationship between knowledge of ergonomics and its use among Nigerian physiotherapists, but shortage of instruments and equipment as a factor in the

occurrence of musculoskeletal disorders. Thus, adherence to ergonomics principles in the workplace is a win-win situation for the employee, establishment and society alike.

There was a significant drop in adherence among the control group between the baseline and 12th-week follow-up periods. Perhaps this oxymoron could have arisen from the low level of formal education among the participants. Some respondents may have misunderstood some of the question items in the instrument, resulting in the wrong answers.

Conclusion

The result of this study reveals significant differences in the level of adherence to ergonomic principles among the participants: among the experimental group between baseline and 12th week follow-up, and between the experimental and the control groups at the beginning and the end of the intervention. This shows a boost in the participants' psycho-cognitive disposition towards adherence to ergonomic principles. Thus, for a sustainable adherence to ergonomic principles constant and recurrent exposure to ergonomic educational intervention programs is inevitable, especially taking cognizance of the level of formal education of the majority of members of this category.

List of Abbreviations

- BU: Babcock University
- BUHREC: Babcock University Health Research and Ethical Committee
- CG: Control Group
- EG: Experimental Group
- ES: Effect Size
- FUNAAB: Federal University of Agriculture, Abeokuta
- IBM: International Business Machine

SPSS: Statistical Package for the Social Sciences

Declarations

Ethics approval and consent to participate

Ethical approvals were sought and obtained from the Babcock University Health Research Ethics Committee (BUHREC: 766/22) and the 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. There were no incentives given to respondents.

Consent for publication

All the authors give consent for the publication of the work under the Creative Commons Attribution-Non-Commercial 4.0 license.

Availability of data and materials

The study data is available upon request to the corresponding author.

Competing interests

The authors declare no conflicts of interest

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Authors' contributions

Study design and conceptualization by NSC; literature review and first draft by NSC and NOA; data analysis and review of draft by NNV and SJF; reading and approval of the final draft by NSC, NOA, NNV and SJF.

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