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ERGONOMICS OF AUTOMATIC TRANSMISSION VEHICLE ON WORK – RELATED MUSCULOSKELETAL DISORDER AMONG ACADEMIC AND NON- ACADEMIC STAFF OF LAGOS STATE UNIVERSITY

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Abstract
The study is examined the ergonomic of automatic transmission vehicle on work – related musculoskeletal disorder among academic and non- academic staff of Lagos State University. The ergonomic effects of automatic transmission vehicles on employee while driving to and from work. Employees that are frequently exposed to long period of standing position when performing work- related functions such as lecturing, laboratory experiment and the sitting position during research, administrative function and even some laboratory experiment like the academic. This can then be compared to employees that are mostly exposed to more sitting position within the same system, non-academics for a robust comparative analysis. The study aimed to examine how the effect of driving automated transmission vehicle on workplace-related musculoskeletal disorders among academic and to investigate the effect of driving automated transmission vehicle on workplace-related musculoskeletal disorders among non-academics in Lagos State University. This study adopted descriptive research design. The population of the study comprise the entire 557 Academic and 1423 non-academic staffs in Ojo campus. Though, the population should be only staffs that drives personally automated transmission vehicles to office, but at the initial stage it was difficult to determine such staffs. It was adequately noted from the questionnaires filled. A sample of 234 and 312 were drawn from the population of academic and non-academic staff respectively using Yamane (1969 as cited by Anokye, 2020). The reliability of the research instrument was assessed using the Cronbach's Alpha coefficient while the validity was assessed using content and face validities. The study found that, there is a weak positive relationship between that driving automated transmission vehicle and workplace-related musculoskeletal disorders among academics in Lagos State University (R = 0.076). This implies that driving automated transmission vehicles do not significantly affect workplace-related musculoskeletal disorders among academics in Lagos State University, that driving automated transmission vehicles explains about (R= 0.032) of workplace-related musculoskeletal disorders among non-academic members of staff of Lagos State University and the more they drive automated transmission vehicles, the more non-academic members of staff of Lagos State University experience workplace-related musculoskeletal disorders, (Beta = 0.178). This study concluded that a slightly increase in the impact of driving ATV on WMSD among non-academics when compared to the academics, this is not significant enough to show that the external work of driving ATV and, therefore, recommended that the management in academic systems should strategically focus their policy more on the workplace environment to reduce WMSDs.
Keywords: Automatic transmission vehicle, ergonomics, work-related musculoskeletal disorder

1.1. Introduction

Researches in ergonomics and health have identified Work-Related Musculoskeletal Disorders (WMSDs) as one of the several lead cause of global occupational hazards (Meisam, et al., 2017). This disorder is an impairment of the musculoskeletal system that are not directly due to incident or accident. Though the disorder may gradually develop into chronic stress and strain in nature (Anghel, Argesanu, Niculescu, & Lungeanu, 2007 as cited by Meisam, et al., 2017). To safeguard the body system from occurance of this disorder and some other health related issues in work place and its environment, the authorised bodies especially in developed countries often enforce regulatory measures that ensures that organisations assess the level of musculoskeletal disorders of their employees periodically especially those engaged in manual activities. Despite the massive financial, human and technological implications involved, the organisations were also forced to extend these regulations to their international partners; thus ensuring the assessment of the global ergonomic risks specific of their industrial sector (Marco, Mauro, Francesco, & Alberto, 2018). Though, this may be easy as these organisations have control over the internally used resources especially the human resources that are assessed, there is limited or no control over the external use of their products. The latter makes it difficult to have a detail assessment of the ergonomic risks specific to the use of their product, thus relying on the possible experiment the products are exposed to and feedbacks from customers which take quite a while. Hence a need for studies to continually assess the level of ergonomic risk a consumer is exposed to, for products like automatic transmission vehicles.

Unlike the manual transmission vehicle that have almost been cleared out of circulation-(Montoya, 2019), the automatic transmission cars restricted the users to the use of mostly a side of the body depending on if it is a left or right wheel vehicle system. This frequent use of a side of the body may cause the overusing of that side of the body's ligaments and muscles while driving that may lead to musculoskeletal disorders includes bones, muscles, tendons, ligaments and soft tissues. Zawn (2019) identified the over use of a side as a major cause of flank pain.

Unfortunately, workers like the academics are frequently exposed to long period in two mechanical posture/position. The standing position when performing work related functions such as lecturing or laboratory experiment and the sitting position during research, administrative function, laboratory experiment and while during to and from work.
The long period in these postures arise when academics are determined to meet up with their work expectation and schedules. They at times have three consecutives two hour of lectures at a stretch or having two to three administrative meetings each lasting more than two hours or a combination of long periods of lectures and meetings. These and other working conditions, have been identified as possible cause of health hazards (Kalakoski, et al., 2020).

In this study, it is observed that, a gradually developing flank pain as a result of pre and post workplace activities such as deriving could contribute to WMSDs as a result of overusing of a side of the body's ligaments and muscles. But most researchers like Safa, Spenser, Linda, & Mark (2017) and Lušetić, Trstenjak, & Ćosić (2018). To these researchers it is mainly caused by the workplace design. Their findings may be because their researches were mainly focused on workplace design and the immediate environment. Hence, in this study, the ergonomic effects of driving automated transmission vehicle on the WMSDs of academic and non- academic staff of LASU.

1.2. Statement of the Problem

Though, researchers like Safa, Spenser, Linda, & Mark (2017) and Lušetić, Trstenjak, & Ćosić (2018), as mentioned earlier, have identified the workplace design as the main reason for health related issues, there is a dearth of research on examination of how pre and post work activities like driving automated transmission car that restricted the users to use mostly a side of the body have compounded the health related issues that arises in workplaces especially among university staff. In other countries, much of the research focus have been on the sitting posture/position of the driver as shown in the works of (Tinitali, Bowles, Keating, & Haines, 2019) and (Abdullaha, Khamisa, Ghania, & Kurniawanb, 2020) or the mileage covered by the driver of the vehicle as shown in the work (Toshihiko, Yuichi, & Atsumasa, 2006).
This study becomes imperative because of the divers' view of medical researchers and even studies on human factor engineering-ergonomics. While stakeholder like Reynolds (2018) and some medical researchers believed that frequent used of a side of the body does not cause WMSDs others like Zawn (2019) has a divergent view. But with ergonomic studies mainly focusing on just the workplace without extending their considerations to pre and post work environment, a critical examination of a wider coverage of the study area is required. That is, examining the ergonomic effects of automatic transmission vehicles on employee

while driving to and from work. Employees that are frequently exposed to long period of standing position when performing work- related functions such as lecturing, laboratory experiment and the sitting position during research, administrative function and even some laboratory experiment like the academic. This can then be compared to employees that are mostly exposed to more sitting position within the same system, non-academics for a robust comparative analysis.

1.3. Objectives of the Study

1. To examine the effect of driving automated transmission vehicle on workplace-related musculoskeletal disorders among academics in Lagos State University
2. To investigate the effect of driving automated transmission vehicle on workplace-related musculoskeletal disorders among non-academics in Lagos State University

1.4. Research Question

1. To what extend does driving automated transmission vehicle affect workplace-related musculoskeletal disorders among academics in Lagos State University?
2. To what extend does driving automated transmission vehicle affect workplace-related musculoskeletal disorders among non-academics in Lagos State University?

1.5. Research Hypotheses

1. Driving automated transmission vehicle does not significantly affect workplace-related musculoskeletal disorders among academics in Lagos State University
2. Driving automated transmission vehicle does not significantly affect workplace-related musculoskeletal disorders among non-academics in Lagos State University

1.6. Relevance of the Study

Past studies in this area have focused more on the physical work environments with activities that can be controlled by organisational management. But this study focused on activities that are outside the control of the management give an insight to ways of improving, not just the workplace, but the entire process of work environment that surpassed both the workstation and work system. This enable possible policies extension to environmental factors that can affect workers' health and productivity. It may also serve as a bases for other researchers or stakeholders in the study area of ergonomic to be able to examine how non-management controlled variables affect their employees in further studies.

1.7. Scope and Limitation of the Study

This study examined the extent non-management variables in the area of ergonomics affect WMSDs and invariably the performance of workers in academic environment. But the scope of this study will be limited to exploring such ergonomics environment through automated transmission vehicle. This can explain the contribution this ergonomic design system- automated transmission vehicle-to WMSDs within an academic environment. This study is, for convenience, cost and time constraints, limited to an academic environment within Lagos State University– LASU.

2.1. Literature Review

This section captured reviews of the conceptual and theoretical works that are relevant to this research. In order to aid proper research work, there will be an insight into particular concepts and literature that will provide a general understanding of the contribution of driving automated transmission vehicle to WMSDs, stress and strain in the academic's environment.

2.2. Empirical Review

According to stakeholders and research institutes like the Spine Institute of North America (2019) and (Canadian Centre for Occupational Health & Safety, n.d.) prolonged sitting and constrained postures while driving are sources of muscular stain or stress. But Magliozzi & Magliozzi (2013) belieiveed that automated transmission vehicles are the solution to this medical chllenges. Reynolds (2018) disagreed with this view of the Magliozzi brothers with the opinion that manual transmission vehicles are more engaging for the driver than the automatic transmission vehicles, thereby balancing the level of idleness of both side of the body in term of level of cognitive and physical ergonomics. But observations of an official of Humantech: Velocity EHS (2017) at the 2017 North American International Auto Show held in Detroit shows that, this may be due to the way consumers lust and procure the latest model of vehicles without due consideration to its ergonomic features. The observer noted as follows

> *"The steering wheel of the Nissan Vmotion 2.0 Concept is similar to what you might see in a race car—your typical bottom half wheel with semi-rounded corners. As advertised by Nissan, the wheel is designed this way to provide an unimpeded view of the display panel for the driver. However, the half-wheel design gives rise to some issues, including:*
> *1. Obstructing the driver from doing the hand-over-hand turning.*
> *2. Preventing neutral wrist movement, since it would require awkward hand positioning.*
> *3. Unbalanced forces on the forearms while turning the wheel due to the uneven distribution of weight.*
> *Exiting the 2017 Chevrolet Corvette Stingray Convertible was a hassle for me since there wasn't an inside door handle. Instead, there's a small button at waist level that opens the door when pressed on. I believe this generates more strain on the finger, as the person is ultimately pushing on the weight of the door. It may also lead to uncomfortable back postures since the button isn't placed within the normal hand motion range".*

The observer thus concluded by emphasising the importance of consumers understanding vehicle ergonomics features, in view of the fact that, the critical control belongs to and mostly affects the driver.

While non researcher's stakeholders as identified above have focus on these divergent views, the dearth in academic research input were noted. This is because most of the researches either focused on workplace environment or the ergonomics features of a vehicle as a system and how it affects the user. But there is rarely any research that examine the extent to which this contributed to WMSDs, Literatures were limited to studies from the individual system-workplace environment and an ergonomic design vehicle system-as the contributors identified in this study.

The basic principle of ergonomics is to develop a system for human fit with the aim of decreasing fatigue and discomfort through product design and/or workplace design. This means when a products and/or workplace fit the user, and are in line with the user's activity, the result can be increased productivity and less stress (McGraw, 2018). Though, the ergonomic design in some vehicles' seat may fit sometimes in the short while but studies have shown it mostly don't fit in the long while. Thus McGraw in convergenc to the studies of Toshihiko, Yuichi, & Atsumasa (2006) noted that, individuals who drives vehicles as the main part of their jobs are at significant risk of musculoskelental disorders (MSDs). This study observed this in academic environments in what was termed repetitive driving injuries by Toshihiko, Yuichi, & Atsumasa (2006). These are injuries such as low back pain, stiff neck, muscles, joint, ligaments and it can be related to WMSDs.

Driving may not be the main part of the job of academics, but much time is spent in traffic and mileage covered per day by most of its members behind the wheel especially in places like Lagos State and USA. While an American spend an average of 293 hours behind the wheel per year, McGraw (2018), commuters in Lagos spend an average 3 hours per day. Fagbe, Folorunso-Ako, & Oko (2020). Thus, this study examined the extent academics are exposed to MSDs as as a result driving automated transmission vihecles and the workplace design of their working environment.

2.3. Conceptual Clarifications

The following variables are critically examined in this study. The independent variable ergonomics and automatic transmission vehicle and the dependent variable WMSDs;

2.3.1. Ergonomics

According to the International Ergonomics Association (IEA, 2000 as cited by Ismaila, 2010) the concept of ergonomics is seen as a scientific discipline concerned with understanding of the interaction among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance. An examination of this concept shows that, one of the main objectives of ergonomics is to improve employee performance in the work place. Ergonomics is also expressed as a holistic approach in which considerations of physical, cognitive, organisational, environmental and other relevant factors are taken into account to enhance the design and evaluation of tasks, jobs, products, environments and systems in order to make them compatible with the needs, abilities and limitations of employees (International Ergonomics Association, 2017) also shows that ergonomics is not limited to the improvement of employee workplace alone but extended to work-supplementary activities external to the actual work environment. This mean for an academic institution, while the actual work environment includes research, lecturing and administrative, the work supplementary activities could be transport activates to and fro work. Thus, the International Labour Organization (ILO) and Content Manager (2011) view ergonomics as the measurement of work. Work in this context signifies purposeful human function not restricted to labour for monetary gain but involve all activities performed by a rational human operator in systematic pursue of an objective. This includes controlling engineered systems or adapting to them, for example, as a passenger in a vehicle. Based on these views of ergonomics and the area of focus of this study, the ergonomics concept as identified by Clemens, Ford, & Karl (2014) was adopted. Clemens, Ford, & Karl (2014) defined ergonomics as a science that combines various branches of science into what is the approach to making the work environment fit the user. Here the work environment is not used in the traditional sense but more translated into both the workplace environment and the activities inside of a vehicle as the employee is transported to and from the work. But this study is limited to investigation of how staff of LASU who drives themselves to and fro work is likely to experience and the challenge this may work to productivity in the short and long run.

2.3.2. Automatic Transmission Vehicle

An automatic transmission is a multi-speed transmission used in motor vehicles that does not require any driver input to change gears under normal driving conditions (Saurin, Bhavya, & Purvi, 2014). This automatic transmission feature and many more like size of the engine, the luxury possessed and safety attribute frequently considered in a vehicle, but how these features affect the ergonomics and health statue are rarely considered by the consumers (Humantech: VelocityEHS, 2017). One of such features as identified earlier in the reviews above is the frequent use of one side of the body, especially a leg to control both the brake and the accelerator.

To conceptualise the phrase ‘Ergonomics-Automatic Transmission Vehicle’ an examination of the Greek origin of the construct ergonomic is considered. The term “ergonomics” consists of two parts, “Ergon” meaning “work”, and “Nomos” relates to the existing laws and conventions in the context of the human capabilities (Bhise, 2012 as cited by Clemens, Ford, & Karl, 2014). This mean adequate consideration should be given to the human limits in the design of any working environment. Clemens et al further stressed the importance of ergonomics as a multi-disciplinary body of Knowledge to design a workplace that balance the capacity with the demand required. This means to design the system that fit the human resource into the machine/workplace/vehicle. (Kroemer, 1997).

This study thus conceptualised the phrase ‘Ergonomics-Automatic Transmission Vehicle’ as a scientific approach to making an automatic transmission vehicle work environment fit the user in other to reduce possible health risk.

2.3.3. Work-Related Musculoskeletal Disorders (WMSDs)

The believe that work may negatively affect health especially in term of WMSDs and invariably become a socio-economic burden is not new. Fabrizio, et al. (2020) stressed that WMSDs affect about a third of the worldwide population representing one of the most important causes of health challenges that reduced productivity and quality of life. Though, MSDs can be acute traumas, such as fractures, that occur during an accident and other health risk related occasion, WMSDs are work related. Thus European Agency for Safety and Health at Work (2007) sees WMSDs as impairments of bodily structures such as muscles, joints, tendons, ligaments, nerves, bones and the localised blood circulation system, that are caused or aggravated primarily by work and by the effects of the immediate environment in which work is carried out. Hence, in this study the concept of WMSDs as stated by European Agency for Safety and Health at Work (2007). This study believed WMSDs is the cumulative disorders, resulting from repeated exposure to high or low intensity work-load demands that exceed each individual; human capacity limit per period of time. (Fabrizio, et al., 2020).

2.4. Theoretical Framework

Karsh (2006) examined theories/models on WMSDs from nine different researchers and stakeholders such as-Armstrong et al. (1993); Hagberg et al. (1995) model; Moon and Sauter 1996) three models of WMSDs; Sauter and Swanson (1996) model; Carayon et al. (1999) model; Feuerstein (1996) workstyle model of WMSD; Kumar (2001) four models, the multi-variate interaction theory, differential fatigue theory, cumulative load theory and the over-exertion theory and the National Research Council (NRC 1999,NRC/IOM 2001) model. Karsh then developed a complicated integrated model. This study will thus be focus models from two of the researchers identified by Karsh- the Kumar (2001) models and NRC/IOM (2001) model. This is because while two of Kumar's theories-the differential fatigue theory and the cumulative load theory-was able to identify the imbalance in the loading of the muscles and the capacity of the muscles the NRC/IOC model examined three interacting factors-workplace, external and organisational.

Kumar's Differential Fatigue Model

This theory shows that different activities differentially loaded on different joints and different muscles. That is if the differential loading is not proportional to the capacity of the tissue, it could lead to fatigue in the short-term because the different muscles were fatiguing at different rates. This can be observed in the different timing academic and non- academic spend behind the wheel as a result of distance covered per day and the frequency of traffic congestion. In the long-term, if the work situation was not changed, the changes in the workings of the muscles could lead to changes in the kinematics of the joints, which could lead to injury. However, as examined in this study the change in work situation is limited to the decision of the driver and some few features allowable in the vehicle design. That is the choice of brand and model of the vehicle and his/her ability to adjust the allowable features like possible adjustment to the vehicle sit

Kumar's Cumulative Load Model

This theory is similar to the often talked about wear and tear mechanism of injury. That is, while biological tissue is capable of self-repair, the tissue can suffer from degradation if loadings are repeated. As a result of most academic and non-academic driving themselves almost seven-times a week to and fro, especially in institutions where part-time studies is run with normal academic work load.
Over time, if the loading is not lowered, permanent deformation of the tissue may result and the stress-bearing capacity may be reduced. Both conditions may lower the level at which tissue fails or injury results.

National Research Council and Institute of Medicine (NRC/IOM 2001)

This model showed that three interacting workplace factors, external loads, organizational factors and social context, could directly impact biomechanical loading as well as outcomes such as pain and impairment. Individual factors, such as adaptation, were shown to independently effect biomechanical loading, internal tolerances and outcomes. Though, this theory established that there is a relationship between external load and workplace strain experience but the extent to which contribute to this is what this study examined.

3.1. Research Methods

This section highlights the process and procedure (which includes: research design, study population, the study sample and sampling techniques, sources of data and method of analysis) used in this study, and also presents important information (data) on specific fields where the survey was carried out.

This study adopted descriptive research design. The population of the study comprise the entire 557 Academic and 1423 non-academic staffs in Ojo campus. Though the population should be only staffs that drives personally automated transmission vehicles to office, but at the initial stage it was difficult to determine such staffs. It was adequately noted from the questionnaires filled. A sample of 234 and 312 were drawn from the population of academic and non-academic staff respectively using Yamane (1969 as cited by Anokye, 2020). The

sample was stratified as shown in table 3.1 to ensure all the faculties, schools were adequately represented. A purposive sampling techniques was used in each stratum because, experience from research field has shown that not all academic staff are willing to fill questionnaires, and return it within an acceptable time. And as identified earlier in the study, scope and limitation, convenience sampling technique was used to choose LASU based on the institutions' proximity and accessibility for the researcher and the field officers. Data was collected through self-develop questionnaire. A five-point Likert Scaled questionnaire was designed to assess how driving automated transmission vehicle on work – related musculoskeletal disorders among academic and non-academic of LASU. Copies of questionnaire was taken to the offices and distributed to the staff with minimal persuasion within one weeks. Only questionnaires from respondents who drives automated transmission vehicles personally to work were considered for analysis.

To establish the validity of the research instrument, the study sought opinions of experts in the field of study (content validity). Also, to establish the validity of the research instrument, the study used Cronbach's Alpha Reliability Statistics, showing the internal consistency with an initial data collected. The collected data was analysed using descriptive statistics (frequency table) and inferential statistics (correlation, regression, coefficients of determination) with the aid of a statistical software called IBM SPSS (Statistical Product and Service Solution).

Yamane Formula

$n= N/(1+N(e)^2)$

Where

n is the sample size,

N is the population size which is **557**, and

e is the level of precision. Taken to be **5%** in this study

For the academics' staffs

Applying this formula, we get $n= 557 /(1+557(.05)^2)$

n= 232. 81 = 233

For the non-academics' staffs

we get $n= 1423 /(1+1423(.05)^2)$

n= 312.23 = 312

The sample size for each strata was represented by n^I. This was determined by getting the fractional contribution of each faculty/school to the entire 557 and multiplying it by the sample size. This formula is thus; n^I.= $\mathbf{(N_f/N_t)*n}$

where n^I.is the sample size in each stratum

N_f is the population in each stratum

N_t is the population of the study

n is the sample size from the Yamane formula

The result is approximated to the nearest whole number. For example, in Faculty of Art the sample will be (83/557) *233=34.72
this is approximate to 35 as shown in table 3.1.
The final summation of the sample size column resulted in 234. Since this figure is higher than the 233 from the Yamane formula it can represent the system adequately.

Table 3.1: Distribution of Samples in Strata for academic and non-academic staffs

S/N	**Faculty/School (Academic)**	**Population**	**Sample**	**Department (Non-Academic)**	**Population**	**Sample**
		Academic N_f	**Academic n^I.**		**Non-Academic N_f**	**Non-Academic n^I.**
1	Art	83	35	Computer Operator, System Analyst & Confidential Sec	355	78
2	Management Sciences	77	32	Health Personal	83	18
3	Social Sciences	71	30	Library	30	7
4	School of Communication	38	16	Technologist and Multimedia	38	8
5	School of Transport	09	04	Security	75	16
6	Law	68	28	Works and Transport	148	33
7	Education	109	46	Bursary, Audit and Procurement	169	37
8	Sciences	102	43	Registry	474	104
9				Others	51	11
	Total (N)	557	234		1423	312

Source: Registry Office (2021)

4.1 Data Analysis and Discussion of Findings

Table 4.1: Percentage of Questionnaires used for Analysis

Categories	Numbers of Questionnaires Distributed	Numbers of Questionnaires Retrieved	% Retrieved	No of Respondents driving Vehicle to and from work	% of Respondents driving Vehicle from the Retrieved Questionnaires
Academics	234	166	70.94%	113	68.07%
Non-Academics	312	122	39.10%	46	37.71%

Source: Field Survey. 2021

Table 4.1 shows that, only 113 and 46 questionnaires retrieved from the academics and non-academics staffs respectively drive vehicles to and fro. Hence, the study analysed data from these respondents

Table 4.2: Analysis of socio-demographic data of the respondents

		Count	Column N %
Gender of the respondents	Male	102	64.2%
	Female	57	35.8%
Age of the respondents	Below 29 years	38	23.9%
	30-39yrs	39	24.5%
	40-49yrs	59	37.1%
	50 yrs and above	23	14.5%
Category of Staff of the respondents	G.A. - L1	29	18.2%
	Senior Lecturer	33	20.8%
	Professorial Cadre	51	32.1%
	Junior Non-Academic Staff	32	20.1%
	Senior Non-Academic Staff	14	8.8%
Length of Service of the respondent	0 - 1yr	13	8.2%
	2 - 3 yrs	26	16.4%
	4 - 6 yrs	73	45.9%
	7 - 9 yrs	28	17.6%
	10 years or more	19	11.9%

Source: Field Survey. 2021

Table 4.2 shows that, of the 159 questionnaires used for the analysis 64.2% of the respondents are male and 35.8% are female. Also, 38 of the respondents are below 29 years, 39 are between 30 and 39 years old, 59 of the respondents are between age 40 and 49 while the remaining 23 are of age 50 and above. Also noted in the results of the analysis of the demographic data of the respondents is that 18.2% of the respondents are academic staff member between the level of Graduate Assistant to Lecturer I, 20.8% are Senior Lecturers, and 32.1% are in the Professorial cadre. In the same vein, 20.1% of the respondents are Non-Academic staff members in the junior cadre and 8.8% are Senior Non-Academic staff members. The result of the category of staff of the respondent's shows that 113 (71.06%) of the respondents are Academic staff members and the remaining 46 (28.94%) are Non-Academic staff members of the University. The data also reveals that 8.2% of the respondents have less spent less than one year of service to the University, 16.4% have spent between 2 – 3 years of service to the University, 45.9% have spent between 4-6years of service to the University, 17.6% have spent between 7 and 9 years of service to the university and 11.9% have spent 10 years and more in service to the University.

The data above summarises that most of the respondents are male, between age 40 and 49 years, in the senior cadre in the respective categories of staff membership, and have spent more than 3 years of service to the university. This concludes that the participants of this study are adults and have spent a reasonable amount of years in the environment of the study.

Table 4.3: Respondents on Automatic Transmission Vehicle

		Count	Column N %
Do you drive yourself with a vehicle to work?	Yes	126	79.2%
	No	33	20.8%
Does the vehicle use automated transmission gear?	Yes	100	79.2%
	No	26	20.8%
Level of comfort consideration	Yes	100	79.2%
	No	26	20.8%
Ability to use both legs for driving	Yes	29	23.0%
	No	97	77.0%

Source: Field Survey. 2021

From the analysis of the table above, 126 (79.2%) of the respondents drive themselves to work, 126 respondents that drive to work daily 100 drive ATV and they all considered the desired level of comfort before driving the vehicle. Three of the respondents who drive ATV indicate their ability to use both legs to accelerate or reduce speed when driving ATV.

Research Hypothesis One: Driving automated transmission vehicle does not significantly affect Workplace-related musculoskeletal disorders among academics in Lagos State University.

Table 4.4: model summary of driving automated transmission vehicle and workplace-related musculoskeletal disorders of LASU academic staff.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.076[a]	.006	-.003	.57053
a. Predictors: (Constant), ATV				

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.591	.372		9.654	.000
	ATV	.077	.097	.076	.798	.427
a. Dependent Variable: Academic WMSDs						

The model summary table above shows that there is a weak positive relationship between that driving automated transmission vehicle and workplace-related musculoskeletal disorders among academics in Lagos State University (R = 0.076). The model also shows the extent to which driving automated transmission vehicle affect workplace-related musculoskeletal disorders among academics in Lagos State University. The coefficient of determination ($R^2 = 0.006$) shows that the driving automated transmission vehicles accounts for 0.6% of the workplace-related musculoskeletal disorders among academics in Lagos State University, Ojo. This result is statistically significant because the p-value of the result (0.000) is less than 0.01 level of significance used for the study. The research hypothesis was accepted. This implies that driving automated transmission vehicles do not significantly affect workplace-related musculoskeletal disorders among academics in Lagos State University, Ojo.

Research Hypothesis Two: Driving automated transmission vehicle does not significantly affect Workplace-related musculoskeletal disorders among non-academics in Lagos State University.

Table 4.5: Model Summary of Driving automated transmission vehicle and workplace-related musculoskeletal disorders of LASU non-academic staff.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.178[a]	.032	.010	.61215
a. Predictors: (Constant), ATV				

The table above presents the results of the linear regression analysis of the effect of driving automated transmission vehicle on workplace-related musculoskeletal disorders among academic in Lagos State University. It indicates that a weak and positive relationship of

(R =0.178) exits between the dependent and the independent variable. A measure of the strength of the computed equation (R = 0.032) indicates that driving automated transmission vehicles explains about 3.2% of workplace-related musculoskeletal disorders among non-academic members of staff of Lagos State University. The research hypothesis was accepted. This implies that driving automated transmission vehicles do not significantly affect workplace-related musculoskeletal disorders among non-academics in Lagos State University, Ojo.

Table 4.6: ANOVA Result.

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.539	1	.539	1.438	.237[b]
	Residual	16.488	44	.375		
	Total	17.027	45			
a. Dependent Variable: Non-Academic WMSDs						
b. Predictors: (Constant), ATV						

The ANOVA (model fit) table presents results from the test of the null hypothesis that driving automated transmission vehicle do not significantly affect workplace-related musculoskeletal disorders among non-academics in Lagos State University. The ANOVA table shows that the computed F statistic is 1.44, with an observed significance level of 0.237 which is more than 0.001. Thus, the hypothesis that driving automated transmission vehicle do not significantly affect workplace-related musculoskeletal disorders among non-academics in Lagos State University is accepted.

Table 4.7: Beta coefficient between the independent and dependent variable.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.960	.737		4.015	.000
	ATV	.226	.189	.178	1.199	.237
a. Dependent Variable: Non-Academic WMSDs						

The Coefficients table presents the standardized Beta coefficient between the independent variable and the dependent variable. The Beta coefficient is shown to be positive and statistically significant at the 0.001 level. Thus, the more they drive automated transmission vehicles, the more non-academic members of staff of Lagos State University experience workplace-related musculoskeletal disorders, (Beta = 0.178), $t = 1.19$, $p < .001$.

4.2 Discussion of Findings

The results from testing hypothesis one above shows that the driving ATV to and fro accounts for only 0.6% of the WMSD among academics in Lagos State University, Ojo. This result is statistically significant because the p-value of the result (0.000) is less than 0.01 level of significance used for the study. Though, researchers like McGraw (2018); Toshihiko, Yuichi, & Atsumasa (2006) etc. may have noted that, individuals who drives vehicles as the main part of their jobs are at significant risk of musculoskelental disorders (MSDs) this does not applied to those that merely drive to work based on the sample of respondents analysed in this study.

This result also shows that, for majority of the respondents analysed, the individual capacity is likely to be able to withstand the differential loading due to the work environment of the vehicle. This account for the insignificant fatigue contribution to WMSD as observed from the Kumar's Differential Fatigue Theory (2006). Also as observed in the literature reviewed in this study, this may be the ability of the driver to adjust the allowable features in the vehicle design. Though, NRC/IOM (2001) theory, may have established that there is a relationship between external load and workplace strain experience but this study shows a divergent result. Showing that, the external load of work-driving to and fro by respondents-does not really affect WMSD.

In hypothesis two, the Beta coefficient is positive and statistically significant at the 0.001 level. Thus, the more the non-academic staffs drive automated transmission vehicles, the more they experience workplace-related musculoskeletal disorders, (Beta = 0.178), t = 1.19, p < .001.

4.3 Conclusion and Recommendation

Comparing the result from the two hypotheses, though the result, shows a slightly increase in the impact of driving ATV on WMSD among non-academics when compared to the academics, this is not significant enough to show that the external work of driving ATV as indicated in the NRC/IOM (2001) theory. Hence this study concluded that driving ATV does not significantly affect WMSD among academics and non-academics staffs in Lagos State University

This study recommended that the management in academic systems should strategically focus their policy more on the workplace environment to reduce WMSD. Thus, less attention should be given to external activities of their work-force since it's not under their control.

References

Abdullaha, S., Khamisa, N. K., Ghania, J. A., & Kurniawanb, R. (2020) Posture Evaluation of the Automotive Maintenance Workers: A Case Study. *Jurnal Kejuruteraan SI, 3*(1), 65-70. Retrieved from https://www.ukm.my/jkukm/wp-content/uploads/2020/si3/1/10.pdf

Anghel, M, Argesanu, V., Niculescu, C., & Lungeanu, D. (2007). Musculoskeletal disorders (MSDs)-consequences of prolonged static postures. *J ExpMed Surg Res, 4*, 167-172.

Canadian Centre for Occupational Health & Safety. (n.d.). *Driving and Ergonomics* . Retrieved from https://www.ccohs.ca/oshanswers/ergonomics/driving.html

Clemens, M., Ford, W. K., & Karl, S. (2014). Ergonomics for Passenger Cars. 1-24. Encyclopedia of Automotive Engineering. Retrieved from https://www.researchgate.net/publication/277693801_Ergonomics_for_Passenger_Cars

European Agency for Safety and Health at Work. (2007). *Introduction to work-related musculoskeletal disorders*. Retrieved from https://osha.europa.eu/en/publications/factsheet-71-introduction-work-related-musculoskeletal-disorders

Fabrizio, R., Cristina Di, T., Luca, F., Giovanna, A., Adriano, P., Vincenzo, D., & Sergio, I. (2020). Prevalence of work related musculoskeletal disorders in Italian workers: is there an underestimation of the related occupational risk factors? *BMC Musculoskelet Disord, 21*. https://bmcmusculoskeletdisord.biomedcentral.com/articles/10.1186/s12891-020-03742-z

Fagbe, T., Fagbe, A. O., Folorunso-Ako, O., & Oko, I. (2020). Traffic Congestion and Health Information on Road Users' Safety and Wellbeing in Apapa-Badagry Expressway, Lagos, Nigeria. *Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT), 14*, 41-48. Retrieved from https://www.researchgate.net/publication/341992986_Traffic_Congestion_and_Health_Information_on_Road_Users%27_Safety_and_Wellbeing_in_Apapa-Badagry_Expressway_Lagos_Nigeria

Humantech: VelocityEHS. (2017). *The Overlooked Ergonomics of a Car*. Retrieved from https://www.humantech.com/2017/02/overlooked-ergonomics-car/

International Labour Organization (ILO) Content Manager. (2011). *The Nature and Aims of Ergonomics*. Retrieved from 29. Ergonomics-Encyclopaedia of Occupational Health & Safefy: https://www.iloencyclopaedia.org/part-iv-66769/ergonomics-52353/goals-principles-and-methods-91538/item/478-the-nature-and-aims-of-ergonomics

Kalakoski, V., Selinheimo, S., Valtonen, T., Turunen, J., Käpykangas, S., Ylisassi, H., . . . Paajanen, T. (2020). Effects of a cognitive ergonomics workplace intervention (CogErg) on cognitive strain and well-being: A cluster-randomized controlled trial. A study protocol. *BMC Psychology, 8*(1), 121-128.

Karsh, B. T. (2006). Theories of work-related musculoskeletal disorders:Implications for ergonomic interventions. *Theoretical Issues in Ergonomics Science, 7*(1), 71-88,. Retrieved from https://sci-hub.se/https://doi.org/10.1080/14639220512331335160

Lušetić, T., Trstenjak, M., & Ćosić, P. (2018). *Ergonomic Design of Workplace*. Retrieved from file:///C:/Users/NCCPRO~1/AppData/Local/Temp/950195.Ergonomic_Desing_Of_A_Workplace.pdf

Magliozzi, T., & Magliozzi, R. (2013). *Back pain may mean it's time for an automatic*. Retrieved from https://www.sfgate.com/cars/article/Back-pain-may-mean-it-s-time-for-an-automatic-4754172.php

Marco, B., Mauro, G., Francesco, P., & Alberto, R. (2018). Automatic assessment of the ergonomic risk for manual manufacturing and assembly activities through optical motion capture technology. *Procedia CIRP, 72*, 81-86. Retrieved from https://pdf.sciencedirectassets.com/282173/1-s2.0-S2212827118X00079/1-s2.0-S2212827118303573/main.pdf?X-Amz-Security-Token=IQoJb3JpZ2luX2VjEDYaCXVzLWVhc3QtMSJGMEQCIEf5NSkpo3hmYx1LFmlBGFPjPA4G7dDnEOMCItLTxiXvAiBVMSE8JDf7YHGc%2FgDbzCLgN%2FNBBt%2Flbq01L2Lw21

McGraw, H. (2018). *The Ergonomics of Adult Car Seat Design and Comfort* . Retrieved from https://dptportfolios.web.unc.edu/wpcontent/uploads/sites/2565/2017/04/ScholarlyPaper_McGraw.pdf

Meisam, M., Mohsen, P., Alireza, K., Mahsa, H., Afshin, D., & Hamed, Y. (2017). REBA method for the ergonomic risk assessment of auto mechanics postural stress caused by working conditions in Kermanshah (Iran). *Annals of Tropical Medicine and Public Health , 10*(3), 589-594. Retrieved from https://www.researchgate.net/publication/319522797_REBA_method_for_the_ergonomic_risk_assessment_of_auto_mechanics_postural_stress_caused_by_working_conditions_in_Kermanshah_Iran

Reynolds, G. (2018). *Broke Your Right Arm? Exercise Your Left. It May Help, Really.* Retrieved from https://www.nytimes.com/2018/05/16/well/move/exercise-sports-injury-arm-leg-broken-strain-sprain.html

Safa, A., Spenser, S. A., Linda, F. C., & Mark, R. C. (2017). *Chapter 6: Occupation and Risk for Injuries.* Washington, DC: International Bank for Reconstruction and Development / The World Bank. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK525209/

Saurin, M. S., Bhavya, R. G., & Purvi, C. (2014). A Scope and Study of Automatic Transmission System in Context of Operating Parameter and Professional Requirement. *National Conference on Emerging Trends in Engineering, Technology & Management. 1.* Ahmedabad: INDUS Institute of Technology & Engineering,. Retrieved from https://www.researchgate.net/publication/272085275_A_Scope_and_Study_of_Automatic_Transmission_System_in_Context_of_Operating_Parameter_and_Professional_Requirement

Spine Institute of North America. (2019). *Prevent Back Pain While Driving.* (B. M. Yanni, Editor) Retrieved from https://spineina.com/blog/prevent-back-pain-while-driving/

Tinitali, S., Bowles, K.-A., Keating, J. L., & Haines, T. (2019). Sitting Posture During Occupational Driving Causes Low Back Pain; Evidence-Based Position or Dogma? A Systematic Review Human Factors. *The Journal of the Human Factors and Ergonomics Society, 63*(1), 111-123. Retrieved from https://journals.sagepub.com/doi/abs/10.1177/0018720819871730

Toshihiko, S., Yuichi, K., & Atsumasa, U. (2006). Effects of driving on low back pain. *Occupational Medicine, 56*, 494-496. Retrieved from https://www.researchgate.net/publication/7000699_Effects_of_driving_on_low_back_pain

Zawn, V. (2019). *What causes flank pain?* Retrieved from https://www.medicalnewstoday.com/articles/324592