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Effect of office chair design on users' response to pain

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Abstract

Only a fraction of several Office Chair Designs (OCDs) attempt to address the numerous musculoskeletal (MS) (as opposed to aesthetics) concerns of users with prolonged sitting. This study seeks to find the OCDs whose prolonged usage offers longer-lasting comfort before body-part pain and muscle fatigue set in. Self- administered questionnaires were purposively distributed electronically to voluntary office workers to collect their demographic information, chair type and time to discomfort in selected eight body parts during chair usage. Fifteen OCDs in the survey were grouped into 5 (3 designs each) and statistical analyses gave the proportional distribution of the OCDs according to the participants' job status as well as measures of comfortability of the chair usage. There were 426 participants, 56% male, with modal age range of 51-60 yrs; comprising 83% regular computer users, 46% with knowledge of Ergonomics. Generally, OCD group-3 had the highest usage, while groups 4 and 5 had negligible number of users. Longest comfortability was found in groups 1 and 3, but least in group 5. Design 7 ranked the highest, while 10 ranked the lowest in comfortability. Discomforts were indicated in all 8 body parts relative to all the OCDs, but design 10 gave the most discomfort. There was positive correlation between the use of heavy-duty chairs with swivel. It took longer time to experience swollen leg (0.120), thigh pain (0.082) and buttock pain (0.097) during the usage of OCDs group-1. Similarly, there is a positive correlation between the use of lighter chairs and delayed body response to neck pain (0.078), indicating that users of OCDs group-2 had more working time before they develop neck pain. Inverse correlations were found in regular wooden chairs usage and delayed body response to neck pain (-0.094), shoulder pain (-0.086) and lower back pain (-0.086). Similarly, plastic chairs usage gave negative correlation with the body delayed response to neck (-0.1) pain, shoulder pain (-.113) and lower back pain (-0.081). Generally, the design of heavy-duty chairs and lighter chairs with swivels have comfortability advantage over the non-padded wooden / plastic chairs and stools.

Keywords: Chair Designs; Musculoskeletal Discomfort; Office Workers; Heavy-Duty Chairs; Comfortability

1. Introduction

Office workers have jobs that require working in a sitting position, they therefore spend many hours sitting to perform tasks such as computer use, in person meetings, online meetings and phone conversations (Clemes et al., 2014, Waongenngarm et al., 2016; Arippa et al. 2022; Houghton et al., 2022). The human body responds to sitting, especially for prolonged period, in complex ways, and involves the anatomy and physiology of the sitter as well as the structure of the seat, the desk and the environment (Corlett, 2006). Thus, the interface of the sitter, the task and the chair is important in chair design, which is a function of user's bodily response. In any workplace, a sitter's posture becomes an important factor, especially if static positions are maintained for long periods of time (Cetin et al., 2020; Califano and Fiorillo, 2021). Posture and spinal stabilization are important considerations in the maintenance of a healthy back. The spine is stabilized by three systems: (i) a passive system, (ii) an active Musculoskeletal System (MSS), and (iii) a neural feedback system. Both standing and sitting postures require some support from the trunk muscles. The sitter's vertebral / spinal column is a modified elastic rod which provides both flexibility and stability to the human body. It has three

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mobile curves (cervical, thoracic and lumbar) and one rigid sacral curve (Hamill and Knutzen, 2009). The vertebral column in a standing subject has cervical lordosis, a thoracic kyphosis and a lumbar lordosis (Andersson et al., 1979).When sitting down, the knees and hips are flexed, and the pelvis rotates backward causing the lumbar lordosis to flatten and there is an increase in the load on the spine (Andersson et al, 1979; Mandal ,1981; Eklund and Corlett (1987). However, forward slumping by a sitter to reduce the load on spine leads to elimination of lumbar lordosis and an increase in the included angle at the hip due to relative forward rotation of the hip (Eklund and Corlett, 1987). The interactions of the spine, the muscles and the spinal discs are important when studying sitting postures (Corlett, 2006).

Some advantages of sitting during work activities when compared with standing include but not limited to lower energy consumption, reduction in fatigue, mechanical stress of the lower extremities and the hydrostatic pressure associated with lower extremity circulation (Nachemson and Morris, 1964; Andersson et al., 1974). In all seated workstations, chair is an indispensable tool that acts as a primary support system and puts its users in contact with their worktop (Dainoff, 1999). However, an ergonomically designed work-seat aims not just to put the user in contact with his workstation, but also that it should do so comfortably, safely, healthily and efficiently for maximum production (Corlett, 2006; Bridger, 1995; Bai et al., 2024). A well-designed chair is therefore important for providing optimal support because in unsupported seating, the lumbar spine moves into kyphosis, while the center of gravity of the upper trunk shifts to the lumbar spine and disc pressure increases as the lumbar spine moves from lordosis to kyphosis (Reinecke and Hazard, 1994).

Sitting has been found to be the primary posture for most sedentary workers in developed countries (Clemes et al., 2014; Califano and Fiorillo, 2021) and this is also true for virtually most office workers in developing countries. Alkhajah et al. (2012) reported that most employed adults (>50% of world's population) spend one-third of their life at work. Moreover, office-based workers spend more than half of their working day seated in a sedentary community (Dunstan et al., 2012; Pronk et al., 2012). Thus, there are several Office Chair Designs (OCDs) to meet the sitting needs of these workers. These different designs have attempted to address the numerous Musculoskeletal (MS) concerns with prolonged sitting. However, some of the chair-design features are concerned more with aesthetics than the functional value to reduce MS concerns (De Carvalho and Callaghan 2023). Several chair designs have been developed for office seats with goals ranging from improving productivity, aesthetics and comfort, to minimizing pain and muscle fatigue (Pynt, 2015; Shesham et al., 2023; Chen and Zhang, 2025). Chair designers have attempted to address numerous MS concerns of sitting for prolonged periods of time.Users are required to be in constant motion during dynamic chair usage but in active chair usage, the sitter provides the action to move the chair using the chair mechanism (Pynt, 2015). Cardoso et al. (2021) reported several studies that investigated different chairs for different reasons. van Dieen et al. (2001) investigated the effect of two different dynamic chairs on trunk kinematics, trunk extensor Electromyography (EMG) and spinal shrinkage. Ellegast et al. (2012) compared four dynamic chairs for their impact on trunk muscle activation, physical activity and posture. Triglav et al. (2019) investigated the physiological and cognitive effects of using a multiaxial chair versus a traditional office chair. Kuster et al. (2018) investigated an inverted chair, an active stool and a standard office chair. Synnott et al. (2017) evaluated an active forward–inclined saddle chair and a static office chair. Snarr et al. (2019) compared the same saddle chair to a stability ball and a standard wooden chair. Holmes et al. (2015) evaluated an active chair that simulated a stability ball (multiaxial chair).

Zemp et al. (2016) reported other studies that analysed office chairs and different sitting positions by means of EMG (Gregory et al., 2006; Kingma and van Dieen, 2009), magnet resonance imaging (Baumgartner et al., 2012; Fryer et al., 2010; Zemp et al., 2013), leg/foot swelling evaluation (Bendix et al., 1985; Chester et al., 2002), motion tracking systems (Ellegast et al., 2012; Kingma and van Dieen, 2009; van Dieen et al., 2001), spinal shrinkage (Kingma and van Dieen, 2009; van Dieen et al., 2001), X-ray (Åkerblom, 1948; Schoberth and Hegemann, 1962), intra-disc pressure (Andersson and Ortengren, 1974; Rohlmann et al., 2001), subjective comfort/discomfort ratings (Carcone and Keir, 2007; Gregory et al., 2006; Alnasaser et al., 2009; Groenesteijn et al., 2009), and pressure distribution measurements of the seat pan and the backrest (Carcone and Keir, 2007; Groenesteijn et al., 2009; Li et al., 2020).

Outcomes of some other studies includes but not limited to office chair with a split seat pan design shows potential to yield biomechanical and physiological benefits for the sitter (Cardoso et al. 2021), Pressure distribution measurements with different office chairs are strongly influenced by different material properties and geometry of the padding material (Zemp et al. 2016). Important ergonomic design features of chairs include a rounded front edge of the seat pan, so that the blood circulation in the legs is not cut off, a back rest angle adjustable to about 120 degrees, a cushioned seat pan and back rest, and support for the legs (Helander, 2003; Sydor and Hitka, 2023).

Prolonged sitting on uncomfortable chair introduces great loads to various parts of the body which may lead to injury (Bendix, 1994; Gross et al., 1994). Millions of office workers use seats that match national or international standards, but are nevertheless damaging to the users' health (Corlette, 2006). Since there are no nerve endings in the discs, chair users are unaware of the increase in disc pressure of about 40-50% during chair usage as compared to standing (Akerblom 1948, Andersson et. al., 1979). There are different reports on attesting to the fact that sitting, chair, and their enabling factors have been extensively studied in the advanced countries but literature is sparse on these issues from Africa (Legg et. al., 2002, Van Dien et. al., 2001). This study from a sub-Sahara African country is therefore designed to identify some of the chairs used in some select office settings and analyse the users' responses to the effect of using the chair design.

2. Methodology

Self-reported surveys were distributed electronically via the google questionnaire to voluntary participants who reported to be computer literate. This study captured office workers alone since they are the exact people who use one type of chair or another in their regular work-a-day jobs. More specifically, the eligibility criteria for inclusion were that participant must not be bound to wheelchair, must have no known musculoskeletal injury, must not be a retiree but must be a healthy office worker. The self-administered questionnaire first introduced the purpose of the study to the participant. The questionnaire survey was clustered into three main parts: demographic information, choice of pictorial chair from fifteen different ones and the indication of discomfort time. Respondents were required to first supply all necessary demographic information like age, gender, job status, years in service, daily sitting time, self-reported knowledge about Ergonomics, and periodic posture adjustment. Next, was the choice of a chair that looks exactly like what the responder used in the office. Still pictures of different, commonly used office chairs in Nigeria were supplied in the questionnaire from which the responder was to pick just one. Lastly, each responder indicated the time it took (from a given list) to feel discomfort in the indicated body parts, while using the chosen chair. The body parts were legs, neck, shoulders, back of the thigh, lower legs, feet and buttocks according to literature (Eklund and Corlett, 1987).

The information from the survey were later analysed with STATA giving the descriptive statistics of the study population demography. For easy assessment, the 15 OCDs used in the survey were grouped into 5 and presented in Table 2 as (i) Heavy-duty chairs with swivel comprising chairs 2, 5 and 8 (ii) Lighter chairs with swivel comprising chairs 3, 4 and 12 (iii) Padded chairs with armrest comprising chairs 1, 6 and 7 (iv) Regular wooden chair comprising chairs 9, 14 and 15 (v) Stools and plastic chair comprising chairs 10, 11 and 13. Descriptive statistics were also used to get the proportional distribution of the different OCD preferences according to the office workers' job status. The frequency and the percentage population usage of each OCD were equally provided. The average values of the reported pain response time by the study participants for each body parts were calculated and recorded against each OCD excluding the ones with less than 1.5% user population (exclusion criterium). The OCDs were later ranked and tabulated against the body parts. To measure the degree of association between each chair design and the body part discomfort response time, inferential statistics were engaged using correlation coefficient to analyse the survey data. This was to check the underlying relationship between the OCD and the body response to pain.

3. Results

There were 426 chair user respondents whose demographic data is presented in both Table 1 and Figure 1. Table 2 shows the different Office Chair Design (OCD) groups and their assigned experimental number. The proportional distribution of chair preference by job status is presented in Table 3, while Table 4 shows the frequency and population usage of the OCD. The pain response time in the different body parts vs the OCDs is presented in Table 5, while Table 6 presents the OCD ranking according to the body part pain response time. The correlations between OCD and discomfort response time are presented in Table 7.

Table 1 Demographic information of the respondents

Data	**Respondent percentage (%)**					
Gender	Male 55.6%			Female 44.6%		
Job Status	Teaching 31.9%	Non – teaching 14.3%	Banker 14.8%	Other office workers 38.9%		
Age (yrs)	21-30 14.1%	31-40 19.7%	41-50 29.8%	51-60 31.5%	61-70 4.5%	71-80 0.5%
Service years	1-10 33.3%	11-20 34.5%	21-30 23.5%	31-40 8.2%	41-50 0.5%	
Workspace tool	Chair and Table only 6.6%	Chair, table and papers 10.6%	Chair, table, papers Computer 82.9%			
Office sitting time (hrs)	1- 3 19%	>3-5 29.8%	>5-7 29.1%	>7-9 16.9%	>9-11 6.1%	

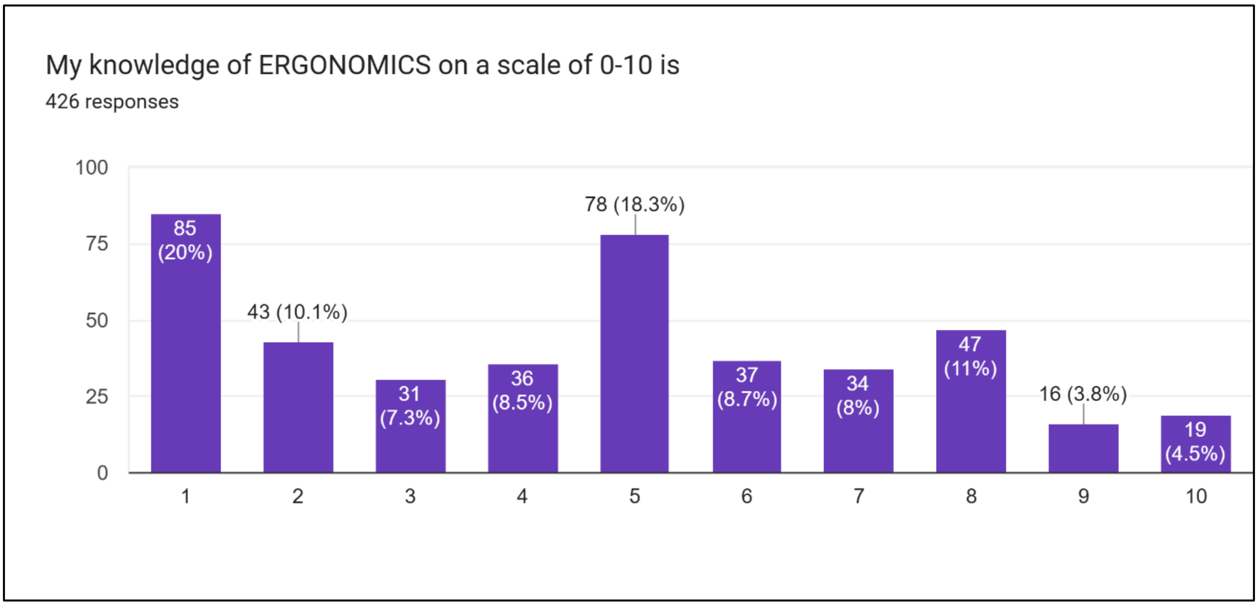

Figure 1 Ergonomic awareness on a scale of 1-10 among respondents

Table 2 Different designs of the chairs used in this study

Chair group	Experimental Chair and Number
Heavy-duty chairs with swivel	2  5  8 
Lighter chairs with swivel	3  4  12 
Padded chairs with armrest	1  6  7 
Regular non-padded wooden chair	9  14  15 
Stools and plastic chair	10  11  13 

Legend of Table 2. Experimental chair number and name

1. Executive leather chair	6. Leather upholstered wooden chair	11. Classic solid wood stool
2. Executive chair	7. Fabric upholstered wooden	12. Mid back mesh Office chair
3. Ergonomic chair	8. Heavy duty office chair	13. Plastic stool
4. Chrome Panel high back chair	9. Seating wooden chair	14. Vintage classic school chair
5. Conference chair	10. Elite plastic chair	15. Wood chair with ladder back

Table 3 Proportional Distribution of Chair Preferences by Job Status

Job Status	Chair Design					
	Padded chair with armrest	Heavy duty chairs with swivel	Lighter Chairs with swivel	Stools and plastic chairs	Regular wooden chairs	Total
Teaching	56.62	26.47	9.56	2.94	4.41	100.00
Others	52.04	18.37	22.45	5.10	2.04	100.00
Office Workers	38.81	32.84	26.87	1.49	0.00	100.00
Non-Teaching	34.43	34.43	16.39	9.84	4.92	100.00
Banker	7.94	20.63	71.43	0.00	0.00	100.00
Average	42.35	25.88	25.41	3.76	2.59	100.00

Table 4 Usage frequency and percentages of the different chairs selected by the study participants

Chair design	Frequency	% Population usage
7	73	17.18
3	68	16.00
6	55	12.94
1	52	12.24
8	49	11.53
4	38	8.94
2	31	7.29
5	30	7.06
10	12	2.82
9	6	1.41
11	4	0.94
15	3	0.71
12	2	0.47
14	2	0.47
Total	425	100.00

Table 5 Chair Design vs Body Parts Pain Time response (mins) reported by the study's participants

Chair design no	Body Parts Pain Time response (mins)							
	swollen legs	neck	shoulder	thigh	lower legs	lower back	feet	buttocks
8	273	228	235	239	247	220	246	222
5	270	220	236	244	234	229	238.	234
2	269	255	257	265	265	259	255	259
6	264	236	256	243	260	237	260	242
4	253	229	243	245	251	231	237	213
3	252	247	241	231	234	221	234	221
7	252	210	224	228	233	225	228	206
1	245	229	231	239	239	234	233	225
10	240	195	195	215	220	205	215	195

Table 6 Chair design ranking according to pain response time

Body Parts	Position of Chair Design Number								
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th
Swollen legs	8	5	2	6	4	3	7	1	10
Neck	2	3	6	4	1	8	5	7	10
Shoulder	2	6	4	3	5	8	1	7	10
Thigh	2	4	5	6	8	1	3	7	10
Lower legs	2	6	4	8	1	5	3	7	10
Lower back	2	6	1	4	5	7	3	8	10
Feet	6	2	8	5	4	3	1	7	10
Buttocks	2	6	5	1	8	3	4	7	10

Table 7 Correlation Coefficients of chair design and the discomfort response time

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Heavy-duty chairs with swivel	1.000												
(2) Lighter chairs with swivel	-0.345***	1.000											
(3) Padded chair with armrest	-0.507***	-0.500***	1.000										
(4) Regular wooden chairs	-0.096**	-0.095**	-0.140***	1.000									
(5) Stools and plastic chairs	-0.117**	-0.115**	-0.170***	-0.032	1.000								
(6) Swollen legs	0.120***	-0.044	-0.038	-0.062	-0.025	1.000							
(7) Neck pain	0.039	0.078***	-0.055	-0.031	-0.100**	0.596***	1.000						
(8) Shoulder pain	0.042	0.029	-0.004	-0.048	-0.113**	0.606***	0.818***	1.000					
(9) Thigh pain	0.082*	-0.020	-0.015	-0.063	-0.050	0.536***	0.646***	0.672***	1.000				
(10) Lower legs pain	0.061	-0.019	0.020	-0.094**	-0.070	0.568***	0.615***	0.626***	0.753***	1.000			
(11) Lower back pain	0.044	-0.034	0.035	-0.042	-0.081*	0.479***	0.633***	0.642***	0.781***	0.765***	1.000		
(12) Feet pain	0.067	-0.032	0.019	-0.086*	-0.060	0.604***	0.585***	0.638***	0.695***	0.797***	0.722***	1.000	
(13) Buttocks pain	0.097**	-0.041	0.003	-0.086*	-0.067	0.466***	0.591***	0.584***	0.625***	0.649***	0.719***	0.676***	1.000

***, ** and * represent significance levels at 1%, 5% and 10%, respectively.

Kindly let the figures and sign in each cell of Table 7 be on a single line please. Thank you

4. Discussion

From the 426 respondents, 56% were male, while 45% were female (Table 1). As office workers, all respondents used chairs, signifying that sitting is the primary posture for workers. This agrees with the findings of Clemes et al. (2014); Jans et al. (2007); Califano and Fiorillo, 2021).The modal age is between 51- 60 yrs followed by 41-50 yrs. Their modal service year is 11-20 (34.5%) range. Approximately 83% of the respondents were personal computer users in addition to table and chair in their workspace. This might account for the prolonged sitting in a range of 3-7 hrs out of the 8 office hrs (Table 1). This is in line with the previous studies of Clemes et.al. (2014) that computer users exhibit prolonged sitting). Sitting for moderate continuous period of 40 minutes can lead to higher body discomfort (Jia and Nussbaum, 2018). Prolonged sitting leads to discomfort in the neck, upper back, low back and buttocks (Waongenngarm et al., 2016). Ergonomics knowledge is generally poor among the respondents because only 46% of them are above average on a scale of 1-10 (Figure 1). Lack of the application of ergonomics knowledge might account for why respondents are engaged in long time sitting (Izza, et al., 2024). The pictures and names of the different chair designs used in the study are presented in Table 2. The 15 chairs were grouped into five according to their design as heavy-duty chairs with swivel (2,5,8), lighter chairs with swivel (3,4,12), padded chairs with armrest (1,6,7), regular wooden chair (9,14,15) as well as stools and plastic chair (10, 11,13).

Group 1 OCDs are large, overstuffed for maximum comfort, upholstered with leather. They have a very high back rest, casters, swivel mechanism, rounded “waterfall” seat as well as adjustability for seat, lumbar support and backrest. Compared with group 1, group 2 OCDs are built of lighter materials and equipped with inferior lumbar support and casters. Their seats are flat and less rounded at the edge; their adjustability mechanism is for the seat height and not the backrest. Group 3 OCDs have fixed legs of either light chrome or wood, they lack adjustability mechanism, and their seat and backrest are lightly upholstered with fabric or cheap leather. Group 4 OCDs are straight sit-up wooden chairs with very light or no padding at all. One of them has stack ability feature, metal legs but wooden seat and backrest. Group 5 consist of a plain plastic chair, wooden stool and plastic stool. They have no padding nor adjustability features. Groups 1-3 have different arm rests while groups 4 and 5 lack arm rest. Table 3 shows the proportional distribution of chair preferences by job status. While the bankers had the highest percentage of 71.43 in light chairs with swivel, teachers had their highest percentage of 56.62 in padded chair with armrest. Although the general usage of plastic and wooden chairs was relatively low, bankers have no usage record of them, but other class of workers did. The frequency and percentage population usage of each chair design is presented in Table 4 excluding design number 13 that had no user. Design 7 had the highest value of 73 (17.18%), while designs 12 and 14 were the least and had a tie of 2 (0.47%). The chairs with over 10% population usage belong to groups 1-3 of Table 2 and they have either swivel or armrests in common.

Considering Tables 1 and 4, group 3 (Table 1) had the highest usage in the hierarchy of the first 5OCDs, while group 4 had the lowest usage in the last 5OCDs (table 4). Design 7 had the highest usage, while OCD 13 had no user among the respondents. Of the 425 respondents, 73 were OCD7 users, while just 2 were users of OCD14, same as OCD 12. Out of the 5 groups of the 15 OCDs, groups 4 & 5 had negligible number of users. The chair designs with less than 10 users in Table 4 are excluded in further analysis because of characterological phenomena (Wely, 1970). Design 1-10 excluding 9 are therefore shown on Table 5 with their corresponding Pain Response Time (PRT) in different body parts. The chosen body parts were based on the pain body parts by established previous studies (Cardoso et al., 2021). Eight body parts were considered for pain report in this study. The PRT as indicated by the chair user is the duration of safely using a chair without any form of discomfort; longer duration is synonymous with longer comfortability. Ranking position (1st-9th) is on the topmost row, the body parts are on the 1st column, while the OCD numbers are on columns 2-10; rows 2-9. All eight body parts PRT were each arranged with the OCD showing their corresponding ranking according to their comfortability (Table 6). Table 6 shows that OCD 10 came last with the lowest PRT followed by OCD-7. OCD- 2 had the highest PRT followed closely by OCD-6. A user is likely to sit comfortably on OCD-2 for a longer time (compared with other OCDs) before feeling any discomfort in the neck, shoulder, thigh, lower legs, lower back and buttocks. On the other hand, OCD-10 usage would make the user feel pain/discomfort in all eight body parts within a relatively short time.

Distribution of chair preferences by job status indicated that the chairs with swivel were mostly used by bankers, while padded chairs with armrest were most common to the respondents in teaching job. The non-teaching and office workers were the highest users of heavy-duty chairs with swivel. While the OCDs in groups 1, 2 and 3 had reasonable users, the OCD groups 4 and 5 had extremely lower number of users. Teaching involves some sedentary behaviour which will require certain level of comfort, but because this job is not a high paying one, most workers in this category use relatively less expensive padded chairs with armrest like OCD 1, 6 and 7. People in other professions (except bankers) have close range results for this group of chairs. Thus, this chair group has the highest average of 42.35 %. Although bankers mostly use chairs with swivel, the results show that while 71.43% of their population use the cheaper, lighter chairs with swivel, only 21% of them use the executive chairs with swivel. It can then be deduced that the cheaper chairs are for the low-level bankers (majority), while the more expensively constructed chairs are reserved for the top executives. The more expensive a chair design is, the less affordable and the smaller the number of users. This implies that affordability is a key factor in the choice of chair design for workers looking for sitting comfort.

In the body parts-pain time response Table 5, chair design 2 had the highest pain time response frequency in six out of eight body parts, while chair 10 had the lowest time response in all the body parts followed by design number 7. The OCDs 10 and 7 have no lumbar support but rigid back rest that only allows for upright sitting. Moreover, chair 10 has no padding which has been reported by Zemp et al. (2016) to influence the pressure distribution of office chair usage. It could then be deducted that users would likely feel pain quicker in their body parts when using OCD 10 followed by OCD 7, while it will take a much longer time to feel the same pain, while using OCD 2. However, the usage of OCD 2 will give quicker swollen legs and feet compared with other body parts.

4.1. Distribution of Chair Preferences by Job Status

Table 3 reveals notable differences in chair preferences across job categories. The type of chair used in an office is believed to significantly influence the comfort, mobility and ergonomics in seating choices (Alnasaser et al., 2009; Groenesteijn et al., 2009, Curran et al., 2015 and Fitrianto et al., 2025; Pagliari et al. (2025). For teaching staff, our findings showed that the padded chair with armrest is the most common choice (56.62%), reflecting the need for comfort during long hours of sitting. In addition, heavy-duty chairs with swivel (26.47%) are also commonly used as compared to the other 3 OCDs. However, the relatively low usage of regular wooden chairs (4.41%) supports the preference for more ergonomic seating. Balancing price, affordability with comfort plays a good role in these results. The non-teaching staff show a similar trend, with a strong preference for heavy-duty chairs with swivel (34.43%) and padded chairs with armrests (34.43%), indicating a balance between comfort and mobility. The usage of lighter swivel chairs (16.39%) also suggests that flexibility in seating is valued, particularly for roles requiring a variety of tasks. Since administrative staff's job involves more sedentary behaviour, they tend to choose a more comfortable chair design (Pagliari et al., 2025).

Bankers, however, displayed a clear preference for lighter chairs with swivel (71.43%), likely due to the need for flexibility and ease of movement within dynamic work environments. The low use of heavy-duty chairs with swivel (20.63%) further emphasizes the priority placed on lighter, more mobile seating in the banking sector. For office workers, the most commonly used chair is the padded chair with armrest (38.81%), followed by lighter swivel chairs (26.87%). The relatively low usage of heavy-duty swivel chairs (32.84%) indicates that the balance between comfort and mobility is key, but with less emphasis on durability compared to other groups. In the Other category, padded chairs with armrests (52.04%) are also the most popular, followed by lighter swivel chairs (22.45%).

4.2. Correlation of chair type and delayed body response to pains

This section examined the relationship between different types of office chairs and the time it takes for office workers to experience body pain after sitting. It offers valuable insights into how chair design affects comfort during prolonged sitting. The results from Table 7 showed the correlation analysis indicating a positive correlation between the use of heavy-duty chairs with swivel and the time it takes to experience swollen leg (0.120***), thigh pain (0.082**) and buttock pain (0.097*). This implies that workers whose work involves the use of this chair are more comfortable and it takes longer time for them to experience these kinds of body pains. The designs of heavy-duty chairs with swivel provide better lumbar support and reduce strain on the body, contributed to improved comfort over longer periods of sitting. Also, the rounded 'waterfall' shape of the seat ensures good blood circulation to the legs (Michel and Helander 1994) and backrest-seat angle adjustability mechanism restores lumber curve that otherwise would have flattened during sitting (Helander, 2003). Seat pan tilt conditions resulted in most neutral back posture in prolonged office sitting (De Carvalho and Callaghan, 2023). Similarly, there is a positive correlation between the use of lighter chairs and delayed body response to neck pain (0.078***), indicating that workers using this chair had more working time without the effect of neck pain. The average sizes of these chairs could be responsible for this unlike the heavy-duty chairs that are built to accommodate physically larger users of about 6'6" (who are not the average size users). This agrees with the findings of (Helander and Zhang, 1997) that fitting the chair size to the user's size would certainly reduce neck pain.

There is an inverse correlation between the use of regular wooden chairs and delayed body response to neck pain (-0.094**), shoulder pain (-0.086*) and lower back pain (-0.086*). Individuals who use regular wooden chairs are more likely to experience an early response to discomfort in these areas. Wooden chairs typically lack lumbar support, proper cushioning, and the adjustability needed to support the natural curvature of the spine. Without these features, prolonged sitting on wooden chairs can lead to increased muscle strain and poor posture, which may exacerbate the development of musculoskeletal discomfort. Similar result was also obtained for the use of plastic chairs, with negative correlation, with the body delayed response to neck (-0.1**) pain, shoulder pain (-.113**) and lower back pain (-0.081*). This agrees with the finding of Helander (2003) that comfort is based on aesthetics and plushness of chair design.

5. Conclusion

All the chairs used in this study were reported to give sitting-induced pain to study participants and this agrees with the findings of De Carvalho and Callaghan (2023). Thus, interventions targeted to sitting-induced pain are called for. This means that irrespective of the type of chair used in the office, workers are prone to discomfort and body pains when sitting is prolonged. This agrees with the findings of Jia and Nussbaum (2018). Therefore, interrupting prolonged sitting with short periods of standing is more ergonomical, and may help reduce musculoskeletal discomfort instead of investing in "ergonomic" chairs (Fitrianto et al., 2025). Generally, the design of heavy-duty chairs and lighter chairs with swivels have comfortability advantage over the non-padded wooden / plastic chairs and stools.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors hereby aver that they have no conflict of interest to declare.

Statement of Ethical Statement

Ethical approval for this study was sought and obtained from the Science and Technology Research Ethics Committee (STREC) of the University of Ibadan, Ibadan, Oyo-State, Nigeria.

Statement of Informed Consent

The study was an online self-administered questionnaire which only consenting adults participated in.

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