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Prevalence, correlates and risk factors of musculoskeletal disorders among Nigerian physiotherapy and architecture undergraduates

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Physiotherapy students are vulnerable to sustaining Musculoskeletal Disorders (MSD) due to manual handling activities. Also, Architecture students who frequently adopt awkward postures while using the drawing board may equally be exposed to some risks of MSD. The degree of MSDs and their precipitating factors among these cohorts have not been empirically compared. This study therefore assessed and compared the prevalence of MSD, its correlates and risk factors among undergraduates in a Nigerian University. This was a cross-sectional study of 200 undergraduates from Architecture and Physiotherapy departments. Musculoskeletal Disorders, General Health (GH), Perceived Stress (PSS) and Emotional intelligence (EI) were assessed using standard scales. Data obtained were analyzed using descriptive statistics, chi-square, Spearman rank correlation and binomial logistic regression at α = 0.05. The total prevalence of MSD was 77% (78 and 76% for Architecture and Physiotherapy students respectively). There was a significant association between Knee MSD and department of study (X2 = 5.604, p = 0.018). There was a significant correlation between Neck MSD and duration on the drawing board (r = -0.244, p = 0.043). MSD was significantly predicted by each of the length of sleep (OR = 0.128; p = 0.034), weight (OR = 1.471; p = 0.036), height (OR = 19.510, 0.037), BMI (OR = 12.547, p = 0.037), EI-self management (OR = 5.136; p = 0.032) and EI- social awareness (OR = 5.918; p = 0.015). Conclusively, there is a high prevalence of MSDs among undergraduate Physiotherapy and Architecture students. Length of sleep, emotional intelligence, weight and height are important predictors of MSD in this population.

Key words: General health, perceived stress, emotional intelligence, anthropometry.

INTRODUCTION

Musculoskeletal disorders (MSDs) are defined as muscular pain or injuries to the human support system that can occur after a single event or cumulative trauma, negatively impacting daily activities (Gupta et al., 2014). MSDs are the major causes of severe long-term pain and disability (Woolf et al., 2010; Woolf and Pfleger, 2010), productivity loss (Martimo et al., 2009), and reduced quality of life (Roux et al., 2005; Carmona et al., 2001), which can lead to reduced educational attainment among students (Abledu and Offei, 2015). MSD can range from pain in the upper limbs, such as the forearm and wrist, to postural muscles such as the upper and lower back, neck and shoulders as well as lower extremities such as hips, thighs, knees and ankles (Thomas, 2002) and has several risk factors.

The risk factors of MSDs can be classified as psychosocial factors (such as emotional intelligence, perceived stress, mental fatigue etc.), personal factors (such as age, weight, height, BMI etc.) and occupational factors (such as manual material handling, static loading, work pace, repetitive movement, awkward postures etc.). Emotional intelligence defined as the ability, capacity, skill, or self-perceived ability to identify, assess, and manage the emotions of one's self, of others, and of groups (Serrat, 2017); has been found to be associated with musculoskeletal disorder prevalence among petrochemical repair and diary factory workers (Ahmadi et al., 2016). Also, perceived stress (Abdullah et al., 2017) and general health (Alexopoulos et al., 2003), are independently associated with MSDs among health workers.

MSDs are common among health workers and studies have shown that Physiotherapists are vulnerable to sustaining MSDs as their job tasks often involve lifting (of patients), bending, twisting, stooping, carrying, pushing or pulling, prolonged standing and application of manipulative force (Abdullah et al., 2017; Alexopoulos et al., 2003; King et al., 2009; Punnett and Wegman, 2004; Cromie et al., 2001). Several studies have reported high prevalence of MSD among physiotherapist, with 85% prevalence in Turkey (Salik and Ozcan, 2004), 91% in Australia (West and Gardner, 2001) and 91.3% in Nigeria (Adegoke et al., 2008). About 60% of musculoskeletal problems among physiotherapists occur as a consequence of work-related MSDs (Campo et al., 2008; Cromie et al., 2000). Vincent-Onabajo et al. (2016) opined that the exposure to many of these physiotherapy work activities commences from the period of undergraduate training thus making MSDs a likely occurrence among physiotherapy students who are exposed to high workload (Adeniyi et al., 2013). In the study by Vincent-Onabajo et al. (2016) 45.5% of physiotherapy undergraduate had low back pain. Given that Low back pain is only an aspect of the general MSDs; an assessment of the general MSDs of Physiotherapy undergraduates may be more revealing. There is a dearth of literature on the prevalence and the risk factors associated with general MSD among Physiotherapy undergraduates especially in developing countries like Nigeria where there is less automation of treatment techniques.

The prevalence and risk factors associated with general MSDs among population of Architecture undergraduates in Nigeria are also unknown. This group of students have been observed to adopt some degrees of constrained body position while drawing and are usually exposed to high work pace (working on the drawing board for hours) on high sitting, without back support, no foot rest and with forward flexion of the spine. It was therefore hypothesized that the Physiotherapy Students (exposed to static loading in standing while on daily clinical rounds) would not have similar prevalence and risk factors of MSDs as their Architecture counterparts (exposed to constrained body posture and high work pace). This study therefore assessed and compared the prevalence of MSD among Physiotherapy and Architecture Students in Nigeria and also determined the risk factors associated with MSDs in this population.

MATERIALS AND METHODS

Participants

Undergraduates recruited from the departments of Medical Rehabilitation (Physiotherapy Students) and Architecture, University of Nigeria participated in this study. The Physiotherapy students were randomly selected using a generated sample frame (from their department's register) and table of random numbers. In situations where the selected sample was not eligible or willing to participate, an additional sample was randomly drawn from the sampling list. Thereafter, age- and sex-matched Architecture students were selected from the department of Architecture. The two groups of participants were matched in order to eliminate possible cofounders.

Eligibility criteria

Only students in their second, third or fourth year of study were included in this study. The first year Physiotherapy students were on a campus different from students in other arms. Secondly, the

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first year Architecture students were not exposed to drawing on the board and their Physiotherapy counterpart do not have clinical exposure. Samples that met the inclusion criteria but had a neurological and/or structural deformity that would affect posture such as scoliosis were excluded from the study.

Instrument

The Nordic Musculoskeletal Disorder Questionnaire (NMQ) as developed by Kourinka et al. (1987) was used to assess regional and general MSD among the participants. NMQ has two sections: Section 1 is a general questionnaire of 40 forced-choice items identifying areas of the body causing musculoskeletal problems. Completion is aided by a body map to indicate nine symptom sites being neck, shoulders, upper back, elbows, low back, wrist/hands, hips/thighs, knees and ankles/feet. Respondents were asked if they had any musculoskeletal trouble in the last 12 months and last 7 days that prevented their normal activity. Section 2 contains additional questions relating to the neck, the shoulders and the lower back. Twenty-five forced-choice questions elicit any accidents affecting each area, their functional impact at home and work (change of job or duties), duration of the problem, assessment by a health professional and a musculoskeletal problem in the last 7 days. The test–retest reliability of NMQ is about 23% with a Validity of 0.8. Its sensitivity ranges between 66 and 92% and its specificity between 71 and 88%. General MSD was operationally defined as having an MSD irrespective of the anatomical region. For example, a participant with MSD of the neck only and a participant with MSD of the neck and knee were positively scored (1 = yes) for general MSD whereas a participant with no MSD in any region of the body was negatively scored (0 = no) for general MSD.

The General Health Questionnaire (GHQ-12) as developed by Goldberg and Hillier (1979) was used to assess the mental health of the participants. It is a self-administered questionnaire, with 12 items. Each item on the scale has four responses from “better than usual” to “much less than usual.” The GHQ scoring method was done using a Likert scale of 0-1-2-3. The scores were summed up by adding all the items on the scale ranging from 0 to 36. Some examples of the items in the GHQ-12 are: 1) been able to concentrate on whatever you are doing; 2) lost much sleep over worry; 3) felt constantly under strain; and 4) been losing self-confidence in yourself. Higher score of GHQ-12 indicates lower mental health status while lower score indicates higher mental health status. GHQ-12 has been found to have a high reliability score (85.2%) as well as optimal sensitivity (81.3%), a high specificity (75.3%) and a good positive predictive value (62.9%) among university students (Yusoff et al., 2014).

The Perceived Stress Scale (PSS-10) as developed by Cohen and Williamson (1988) was used to assess the participants’ perception of stress in life situation. It is a self-reported questionnaire with 10 items. The PPS items evaluate the degree to which an individual believes his/her life has been unpredictable, uncontrollable, and overloaded during the previous month. Each item was rated on a 5-point scale ranging from never (0) to almost always (4). Positively worded items were reverse scored, and the ratings were summed, with higher scores indicating more perceived stress. PSS-10 has an excellent (croncbach >0.78) internal consistency (Cohen, and Williamson, 1988; Remor, 2006; Roberti et al., 2006), and a good (r = 0.77) test retest reliability (Remor, 2006). It also has a high (r = 0.70) Criterion (SF-36) related validity especially for the mental component (Mitchell et al., 2008).

The Schutte Self-Report Emotional Intelligence Scale (SSEIS) as developed by Schutte et al. (1998) was used to assess the general Emotional Intelligence (EI) of the participants. It has four sub-scales (emotion perception, utilizing emotions, managing self-relevant emotions, and managing others’ emotions). The SSEIS is structured off from the EI model by Salovey and Mayer (1990). SSEIs is a 33-item self-report using a 1 (strongly agree) to 5 (strongly disagree) scale for responses. Each sub-test score was graded and then added together to give the total score for the participant. It has an excellent reliability rating of (croncbach = 0.90) for their emotional intelligence scale (Ciarrochi et al., 2001). The EI overall score, is fairly reliable for adults and adolescents; however, the utilizing emotions sub-scale has shown poor reliability. It has a moderate to high (r>0.50) correlations with the Big Five (concurrent and discriminant validity)(Petrides and Furnham, 2001).

Stadiometer with a weighing scale (SECA, Germany)

This is a combination of height metre and a weight scale. The weight scale component is callibrated from 0-160 kg while the height meter component is callibrated from 0-190 cm.This instrument measures height and weight to the nearest 0.1cm and 1.0 kg respectively. To avoid measurement error, height and weights were measured twice and their average scores were used (Ezeukwu et al., 2015).

Self developed interview guide

This was used to obtain demographic information, length of sleep, time spent on the drawing board, alcohol consumption status, smoking status and exercise status from the participants. Its psychometric properties were not tested because it was not developed for usage outside this study

Study design

The study had a cross-sectional exploratory matched research design. Participants from the two departments were matched for age, sex and level of study. The Physiotherapy students were recruited using a simple random sampling technique. The study adhered to the principles of the Declaration of Helsinki (World Medical Association, 2000). The minimum sample size was determined for the Physiotherapy students using a finite sample size formula (Solvin’s formula)(Yamane, 1967),

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

n = minimal sample size
N = total number of Physiotherapy Students (2nd yr – 4th yr) = 264
e = precision = 0.08
$n = 264 / 1 + 264 (0.08)^2 = 98.14$
Therefore, a minimum of 98 Physiotherapy students (2nd yr – 4th yr) were required for this study. Minimum sample size was not calculated for the Architecture students because this study had a matched design. Therefore, 98 Architecture students in 2nd, 3rd and 4th years were also requisite in this study.

Data analysis

The data obtained was cleaned and analyzed using statistical package for social sciences, version 20.0 (SPSS Inc. Chicago, IL, USA). Descriptive statistics of frequency, percentage, mean, standard deviation and charts were used to describe the participants. The difference in variables between Physiotherapy and

Table 1. Summary of Participants' Variables (categorical) for the various departments and combined (N = 200).

Variables	Archy(n = 100)		Physio (n = 100)		Total (N = 200)
	f (#%)	% total	f (#%)	% total	F (%)
Alcohol Consumers	56 (56.0)	54.9	46 (46.0)	45.1	102 (51.0)
Smokers	14 (14.0)	53.8	12 (12.0)	46.2	26 (13.0)
General MSDs	78 (78.0)	51.0	76 (76.0)	49.0	154 (77.0)
ADL Limitation	34 (34.0)	50.7	33 (33.0)	49.3	67 (33.7)
Trouble	25 (25.0)	41.7	35 (35.0)	58.3	60 (30.0)
Regional MSDs					
Neck	51 (51.0)	52.6	46 (46.0)	47.4	97 (49.0)
Shoulder	37 (37.0)	53.6	32 (32.0)	46.4	69 (34.7)
Elbow	21 (21.0)	56.8	16 (16.0)	43.2	37 (18.5)
Wrist/Hand	29 (29.0)	54.7	24 (24.0)	45.3	53 (26.5)
Upper Back	41 (41.0)	58.6	29 (29.0)	41.4	70 (35.0)
Low Back	38 (38.0)	50.0	38 (38.0)	50	76 (38.0)
Hip/Thigh	25 (25.0)	43.1	33 (33.0)	56.9	58 (29.1)
Knee	12 (12.0)	32.4	25 (25.0)	67.6	37 (18.5)
Ankle/Foot	20 (20.0)	51.3	19 (19.0)	48.7	39 (19.5)

Key: Archy – Architecture students, Physio – Physiotherapy students, MSD – Musculoskeletal disorder; ADL- Activity of Daily Living; Trouble - having problems (ache, pain, discomfort, numbness) in the previous 7 days, #% = f/n*100, % total = f/F*100.

Architecture students was assessed using paired t-tests. The association between MSD and other participants' categorical variables was analyzed using a Chi-square test while Spearman correlation was used to evaluate the relationship between the occurrence of MSD and the participants' continuous variables. Binomial logistic regression was used to determine the risk factors of MSD. The level of significance (α) was set at 0.05.

RESULTS

Summary of Participants characteristics

A total of 200 undergraduates (100 physiotherapy students and 100 age-, sex- and level-matched Architecture students) participated in this study. A greater proportion of participants (86%) were males. The Prevalence of General MSDs across the total population was 77.0% with the Architecture students (78.0%) having slightly higher MSDs prevalence than their Physiotherapy counterparts (76.0%). More students in the Architecture department (56.0%) reported consumption of alcohol than the Physiotherapy students (46.0%). However, more Physiotherapy students (35.0%) reported to have had a recent MSDs troubles than the Architecture students (25.0%). While more Architecture students (58.6%) reported MSD of the upper back than the Physiotherapy students (41.4%), more Physiotherapy students (67.6%) had MSDs at the knee region than their Architecture counterparts (32.4%) as shown on table 1.

Mean distribution of participants' variables

The mean ages of Architecture and Physiotherapy students were similar (21.41 ± 2.67yrs). However, the mean lengths of sleep of the Architecture (6.37 ± 1.39 hrs) and Physiotherapy student (6.54 ± 1.71hrs) were not significantly different (t = -0.96, 0.340). The mean duration spent on the drawing board by the Architecture students was 8.65 ± 4.98hrs. The Architecture students had a slightly higher mean BMI (22.99 ± 3.33 kg/m^2) than their Physiotherapy counterparts (22.80 ± 3.42 kg/m^2) although the difference was not significant (t = 0.27, p = 0.786). The Architecture students (16.87± 5.26) had higher but non-significant mean score of General health than their Physiotherapy colleagues (15.72 ± 5.25). However, the Architecture students (18.77 ± 5.31) reported significantly higher perceived stress (t = 2.54, p = 0.013**)** than the Physiotherapy students (17.03 ± 5.81). The Physiotherapy students (67.92 ± 14.56) had a non-significantly higher mean score of emotional intelligence (t = -1.07, p = 0.287) than their Architecture counterpart (65.97 ± 11.15) as shown in table 2.

Association between participants' variables (categorical) and musculoskeletal disorder

There was no significant association between general MSD and the department of study (χ^2 = 0.001, p = 0.892),

Table 2. Mean Distribution of Participants' variables (continuous) for the various departments and combined (N = 200).

Variables	Architecture (n = 100)		Physiotherapy (n = 100)		Total (N = 200)		Paired t-test	
	Mean	SD	Mean	SD	Mean	SD	t	p
Age (yrs)	21.41	2.67	21.41	2.67	21.41	2.67	N/A	N/A
Length of Sleep (hrs)	6.37	1.71	6.54	1.39	6.45	1.56	-0.96	0.340
DOD (hrs)	8.65	4.98	N/A	N/A	8.65	4.98	N/A	N/A
MOE	24.48	17.39	28.93	21.56	26.79	19.73	-1.05	0.298
DOE	3.38	2.31	4.65	7.73	4.02	5.74	-1.02	0.311
Weight (Kg)	69.30	10.33	68.04	11.11	68.66	10.72	0.76	0.449
Height (m)	1.74	0.09	1.73	0.09	1.73	0.09	0.61	0.547
BMI (kg/m^2)	22.99	3.33	22.80	3.42	22.89	3.37	0.27	0.786
General Health	16.87	5.26	15.72	5.25	16.30	5.27	1.72	0.089
Perceived Stress	**18.77**	**5.31**	**17.03**	**5.81**	**17.90**	**5.62**	**2.54**	**0.013***
Emotional Intelligence	65.97	11.15	67.92	14.56	66.95	12.97	-1.07	0.287
EI (Self Awareness)	17.13	3.16	17.14	4.13	17.14	3.67	-0.02	0.984
EI (Self Management)	16.01	3.76	16.10	4.42	16.06	4.09	-0.15	0.878
EI (Social Awareness)	16.09	3.98	17.21	4.30	16.65	4.17	-1.89	0.062
EI (R/ship Management)	16.74	3.89	17.47	4.48	17.11	4.20	-1.26	0.211

Key: MOE- Minutes of Exercise, DOE - Days of Exercise, BMI- Body Mass Index, DOD - Duration on Drawing Board, EI – Emotional Intelligence.

but knee MSD had a significant association (χ^2 = 5.604, p = 0.018) with the department of study. There was a significant association between general MSD and Sex (χ^2 = 4.188, p = 0.041). Alcohol intake had no significant association with general MSD (χ^2=1.478, p=0.224) as well as with all the regional MSDs (p > 0.05) except neck MSD (χ^2 = 5.871, p = 0.015); haven experienced MSD troubles within the past seven days, it was significantly associated with alcohol consumption (χ^2 = 3.903, p = 0.048) and smoking (χ^2 = 8.092, p = 0.004). Also, smoking was significantly associated with the limitations in activities of daily living (χ^2 = 5.452, p = 0.020) as shown in Table 3.

Relationship between participants' physical characteristics (continuous) and musculoskeletal disorders

There was a significant but inverse correlation between general MSD and the age of the participants (r = - 0.201, p = 0.004). In like manner, there was a significant, inverse relationship between age and upper back MSD (r = - 0.204, p = 0.004) and Ankle/Foot MSD (r = -0.183, p= 0.010). Also, there was a significant, inverse relationship between low back MSD and length of sleep (r = -0.202; p = 0.004). While there was no significant relationship between weight and any of the general or regional MSDs, a significant relationship was seen between Neck MSD and each height (r = -0.169, p = 0.019) and BMI (r = 0.166, p = 0.021). There was also a significant but inverse relationship between duration on the drawing board for the Architecture students and Neck MSD (r = - 0.204; p = 0.043) as shown in table 4.

Relationship between participants' psychosocial characteristics (continuous) and musculoskeletal disorders

General musculoskeletal disorder had no significant relationship with any of the psychosocial characteristics of the participants (p > 0.05). However, there was a significant relationship between general health scores and each of the Neck MSD (r = 0.193, p = 0.006), Shoulder MSD (r = 0.192, p = 0.006), and Elbow MSD (r = 0.212, p = 0.003). Perceived level of stress had a significant relationship with each Shoulder MSD (r = 0.145, p = 0.041), Elbow MSD (r=0.160, p=0.024), Hip/Thigh MSD (r=0.146, p=0.04) and ankle/foot MSD (r=0.158, p=0.025). Also, the self awareness component of emotional intelligence was significantly related to lower back MSD (r = -0.147, p = 0.038). There was a significant relationship between the social awareness component of emotional intelligence and Shoulder MSD (r = - 0.154, p = 0.030). There was a significant relationship between lower back MSD and self awareness (r = -0.147, p = 0.038), relationship management (r = -0.188, p = 0.008) and total (r = -0.193, p = 0.006) components of emotional intelligence as shown in Table 5.

Table 3. Association between participants' variables (categorical) and musculoskeletal disorders using Chi-Square (N = 200).

Variables	χ^2 (P - Value)					
	Dept	YoS	Sex	MS	Alcohol	Smoking
MSD	0.001 (0.892)	5.429 (0.066)	***4.188 (0.041)**	3.563 (0.059)	1.478 (0.224)	0.762 (0.383)
ADL Limitation	0.01 (0.921)	2.054 (0.358)	0.034 (0.854)	0.510 (0.475)	1.954 (0.162)	***5.452 (0.020)**
Trouble	2.381 (0.123)	2.243 (0.326)	0.071 (0.790)	0.431 (0.512)	***3.903 (0.048)**	***8.092 (0.004)**
Neck MSD	0.505 (0.477)	4.509 (0.105)	0.274 (0.601)	0.965 (0.326)	***5.871 (0.015)**	0.907 (0.341)
Shoulder MSD	0.480 (0.488)	1.224 (0.542)	0.092 (0.762)	0.533 (0.465)	0.348 (0.555)	0.189 (0.663)
Elbow MSD	0.829 (0.363)	6.030 (0.049)	0.185 (0.667)	0.228 (0.633)	0.169 (0.681)	2.994 (0.084)
Wrist and Thigh MSD	0.642 (0.423)	0.462 (0.794)	0.072 (0.789)	0.362 (0.547)	0.097 (0.756)	0.280 (0.597)
Upper Back MSD	3.165 (0.075)	1.342 (0.511)	0.854 (0.347)	0.541 (0.462)	0.254 (0.614)	0.235 (0.628)
Lower Back MSD	0.001 (1.000)	2.325 (0.313)	0.326 (0.568)	0.616 (0.433)	0.049 (0.825)	0.235 (0.629)
Hip/Thigh MSD	1.446 (0.229)	0.649 (0.723)	0.271 (0.603)	0.413 (0.520)	0.725 (0.394)	0.433 (0.510)
Knee MSD	***5.604 (0.018)**	3.460 (0.171)	0.384 (0.536)	0.228 (0.633)	1.093 (0.296)	0.192 (0.661)
Ankle/Foot MSD	0.032 (0.858)	1.306 (0.521)	0.056 (0.813)	0.243 (0.622)	0.101 (0.751)	2.418 (0.120)

Key: MSD- Musculoskeletal Disorder, ADL- Activities of Daily Living, Dept = Department, YoS = Year of Study, MS = Marital Status.

Table 4. Relationship between participants' physical characteristics (continuous) and musculoskeletal disorders using spearman rank correlation (N = 200).

Variables	Correlation Coefficient r (p - value)									
	MSD	Neck MSD	Shoulder MSD	Elbow MSD	Wrist / Thigh MSD	Upper Back MSD	Lower Back MSD	Hip / Thigh MSD	Knee MSD	Ankle / Foot MSD
AGE (yrs)	*-0.201 (0.004)	-0.012 (0.868)	-0.040 (0.574)	-0.040 (0.574)	-0.025 (0.721)	*-0.204 (0.004)	-0.068 (0.335)	-0.051 (0.475)	-0.056(0.432)	*-0.183 (0.010)
LoS	-0.134 (0.059)	-0.012 (0.871)	-0.020 (0.786)	-0.019 (0.786)	-0.024 (0.739)	-0.128 (0.071)	*-0.202 (0.004)	-0.054 (0.446)	-0.097(0.172)	-0.163 (0.022)
DoD	-0.023 (0.813)	*-0.204 (0.043)	0.064 (0.528)	0.064 (0.528)	0.088 (0.383)	-0.073 (0.469)	-0.043 (0.668)	0.093 (0.359)	0.158 0.117)	0.024 (0.816)
MoE	-0.055 (0.480)	-0.065 (0.413)	-0.006 (0.942)	-0.006 (0.942)	-0.151 (0.054)	0.057 (0.466)	0.014 (0.854)	0.061 (0.438)	0.036 0.649)	0.127 (0.104)
DoE	0.016 (0.836)	-0.013 (0.862)	-0.062 (0.425)	-0.062 (0.425)	*-0.216 (0.005)	-0.044 (0.570)	0.134 (0.080)	0.041 (0.597)	0.078 0.311)	-0.050 (0.518)
WT (Kg)	-0.128 (0.076)	0.015 (0.834)	0.014 (0.847)	0.014 (0.847)	0.041 (0.571)	-0.017 (0.810)	0.040 (0.583)	0.110 (0.127)	-0.030(0.682)	0.020 (0.786)
HT(m)	-0.092 (0.204)	*-0.169 (0.019)	0.013 (0.860)	0.013 (0.860)	0.088 (0.222)	-0.090 (0.210)	0.038 (0.595)	0.036 (0.616)	-0.073(0.311)	-0.086 (0.231)
BMI (Kg/m^2)	-0.037 (0.614)	*0.166 (0.021)	0.033 (0.649)	0.033 (0.649)	0.013 (0.859)	0.058 (0.424)	0.022 (0.762)	0.118 (0.104)	0.089 0.219)	0.141 (0.051)

Key: LoS- Length of Sleep, DoD = Duration on the Drawing board, MoE- Minutes of Exercise, DoE- Days of Exercise, WT- Weight, HT- Height, BMI- Body Mass Index.

Regression model for general MSD for physiotherapy and architecture students

A logistic regression model was performed to ascertain the risks of smoking, alcohol intake, length of sleep, level of study, duration on the drawing board, anthropometrics (weight, height and BMI) and psychosocial variables (general health, perceived stress and emotional intelligence) on the likelihood that the participants have MSD. The logistic regression model was statistically significant (X^2 = 21.16; p <0.0001). The model explained 75.0% of the variance in MSD and correctly classified 88.9% of cases. Height and BMI had the highest odds of

Table 5. Correlation between Participants' Psychosocial Characteristics (continuous) and Musculoskeletal Disorders using Spearman Rank Correlation (N = 200).

Variables	Correlation Coefficient r (p - value)									
	MSD	Neck MSD	Shoulder MSD	Elbow MSD	Wrist / Thigh MSD	Upper Back MSD	Lower Back MSD	Hip / Thigh MSD	Knee MSD	Ankle / Foot MSD
GH	0.051 (0.470)	*0.193 (0.006)	*0.192 (0.006)	*0.212 (0.003)	0.017 (0.809)	0.103 (0.147)	-0.021 (0.771)	0.146 (0.040)	0.076 (0.282)	0.014 (0.849)
PSS	0.064 (0.369)	0.081(0.257)	*0.145 (0.041)	*0.160 (0.024)	-0.005 (0.939)	0.063 (0.379)	0.071 (0.320)	*0.146 (0.040)	0.073 (0.307)	*0.158 (0.025)
EI - Self Awareness	-0.053 (0.459)	-0.030 (0.678)	0.016 (0.828)	-0.014 (0.846)	0.060 (0.401)	0.019 (0.793)	*-0.147 (0.038)	0.012 (0.871)	0.037 (0.603)	-0.043 (0.548)
EI - Self Mgt	0.078 (0.271)	-0.075 (0.296)	0.013 (0.852)	-0.098 (0.169)	-0.019 (0.785)	-0.002 (0.981)	0.122 (0.086)	-0.063 (0.380)	-0.040 (0.574)	-0.062 (0.383)
EI- Social Awareness	0.093 (0.192)	-0.103 (0.149)	*-0.154 (0.030)	0.009 (0.904)	0.116 (0.103)	0.002 (0.980)	0.107 (0.131)	0.001 (0.989)	0.004 (0.960)	0.111 (0.118)
EI - Rship Mgt	0.056 (0.428)	-0.073 (0.305)	0.018 (0.797)	-0.089 (0.212)	0.042 (0.557)	0.098 (0.169)	*-0.188 (0.008)	-0.035 (0.619)	-0.033 (0.639)	0.010 (0.886)
EI – Total	0.077 (0.279)	-0.08 (0.262)	0.089 (0.209)	-0.058 (0.414)	0.057 (0.423)	0.051 (0.470)	*-0.193 (0.006)	-0.023 (0.750)	-0.008 (0.913)	-0.001 (0.990)

Key: GH- General Health, PSS- Perceived Stress, EI- Emotional Intelligence, Mgt- Management, Rship- Relationship.

developing MSD (OR = 19.510, p = 0.037 and OR = 12.547, p = 0.037 respectively). Other significant risk factors of MSD in this population were length of sleep (OR = 0.128, p = 0.034), weight (OR = 1.495, p = 0.036) and age (OR = 0.081, p = 0.025). Also, the self management (OR = 5.136, p = 0.032) and social awareness (OR = 5.918, p = 0.015) components of emotional intelligence significantly predicted the likelihood of developing MSD as shown in Table 6.

DISCUSSION

Globally, there is a high prevalence of musculoskeletal disorders (MSDs) (Woolf and Pfleger, 2010), which affect people of all ages, gender and socio-demographic background (Woolf et al., 2010). Undergraduates in a developing country like Nigeria may be exposed to some risk factors of MSDs due to reduced mechanization of tasks as well as poor awareness and knowledge of ergonomics that may culminate in habitual and prolonged sitting hours during lectures, awkward study postures, non-ergonomic compliant study environments, poor lifestyle habits, physical inactivity and inadequate exercise. This study revealed that a greater proportion of the students (over three-fourths) had MSDs in at least one anatomical region within the previous 12 months. This prevalence rate is similar to the prevalence rates reported in literature for college students that varied between 32.9 and 89.3% (Ekpenyong et al., 2013; Hayes et al., 2009). The MSD prevalence among these Nigerian undergraduates is higher than the 32.9 and 36.9% reported among students in Japan (Smith et al., 2002, 2003), but lower than the 83.3 and 80.0% reported among students in Korea and Australia respectively (Smith et al., 2005; Smith and Leggat, 2004). A high prevalence of MSDs was also observed in the different regions of the body particularly in the neck, shoulder, upper back and lower back regions of the participants. Similarly high prevalence of MSDs in these body regions among students have been reported among Korean and Australian students (Smith et al., 2005; Smith and Leggat, 2004).

Musculoskeletal Disorder of the upper back was more prevalent among the Architecture students than the Physiotherapy students whereas, more Physiotherapy students had knee MSD than their Architecture counterparts. This difference in MSD prevalence between these two groups of students may be as a result of the differences in their work postures. While the Architecture students sit more often when drawing, usually with forward flexion of their spine especially the upper back region; the Physiotherapy students stand more often during clinical rounds and by so doing bear most of their body weight on their knees (Guyton and Hall, 2006). There appear to be no study that compared MSD prevalence between similar groups of undergraduates. However, in a study by Harcombe et al. (2014) that compared MSD between New Zealand Nurses and office workers, the prevalence of knee MSD was higher among the nurses than the office workers. It is expected that the Nurses would adopt a standing work posture more often than the office workers who may more frequently adopt a sitting work posture. This difference in work posture as seen in the study by

Table 6. Prediction Model of MSD for physiotherapy and architecture students (N = 200).

Variables	Categories	n (N)#	Model Summary		Prediction Model	
			X^2 (p)	R^2 (C)	OR	P-value
Age	N/A	N/A			**0.081**	**0.025***
Sex	Male	63 (172)			1	0.997
	Female	9 (28)			2.248	
Length of sleep	N/A	N/A			**0.128**	**0.034***
Alcohol	No	31 (98)			1	0.095
	Yes	41 (102)			0.301	
Smoke	No	62 (174)			1	0.151
	Yes	10 (26)			0.029	
Weight (Kg)	N/A	N/A	21.16 (<0.0001)	0.75 (88.9%)	**1.495**	**0.036***
Height (m)	N/A	N/A			**19.510**	**0.037***
BMI	N/A	N/A			**12.547**	**0.037***
General health	N/A	N/A			0.572	0.090
Perceived stress	N/A	N/A			1.387	0.122
EI (self awareness)	N/A	N/A			0.179	0.052
EI (Self management)	N/A	N/A			**5.136**	**0.032***
EI (Social awareness)	N/A	N/A			**5.918**	**0.015***
EI (Relationship management)	N/A	N/A			0.505	0.107

Key: (*N*)#: Number of participants with MSDs (number of participants in each category); X2 (p): Chi-square (significance) of the model; R2 (C): Nagelkerke R Square (degree of classification) by the model; OR: the odds ratio of each predictor variable; P-value: significance of each predictor variable; N/A: Not Applicable; EI – Emotional Intelligence.

Harcombe et al. (2014) and the present study may possibly explain the observed differences in MSD prevalence. Further studies on the comparative effects of the standing and sitting work postures on MSD prevalence are therefore recommended.

There was no significant association between year of study and MSD. This may imply that the occurrence of MSD is independent of a student's year of study. This is in agreement with some studies (Smith et al., 2005; Smith and Leggat, 2004), that equally found no relationship between level of study and MSD in Korean and Japanese nursing students respectively. However, the study by Alshagga et al. (2013) reported a strong association between MSD and academic year among Malaysian Medical students. This difference in report may be due to difference in study design. While the study by Alshagga et al. (2013) assessed only neck, shoulder and low back pain among a more homogenous sample of Medical students, the present study assessed MSDs in all regions of the body among heterogeneous samples of Architecture and Physiotherapy students.

A significant association between MSD and smoking was observed; the result showed that students who smoked reported more MSD related complaints (ADL limitation and having troubles like ache, discomfort, numbness in the previous 7days). This result is in line with the findings of Palmer et al. (2003) and Brage and Bjerkedal (1996) that reported increased prevalence of MSDs among smokers than non-smokers. There was also a significant association between alcohol consumption and each of the neck MSD and a report of recent MSD trouble within the last 7 days. Alshagga et al. (2013) found a similar correlation, stating that Japanese nurses that reported intake of alcohol and tobacco had a higher prevalence of MSDs. Also, there was a significant association between sex of the participants and the occurrence of MSD with a higher MSD prevalence among the male participants. This finding contrasts with result of the study by Jung (2001) who reported a significantly higher ratio of females with work-related musculoskeletal symptoms than their male counterparts. The result of this present study on the association of MSD and sex should be interpreted with caution as majority of the participants were males. Further studies with equal distribution of male

and female participants are recommended.

There was a significant inverse relationship between age and MSDs of the upper back and ankle/foot; and age was a significant predictor of general MSDs. This implies that the younger students may have greater odds of having MSD especially at the upper back and foot. It is possible that the younger students who are usually in the lower classes may not have developed the adaptive skills or knowledgeable enough about correct work postures especially among those in Architecture department that reported higher proportion of students with upper back MSD. However this does not agree with some studies (Pransky et al., 2005; Werner et al., 2005; Lin et al., 2008), that reported that human functional capacity declines progressively with age and that several factors other than chronological age, such as level of physical activity and demands of work, tend to contribute more to MSD susceptibility during work. Similarly, there was a significant inverse relationship between length of sleep and lower back MSD; and length of sleep was also a significant predictor of MSD. This may imply that students with reduced sleep duration have greater odds of developing MSD especially low back MSD. Having adequate sleep reverses the progression of daily micro-trauma into a cumulative trauma (MSD)(Guyton and Hall, 2006). This is because adequate sleep gives the affected soft tissues adequate time to rest and regenerate (Adam and Oswald, 1984). Therefore, practices such as whole body relaxation, mental relaxation and adequate sleep among students should be encouraged so as to control the occurrence of MSDs in this population.

There was a significant relationship between duration on the drawing board for the architecture students and neck MSD. This may imply that spending more time on the drawing boards increases the odds of developing MSD especially in the neck region. This is similar to the results obtained by Nasrin et al. (2012) where the researchers concluded that some disorders were statistically associated with working hours. An inversely significant relationship existed between days of exercise and wrist MSD. This implies that participants, who engaged in exercise for longer days in a week, reported lesser MSDs especially that of the wrist than those that exercised for fewer days in a week. This is also in agreement with the study by Nasrin et al. (2012) that reported drivers who did not exercise regularly to have had more discomforts in their hands, fingers, knees, legs and ankles. Regular exercise is therefore recommended among undergraduates so as to limit the tendency of developing MSDs.

The result of this study further revealed a negative but significant relationship between neck MSD and height of the students; with height being a significant predictor of MSD. This may imply that the odds of developing MSD especially neck MSD is higher among students with smaller stature. This could be attributed to compensatory postures possibly adopted by student with smaller stature such as leaning forward and extending the neck in order to have better views of their work piece or work surface. This is in agreement with the work conducted among drivers by Sadeghi et al. (2000) that revealed a similar association between height and MSD. On the other hand, BMI had a positive significant relationship with neck MSD and was also a significant predictor of MSD. This suggests that increasing BMI may be a risk factor to the development of MSD especially in the neck region among this population. This agrees with the study by Moreira-Silva et al. (2013) in which they concluded that being overweight/obese was a significant predictor of shoulders MSD among factory workers. Also, Vijaya et al. (2013) findings which states that overweight dentists had greater MSD prevalence in the neck, further corroborates this finding.

There was a linear significant relationship between general health score and each of the neck, shoulder and elbow MSDs. Since higher scores of the general health questionnaire implies lower mental health status (Goldberg and Hillier, 1979) it therefore implies that the lower the mental health status, the higher the tendency of developing neck, shoulder and elbow MSDs and vice versa. This is supported by the findings of Akrouf et al. (2010) who reported a significant relationship between mental health measured using the general health questionnaire and MSD among bank workers in Kuwait. In the same vein, there was a significant relationship between perceived stress and MSDs in the shoulder, elbow, hip/thigh and ankle/foot. This implies that stress may be a predisposing factor in the development of MSD especially around the shoulder, elbow, hip/thigh and ankle/foot regions of the body. This observation is in line with the findings of Kim et al. (2013) and Chen et al. (2005). In the study by Adam and Oswald, (1984) they found a significant relationship between perceived occupational stress and work related musculoskeletal disorders among male Korean fire fighters. Also, in the study by Chen et al. (2005) a similar significant relationship was found between occupational stress and musculoskeletal pain among Chinese offshore oil installation workers. Therefore stress management program may be required among students to reduce the occurrence of MSD.

Finally, there was a significant but inverse relationship between MSD (low back and shoulder) and some components of emotional intelligence. The self management and social awareness components of emotional intelligence were significant predictors of MSD. This may imply that persons with greater emotional intelligence may be less susceptible to developing MSD in some regions of the body and so have lower odds of MSD. Persons with high level of emotional intelligence use mechanisms which help them to adapt to environmental changes (El-Sayed et al., 2014). Since

adaptation mechanisms play an important role in a person's reaction against environmental stress (Oginska-Bulik, 2005), it is therefore expected that persons with high level of emotional intelligence should experience less stress and thus decreased susceptibility to MSDs. Stress has been shown in this study and other studies to have a significant relationship with MSD. Studies have shown that emotional intelligence can be enhanced through training and feedback (Slaski and Cartwright, 2003). It is therefore recommended that strategies for developing emotional intelligence such as valuing self and others, responsive awareness, courage and authentic success etc. (Hughes et al., 2009) should be emphasized in the training of undergraduates. A major limitation of this study is the non-inclusion of the first grade Physiotherapy and Architecture students as well as the exclusion of the fifth grade physiotherapy students; that may possibly influence the external validity of this study.

Conclusion

Based on the findings from this study, it was concluded that there is a high but similar prevalence of MSD among Physiotherapy and Architecture students and that the course of study has no significant association with MSD. Also, MSD of the upper back is more prevalent among the Architecture students while Knee MSD is more prevalent among the Physiotherapy students. Finally, age, length of sleep, measures of anthropometry and emotional intelligence are significant predictors of MSD among Physiotherapy and Architecture students.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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