



Case Study

Physical Activity Pattern and Its Association with Functional Limitation, Physical Health and Mental Wellbeing of Nurses with Low Back Pain

Ganiyu Sokunbi¹, Mukadas Akindele¹, Bashir Bello¹, Umar Bello², Iveren Terso-ivase³

About the Authors

¹Department of Physiotherapy, Faculty of Allied Health Sciences, College of Health Sciences, Bayero University Kano, Nigeria

²Department of Physiotherapy, General Sanni Abacha Specialist Hospital, Damaturu, Yobe State, Nigeria

³Department of Medical Rehabilitation, University of Maiduguri, Borno State, Nigeria

*Corresponding Author:

Ganiyu S
ganiyusokunbi@gmail.com

Editor:

Dr. Somchai Amornyotin

Department of Anesthesiology and Siriraj GI Endoscopy Center, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, THAILAND.

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Abstract:

Background:

The prevalence of low back pain among nurses may be comparable in both Africa and western countries but the working and living conditions in both settings might not be comparable. With that in mind, therefore, nurses in Africa, particularly in the North Eastern Nigeria, where the study was conducted, might be differently affected by low back pain (LBP) compared with their counterparts in the western countries.

Aim:

The purpose of this study was to investigate the physical activity (PA) pattern and its association with functional limitation, physical health and mental wellbeing among Nurses with LBP in Maiduguri, North Eastern Nigeria.

Materials and Methods:

Convenient samples of Nurses with LBP participated in this study. International physical activity questionnaire (IPAQ) was used to assess the physical activity, Rolland Morris disability Questionnaire was used to assess functional limitation while Rand 36 questionnaire was used to assess bodily pain, physical health and emotional wellbeing.

Results:

The results of the study showed 94.7% prevalence of LBP among the nurses out of which 94.27% participants had chronic (> 3 months duration) LBP. The mean \pm Standard deviation scores for job related physical activity, house-work related physical activity, transport related physical activity, and recreational related physical activity domains were 8565.78 ± 95.44 , 3158.65 ± 56.07 , 4055.80 ± 62.41 , 2179.82 ± 39.67 respectively. Eighty percent of the participants were active in each of the domains of transport related and job related physical activity while 90% and 100% of the participants were inactive in housework related and recreational related PA domains respectively. Age group and gender did not show statistical significant difference in the PA scores of the participants ($P > 0.05$). Functional limitation, physical health and mental wellbeing explained 2.5% variance in the total physical activity

scores which also was not statistically significant ($R^2 = 0.025$ $F = 1.044$, $P = 0.376$). Standardised correlation coefficients values of -0.045, 0.061 and 0.143 between physical activity and each of functional limitation, physical health and emotional wellbeing respectively were obtained, none of which was statistically significant ($P > 0.05$).

Conclusion:

Based on the findings of this study it was concluded that Nurses were more active in job related and transport related PA domains and less active in house-work and recreational related PA domains. Physical activity did not differ between male and female nurses and among nurses of different age groups. Similarly, functional limitation due to LBP, physical health and emotional wellbeing did not show significant association with physical activity.

Keywords: Low back pain Physical activity pattern; functional disability; Physical health; Emotional well-being

Background

Low back pain is an important public health, social and economic problem. It is also a disorder with many possible aetiologies occurring in different groups and is also a common health problem in working population. It has been estimated that up to 60-80% of population will at some point in their lives experience back pain [1]. Back pain leads to high cost for the individual, the work place and the society and it is one of the most cited causes of sickness absence [2]. Musculoskeletal disorders especially chronic low back pain (CLBP) are a major cause of disability in the working population. An all-encompassing definition of physical activity is 'any bodily movement produced by skeletal muscles that requires energy expenditure [3,4]. There appeared to be a connection between physical activity and low back pain. In the first instance, non-specific low back pain is often accompanying with impaired ability to perform functional activity. Thus, it could be assume that patient with higher level of functional limitation due to low back pain will have more daily life restrictions and consequently lower level of physical activity. In terms of treatment advice, patients with acute low back pain are often advice to stay active and avoid prolonged bed rest so as to aid recovery and limit functional limitation [3,4]. However the assumption of correlation between low back pain and physical activity has not been sufficiently proven, there are no consistent evidence that patients with pain have lower level of physical activities. van Werring et al[5], in a systematic review reported that patients with chronic low back pain have the same level of physical activity as the healthy control.

Certain health care professionals such as nurses are commonly identified as being at greater risk for work related low back pain [6], but many other health care professionals providing direct care during the course of a patient's hospital stay are also potentially at risk. Patient handling has been identified as a significant contributor to musculoskeletal injuries among health care professionals. The nature of stresses sustained by human back during lifting are multiple, including vertical compression, horizontal shear, rotatory torque and a variety of combination of these [6]. During such an activity, every structural elements of the human trunk, i.e. the vertebrae, the spinal ligaments and the spinal muscles will take part and endure the stress and these different structural elements are stressed differently in different phases of any given lift. Weightlifting generates large compressive forces acting in the long axis of the spine. The magnitude of such forces depends at any given moment on the amount of weight being lifted, its acceleration and posture of the trunk. The interaction of these entities determine the strength of muscular contraction required for the accomplishment of the task [7]. In the standing posture, the centre of gravity lies in or anterior to the first lumbar vertebrae, there is virtually no muscular activity when the body is in a balanced upright position. As one stoops, the trunk approaches a horizontal position and compressive forces acting in the long axis of the spine increases [8]. Combination of these factors can increase the risk of LBP and make an existing low back pain worse among nurses [6]

According to the literature, engaging in regular physical activities and exercises such as aerobics and strengthening exercises for the back and leg muscles can prevent low back pain [9,10]. Yip [9] suggested that participation in regular physical activity enhances the psychological

wellbeing of individuals, improves job-related fatigue and muscle pains by increasing and maintaining the musculoskeletal system in shape. More so, studies have shown that physically-active nurses present with less symptoms of low back pain as well as improved psychosocial behaviour [10]. Thus, this study was design to answer the following questions.

- i) What is the pattern of physical activity by selected sociodemographic variables among nurses with chronic low back pain?
- ii) Will there be any association between physical activity and functional limitation among nurses with chronic low back pain?
- iii) Will there be any association between physical activity and physical health among nurses with chronic low back pain?
- iv) Will there be any association between physical activity and emotional wellbeing among nurses with chronic low back pain?

Materials and Methods

Effects of Treatment on Pain Intensity

Figure 1 shows the effects of treatment on back pain, leg pain and time of first notice (onset) of aggravation of pain while doing treadmill walking (TFS). The results show that back pain was completely resolved after 5 weeks of treatment while leg pain was reduced from 8/10 to 1/10 after 6 weeks of treatment. Patient reported a TFS score of 2 minutes in the first week of treatment and a score of 10 minutes after the 4th week of treatment.

Design: Cross sectional survey: Information on health status and functional limitation from a cross section of population of nurses' with chronic low back pain was collected and analysed in this study.

Aim and Objectives: This study was aimed at investigating the pattern of PA among Nurses with CLBP and the correlation between PA, physical health, functional limitation and mental wellbeing of nurses with CLBP

Ethics: Approval to carry out this study was obtained from the Research and Ethics Committee of the University of Maiduguri Teaching Hospital, Maiduguri. Detailed information on what the study was and what was expected of the participants was provided in participant's information sheet. Participants were required to sign the written informed consent, and they were given enough time to decide whether they will take part in this study.

Recruitment Strategies: Participants were recruited from among the nurses with low back pain from University of Maiduguri Teaching Hospital (UMTH), State Specialist Hospital, Maiduguri Borno State, Nigeria between January 2015 and May 2015. Prior to this, printed recruitment posters and handbills containing information on what the study is all about were distributed to prospective participants in the outpatient clinics of these hospitals. Recruitment posters were also displayed on notice boards at strategic areas within these hospitals.

Sample size: The formula below by Niagn et al [14] was used to calculate the sample size

$$N = \frac{(Z\alpha)^2 Pq}{\beta^2}$$

Where, N = Sample size,

Z = Coefficient of standard normal deviate (usually express at 1.96 for 95% confidence interval),

P = Sample proportion,

q= 1-p.

β = sampling error (it was considered for this to be within 5% of its

actual parameter with 95% confidence), The proportion (p) of Nurses that could be suffering with LBP was estimated at 0.6

$$N = \frac{1.96 \times 1.96 \times 0.6 \times 0.4}{0.05 \times 0.05}$$

$$N = 368$$

Participants

Convenience sample of nurses with nonspecific low back pain, aged 18 to 65 years and who are willing to participate were involved in this study. The following eligibility criteria were applied: - nurses with at least 1 year of clinical experience working in different clinics of UMTH and State Specialist Hospital Maiduguri, Borno State, nurses with non-specific CLBP with or without leg pain. Nurses with red flag factors such as cancer, tuberculosis, tumour and other serious spinal pathological conditions were excluded from this study.

Questionnaires

Data were collected using three self-administered questionnaires;- Sociodemographic questionnaire (SDQ), International Physical Activity Questionnaire (IPAQ), Roland and Morris Disability Questionnaires (RMDQ) and Rand 36 Questionnaire.

SDQ was used to collect socio-demographic information such as age, sex, presence or absence of LBP and duration of LBP. IPAQ long form was used to assess the PA level of the participants. The IPAQ demonstrated criterion validity correlation with values ranging from 0.14 - 0.53 and reliability correlations ranging from 0.96-0.46[11] (Craig, 2003). Respondents were asked the number of days they did vigorous PA, moderate PA (not including walking) and walking, as well as the number of hours and minutes per day they did the three kinds of activities in the last 7 days respectively. These activity categories were treated separately to obtain the activity MET/week/min by multiplying the number of days they exercise in a week (frequency) by the duration of time in minutes by their estimated intensity in METs and summed to gain an overall estimate of PA in a week (www.ipaq.ki.se). One MET represents the energy expended while sitting quietly at rest and is equivalent to 3.5 ml/kg/min of VO₂. The MET intensities used to score IPAQ in this study were vigorous (8 METs), moderate (4 METs), and walking (3.3 METs) (www.ipaq.ki.se). Participants were also graded as being either physically active or inactive, according to the new WHO global standard, satisfying the recommendations for being physical active was defined as engaging in at least 150 minutes of moderate-intensity activity per week, 75 minutes of vigorous-intensity activity per week, or an equivalent combination of moderate- and vigorous-intensity activity. Thus, participants who met any of these criteria were graded as active while those who did not were graded as inactive [11]. RMDQ was used to assess activities of daily living restriction due to LBP. Subjects were asked to tick the number of items that describe how low back pain affect their activities of daily living. In patient with chronic low back pain RMDQ has a correlation coefficients of 0.72 with interclass correlation coefficient which range from 0.42-0.53 has been reported for the use of RMDQ in patient with chronic low back pain [12]. The Rand -36 Questionnaire were used to assess bodily pain, physical health and mental wellbeing of the participants. It has 36-items that measures physical functioning, bodily pain, and role limitation due to physical health problems, role limitation due to personal or emotional problems, emotional well-being, social functioning, energy/fatigue, and general health perceptions [13]. With regards to the scoring of items on Rand 36 questionnaire, a high score indicates an excellent (positive) outcome while a low score indicates a poor (negative) outcome. Rand 36 has been reported to be a reliable outcome measure to assess bodily pain, physical mental health variables and quality of life [13].

Procedure

Three hundred and seventy questionnaires were administered by hand to the participants who were also required to complete and returned within 24hours. Completed questionnaire were collected by hand by the researcher

Data analysis

The Statistical Package for the Social Sciences (SPSS, version 18.0) was used for data analysis. Descriptive statistics of frequency and percentage were used to summarize the demographic data such as age-groups, gender, indications for LBP and duration of LBP. Mean and standard deviation were used to summarize continuous variables such as age, physical activity level scores, bodily pain RMDQ functional disability scores, Physical health and mental wellbeing scores. Analysis of Variance (ANOVA) was used to compare the mean scores of the physical activity among the different age groups. Independent t test was used to compare PA scores between male and female participants. Linear regression analysis was used to test the association between physical activity level scores and each of functional limitation, physical health and mental health. Level of significance was set at alpha level = 0.05.

Results

A total of 400 questionnaires were distributed, 380 were returned and a response rate of 95 % was obtained. Ten of the returned questionnaires did not meet the inclusion criteria, thus only 370 were analysed. Sociodemographic variables of the participants are presented in Table 1. Three hundred and seventy of the 380 nurses had LBP, thus giving a point prevalence of 97.4% of LBP among the nurses surveyed in this study (Table 1). Participant with LBP of more than 3 months duration were 360 (97.29%). The average scores for the participants bodily pain was 135.12 ± 39.24 (Table 1).

Pattern of physical activity

Figure 1: shows the average scores of physical activity by area of PA domains. It shows that PA average scores was highest in job-related PA domain and least in recreational related PA domain. Figure 2 shows participants' physical activity level (MET/week/min) by domain of PA. Eighty percent of the participants could be considered physically active in the areas of transport related and job related PA domains while 90% and 100% of the participants did not meet the criteria needed to be considered physically active (were inactive) in housework related and recreational related PA domains. Table 2 shows participants' physical activity level by gender and age groups. Comparison of the average score of physical activity between male and female did not show statistical significant difference ($t=0.567$, $P=0.453$). Similarly comparison of the average score of physical activity among different age groups did not show statistical significant difference ($F=0.533$, $P=0.712$)

Relationship between physical activity level, bodily pain, functional limitation, physical health and emotional wellbeing

Table 3 shows the association between physical activity and each of functional disability, physical health and emotional wellbeing of participants with LBP. The average scores for functional disability, physical health and emotional wellbeing of participants with LBP were 4.2362 ± 1.59 , 194.09 ± 14.70 , 475.00 ± 19.59 respectively. The association between physical activity and each of functional disability, physical health and mental wellbeing of the participants using linear regression analysis is presented in Table 3. It shows that combination of functional disability, physical health and mental wellbeing explained 2.5% variance in physical activity which also was not statistically significant ($R^2 = 0.025$, $F = 1.044$, $P = 0.376$). Linear regression analysis showed a standardised correlation coefficients of -0.045, 0.061 and 0.143 between physical activity and each of functional limitation, physical health and emotional wellbeing respectively, none of which was statistically significant ($P > 0.05$).

Discussion

The purpose of this study was to investigate the physical activity patterns and its association with functional disability, physical health and mental wellbeing of nurses with LBP. Thus the discussion was presented under the following headings:

Pattern of Physical activity among the Nurses with Low back pain

Results from this study which indicated 97.4% prevalence of LBP among the nurses and out of which 97.2% reported having chronic (> 3 months duration) LBP. This results concur with the findings of previous studies [6,15]. The present study also investigated the pattern of physical activity and its association with functional disability, physical health and mental wellbeing among nurses in Maiduguri, Borno State, Nigeria. In term of pattern of physical activity of the nurses, the outcome of this study showed that nurses in this study were more active in job related and transport related physical activity domains and less active in the domains of housework related and recreational related physical activity. This is similar to the results reported by Lela and Franz [16]. High level of job related physical activity might perhaps be due to the nature of the hospital nursing job which may sometimes involve the use of manual techniques of lifting or transferring activities. While the high level job related PA might be conceived to have positive effects of enhancing overall physical activity and potentially the overall health status of the participants, heavy lifting and transfer techniques could also be a risk factor for work related musculoskeletal disorders (WRMD) including LBP among nurses[6].

The results also showed that the participants were less active in the domains of housework related and recreational related physical activity. This could partly be attributed to lack of enough time to engage in recreational activities due to the long hours spent at work combined with the stress of shift-duty and/or call duty routine typically associated with hospital nursing job. Thus, with this findings one might suggest that the relevant authority and policy makers in health care management need to renew and expand their roles in providing and promoting recreational related physical activities for nurses in the place of work and also to set aside a work-free day during which all nursing staff will be routinely engaged in activities and events that could enhance their recreational related physical activity and thus their general health.

The female nurses have higher average physical activity scores than their male counterparts in this study, although comparison of the mean scores between both male and female did not show statistical significance difference. This result is at variance with Awotidebe et al[17] who reported that male undergraduate students showed higher level of physical activity than female students. However Awotidebe's study was not carried out on nurses or nurses and/or health care professionals and the age range of the participants in their study was lower than in those in the present study. The discrepancy in the result with that of the studies might also be due to the differences in the number of male and female participants in both studies as there are relatively more females than male nurses in the present study. If same number of both gender were present, the result might perhaps be different.

The outcome of this study also showed that average scores of physical activity was lower in in the age group of 15-24years than age-group 45-54years. The participants in the age group of 55-64years recorded slightly lower average PA scores than 45-54years, although the differences in the PA scores among the different age groups were not statistically significant ($F = 0.533$, $P = 0.712$). This findings was similar to Lela and Farantz[16] However, in Awotidebe's study a decline in average PA scores with age was reported unlike in the present study where PA showed initial increase to the age group of 45-54years before its decline in the older age group. It is not clear whether the increase followed by a decline in PA scores with age in the present study was due to the biological changes associated with ageing. It could also be that the many other factors such as varying socioeconomic and psychosocial factors peculiar to different participants of different age groups could in turn affect their level of physical activity level differently.

Association of Physical activity with functional disability, physical health and mental wellbeing of participants with low back pain.

The results of this study did not show statistically significant association between functional disability due to LBP and physical activity of the participants ($P > 0.05$). This result

corroborates the findings of Lela and Fratz[16] who reported no significant association between LBP and all the domains of physical activity investigated in a population of nurses with LBP. However, in Lela and Fratz study, association between physical activity and functional limitation due to LBP was not investigated. It is often assume that patients who feel more disable from LBP will be less physically active but this fact has not been unambiguously confirmed. Van Weering et al [5] in their study on the comparison daily PA levels in patient with chronic low back pain and asymptomatic participants did not find significant differences in the PA levels of both group. Lack of significant association might be due to the multifactorial nature of the impacts of LBP on functional disability. It might also be due to the fact that both functional disability and physical activity are not exactly identical, although they both have negative impact on daily functioning. Disability according to WHO has been previously described as inability to carry out a function within a range that could be considered to be normal [18]. This definition was later reversed in WHO classification of functioning, disability and health (ICF) in which disability was used to encompass 3 different areas i.e. body function and structure, activity limitation and participation restriction [19]. Physical activity on the other hand according to WHO is any bodily movements produced by skeletal muscles that results in substantial energy expenditure [19]. Thus, it appears that functional disability focuses on what a person cannot do, physical activity focuses on what a person is able to do for daily living.

The result of this study showed a weak positive correlation coefficient which was not statistically significant of the association between physical activity and each of physical health and mental wellbeing. It appeared that there are not many research reports of studies carried out investigating association between physical activity, physical health and mental wellbeing of CLBP patients, thus limiting comparison of the findings of the present study with others. However, there are several reports that are suggestive of a possible positive association among physical activity, physical health and mental wellbeing. Physical activity may affect physical health and mental wellbeing via offering an alternative approach to reducing or managing stress, as summarised by Gerber and Puhse[20] . Physical activity reduces arousal (i.e. enhances mood due to distraction from worries or biochemical changes) and increases positive health behaviours during periods of stress (i.e. decreased smoking and healthier eating habits). It has also been suggested that the higher levels of fitness brought about by physical activity result in a more efficient stress regulation (i.e. reduced secretion of hormones, lowered blood pressure) or enhanced recovery from stress [20]. Other hypotheses that have been proposed to explain the possible beneficial effects of physical activity on mental wellbeing include distraction, self-efficacy, self-esteem, improved cognitive functioning and social interaction [20].

Lack of significant association between physical activity and each of physical health and mental wellbeing in this study could be partly due to the use of self-report questionnaires. There are many barriers present in accurately diagnosing and assessing severity of mental wellbeing and psychosocial distress with self-report questionnaires [21]. It could be that if standard measures for diagnostic assessment (e.g. the Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders [DSM] [SCID] etc.) were used these results might be different.

Implication for Practice

Prevalence of LBP among nurses is very high and is not simply a physical problem. It could also be that if more subjects were involved significant association between low back pain, impaired physical health and mental wellbeing could have been established. Thus, the whole picture encompassing musculoskeletal pain, physical and mental health needs to be considered when managing individual patients with back pain in nurses and other professionals whose job demands are similar to Nurses. Treatment should not just be aimed at pain relief; intervention strategies should be aimed at education on the importance of life enhancing and recreational physical activity program capable of impacting positively on physical health and mental wellbeing in addition to reducing the menace of LBP.

Limitation of the Study

The present study did not take into account the impact of recurrence of back pain on the physical activity level, self-report functional limitation, physical health and mental wellbeing status of the participants. It could be possible that nurses with low back pain who experience recurrence of back pain might have more impairments with physical health and mental wellbeing than those who did not experience recurrence of symptoms. Future research should also look how socioeconomic status affects PA and its relationship with LBP among nurses. A mixed method study design incorporating cross sectional observational cross sectional survey and focus group interview on PA and its association with physical health and mental wellbeing could have provided enriched information on the participant's experience of the physical and mental wellbeing to compliment the information obtained from the use of self-reported questionnaires.

Conclusion

Results from this study showed high prevalence of LBP among nurses with CLBP in Maiduguri, North- East, Nigeria. Nurses in this study could be considered active in the domain of job related physical activity and transported related physical activity, Physical activity did not differ significantly among males and females' nurses and among nurses of different age-groups. Functional limitation due to LBP, physical health and mental wellbeing did not show significant association with physical activity among nurses who suffer with CLBP.

Tables and Figures

Table 1: Participants Demographic data

N = 380			
Variables	X±SD	Frequency	%
Total Age(years)	37.5± 6.8		
Bodily Pain	135.12±39.24		
Age groups(years)			
15-24		45	12.16
25-34		105	28.38
35-44		70	18.92
45-54		105	28.38
55-64		45	12.16
65 and above			
Gender			
Male		110	29.73
Female		260	70.27
Marital Status			
Married		220	59.46
Single		150	40.54
Low back pain			
Yes		370	97.37
No		10	2.63
Duration of low back pain			
Less than 3 months		10	2.77
More than 3 months		360	97.23

N = Total number of participants

Table 2: Physical Activity Level by gender and age groups

Physical activity level MET/week/min		
Cartegories	X±SD	Statistics
Gender		
Male	16522.94±174.06	
Female	18924.45±177.62	
		(t = 0.567, P = 0.453)
Age groups (years)		
15-24	11883.33±120.57	
25-34	18104.25±203.99	
35-44	19524.97±164.96	
45-54	19026.23±190.23	
55-64	18021.40±113.48	
		(F =0.533, P = 0.712)

Table 3: Relationship between PA, Functional Disability, Physical Health and Mental Health of LBP

Correlation with Physical Activity level			
Variables	X±SD	SCC value	P-value
Functional limitation	4.23±1.59	-0.045	0.616
Physical Health	194.09±14.70	0.061	0.498
Mental Wellbeing	475.00±19.59	0.143	0.113

SCC = Standardised correlation coefficient
 [Predictors: (Constant), Physical Health, RMDQ Scores, Emotional Wellbeing
 Dependent Variable: Total Physical Activity Level Scores (R-square = 0.25 F = 1.044, P = 0.376)]

Figure 1: Average Scores of Physical Activity by Domains of PA

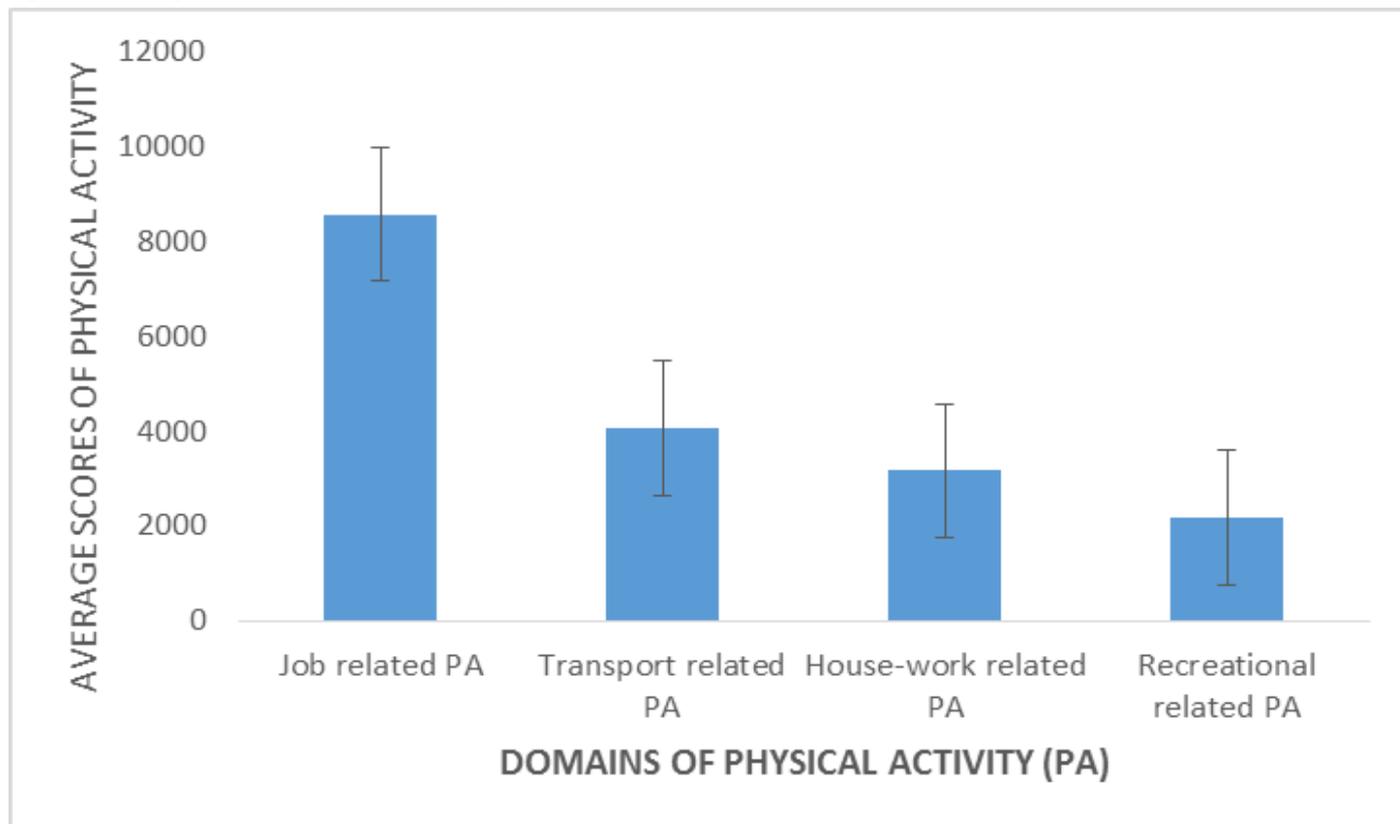
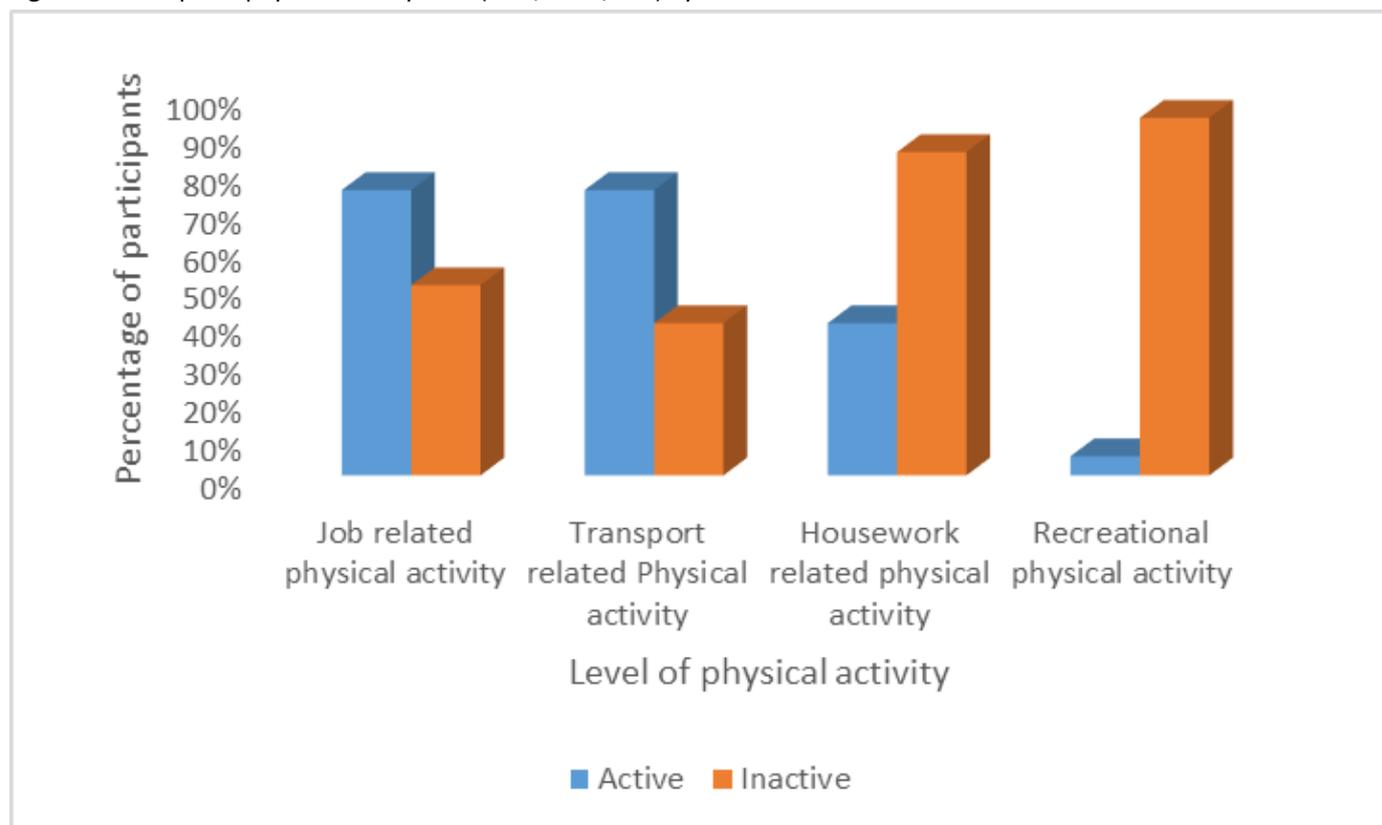


Figure 2: Participants physical activity level (MET/week/min) by PA Domain



Declaration

On behalf of all Co-Authors, the corresponding Author, states that this research work is original and has not been published in whole or in part elsewhere.

Authorship (author(s) contribution or attribution)

All Authors contributed to the design, implementation analysis of data and writing of this manuscripts

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