

Status of Participation in Physical Activity by Employees in Kenyan Universities at Onsite Fitness Centers in Kenya

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Abstract

Physical activity plays a critical role in preventing and reducing risks of many diseases while at the same time maintaining physical and mental health. On the contrary, physical inactivity has been found to be one of the four modifiable risk factors that potentially predispose individuals to Non-communicable diseases (NCDs). To curb the negative social and financial implications associated with NCDs, many corporate organizations, as well as universities, are offering furnished wellness centers to their employees. This paper is based on a study that aimed at establishing the status of participation in physical activity (PA) at onsite fitness centers among Kenyan university employees. A cross-sectional analytical design was used to examine 499 employees from two institutions (a private and public university) that were purposefully selected on the basis of their well-equipped physical fitness facilities. University employees were randomly stratified according to their, age, gender, type of university and designation (non-teaching, teaching and management staff), while respondents in each stratum were selected using systematic random sampling technique. Data was collected using a closed-ended questionnaire which was administered to respondents in both universities. The employees' level of participation in PA was summarised using descriptive statistics. Mann-Whitney U and Kruskal Wallis tests were used to analyse differences in percentages of maximum possible scores with the help of the Statistical Package for Social Sciences (SPSS) version 20.0. It was found that 25% of the employees were physically active while 75% were physically inactive (Mean = 38.20) in relation to use of onsite fitness centres. The most active group were employees below the age of 30 years. Both male and female employees recorded a similar status in participation in PA which was low. There was a significant difference in the status of participation in PA between the two universities ($p < .001$). This paper recommends that university employees need to take up the opportunity provided by their employers to use the available fitness facilities so as to accumulate the desired daily physical activity amount of at least 30 minutes of moderate to vigorous PA. This is meant to support their physical and mental health needed for their work performance. By the same token, the paper recommends that university administrators should look into strategies that would promote use of onsite fitness centres by the employees so as to increase participation in PA and consequently prevent occurrence of NCDs while promoting productivity at work.

Keywords: Employees, On-Site Fitness Centre, Physical Activity, Physical Fitness, Wellness.

INTRODUCTION

Physical activity has been described by the World Health Organization (2018) as having significant health benefits and contributes to prevention and management of Non Communicable Diseases (NCDs). For Instance, Moderate-to-vigorous physical activity is associated with a reduced risk of excessive weight gain for both the general population and for pregnant women, reduces feelings of anxiety and depression, and improves sleep and quality of life (2018, Physical Activity Guidelines Advisory Committee [PAGAC]). The committee also indicates that, among older adults, regularly performed physical activity reduces the risk of dementia, improves physical function and reduces the risk of falling and the risk of injury if a fall does occur. Further to this, physical activity reduces the risk of cancers of the bladder, breast, colon, endometrium, esophagus (adenocarcinoma), kidney, stomach, and lung. For people with colorectal cancer, women with breast cancer, and men with prostate cancer, greater amounts of physical activity are associated with reduced risk of mortality from the original type of cancer. Physical activity-related benefits also have been demonstrated for the large number of individuals who already have one or more chronic conditions, such as osteoarthritis, hypertension, type 2 diabetes, dementia, multiple sclerosis, spinal cord injury, stroke, Parkinson's disease, schizophrenia, attention deficit hyperactivity disorder, and recent hip fracture. Individuals considered to be frail also benefit from regular physical activity (PAGAC, 2018).

On the contrary, physical inactivity has been recognized as an important risk factor for multiple causes of death and chronic morbidity and disability. According to WHO (2020), physical inactivity has been identified as the 4th leading risk factor for global mortality contributing 6% of deaths. It is also estimated to be the main cause of approximately 21-25% of breast and colon cancer, 27% of diabetes and 30% of ischaemic heart disease burden (WHO, 2020).

In Kenya, rates of inadequate physical activity are estimated to be 10% in males and 14% in females with uneven distribution among rural and urban populations where levels of physical activity among rural populations are higher (Muthuri et al., 2014). According to Popkin 2015, major changes in economic structures from agrarian economies to industrialized economies have reduced PA a situation that has not only occurred in workplace but also in home settings whereby daily tasks that were once laborious engagements are now much easier with the help of technological advancements.

Some of the barriers to PA in Kenya include urbanization, poor built environment, lack of safe environment in which to walk or cycle, inadequate information, motorized transport and social cultural factors (WHO, 2018). Most Kenyan employees, including those in institutions of higher learning spend substantial portion of their time at their work place. According to Parry and Straker (2013), modern workplaces contribute to ill health whereby desk jobs lead to physical inactivity among other risks which can predispose the workers to poor health, compromised productivity and increased cost on treatment.

Fortunately, the workplace is an opportune setting for health promotion targeting a large proportion of the working population. Scientific studies show that when done right, workplace health promotion and disease promotion programs can improve the health of the employees, reduce healthcare costs, increase productivity and produce

positive return on investment resulting in a win-win for employees and employers (Grimani et al., 2019).

Statement of the Problem

There exists an inverse relationship between participation in physical activity and occurrence of NCDs. Presence of NCDs in any individual affects their health, wellbeing and their productivity. The effects of NCDs are more compounded by the fact that they require long-term management which demands that employers plan for their medical treatment which is normally expensive. In attempting to reverse the situation, corporate institutions have established among other programs physical fitness facilities to be used by their employees. The reasoning behind this is to ensure that employees have access to fitness facilities within their reach so as to promote their engagement in physical activity. The other important aspect of provision of the facilities is to ensure that the employees are provided with friendly modes of subscribing to the facilities so as to encourage members or their families to participate in physical activity. The money generated from their subscription is supposed to maintain the facilities but part of it generates income for the universities. This is an innovative venture for a developing economy.

Records from University A's health unit (2017) indicate that a minimum of 210 university employees are treated every month with hypertensive medication, while at least 55 employees from University B go through the same medical treatment for hypertension per month., despite the fact that the universities have well equipped fitness centers. The university sector presents an important study population for this paper because the maximum concentration of intellectual assets of a nation who drive the economy is drawn from there. The setting up of the on-site fitness centers in the universities is meant to reduce the economic and intellectual loss to the nation due to NCDs emanating from physical inactivity. Despite the potential health and economic benefits of onsite health fitness centres, no studies have been conducted in Kenyan universities to document the extent of use of the facilities by the employees, the factors determining the use or disuse as well as the impact if any.

It is against this background that this paper examined the level of employees' involvement in physical activity within the established on-site fitness centers. The findings in this paper are hoped to help understand the status of participation or non-participation in physical activity so as to guide development of strategies to promote and /or support university-wide involvement in physical activity.

REVIEW OF LITERATURE

The human economic and social patterns have been revolutionising worldwide, resulting in a higher level of sedentary lifestyle which present a great risk to health if ignored. Physical activity can improve a person's physical and mental health (Lee, 2012). For a person to attain the benefits of engaging in physical activity, the World Health Organization (WHO) (2010) and American College of Sports Medicine (ACSM) as cited in Chodzko-Zajko, Proctor, Fiatarone Singh, et al (2009) recommended that one should be involved in an activity of moderate to vigorous intensity for at least two and half hours, for five days in a week. This can be achieved through household chores, occupation, leisure time and commuting (So, Yoo, & Sung, 2016).

Physical activity decreases waist circumference, systemic vascular resistance, plasma renin activity and sympathetic activity. In addition, it improves heart rate variability, helps maintain body weight by reducing body fat, improves immune function, improves insulin resistance, reduces systemic inflammation, raises High-density lipoproteins (HDL) and lowers Low-density lipoproteins (Mckinney et al., 2016). These benefits significantly reduce the risk to chronic diseases such as cardiovascular disease, hypertension, Type II diabetes mellitus, some forms of cancer among others. Furthermore, an increase in physical activity results in an increase in fitness and general wellbeing which are important for productivity and work performance. Absence of disease reduces medical expenditure and absenteeism by employees, thus saving on financial resources that can be channelled to other development projects at the institutional or family level (Mwangi & Rintaugu, 2017; Joubert & Grobler, 2015).

Physical inactivity is a risk factor to a number of non-communicable diseases which are costly and debilitating. WHO (2013) reports that about 3.2 million deaths worldwide are as a result of physical inactivity related causes. This echoes the views of Reiner, Niermann, Jekauc and Woll (2013), who noted that a combination of unhealthy eating habits and physical inactivity leads to weight gain which then leads to overweight and eventually obesity; a major risk factor to a number of non-communicable diseases[NCDs] (Creber et al., 2017; Eibl et al., 2018).

A study conducted by Cooper and Barton (2016) investigating university employees' workplace physical activity levels in the United Kingdom revealed that the respondents' physical activity level was low. A cross-sectional study conducted by Mwangi and Rintaugu (2017) on the physical activity level and health-related physical fitness attributes of 237 Kenyan university employees also showed that the university employees were physically inactive with 26.16% of them being physically active inside the university. Similarly, Umeifekwem and Onyechi (2014) in a study assessing physical activity readiness and participation among 600 workers in Nigerian Universities, observed that 60% of the respondents were either not engaging in physical activity or doing so infrequently.

Age is a determinant of participation in physical activity. Although non-communicable diseases do not discriminate, the most affected group is the elderly because of inadequate physical activity. Townsend, Wickramasinghe, Williams and Bhatnagar (2015) carried out a study on physical activity statistics on the United Kingdom population and found out that the level of engaging in physical activity declined with age for both males and females. Agha and Al-Dabbagh (2010) studied the level of physical activity among 536 teaching and support staff in Iraq and the young respondents were found to be more active than the older age groups.

The level of physical activity can also be determined by gender. According to the findings by Agha and Al-Dabbagh (2010) women were found to be statistically insignificant physically active than men. Other studies by Cooper and Barton (2016), Townsend et al (2015) also reported that males were more active than females.

In most cases the level of education an individual attains determines the job position a person gets. The more educated an individual is the more the income they get and the less the time they spend participating in physical activity. It is alleged that high income has a negative correlation with physical activity. Cheah and Poh (2014) agrees with this notion stating that quite often individuals with highly paying jobs tend to trade-off

their leisure time with work leading to physical inactivity. Biernat, (2015) studied 373 employees from a public institution in Poland and found out that a person's level of education does not have any bearing with one's physical activity status. These findings are contrary to those of Abdi, Eftekhar, Mahmoodi, Shojayzadeh, and Sadeghi (2015) who reported that individuals who are highly educated were more physically active. In a study by Agha (2010), it was concluded that more than half of teaching staff were highly physically active compared to a third of their non-teaching staff counterparts.

A study by Fountaine, Piacentini and Liguori (2014) reported that United States university workforce spent almost seventy-five per cent of their working hours seated, and they hardly engage in physical activity to compensate for the inactive hours. Africa lacks comprehensive data on the physical activity levels of University employees (Umeifekwem & Onyechi, 2014). More so, there are no physical activity policies in most African universities that compel staff members to engage in physical activity all setting the stage for conduct of this study.

METHODOLOGY

The study from which this paper was developed adopted the cross-sectional analytical research design. The purpose of this paper was to establish the status of employee's participation in physical activity at the fitness centers established within their workstations. The first objective was to examine the physical activity status of employees according to their age. The hypothesis was that there is no significant difference in the physical activity status of employees by age. The paper also sought to determine the employees' physical activity status in relation to their gender. It was hypothesised that there is no significant difference in the physical activity status of employees by gender thirdly, the paper sought to compare physical activity status of university employees according to type of university (public or private). It was assumed that there is no significant difference in the status of participation in physical activity at the onsite fitness centers by type of university. A comparison of the levels of employees' participation in physical activity among the three job categories in the two universities was the fourth objective. The hypothesis was that there is no significant difference in the status of participation in physical activity at onsite fitness centers by job category or designation. The study to this paper was informed by the Health Belief Model as the theoretical framework (Sharma & Romas, 2012).

Data was collected from a public (A) and a private (B) University in Kenya. The two universities were selected because of their well-established onsite fitness centers. They provided a target population of 3 516 permanent and contract workers. Sample size was 513 respondents (University A had 153 and University B had 360) as determined using the Krejcie and Morgan formula (1970), with 10% added to each institution sample so as to provide room for attrition and unforeseen nonresponse. Purposive sampling was initially utilised to pick the two universities as they have well-established on-site fitness centers. University employees were stratified as follows: gender (male and female), type of university (public [A] and private [B]), age (<30, 30-39, 40-49, 50-59 and >59) and designation (Management, Teaching and Non-Teaching staffs). To select respondents from each stratum systematic random sampling was employed. Returned questionnaires for analyses were 499 (351 from university A and 148 from university B) indicating 92.7% response rate.

A questionnaire with close-ended questions on a five-point Likert scale was used to collect data from the employees. The tool was pre-tested prior to data collection. The facility managers were consulted to give records of attendance by employees. Clarifications to questionnaire items were done upfront during the time of administration. Ethical clearance was sought from Kenyatta University Ethics Review Committee while research permit was provided by the National Council for Science and Technology (NACOSTI). Permission to conduct the study in the two universities was granted by Deputy Vice- Chancellor in charge of Research, Innovation and Outreach (A) and Deputy Vice- Chancellor Academic Affairs (B). Participants were assured of confidentiality and were provided with the opportunity to consent. Questionnaire based data were analysed using version 20.0 of Statistical Package for Social Sciences (SPSS). The employees' level of participation in physical activity was summarised using descriptive statistics. Graphs, percentages and frequency distribution tables were used to present the results. Mann Whitney U and Kruskal Wallis tests were used to assess for differences at $p < .05$ level of significance.

RESULTS AND DISCUSSION

Respondents' Participation in Physical Activity

Four hundred and ninety-nine (499) questionnaires were considered for analysis, 351(70%) from university A and 148(30%) from university B. The overall participation in physical activity by employees in the two Kenyan universities at onsite fitness centers is presented in Figure 1. The figure indicates that on-site fitness centers are used by 37.7% of the respondents (188 workers) with (22.3% [111] from University A and 15.4% [77] from University B). The results also show that 62.3% of the respondents (311 workers) were not users of the on-site fitness centers (48.1% [240] from University A while 14.2% [71] were from University B).

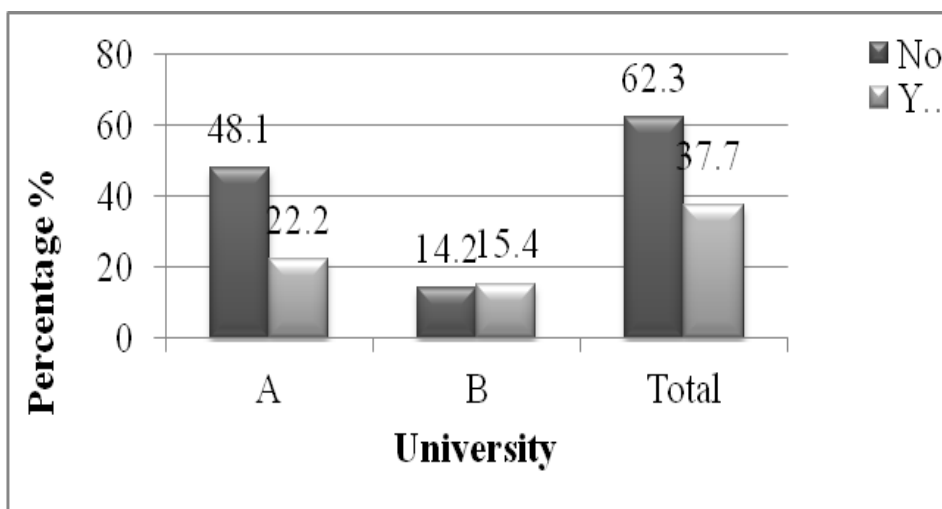


Figure 1: Participation in physical activity in the on-site fitness centers by respondents

For objectivity purposes, the respondents were also required to report whether they were involved in physical activity outside the onsite fitness centers. This was done in

order to help judge the level of general participation in physical activity by university employees.

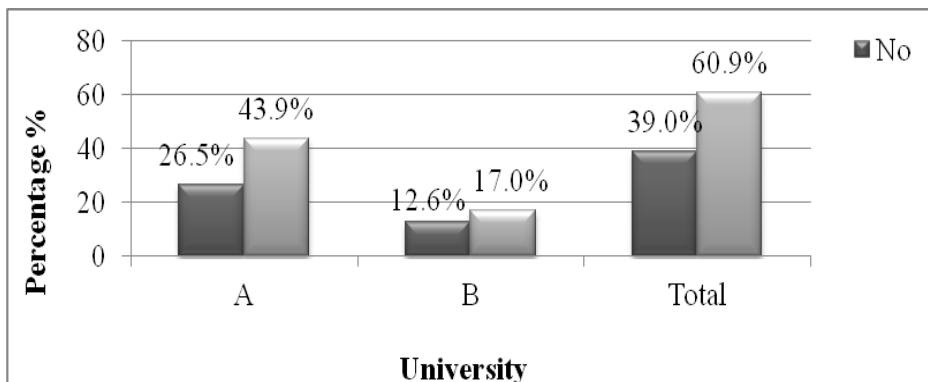


Figure 2: Participation in physical activity outside the on-site fitness centers by respondents

The findings showed in Figure 2 indicate that 61% of the respondents (304 employees) were actively using the off campus facilities. Forty-four per cent (219) were from University A and 17% (85) were from University B. However, 39% (195) of the employees indicated that they were not using any physical activity facilities outside the university. Twenty-six per cent (132) were from University A and 13% (63) were from University B.

The general status of being active or not active was determined by considering how many days per week one was engaging in on-site fitness centers, how intense the workout was and for how long they were doing it in terms of time. Two point five (2.5) or more mean score of the Likert scale and 50% or more of the percentage of maximum possible score (POMPS) was set as the cut-off point. A respondent whose score was equal to or above the cut-off was ranked as active and vice-versa.

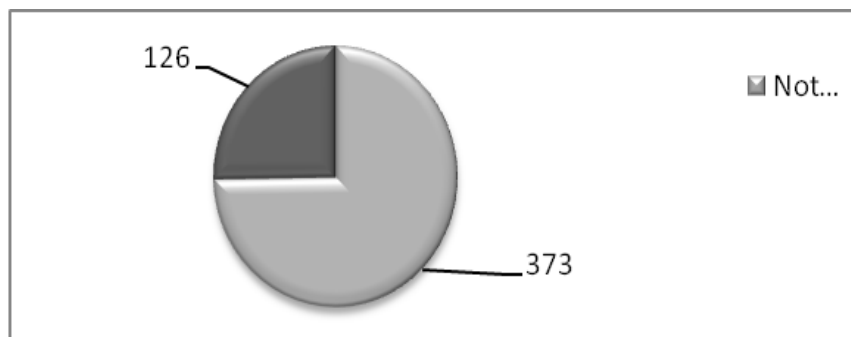


Figure 3: Respondents' physical activity status in on-site fitness centers

The results in figure 3 indicate that a quarter of the respondents (126 out of 499) fitted within or above the cut-off point hence were considered to be active while 373 (75%) fitted below the cut-off point and were therefore considered to be inactive. This therefore indicated a low physical activity status (Mean = 38.2, SD = 19.7) for Kenyan university employees. These findings concur with those of Mwangi and Rintaugu's

(2017) and Umeifekwem and Onyechi (2014), which concluded that Kenyan and Nigerian university employees were not physically active respectively. These results are consistent with those by Cooper and Barton (2016).

Table 1: Respondents' level of participation in physical activity in the on-site fitness centers by age, gender and designation

Demographics	On-site PA level		Total
	Not Active	Active	
Age			
<30	49	24	73
30-39	153	56	209
40-49	94	38	132
50-59	52	9	61
>59	22	2	24
Gender			
Male	179	66	245
Female	191	63	254
Designation			
Management	3	4	7
Teaching Staff	108	35	143
Non-Teaching Staff	262	87	349
University			
A	273	78	351
B	100	48	148
TOTAL	373	126	499

The status of physical activity was further analysed in relation to the age, gender and designation of the respondents and the results presented in Table 1. The table shows that, in the age group 30 and below, 24 respondents were active while 49 of them were not active. Fifty-six employees in the age group 30-39 were physically active while 153 were physically inactive. The age group 40-49 had 38 active employees and 94 inactive employees. Nine employees were physically active in the 50-59 age group and 52 were physically inactive. Out of 24 employees who were above the age of 59, two of them were active while 22 of them were inactive. The findings in this paper showed that the age group <30 was the most active of them all at 32% followed by the 40-49 while the least active group was those above 59 at eight per cent. This indicates that maybe the young employees have some time to spare for physical activity as compared to elderly employees. The current findings are similar to those of Agha (2010) and Townsend et al (2015) who concluded that physical activity declined with age.

The results in table 1 also shows that out of 129 employees who were physically active (66 were males and 63 females), while 370 employees were not physically active, 179 being males and 191 females. This indicated that the physical activity status of both males and females was similar. This reveals that regardless of gender the respondents participated in physical activity at the same level and most of them were found to be physically inactive. The results do not agree with the observation by Cooper and Barton (2016) that males were more active than females but concurs with those by Iwuala et al (2015) and Townsend et al (2015) who found that physical activity was low in both genders. These results are also in agreement with Umeifekwem and Onyechi (2014) who concluded that regardless of gender university employees were generally inactive

In addition, out of seven (7) management staff, four of them were physically active whereas the other three were not physically active. Thirty-five out of 143 teaching staff made use of the on-site fitness centers while the other 108 were not active. Eighty-seven non-teaching employees were active and 262 were not active. The findings showed that 57% of management staff had the highest status of participation in physical activity than non-teaching staff (25%) and teaching staff (24%). University A had a total of 351 respondents, 78 of them were physically active and the other 273 were not physically active. University B had 48 active employees and 100 inactive employees. These results depart from the finding by Abdi et al. (2015) and Townsend et al (2015) who observed that education level and income level respectively influences one's physical activity level as the current study was done at an institution of higher learning where most employees are believed to be highly educated.

Table 2: Cross tabulation result of physical activity status of respondents by university job category

University	Job Category	PA Status verdict		Total
		Not Active	Active	
A	Management	3	1	4
	Teaching Staff	75	26	101
	Non-Teaching Staff	195	51	246
	Total	273	78	351
B	Management	0	3	3
	Teaching Staff	33	9	42
	Non-Teaching Staff	67	36	103
	Total	100	48	148
Total	Management	3	4	7
	Teaching Staff	108	35	143
	Non-Teaching Staff	262	87	349
	Total	373	126	499

Table 2 shows that non-teaching staff from University A were the most inactive group (79%) in the on-site fitness centers; the management group (75%) was second then lastly the teaching staff (74%). These results are congruent with the findings of Agha and Al-Dabbagh (2010), who concluded that teaching staff were physically active as compared to other staff members.

Table 3: Kruskal-Wallis results on the respondents' physical activity status by age

	Age	N	M-Rank	Z	Sig. (2-tailed)
PA Status	<30	73	273.68	21.928	0.000
	30-39	209	265.77		
	40-49	132	249.99		
	50-59	61	203.42		
	>59	24	159.06		

Table 3 show a significant difference in the physical activity status of employees by age, <30 [Mean-Rank = 273.68], 30-39 [Mean-Rank = 265.77], 40-49 [Mean-Rank = 249.99], 50-59 [Mean-Rank = 203.42] and >59 [Mean-Rank = 159.06]. Therefore, the hypothesis there is no significant difference in the physical activity status of employees

by age was rejected. These findings are similar to those observed by Townsend et al (2015) and Agha (2010) that physical activity declined with age.

Table 4: Physical activity status of respondents' by gender

	Gender	N	Mean	SD	t	df	Sig (2-tailed)
PA Status	Male	245	38.54	19.80	.378	497	.706
	Female	254	37.87	19.69			

The findings in Table 4 indicate that there was no significant difference in the physical activity status of employees by gender, male ($M = 38.54$, $SD = 19.80$) and female ($M = 37.87$, $SD = 19.69$); $t(497) = .378$, $p = .706$. This indicated that participation in PA is not gender specific, an observation that departs from that made by Cooper and Barton (2016) that males were more active than females. This observation is similar to that by Iwuala et al (2015) and Townsend et al (2015) who found that physical activity was low in both genders. These results are also in agreement with Umeifekwem and Onyechi (2014) who concluded that regardless of gender university employees were generally inactive.

Mann-Whitney U test was used to analyse difference in participation of employees in physical activity between the two type of university (Public [A] and private [B]) and the results are presented in Table 4. The results show that there was a significant difference in the status of participation in physical activity between the two universities A [$M\text{-Rank} = 231.76$] and B [$M\text{-Rank} = 293.25$], $Z = -4.512$, $p < 0.001$. These results were based on POMPS which were converted from the Likert scale. Therefore, the null hypothesis that there is no significant difference in the status of participation in physical activity at onsite fitness centers by Kenyan University employees was rejected.

Table 5: Mann-Whitney U Test on physical activity status of respondents' by type of university

	University	N	M-Rank	Z	Sig. (2-tailed)
PA Status	A	351	231.76	-4.512	.000
	B	148	293.25		

Table 6: Kruskal- Wallis test on Physical Activity Status by respondents' designation

	Designation	N	M-Rank	Z	Sig. (2-tailed)
PA Status	Management	7	346.71	4.716	.095
	Teaching Staff	143	237.55		
	Non-Teaching Staff	349	253.16		

Participation in physical activity was also analysed among employees by designation (non-teaching staff, management and teaching staff) using the Kruskal- Wallis test and the results are presented in Table 6. These results were based on POMPS. The results show that there was no significant difference in physical activity status according to designation Management [$M\text{-Rank} = 346.71$], Teaching Staff [$M\text{-Rank} = 237.55$] and Non-Teaching Staff [$M\text{-Rank} = 253.16$], $Z = 4.716$, $p = 0.095$. Therefore, the null hypothesis that there is no significant difference in the status of participation in physical activity at onsite fitness centers by job category or designation was not

rejected. These results concur with those of Umeifekwem and Onyechi (2014) that there is no significant difference in participation in physical activity by staff categories.

CONCLUSION AND RECOMMENDATIONS

The paper concluded that the status of university employees' participation in physical activities at the established onsite fitness centres was low. In relation to this, it recommends that university employees need to take up the opportunity provided by their employers to use the available fitness facilities so as to accumulate the desired daily physical activity amount of at least 30 minutes of moderate to vigorous PA. This is meant to support their physical and mental health needed for their work performance. By the same token, the paper recommends that university administrators should look into strategies that would promote use of onsite fitness centres by the employees so as to increase participation in PA and consequently prevent occurrence of NCDs while promoting productivity at work.

REFERENCES

- Abdi, J., Eftekhari, H., Mahmoodi, M., Shojayzadeh, D., & Sadeghi, R. (2015). Physical Activity Status and Position of Governmental Employees in Changing Stage Based on the Trans-Theoretical Model in Hamadan, Iran. *Global Journal of Health Science*; 7(5), 23-32.
- Agha, S., & Al-Dabbagh, S. (2010). WHO EMRO | Level of physical activity among teaching and support staff in the education sector in Dohuk, Iraq | Volume 16, issue 12 | EMHJ volume 16, 2010. *Eastern Mediterranean Health Journal*, 16(12), 1278–1284.
- Biernat, E. (2015). Factors Increasing the Risk Of Inactivity Among Administrative , Technical , And Manual Workers in Warszawa Public Institutions, 28(2).
- Brown, W. J., & Bauman, A. E. (2000). Comparison of estimates of population levels of physical activity using two measures. *Aust N Z J Public Health*, 24(5), 520-525.
- Cheah, Y. K., & Poh, B. K. (2014). The Determinants of Participation in Physical Activity in Malaysia. *Osong Public Health and Research Perspectives*, 5(1), 20–27. doi.org/10.1016/j.phrp.2013.12.002
- Chodzko-Zajko WJ, Proctor D, Fiatarone Singh M, et al (2009). American College of Sports Medicine position stand. Exercise and physical activity for older adults. *Med Sci Sports Exerc* (41), 1510–30
- Cooper, K., & Barton, G. C. (2016). An exploration of physical activity and wellbeing in university employees. *Perspectives in Public Health*, 136(3), 152–160. http://doi.org/10.1177/1757913915593103
- Eibl, G., Cruz-Monserrate, Z., Koc, M., Petrov, M.S., Goodarzi, M.O., Fisher W. E., & Andersen, D.K. (2018). Diabetes Mellitus and Obesity as Risk Factors for Pancreatic Cancer. *Journal of the Academy of Nutrition and Dietetics*, 118(4) 555-567 <https://doi.org/10.1016/j.jand.2017.07.005>
- Fountaine, C., Piacentini, M., & Liguori, G. (2014). Occupational Sitting and Physical Activity Among University Employees. *International Journal of Exercise Science*, 7(4), 295–301. Retrieved from <http://digitalcommons.wku.edu/ijes/vol7/iss4/5>
- Grimani, A., Aboagye, E., Kwak, L., (2019). The Effectiveness of Work Place Nutrition and Physical Activity Interventions for Improving Productivity and Workability: A Systematic Review. BMC Public Health. <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-8033-1>
- Haskell, W. L., Lee, I. M., Pate, R. R., Powell, K. E., Blair, S. N., Franklin, B. A., Bauman, A. (2007). Physical activity and public health: Updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. National Center for Biotechnology Information, Rockville Pike, Bethesda.
- Masterson Creber, R. M., Fleck, E., Liu, J., Rothenberg, G., Ryan, B., & Bakken, S. (2017). Identifying the Complexity of Multiple Risk Factors for Obesity Among Urban Latinas. *Journal of Immigrant and Minority Health*, 19(2), 275–284. <https://doi.org/10.1007/s10903-016-0433-z>
- McKinney, J., Lithwick, D. J., Morrison, B. N., Nazzari, H., Isserow, S. H., Heilbron, B., ... Krahn, A. D. (2016). The health benefits of physical activity and cardiorespiratory fitness. *Bc Medical Journal*, 58(3), 131–137. Retrieved from http://www.bcmj.org/sites/default/files/BCM_J_Vol58_No_3_cardiorespiratory_fitness.pdf
- Muthuri, S.K, Francis, C.E., Wachira, L-J.M, Leblanc, A.G, Sampson, M, Onywera, V.O, Tremblay, M.S.(2014) Evidence of an Overweight/Obesity Transition among School-Aged Children and Youth in Sub-Saharan Africa: A Systematic Review <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3968060/>

- Mwangi, F. M., Rintaugu, E. G., Mwangi, F. M., & Rintaugu, E. G. (2017). Physical Activity and Health Related Physical Fitness Attributes of Staff Members in a Kenyan Public University. *International Journal of Sports Science*, 7(2), 81–86.
- Parry, S., Straker, L. (2013). The Contribution of Office Work to Sedentary Behaviour Associated Risk. *BMC Public Health*. <https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-13-296>
- Popkin, B.M. (2015). Nutrition Transition and Global Diabetes Epidemic. <https://www.ncbi.nlm.nih.gov>
- Physical Activity Guidelines Advisory Committee Scientific Report. Washington, DC: U.S. Department of Health and Human Services, 2018. Geneva: World Health Organisation.
- Reiner, M., Niermann, C., Jekauc, D., & Woll, A. (2013). Long-term health benefits of physical activity--a systematic review of longitudinal studies. *BMC Public Health*, 13(1), 813. <https://doi.org/10.1186/1471-2458-13-813>
- So, W.-Y., Yoo, B.-W., & Sung, D. J. (2016). The Relationship between Occupational Status and Physical Activity in Korea. *Social Work in Public Health*, 31(6), 490–497. <https://doi.org/10.1080/19371918.2016.1160332>
- Townsend N, Wickramasinghe K, Williams J, Bhatnagar P, R. M. (2015). *PHYSICAL ACTIVITY STATISTICS 2015*. London.
- Umeifekwem, J. E., & Onyechi, K. C. (2014). Assessment of Physical Activity (PA) Readiness and Participation among Staff in Nigerian Universities. *Journal of Education and Practice*, 5(27), 122–129. Retrieved from <http://iiste.org/Journals/index.php/JEP/article/viewFile/15977/16316>
- World Health Organization (2010). *Global recommendations on Physical Activity for Health*. <https://www.who.int/dietphysicalactivity/global-PA-recs-2010.pdf>
- World Health Organization, 2018. Benefits of Physical Activity and Risk of Insufficient Physical Activity. <https://www.who.int/news-room/fact-sheets/detail/physical-activity#>:
- World Health Organization, (2020). Global Strategy on Diet, Physical Activity and Health. <https://www.who.int/dietphysicalactivity/pa/en/>