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Perception of Built Environment and Its Association with Physical Function Among Older Adults in Maiduguri Metropolis, Nigeria: A Cross-Section Study

Cornelius M. Ishaku[1], Munirat B. Onundi[2], Mahmud A. Karaga[3], Chungsyn C. Ajuji[4], Desmond A. Zaki[5], Anthony M. Audu[6], Francis Fidelis[7]

[1,3,4,5,6]Federal University Wukari, Taraba State, Nigeria

[2,7]College of Medical Sciences University of Maiduguri, Borno State, Nigeria

corniez10@gmail.com

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Abstract

Introduction: Ageing is associated with decline in muscle mass and strength which compromise functions and participation. Physical function is a good indicator of overall health status as it lowers the risk of falls, chronic diseases and disability among older adults. **Aims:** To investigate the association between physical function and the perception of built environment among older adults in Maiduguri Metropolis. **Methods:** A cross-sectional survey was conducted to recruit apparently 400 healthy older adults aged 60 years and above, using a multi-stage random sampling technique. Descriptive statistics of mean, standard deviation and percentage were used to summarize the socio-demographics; physical function and perception of built environment among the participants. Logistic regression was used to examine the association between physical function and access to destination; social environment; neighbourhood infrastructure; aesthetic quality; and neighbourhood safety. Data was analysed using SPSS version 22 at an alpha level 0.05. **Results:** Most

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participants were males (68.8 %), living in low-income area (70.0 %) with average age of 68.77± 6.52 and mean score of 83.30 ± 25.96 physical function. There was no statistically significant association found between physical function and perception of the built environmental variables among the participants, however, 3 out of the five built environment features are likely to improve physical functions. **Conclusion**: Although there was no significant association, access to destination in the neighbourhood, neighbourhood aesthetic quality and social environment were positively associated with the physical function. The findings of the study should be interpreted with caution as more that 70% of the participant fall in the category of those living in low-income area which may affect their built environment.

Keywords*:* Physical Function, Perception, Built Environment, Older Adults

INTRODUCTION

Aging is accompanied by changes in the physiological, musculoskeletal and cardiovascular systems in the body that leads to a decline in muscle mass, muscle strength and physical function [1,2]. Although the changes and how it relates to their wellbeing and quality of life is complex [3], it is documented that older adults lose 1% of their muscle mass annually and a decline in muscle strength of about 4% per year which contributes to decline in physical function [4]. Physical function is a good predictor of subsequent disability especially among older adults, people with poor levels of physical function are more likely to go on to suffer disability than those that are physically fit [5]. Hence, physical function plays a central role in the ability to perform activities of daily living and maintaining physical independence, as any decline in ability to perform activities of daily living leads to increased probability of loss of physical function [6,7].

The common and safe type of physical activity for older adults is walking in the neighbourhood [8]. Several studies have found that built environment, such as the availability of sidewalks, the presence of neighbourhood footpaths, recreational areas, and parks to be strongly correlated with increased rates of walking and physical activity and as such related to physical function [9,10,11]. Although, studies have been conducted in the United States and United Kingdom on how built environment may influence physical function, it is less known extensively on how built environment influence physical function in Asian and African countries [12,13]. These gives a substantial base for this study to be

carried out. Therefore, the aims of this study were to investigate the association between physical function and perception of the built environment among older adults in Maiduguri Metropolis.

METHODOLOGY

Study design and procedure

This cross-sectional study was conducted in Maiduguri metropolis of Borno state, Nigeria. The participants were apparently healthy older adults aged 60 years and above, who understand English and Hausa language and were willing to participate in the study. Sample size was calculated using the Taro Yamane formula with 95% confidence level, where the sample size was found to be 400 [(14)]. A multi-stage probability random sampling technique was used to recruit participants. In the first stage: Out of the two local government area (Jere Local Government Area and Konduga Local Government Area), one was randomly selected alongside Maiduguri Metropolitan Council (MMC), reason being that most highbrow areas are in MMC, thus MMC was not randomized so as to avoid skewness. Stage 2: In each of the two selected Local Government Areas (LGA), four wards each were randomly selected from the available wards. Stage 3: Out of the four wards of each LGA, 2 high income and 2 low-income areas were picked at random. Ethical approval from the Research and Ethic Committee of University of Maiduguri was sought and obtained. The aim of the study and expected time to complete the questionnaire (7-10 minutes) were explained to the participants, those who met the inclusion criteria were told that participation was totally voluntary and that they can withdraw at any point. They were allowed to go through the information sheet to understand the study and all questions were answered before they were asked to sign the consent form.

Measurements

Physical function was assessed as a self-reported measure using the Medical Outcome Study (MOS) Questionnaire Short Form 36 Health Survey (SF-36), which required the participants to recall the activities performed in the past 4 weeks with scores ranging from 0 to 100 based on the following; vitality, physical functioning, bodily pain, general health perception, physical role functioning, emotional role functioning, social role functioning and mental health. The scores are summed from questions in each section, the lower scores indicate more disability while the higher scores indicate less disability but for accuracy in

scoring, a free online SF-36 score calculator package was used [15,16,17]. The questionnaire has internal consistency measured by Cronbach's alpha exceeded 0.80 for all dimension except social functioning [18,19].

Physical Activity Neighbourhood Environment Survey (PANES) was the questionnaire used to assesses the built environment. It assesses five domains which includes access to destination, the neighbourhood aesthetics quality, neighbourhood safety, social environment, and neighbourhood infrastructure. It assessed respondent's perception of the built environment features. Likert scale was used which required the respondent to agree or disagree with 5 points scale. Each domain was scored individually by agreeing or disagreeing with the statement determining the perception of each domain depending on the question asked. Where 1 is strongly disagree, 2 is somewhat disagree, 3 is somewhat agree, 4 is strongly agree and 5 is don't know. The questionnaire has shown fair to substantial reliability (Kappas = 0.35 to 0.70) and acceptable validity (rho = 0.31 to 0.81). Test-retest intraclass correlation (ICC) from sum of five items was 0.86 with Cronbach's alpha as 0.92 [20].

Data Analyses

Descriptive statistics of mean, standard deviation and percentage were used to summarize the socio-demographic characteristics, the physical function characteristics and perception of the built environment among the participants. Logistic regression was used to examine the association between physical function and access to destination; social environment; neighbourhood infrastructure; aesthetic quality; and neighbourhood safety of the participant. Data was analysed using Statistical Package for Social Sciences (SPSS) version 22 at an alpha level 0.05, 95% confident interval.

RESULTS.

A total of four hundred older adults living in high and low-income areas (30.0 %, 70.0 %respectively) in Maiduguri Metropolis participated in this study. The participants comprised of 125(31.3 %) females and 275(68.8 %) males, the mean score of physical function was 83.30 ± 25.96. Most of them were married (73.3%) and have attained tertiary education (29.8%). Fifty-four (13.5%) of participants were employed, 14.5% were unemployed, details showed in Table 1. The mean age of the participants was 68.77± 6.52.

Table 1: Socio-demographic characteristics of participants

Social Characteristics	Values	Physical Characteristics	Values
Marital Status		**Age** (years)	
Single	23(5.8%)	Mean (S.D)	68.77 (6.52)
Married	293 (73.3%)	Range	60 – 90
Divorced	35 (8.8%)	**Weight** (kg)	
Widow/Widower	49 (12.3%)	Mean(S.D)	73.17 (12.79)
Location		Range	40 – 115
High income area	120 (30.0%)	**Height** (m)	
Low income area	280(70.0%)	Mean(S.D)	1.67 (0.10)
Level of education		Range	1.20 – 2.10
None	65(16.3%)	**BMI** (kg/m)	
Islamic education	104(26.0%)	Mean (S.D)	26.10(4.79)
Primary education	50 (12.5%)	Range	15.62 – 55.00
Secondary education	62(15.5%)	**Gender**	
Tertiary education	119(29.8%)	Female	125(31.3%)
Occupation		Male	275 (68.8%)
Employed	54(13.5%)		
Unemployed	57(14.2%)		
Retired	118(29.5%)		
Others	171(42.5%)		

*Values are Mean (S.D) and Range

Three Hundred and Eleven (77.8%) of the participants agreed that there were many places such as shops, stores and markets to buy things they need within easy walking distance of their home, indicating good access to destination in the neighbourhood. In the case of social environment, majority (64.5 %) of the participants agreed that there were many people in their neighbourhood doing things like jogging, playing football and other sports. Two Hundred and Fifty Four (63.5%) of the participants disagreed that their neighbourhood had several infrastructures such as open field, parks, public spaces and gymnasium to exercise and play sports, while 59.5% of the participants disagreed that there were many beautiful places such as architectural designs, shade trees, building varieties and attractive landscape to look at while walking in their neighbourhood, indicating inadequate neighbourhood facilities and good aesthetic quality respectively (details in Table 2).

Table 2: Perception of Built Environment Features among Participants

Attributes	Agree		Disagree	
	n	%	n	%
Access to destination in the neighbourhood				
Many shops, stores, market are within walking distance of my home	311	77.8	89	22.3
Social Environment				
I see many people being physically active in my neighbourhood	258	64.5	142	35.5
Neighbourhood Infrastructure				
Many places such as open field, parks, public spaces and gymnasium to exercise and play sports	146	36.5	254	63.5
Aesthetic Quality				
There are many beautiful things to look at while walking in my neighbourhood	162	40.5	238	59.5
Neighbourhood Safety				
Walking is dangerous in my neighbourhood during the day because of inadequate security	25	6.3	375	93.5

Table 3: Association between Physical Function and Built environment

Characteristics	Odd ratio	CI 95%	P value
Access to destination in the neighbourhood	1.00	0.99,1.00	0.14
Social Environment	1.00	0.99,1.00	0.61
Neighbourhood infrastructures	0.99	0.98,1.00	0.23
Aesthetic quality	0.99	0.98,1.00	0.24
Neighbourhood Safety	1.00	0.99,1.00	0.51

Logistic regression analysis with Odd Ratio at 95% confidence interval was used to determine the association between physical function and perception of built environment among older adults in Maiduguri Metropolis. The results are shown in Table 3. There was no statistically significant association between physical function and access to destination. Older adults who perceived that "there are many places such as shops, stores and markets

to buy things they need within easy walking distance from their homes" are 1.00 times more likely to have good physical function than those who did not (p= 0.14, CI= 0.99,1.00). The study also showed no statistically significant association between physical function and social environment. Older adults who reported that "they see many people in their neighbourhood doing things like walking, jogging, playing football and other sports" are 1.00 times more likely to have good physical function as those who did not. (p= 0.61, CI= 0.99,1.00). There was no statistically significant association between physical function and neighbourhood infrastructures. Participants who perceived that their neighbourhood has "several places such as open field, school playground, parks, public spaces and gymnasium to exercise and play sports" are 0.99 times less likely to have good physical function than those who did (p= 0.23, CI = 0.98,1.00). Also, there was no statistically significant association between Physical functions and aesthetic quality. Older adults who reported that "there are many beautiful things such as architectural design, shades trees, building varieties and attractive landscaping to look at while walking in their neighbourhood" are 0.99 times less likely to have a good physical function than those who did not (p= 0.24, CI = 0.98,1.00). **A**lthough, there was no statistically significant association between neighbourhood safety and physical function. Older adults who did not perceive "walking is dangerous in their neighbourhood during the day because of inadequate security from molestation, crime and harassment from hooligans, rascals and drug addicts" are 1.00 times more likely to have good physical function than those who did. (p= 0.51, CI= 0.99, 1.00).

DISCUSSION

This study aimed at determining the association between physical function and perception of the built environment among older adults in Maiduguri Metropolis. Four hundred older adults living in both high-income area and low-income area in Maiduguri Metropolis participated in this study even though majority of the participants reside in low-income areas. The sample comprised more of males than females. The average score of physical function in reference to the mean age seems to be on the high side for older adults. In this study**,** some participants perceived their built environment to have favourable physical function attributes. In view with this, majority of the participants perceived their built environment to have good access to destination and social environment, and perceived

there are no enough neighbourhood infrastructures, aesthetics quality and living in an unsafe neighbourhood.

No statistically significant association was found between the five built environment features and physical function; however, three out of the five tested built environment features were associated with more likelihood of good physical function (access to destination, social environment, neighbourhood safety). The finding of the study showed that older adults with access to places like shops, and stores which are also within walkable distances from their homes, are more likely to have good physical function. The findings in this study are consistent with that of Henson et al, [21] which found having a clear and clean street, good neighbourhood and sidewalk as access to destination to be most important factor for older adults' walking. Older adults who reported "seeing many people in their neighbourhood doing things like walking, jogging, other sports" (Social environment) have more likelihood of good physical function than those who did not. This finding is in agreement with a study conducted by Lotvonen et al [22] where physical function was found to increase in a social environment. The study indicated no association between physical function and neighbourhood infrastructure and participants who agree to availability of open field, parks, public spaces and gymnasium to exercise and play sports reported less likelihood to have good physical function. This finding is unusual, as neighbourhood infrastructures are expected to improve physical function. This finding is inconsistent with that of Fisher and Li [23] where access to recreational facilities improve physical function. This uncommon finding may be as a result of having 70% of the participants recruited from low-income areas. Although, not statistically significant, those participants who agree to presence of beautiful surrounding structures in their neighbourhood were found less likely to have better physical function than those who disagree. This is also an uncommon finding that did not corroborate previous studies [24]. It could also be due to same reason as the former where less aesthetic features are likely to be available in a lowbrow area. Neighbourhood safety was found to increase likelihood of physical function too even though not statistically significant in this study. Older adults who perceived their environment to be safe and secure were likely to show better physical function.

CONCLUSION

Although not statistically significant, the study found access to destination in the neighbourhood, social environment and neighbourhood safety to be positively associated with physical function among older adults in Maiduguri Metropolis. However, we will like to call for caution in the interpretation of findings of this study as the data was not adequate enough to present statistically significant findings, this may be due to the unequal proportion in the distribution of those in low- and high-income area and the high mean score value of physical function when compared to the age of the participant. We therefore recommend a study that will leverage on a more objective measures than subjective.

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Conflict of Interest

We declare there is no conflict of interest among the authors.

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