Examining relationships between perceptions and objective assessments of neighborhood environment and sedentary time: Data from the Washington, D.C. Cardiovascular Health and Needs Assessment

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ABSTRACT

Sedentary time (ST) and neighborhood environment (NE) are predictors of cardiovascular (CV) health. However, little is known about ST's relationship with NE. We examined associations of perceived and objective NE with ST in the predominantly African American faith-based population of the Washington, D.C. CV Health and Needs Assessment. After using community-based research principles, participants reported NE perceptions, including sidewalks, recreational areas, and crime presence. Factor analysis was conducted to explore pertinent constructs; factor sums were created and combined as Total Perception Score (TPS) (higher score = more favorable perception). Objective NE was assessed using Google Maps and the Active Neighborhood Checklist (ANC). ST was self-reported. Linear regression determined relationships between TPS and ST, and ANC scores and ST, for 1) overall population, 2) lower median-income D.C. areas, and 3) higher median-income DC and Maryland areas. For the sample (N = 98.9% African-American, 78% female), lower median-income areas had significantly lower mean TPS and ANC scores than higher median-income areas (p < 0.001). Three factors (neighborhood violence, physical/social environment, and social cohesion) were associated with overall NE perception. Among those in lower median-income areas, there was a negative association between TPS and ST that remained after covariate adjustment; this was not observed in higher median-income areas. There was no association between ANC scores and ST. Poorer NE perception is associated with greater ST for those in lower income areas, while objective environment is not related to ST. Multi-level interventions are needed to improve NE perceptions in lower-median income areas, reduce ST, and improve CV health.

1. Introduction

Sedentary behavior, defined by sitting or lying down for long periods of time (Department of Health, n.d.), is a known independent risk factor for cardiometabolic disease (Same et al., 2016), with mounting evidence of its association with all-cause mortality (Young et al., 2016). A Finnish population-based survey on risk factors of chronic, non-communicable diseases found that total daily sitting time was a predictor of CVD (cardiovascular disease), even after adjusting for potential confounders, such as age, gender, BMI, smoking status and physical

activity (Borodulin et al., 2015). Further research has also shown that as little as a 30-minute decrease or increased breaks in sedentary time per day can have a positive impact on body mass index (BMI) comparable to moderate to vigorous physical activity (MVPA) (Saleh et al., 2015; Healy et al., 2008).

A significant contributing factor to CVD risk is the neighborhood built environment (Malambo et al., 2016). Individuals' physical neighborhood surroundings, their perceptions of the local environment, as well as their interaction with the community's resources are all neighborhood built environment factors that strongly predict CV health (Chum and O'Campo, 2015). However, despite the growing body of evidence on the detrimental effects of sedentary time, much of the research evaluating the relationship between neighborhood environment and CVD risk factors has centered solely on physical activity. For example, it is established that an individual's built environment can influence physical activity (Malambo et al., 2016). It is also known that one's perceptions about the neighborhood environment are related to physical activity levels (Florindo et al., 2013), and may have a stronger relationship to physical activity than the objective built environment (Hanibuchi et al., 2015; Nyunt et al., 2015; Prins et al., 2009). Furthermore, lower socioeconomic areas appear to be differentially impacted with lower rates of physical activity due to decreased accessibility to physical activity resources (Estabrooks et al., 2003). Unsurprisingly, communities with higher socioeconomic disadvantage are thus associated with higher BMI and obesity rates (Powell-Wiley et al., 2013; Robert and Reither, 2004).

Unlike studies evaluating physical activity, however, studies examining the potential neighborhood environmental predictors of sedentary time, especially the psychosocial and environmental factors, remain scant and contradictory (Koohsari et al., 2015). One cross-sectional survey suggested that physical and social neighborhood conditions were associated with higher television viewing behaviors (Strong et al., 2013), while another could not reach clear conclusions about the correlates to sedentary time (Van Dyck et al., 2012). Furthermore, both of these studies restricted their analyses to perceived neighborhood environment, which precluded comparisons between perception and objective measures that might aid in identifying targets for intervention. Research incorporating socioeconomic status for examining sedentary time is even more scarce (Young et al., 2016). Therefore, it is pertinent to further characterize the relationship between neighborhood physical and social environment and sedentary time. Understanding the association between individuals' surroundings and excessive sitting behavior may elucidate potential information through which environment impacts CVD risk.

Using data from a community-based participatory research (CBPR) study, we examined the relationships between perceptions of neighborhood environment and sedentary time, as well as between the objective built environment and sedentary time among predominantly faith-based African Americans at high risk for CVD. We hypothesized that there would be a difference in strength of the two relationships, that perceptions of one's neighborhood environment would be more strongly associated with sedentary time compared to objective measurements of neighborhood environment, and that this relationship may be stronger within lower income neighborhoods.

2. Methods

2.1. The Washington, D.C. Cardiovascular Health and Needs Assessment

The Washington, D.C. CV Health and Needs Assessment (DC-CHNA) was a CBPR-designed, observational study to evaluate CV health factors, neighborhood environment characteristics, and cultural norms in a predominantly African-American faith-based population in Washington, D.C. communities at risk for significant CV disease. As a generally understudied community, low-income African Americans represent a population with the potential for significant improvement in CV risk factors. The DC-CHNA serves as a preliminary step in the development of a community-based behavioral change intervention to improve CV health in this community (Yingling et al., 2016; Thomas et al., 2016).

The project was conducted in 2014–2015 in partnership with a community advisory board, the D.C. Cardiovascular Health and Obesity Collaborative (D.C. CHOC), and has been described previously (Yingling et al., 2016). Data analyses were performed in 2016–2017. The Washington, D.C. CV Health and Needs Assessment was approved by the National Heart, Lung, and Blood Institute (NHLBI) Institutional Review Board (ClinicalTrials.gov NCT01927783). Informed consent was obtained from all study participants. Details about the design, recruitment and participation have been previously reported (Yingling et al., 2016, 2017; Thomas et al., 2016). Briefly, the study was designed using CBPR methods in collaboration with the D.C. CHOC, a community advisory board comprised of research team members, community members, and faith-based community leaders. Participants were recruited from Christian churches of various denominations in Wards 5, 7, and 8 of Washington, DC to facilitate a culturally appropriate, multicomponent study with the possibility of fostering future behavior change through the churches' influence as prominent social institutions.

2.2. Study definitions and measurements

2.2.1. Perceptions of neighborhood environment

The questions used to assess individuals' perceptions of their neighborhood were derived from the Project on Human Development in Chicago Neighborhoods (https://www.icpsr.umich.edu/icpsrweb/PHDCN/about.jsp). Participants were asked to respond to 18 questions about perceptions of their neighborhood environment, ranging from access to sidewalks and recreational areas to the seriousness of violence. The responses were standardized on a scale of 1 to 5 such that a higher score on the scale represents a more favorable perception of that specific characteristic.

Principal components factor analysis with varimax (orthogonal) rotation was used to define constructs or factors based on the 18 questions, as has been previously described (Estabrooks et al., 2003). Factor sums were then calculated by totaling numeric values of the answers for questions within each factor. A Total Perception Score (TPS) was derived by adding the factor sums. A higher TPS represents a more favorable perception of the neighborhood environment and vice versa.

2.2.2. Neighborhood environment audits

The Active Neighborhood Checklist (ANC), a validated neighborhood audit measure (Hoehner et al., 2007), was paired with Google Maps Street View to obtain objective information about participants' neighborhood environment. The measure consists of five sections (89 items) that assessed land use, residential density, street characteristics, and environmental quality.

For conducting the virtual audits, home addresses of study participants were obtained as part of the DC-CHNA. Up to 16 street segments, approximately 4 blocks in length, immediately adjacent to the participants' home addresses were assessed for the five sections on the ANC (land use, public transit stops, street characteristics, quality of the environment for a pedestrian, and places to walk and bicycle). A neighborhood street-segment map was created for each address. Each item on the ANC was scored on a scale of 0–2 points (maximum of 87 points per segment) based on its hypothesized influence on physical activity engagement. Two points indicated a positive effect on PA, while zero points were assigned to feature(s) with little to no effect on PA. The scores from all the segments were added to yield a Total ANC Score. Further details about the assessment process have been previously reported (Adu-Brimpong et al., 2017).

2.2.3. Sedentary time

Sedentary time was assessed using a single question derived from the Global Physical Activity Questionnaire (also used in the 2013–2014 National Health and Nutrition Examination Survey (NHANES)) (Armstrong and Bull, 2006). Participants were encouraged to report non-sleeping time spent in the following or similar activities: sitting in an office, reading, watching TV, using a computer, doing hand crafts like knitting, resting.

2.2.4. Physical activity: objective measurement

Physical activity was denoted by the average number of steps taken per day by the individual over the course of a 30-day assessment period. The data was collected using wearable wristband technology and the specific method has been previously described (Thomas et al., 2016).

2.2.5. Demographic and anthropometric measures

Demographic information, including age, sex, attained educational level, and household income, were self-reported. Income categories for analysis were selected based on previous published papers using the DC-CHNA (Yingling et al., 2016). Height was measured using a stadiometer (Perspective Enterprises, Portage, MI). Weight was measured using a calibrated scale (Doran Scales, Inc., Batavia, IL). BMI was calculated from the height and weight measured during the study (Thomas et al., 2016).

2.3. Data analyses

Participant (n = 99) characteristics were compared between those living in the lowest median income wards of Washington, D.C. (Wards 5, 7, and 8) and participants in other areas of DC as well as Maryland neighborhoods of relatively higher median incomes. Although the participants outside of the target wards (5, 7, and 8) are categorized as "higher" median income, these participants are still of low socioeconomic status overall. Continuous variables were compared between these two groups using Student's *t*-test for continuous variables and chi-square testing for categorical variables. The overall population's baseline characteristics were also calculated.

Linear regression modeling was used to determine the relationship between perception of one's neighborhood environment and sedentary time. The association between each of the factor sums and TPS with sedentary time was modeled for the overall population, for those in the lowest income Washington, D.C. areas, and for those in the higher median income areas. Linear regression models for the three groups were also utilized to assess the association between objective neighborhood environment as measured by the overall ANC and its section scores with sedentary time. Models were adjusted for age, sex and income, and p-values ≤ 0.05 for beta coefficients were considered significant.

Analyses were performed using Statistical Analysis Software (version 9.4, SAS Institute Inc., Cary, NC).

3. Results

The study participants were mostly African American (N = 98, 98.9%), female (N = 78, 78.8%), and the mean age was 59 ± 12 years old (Table 1). There were no significant differences between the gender distribution, mean age, and education levels between the lowest median income areas of Washington D.C., and other areas of Washington, D.C. and Maryland. The average household income in the lower socioeconomic areas, however, was significantly different from the other areas in the region (p < 0.05). The lower median income wards had a higher percentage of households that earned less than $60,000 (Table 1). However, the higher median income areas are still relatively low-socioeconomic status. In terms of physical activity, average BMI, and average amount of sedentary time, there were no substantial differences between the two groups.

Moreover, the average TPS was much lower among individuals living in the lower median income areas. A similar trend was seen with the average factor sums for Factor 1 (violence) and Factor 2 (physical and social environment), which were significantly lower for the lowest income wards (Table 1). The average ANC score was also significantly lower for the lower median income group.

Table 2 shows the results of principal components factor analysis pertaining to the neighborhood perceptions questions. This analysis yielded three factors with Eigenvalues greater than or equal to two that explained up to 92% of the common variance in the population's data. These three factors were 1) neighborhood violence, 2) Physical and social environment and 3) social cohesion with Cronbach's alpha coefficients of 0.91, 0.86, and 0.82, respectively. As shown in Table 2, five questions defined the perceptions of neighborhood violence, six questions defined the physical and social environment, and four questions defined social cohesion, with loading scores ranging from 0.43 to 0.88.

In the linear regression model for the lowest median income areas, there was a significant relationship between TPS and ST (beta coefficient −0.115, p < 0.05) as well as Factor 2 and ST (beta coefficient −0.255, p < 0.05), even after adjusting for age, sex, and income (Fig. 1, Table 3). This association was not observed in the higher income areas. In unadjusted models, Factors 1 and 3 were also related to ST. However, these relationships did not remain significant when adjusted for covariates. For the ANC, neither the total scores nor any section scores had significant associations with ST (Fig. 1, Table 3).

4. Discussion

Our exploratory hypothesis-generating analyses suggest a relationship between the perceptions of neighborhood environment and sedentary time among predominantly African American, faith-based communities in lower socioeconomic areas of Washington, D.C., but not a relationship between objectively measured neighborhood environment and sedentary time. Although the perception of neighborhood environment has often been discussed in the context of physical activity or television viewing time, our study appears to be one of the first to explore the concept's relationship to overall sedentary behavior among adults in the United States (Florindo et al., 2013; Strong et al., 2013; Hoehner et al., 2005). In particular, our work highlights three different constructs that constitute an overall perception of neighborhood environment within our population. The factors - perceived violence, physical and social environment, social cohesion - are consistent with perceptions that have been found in other populations (Estabrooks et al., 2003). Out of the three factors, the physical and social environment perceptions were most correlated with sedentary time, while violence and social cohesion were not significantly associated, suggesting that physical and social environmental aesthetics may have a greater impact on sedentary time compared to crime and social cohesion alone.

Over the past few decades, literature has shown that the congruence between perception and objective environment is, at best, limited (Prins et al., 2009; Ball et al., 2008). It is also documented that individual perceptions of neighborhood environment can be stronger predictors of physical activity than their objective counterparts (Nyunt et al., 2015; Ball et al., 2008). Our finding is particularly interesting in this context as it is one of the first to highlight a similar pattern of relationships between objective and perceptive measures of neighborhood environment to sedentary behavior. Our study revealed that only the perceptions of neighborhood environment, and not the objective audits conducted of the neighborhood, were related to sedentary time in the low-median income areas, and calls for a deeper examination of differences in perceived versus objective neighborhood factors relative to sedentary time in future research. The reason for perceptions being a stronger predictor of sedentary time could be that an individual's interpretations of his/her surroundings are often different from the "real" environment.

Table 1

Demographics, cardiovascular health measures and neighborhood perception and objective scores for DC-CHNA across socioeconomic groups.

|	All individuals N = 99	Low median income wards (wards 5,7,and 8) N = 38	Higher median income wards (residents NOT in wards 5,7, and 8) N = 61	p-Trend
Demographic characteristics				
African American, N (%)	98 (99.9)	38 (100.0)	60 (98.4)	
Female, N (%)	78 (78.8)	32 (84.2)	46 (75.4)	0.29
Mean age, years (SD)	59.1 (12.1)	57.6 (13.9)	60 (10.9)	0.32
Education, N (%)				
< High school	9 (9.2)	5 (13.5)	4 (6.6)	0.25
High school	10 (10.2)	4 (10.8)	6 (9.8)	0.87
Some college	34 (34.7)	13 (35.1)	21 (34.4)	0.94
College	45 (45.9)	15 (40.5)	30 (49.2)	0.41
Yearly household income, N (%)				
< $60,000	40 (58.8)	20 (74.1)	20 (48.8)	**0.03**
$60,000–99,999	28 (41.2)	7 (25.9)	21 (51.2)	**0.03**
$100,000 +	0	0	0	
Cardiovascular health measures				
Physical activity (steps/day) mean (SD)	8803.4 (4347.1)	8612.5 (4389.4)	8917.9 (4219.1)	0.72
Mean BMI, kg/m^2 (SD)	32.6 (7.0)	33.2 (6.9)	32.2 (7.1)	0.50
Sedentary time (hours/day), mean (SD)	6.6 (3.8)	7.1 (4.6)	6.4 (3.3)	0.86
TV watching (hours/day) mean (SD)	3.4 (1.5)	3.5 (1.4)	3.3 (1.5)	0.61
Neighborhood environment characteristics				
Total Perception Score mean (SD)	56.1 (12.6)	51.0 (13.5)	59.3 (11.0)	**0.0004**
Factor 1 (violence) score Mean (SD)	19.8 (5.3)	17.7 (5.4)	21.1 (4.8)	**0.001**
Factor 2 (physical and social environment) score mean (SD)	23.9 (5.7)	21.8 (6.5)	25.1 (4.9)	**0.01**
Factor 3 (social cohesion) score mean (SD)	13.0 (3.4)	12.3 (3.5)	13.4 (3.2)	0.26
ANC score mean (SD)	390.1 (34.5)	384.0 (33.8)	413.0 (27.7)	**0.001**

Bold: p < 0.05

Table 2

Factor analysis for neighborhood environment perception in Washington, D.C. CV Health and Needs Assessment (DC-CHNA).

Component	Question pertaining to	Mean (SD)	Factor 1	Factor 2	Factor 3
Violence (Factor 1)	Sexual assault	4.19 (1.02)	0.88	0.14	0.06
	Gang violence	4.33 (1.09)	0.87	0.15	0.15
	Robbery	3.69 (1.32)	0.71	0.27	0.08
	Violent arguments	3.94 (1.29)	0.66	0.37	0.38
	Fights with weapons	3.64 (1.41)	0.65	0.36	0.18
Physical and social environment (Factor 2)	Trash and litter	4.04 (1.24)	0.21	0.82	0.19
	Violence	3.90 (1.35)	0.33	0.71	0.16
	Excessive noise	4.13 (0.99)	0.35	0.68	0.08
	Heavy traffic	3.74 (1.24)	0.31	0.63	− 0.02
	Sidewalks	4.33 (1.07)	0.01	0.53	0.06
	Lack of recreational areas	4.13 (1.28)	0.08	0.43	0.12
Social cohesion (Factor 3)	Willingness to help others	3.56 (0.97)	0.22	0.28	0.8
	Close knit neighborhood	3.13 (1.08)	0.08	0.08	0.76
	Trustworthy people	3.30 (0.94)	0.12	0.3	0.75
	Shared values	3.19 (0.99)	0.06	0.01	0.57
	Eigenvalue		3.39	3.17	2.69
	Common variance explained by each component		67.49	13.94	11.21
	Cronbach's alpha coefficient		0.91	0.86	0.82

Individuals consider not only the objective physical environment, but also, social cues, attitudes and other psychosocial processes when forming perceptions of their surroundings. For example, stress could impact the way an individual thinks about his or her environment, with excessive stress swaying perception negatively (Wen et al., 2006). Stress could then potentially mediate the relationship between neighborhood environment and sedentary time, and thus increase a person's sedentary behaviors. The inclusion of factors and mediators such as neighborhood-related personal stress, poor prior individual health, socioeconomic status, or personal attitudes about or experience with the neighborhood may explain why perception is more influential in an individual's decision to remain sedentary and/or engage in physical activity. However, there is a paucity of research on mediators of neighborhood environment and sedentary time, such as neighborhood stress – the chronic stress of being exposed to a deprived neighborhood environment – or BMI. Thus, the potential mechanisms that affect perception and its relationship to sedentary time need to be further explored using both qualitative and quantitative methods to gain a richer understanding of what may make perceptions different from and more influential than objective assessments in predicting sedentary time.

Another salient finding from our study is the specificity of the
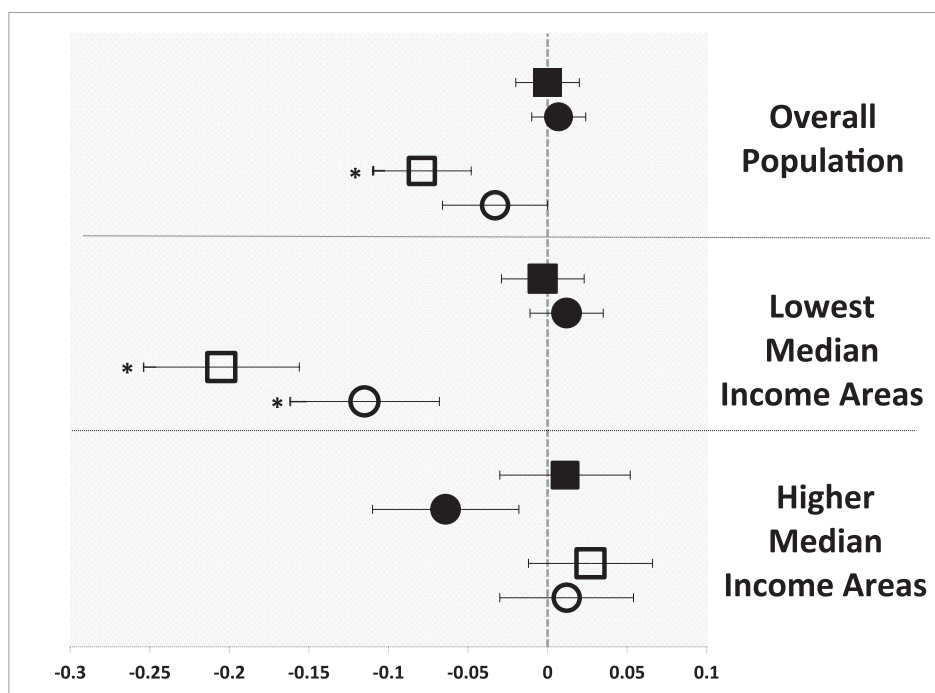
Fig. 1. β coefficients for Total Perception Score and Total ANC Score vs. sedentary time, Washington, D.C. Community Health and Needs Assessment (DC-CHNA).
* β coefficient, p < 0.05.

■ □   Unadjusted β coefficient

● ○   Adjusted β coefficient

■ ●   Shaded figures: β coefficient for Total ANC Score vs. Sedentary Time

□ ○   Unshaded figures: β coefficient for Total Perception Score vs. Sedentary Time

* β coefficient, p<0.05

Table 3
β coefficients for neighborhood environment perception factors and ANC section scores vs. sedentary time (DC-CHNA).

	Overall population (N = 99)		Low median income areas - DC wards 5,7, and 8 (N = 38)		Higher median income areas - other DC wards and Maryland (N = 61)	
	Unadjusted β (SE)	Adjusted β for age, sex, and income (SE)	Unadjusted β (SE)	Adjusted β for age, sex, and income (SE)	Unadjusted β (SE)	Adjusted β for age, sex, and income (SE)
Factor 1-neighborhood violence	**− 0.154*** (0.077)	0.041 (0.083)	**− 0.421**** (0.139)	− 0.035 (0.177)	0.021 (0.094)	0.039 (0.100)
Factor 2-physical and social environment	**− 0.185*** (0.071)	**− 0.146*** (0.071)	**− 0.430***** (0.114)	**− 0.255*** (0.099)	0.025 (0.091)	− 0.044 (0.099)
Factor 3-social cohesion	− 0.121 (0.121)	− 0.036 (0.126)	**− 0.467*** (0.221)	− 0.328 (0.205)	0.132 (0.140)	0.033 (0.167)
Part A-land use	0.009 (0.031)	0.041 (0.035)	− 0.029 (0.085)	0.076 (0.084)	0.006 (0.052)	0.071 (0.056)
Part B-public transportation	0.065 (0.118)	0.164 (0.125)	− 0.025 (0.227)	**0.463*** (0.215)	0.103 (0.14)	0.029 (0.149)
Part C-street characteristics	0.029 (0.041)	0.061 (0.043)	− 0.134 (0.111)	0.056 (0.115)	0.065 (0.041)	0.055 (0.046)
Part D-environmental quality	0.017 (0.035)	− 0.004 (0.037)	− 0.027 (0.086)	− 0.108 (0.068)	0.068 (0.042)	0.067 (0.050)
Part E-walking/bicycling places	0.011 (0.009)	0.016 (0.009)	0.031 (0.047)	0.033 (0.039)	0.009 (0.009)	0.014 (0.010)

β coefficient: the change in sedentary time for every one-unit increase in total neighborhood environment perception score.
SE: standard error.
Bold: p < 0.05
* p < 0.05.
** p < 0.01.
*** p < 0.001.

relationship between perceptions of neighborhood environment and sedentary time to the lower socioeconomic areas of Washington, D.C. While there was a significant relationship between the two, it did not hold true for the higher median income communities. The individuals in the lower socioeconomic areas of Washington D.C. also had a significantly lower Total Perception Score, on average, compared to their counterparts. It is possible that since individuals in lower socioeconomic areas had more unfavorable perceptions, they were also more likely to utilize those negative interpretations as stronger decision-making factors for their sedentary behavior. On the other hand, those in higher median income neighborhoods, who had more favorable perceptions, did not consider their environment to be a large component of the decision for engaging in sedentary behavior.

Our findings, thus, suggest that improving cardiovascular health in lower socioeconomic neighborhoods may require enhancing perceptions of neighborhood environment, addressing potential mediators, and thereby, curbing sedentary time. Therefore, there is a need for targeted, multi-level interventions that affect an individual's propensity for sedentary time and impact neighborhood-level factors that influence perceptions of environment. For instance, improving knowledge of safe, high-quality and affordable resources for physical activity in one's neighborhood environment may improve perceptions about neighborhood environment, specifically perceived physical environment, and thereby decrease sedentary time (McNeill and Emmons, 2011). Although sedentary time is not necessarily the reverse of physical activity, improved physical activity resources have the potential to stimulate reallocation of time and behavior from sedentary to active during leisure hours. Combining these strategies with interventions addressing potential individual-level barriers that promote excess sedentary time, such as time availability or limited social support, may be particularly effective (Speck et al., 2007; Krieger et al., 2009). Perceived social environment was strongly implicated in the current study and therefore future research should investigate the social environment as a point of intervention. It is likely that each community and neighborhood faces unique barriers to strong social cohesion, however, there is potential for crime-reduction strategies, community building, and multi-level interventions to engage community members and improve neighborhood social environment (Economos et al., 2007). The possibility of altering mediators of the relationship between perceived neighborhood environment and sedentary time for the development of targeted interventions needs to be further explored, especially as the use of factor analysis – and therefore bundling of the survey questions - in this study may obscure the specific neighborhood attributes that require attention to reduce sedentary time.

As with most community-based research, our sample was small and specific to one community and population. The focus of the study was a faith-based, predominantly African-American population in a lower socioeconomic, urban setting. The findings may be different in a non-faith-based population, which would likely be younger (Powell-Wiley et al., 2013; Feinstein et al., 2010) and therefore might have differing perceptions of neighborhood environment (Powell-Wiley et al., 2013), or a rural population, as the neighborhood environment questions used do not apply to rural settings. We chose to engage the African American faith-based population due to the significant health disparities experienced by this population, and the opportunity to leverage the social support of the church to involve the community in intervention development and implementation via CBPR techniques such as the community advisory board and focus groups.

5. Limitations

Due to our small sample size, we were unable to examine the effects of potential mediators, such as physical activity and BMI. It is possible that the relationship between perceptions of neighborhood environment and sedentary time was mediated by factors not accounted for in our analyses. For example, although, physical activity is an independent

risk factor for cardiovascular disease, it could potentially mediate the relationship between perceptions of neighborhood environment and sedentary time. Previous research has shown that individuals who perceive their neighborhood in a more unfavorable light are less likely to engage in physical activity resources within their community (Van Dyck et al., 2015; Jáuregui et al., 2016), which likely yields more sedentary behavior such as TV watching. Similarly, a person's current health status, their BMI, weight perceptions, or general neighborhood stress may mediate the relationship between their perception of the neighborhood environment and sedentary time. The role of these potential mediators should be analyzed in depth in future, larger studies. More research and increased data on neighborhood and environmental predictors of sedentary time, thus, are crucial for further understanding the underlying mechanisms for the relationship between neighborhood environment and sedentary time.

We recognize also the limitations of using the ANC as an objective measure of neighborhood environment as it does not weigh the elements included within the checklist and relies on GSV for the visual aspects of the environment rather than direct observation, therefore introducing the possibility for error. However, previous validation of the ANC has shown it to be an efficient and cost-effective method for measuring neighborhood environment (Hoehner et al., 2007; Adu-Brimpong et al., 2017).

Lastly, our study utilized self-reported sedentary time measured by a single survey item alone, which may not have adequately captured total sedentary time. Although self-report data for sedentary time has been used extensively in the past, it often represents an underestimate in comparison to device-measured sedentary time (Thorp et al., 2012). Future studies examining the relationship between neighborhood environment and sedentary time should attempt to use accelerometer-based sedentary time data.

6. Conclusions

Our study shows that there is a potential connection between perceptions of neighborhood environment and sedentary time in a low-SES, high risk, predominantly African-American faith-based population. Our analyses further reveal the specificity of the association within lower socioeconomic areas of Washington, D.C. and we attempt to provide potential explanations for these findings. Although our sample is small, overall low-income, and limited to primarily African American women, the hypotheses generated in our study are pertinent to future research and can be utilized for shaping analyses in larger population studies. Future work, thus, should further explore the associations discovered within this sample in a larger and more diverse cohort.

Heart, Lung, and Blood Institute; the National Institutes of Health; or the U.S. Department of Health and Human Services.

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