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Does Social Support Mediate the Relationship Among Neighborhood Disadvantage, Incivilities, Crime and Physical Activity?

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Introduction

Minority women are a vulnerable population expressing significant disparities in physical activity. Women report lower levels of physical activity (PA) (42.6%) compared to men (52.1%), and African Americans (17.3%) and Hispanics (14.4%) report lower levels of PA compared to whites (22.8%; CDC, 2013). Physical inactivity in ethnic minority women has contributed to increased incidence of obesity and related comorbidities such as diabetes, cardiovascular disease, and some cancers in this population (McAlexander et. al., 2009).

Individually focused strategies aimed at increasing PA have produced modest results that are insufficient for maintaining behavior changes (Lee, Medina, et al., 2011; Pearce & Maddison, 2011). Previous research has shown that health behaviors such as PA are impacted by social and environmental factors beyond the individual (McNeill, Kreuter, & Subramanian, 2006). The Ecological Model of Physical Activity (EMPA) provides a framework for mapping the interaction between social and environmental factors and their influence on PA behaviors in the individual (Spence, 2003). Ecologic approaches are critical in understanding the low levels of PA reported by minority women, as key determinants of physical inactivity in this population are multi-faceted and span multiple environments.

The micro-environment is defined by the EMPA as the environment in which one lives, works, and plays, such as the home, school, workplace, or neighborhood. The meso- and exo-environment represent the direct and indirect social links and connections that exist between micro-environments. According to the EMPA, relatively static micro-level environment characteristics such as neighborhood streets, physical activity resources, and neighborhood goods and services can influence and interact with the more dynamic meso-

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and exo-level environmental social links and connections to promote or hinder PA (Spence, 2003). Despite these thoughtfully conceptualized drivers of behavior, few studies have tested these levels and pathways. Such studies are needed to inform PA research and promotion among minority women (Pearce & Maddison, 2011).

Neighborhood disadvantage is a micro-level environmental factor characterized by high rates of poverty, unemployment, low wage jobs, female-headed households, and low educational attainment (Boone-heinonen et al., 2011). High levels of disadvantage discourage residents from engaging in PA outdoors (Hannon et al., 2012; Miles, Panton, Jang, & Haymes, 2008; Ross & Mirowsky, 2013). Disadvantaged neighborhoods express visible signs of disorder such as crime and incivilities that also discourage PA by creating an environment that is perceived as unsafe and unappealing (Ball et al., 2010; Heinrich et al., 2007; Lee, Cubbin, & Winkleby, 2007; Lopez & Hynes, 2006; Miles & Panton, 2006). Neighborhood disadvantage, crime, and incivilities are micro-level barriers to PA that disproportionately impact minority neighborhoods in the US (Boone-heinonen et al., 2011; Hannon et al., 2012).

Social linkages and connections in the dynamic meso- and exo-environments also play an influential role in promoting or inhibiting PA between people and places (Å, Cushman, & Gidlow, 2009; Ball et al., 2010; Hannon et al., 2012). The probability of achieving recommended levels of PA significantly increases in social environments that support individual efforts to change behavior (Carlson et al., 2011; Yu et al., 2011a). Peer social support has been identified as a particularly important construct in the cultural context of minorities and is significantly correlated with PA among African American and Hispanic Latina women (Eyler et al., 1999; Griffin et al., 2008).

Neighborhood disadvantage, crime, and incivilities discourage outdoor activity and can inhibit important meso- and exo-environment links like social support by conveying that social control in the neighborhood is weak (Ross & Mirowsky, 2013). According to Taylor's Theory of Environmental Incivilities, the presence of incivilities conveys a sense of disorder, creating barriers that limit neighbors from socializing and engaging in PA in their neighborhood (King, Stokols, Talen, Brassington, & Killingsworth, 2002). In the same way, high levels of crime inhibit PA by limiting socialization and creating feelings of stress, fear, and distrust among neighbors (Burdette & Hill, 2008; Foster & Giles-Corti, 2008; Tucker-Seeley, Subramanian, Li, & Sorensen, 2009).

Efforts to reverse factors associated with neighborhood disadvantage, crime, and incivilities may prove arduous, time consuming, and require a coordinated effort spanning multiple levels of society; in contrast, creating a socially supportive environment in the neighborhood or home may be a feasible solution to increasing PA in ethnic minority women. Although studies have shown that peer social support is a significant predictor of PA in minority women, more research is needed in order to understand the mediating role of social support in this population (Lee, Medina, et al., 2011; Lindsay et al., 2011). The purpose of this study was to examine whether social support mediates the effects of neighborhood disadvantage, incivilities, and crime on PA. The theoretical framework for this study is illustrated in Figure 1.

Methods

This study is a secondary cross-sectional analysis of data collected in 2005 in the Health Is Power (HIP) study (R01 CA109403). HIP was a randomized controlled trial aimed at improving PA or fruit and vegetable consumption in minority women in Houston and Austin, TX. HIP participants were recruited through various media outlets, online resources, and community partnerships. Participants were screened to be physically inactive, free from health compromising conditions that would inhibit regularly performed moderate intensity PA and between the ages of 25-60 years old.

Procedures

Data used in the current study were taken from the HIP baseline health assessment. Four hundred and ten (Houston=311, Austin=99) African American ($N=262$) and Hispanic Latina ($N=148$) women completed interviewer-administered questionnaires. The residential address of each participant was collected and geocoded using Geographic Information Systems (GIS), which was then used to determine the location and census tract of each address. The census tract for each participant's residential address was then linked to the corresponding environmental data that was collected at the tract level. All HIP participants completed consent forms prior to completing all measurements and assessments. The Committee for the Protection of Human Subjects at the University of Houston approved all procedures and protocols used in the study and participants gave their informed consent to participate.

Micro-level Environment Measures

Neighborhood Disadvantage—Data on neighborhood disadvantage was obtained from the Inter-University Consortium for Political and Social Research through the *National Neighborhood Crime Study (NNCS), 2000*. The purpose of the NNCS study was to compile census tract-level crime and sociodemographic data in communities of varying ethnicities in a representative sample of major US cities including Houston and Austin, TX (Peterson & Krivo, 2000). The NNCS study collected tract level information of structural disadvantage which included the average standard scores of six indices: low-wage jobs, joblessness, percent of professionals and managers, percent high school graduates, female headed households, and poverty. Higher average scores indicate greater neighborhood disadvantage.

Crime—Crime data from the NNCS study included seven index offenses at the census tract level. These offenses include violent crimes such as manslaughter, rape, robbery, aggravated assault, and property crimes such as burglaries, larcenies, and motor vehicle thefts. The total crime variable used in this study represents the total number of offenses per tract (Peterson & Krivo, 2000).

Incivilities—The Pedestrian Environment Data Scan (PEDS) measured the frequency of incivilities within a 400-meter buffer surrounding each participant's home address. The PEDS assessment was conducted by trained field assessors as a part of the HIP study in 2005. The PEDS instrument objectively measures the quality and condition of the pedestrian environment and is able to capture micro-scale features that are often overlooked in public

data sources. PEDS has demonstrated reliability in measuring safety and attractiveness of both commercial and residential environments (Clifton, Livi, & Rodriguez, 2006). Item 31 on the PEDS instrument was used in this study to measure the frequency of litter, graffiti, and broken glass. A higher score indicates greater number of incivilities.

Meso- and Exo-environment Measures

Social support for exercise was assessed using the Family and Friend Support for Exercise Habits scale. This scale assesses social support in the form of verbal persuasion, encouragement, motivation, physical support, in which a friend offers to exercise with the participant, and the level of exposure to social networks that support behavior change and are focused on achieving similar goals. This scale uses 5 items and a 5-point Likert-type scale (0=never; 4= everyday) to assess social support. Total scores can range from 0 to 20 with higher scores indicating more social support ($\alpha=.81$) (Eyler et al., 1999; Sallis, Grossman, Pinski, Patterson, & Nader, 1987).

Behavioral Outcome

Self-reported PA was measured using the interviewer-administered, long form International Physical Activity Questionnaire (IPAQ). The IPAQ measures the type, intensity, frequency, duration, and intensity of self-reported PA over a period of 7 days (Hagströmer, Oja, & Sjöström, 2007). Using the IPAQ, HIP participants reported PA in terms of days per week and minutes and/or hours per day. Total PA was estimated in metabolic equivalent minutes (MET-min) (Lee, Mama, et al., 2011).

Individual Measures

Baseline health assessments included measures of BMI, demographics, and PA. To measure BMI, participants removed their shoes and heavy outer clothing while trained research assistants measured height using a portable stadiometer (Seca 225 Hite Mobile Measuring Device) and weight using a bioelectric impedance monitor with scales (TBF-210) (Lee, Mama, et al., 2011; McAlexander, Mama, Medina, O'Connor, & Lee, 2011). Demographics such as ethnicity, age, income status, and education level were measured using self-administered questionnaires.

Analysis

All analyses were conducted using SPSS (version 20.0). Data were cleaned and screened for errors and outliers prior to analyses. Raw scores with a z score greater than three or smaller than negative three were considered outliers. Cases in which outliers were identified were excluded. A preliminary inspection of data revealed violations of the assumptions of normality. Neighborhood disadvantage, crime, and total PA were square root transformed for normality.

Bivariate Pearson correlation coefficients were used to investigate correlations among neighborhood disadvantage, crime, incivilities, PA and social support. T-tests were used to investigate differences in individual and micro-environment factors between African American and Hispanic participants. To assess peer social support as a mediator between neighborhood disadvantage, crime, incivilities, and PA the methods of testing mediation

outlined by Baron and Kenny were followed (Baron & Kenny, 1986). Site, ethnicity, age, income, and education were included as covariates in all models. In the first model, the association of neighborhood disadvantage, crime, and incivilities to PA was tested. In the second model, the association of neighborhood disadvantage, crime, and incivilities to social support was tested. In the third model, the association between social support and PA was tested. In the fourth model, the association of neighborhood disadvantage, crime, incivilities, and social support to PA was tested. Evidence of a mediation effect is provided if the presence of a significant effect of social support in the final model significantly reduces the relationships between neighborhood disadvantage, crime, and incivilities with PA, provided that Models 1 and 2 are significant.

Results

Descriptive Statistics

Most participants were classified as overweight or obese ($M=34.32$, $SD=7.97$), self-identified as African American ($N=229$) or Hispanic Latina ($N=141$) and had a mean age of 45 ($SD=9$). Nearly half of all participants (44.6%) reported an income of greater than 401% of the federal poverty level. The majority of participants (84.1%) were educated beyond high school with 44.6% reporting some college education and 39.5% reporting that they had completed college. The average score for peer social support for exercise was 12.9 ($SD=3.54$). African American and Hispanic participants did not report significantly different levels of peer social support ($t(350)=.63$, $p>.05$). African American participants reported less total PA ($M=38.23$, $SD=23.3$; $t(326)=-2.445$, $p<.05$) compared to Hispanic participants ($M=44.87$, $SD=24.47$). All descriptives are presented in Table 1.

Levels of neighborhood disadvantage were lower for African American participants ($M=1.65$, $SD=.17$; $t(368)=-2.56$, $p<.05$) compared to Hispanic participants ($M=1.7$, $SD=.19$). Crime rates were significantly higher in the neighborhoods of African American participants ($M=8.19$, $SD=1.38$; $t(368)=2.84$, $p<.05$) compared to the neighborhoods of Hispanic participants ($M=7.73$, $SD=1.69$). Incivilities did not differ between the neighborhoods of African American and Hispanic participants ($t(368)=-1.92$, $p>.05$).

Bivariate Associations

Bivariate correlations are presented in Table 2. Bivariate correlations revealed that social support was negatively correlated with neighborhood disadvantage; however, social support was not significantly correlated with crime or incivilities. Bivariate correlations also showed that PA was negatively correlated with neighborhood disadvantage, but was not significantly correlated with crime, incivilities, or peer social support.

Regression Models

Linear regression models were used to examine social support as a mediator in the relationship of neighborhood disadvantage, crime, and incivilities to PA. In Model 1, the full model revealed that in combination, neighborhood disadvantage ($\beta=-.102$, $p>.05$), crime ($\beta=.096$, $p>.05$), and incivilities ($\beta=.027$, $p>.05$) were not significantly associated with PA ($F(3,264)=2.22$, $p>.05$). Neighborhood disadvantage, crime, and incivilities explained 2.3%

of the variance in PA ($R^2 = .023$). In Model 2, the full model revealed that neighborhood disadvantage, crime, and incivilities were not significantly associated with peer social support ($F(3,264) = 2.02, p > .05$). As individual predictors, neighborhood disadvantage ($\beta = -.157, p < .05$) was significantly associated with peer social support; however, crime ($\beta = -.016, p > .05$), and incivilities ($\beta = .019, p > .05$) were not significantly associated with peer social support. Overall neighborhood disadvantage, crime, and incivilities explained 2.2% of the variance in peer social support ($R^2 = .22$). In Model 3, social support ($\beta = .118, p > .05$) was not significantly associated with PA ($F(1,266) = 3.8, p = .052$). Social support explained 1.3% of the variance in PA ($R^2 = .013$). In Model 4, the full model revealed that in combination, social support, neighborhood disadvantage, crime, and incivilities were marginally associated to PA ($F(4,263) = 2.4, p = .051$). As predictors, Neighborhood disadvantage ($\beta = -.086, p > .05$), crime ($\beta = .098, p > .05$), incivilities ($\beta = .025, p > .05$) and social support ($\beta = .103, p > .05$) were not significantly associated with PA.

Peer social support did not mediate the relationship among neighborhood disadvantage, crime, incivilities, and PA as Model 1 revealed that neighborhood disadvantage, crime, and incivilities were not significantly associated with either PA or peer social support after adjusting for site, ethnicity, age, income, and education. A summary of each regression model is presented in Table 3.

Discussion

The purpose of this study was to examine peer social support as a mediator among neighborhood disadvantage, incivilities, crime and PA. Social support was significantly associated with neighborhood disadvantage; however, peer social support did not mediate the relationship among neighborhood disadvantage, crime, incivilities, and PA.

T-test results showed that there were significant differences in micro-level factors between African American and Hispanic participants. African American neighborhoods had lower levels of neighborhood disadvantage, yet higher levels of crime compared to Hispanic neighborhoods. Significant differences in PA levels also existed between African American and Hispanic women, with African American participants reporting less PA compared to Hispanic participants. The increased levels of crime observed in African American neighborhoods may explain the decreased levels of PA reported among these participants (Foster & Giles-Corti, 2008).

Bivariate associations revealed that total PA was negatively associated with neighborhood disadvantage indicating that increased levels of neighborhood disadvantage discouraged PA (Lee et al., 2007; Miles et al., 2008; Ross & Mirowsky, 2013; Yu et al., 2011b). Peer social support was also negatively associated with neighborhood disadvantage, which is consistent with studies that have shown that social support and neighborhood disadvantage are inversely related (Ross & Mirowsky, 2013). Women who live in disadvantaged neighborhoods often have limited opportunities to build social connections with others and can become socially isolated negatively impacting PA (Lee et al., 2007). Peer social support was not significantly associated with crime or incivilities. About half of the women in our sample (49.8%) reported an income greater than 401% of the federal poverty level and

88.8% reporting an education level beyond high school, higher than the population average in their communities, which may explain the weak associations observed between peer social support and crime and incivilities (Lee et al., 2011). High SES minorities tend to live in more affluent neighborhoods with decreased levels of neighborhood disorder (Huston, Evenson, Bors, & Gizlice, 2010; Legh-Jones & Moore, 2012; Lopez & Hynes, 2006; Tucker-Seeley et al., 2009; Vidrine et al., 2013).

Social support was positively associated with PA, however this relationship was not statistically significant. This finding differs from previous studies that show a significant positive association; however, women in the study reported fairly low levels of social support with an average score of 12.9 (3.54) out of a possible score of 20, suggesting a baseline effect (Kahn et al., 2010; Miles & Panton, 2006; Parks, Housemann, & Brownson, 2003).

Regression analyses showed there was no evidence of mediation, as neighborhood disadvantage, crime, and incivilities were not significantly related to PA or social support. The literature supports that these micro-environmental factors are negatively associated with PA and social support, yet these associations were not observed in this sample (Ball, Timperio, & Crawford, 2006; Heinrich et al., 2007). As mentioned earlier, the use of a high-income, educated sample may have limited our ability to test social support as a mediator. Due to their high SES, women in this sample may have resided in neighborhoods where signs of disorder were not barriers to PA or social support (Anderson & Bulatao, 2004; Tucker-Seeley et al., 2009). Studies have shown that individuals with higher levels of income and education have access to more, safe PA resources leading to increased PA and opportunities for social interaction (Huston et al., 2010; Parks et al., 2003; Vidrine et al., 2013). Stronger association between neighborhood disadvantage, crime, incivilities, and PA may be observed among low SES women as they are exposed to higher levels of neighborhood disorder (Anderson & Bulatao, 2004; Tucker-Seeley et al., 2009).

Strengths of this study include a sizeable sample of African American and Hispanic women. This is a vulnerable at-risk population as minority women report higher levels of obesity and obesity related co-morbidities compared to white women. Limitations to this study include the use of self-reported data for PA, which may have resulted in participants over-reporting their achieved level of PA. A further limitation to our measures of PA is the inability to distinguish between PA performed within or outside of one's neighborhood micro-level neighborhood environment. Unfavorable micro-level neighborhood environment factors may not have an effect on participants that engage in PA outside of the neighborhood micro-environment. The use of personal data on PA, social support, and the PEDS assessment collected in 2005 and neighborhood disadvantage and crime data collected in 2000 is an additional limitation. Data on neighborhood disadvantage from 2000 was used as this represented the most recent survey of these variables in Houston and Austin; however, these statistics may have changed between the years 2000 through 2005. While the Baron and Kenny method of testing mediation is valid and has been a mainstay of mediation analyses for nearly 30 years, there may be newer methods of testing mediation that would also be suitable for these analyses.

Findings in this study demonstrate that neighborhood disadvantage is negatively correlated to PA and negatively associated with social support indicating that neighborhood disadvantage is a significant inhibitor of PA and social support. The persistent presence of neighborhood disadvantage can amplify a resident's negative perceptions of the neighborhood and can lead to significant reductions in PA and social interaction (Foster & Giles-Corti, 2008). These results emphasize the need to identify effective strategies to decrease the impact of neighborhood disadvantage on health behaviors in this population.

Policy can work to create environments that support PA in disadvantaged areas by implementing micro-level factors that encourage outdoor PA such as street lighting and sidewalks. The implementation of streetlights and sidewalks can help facilitate safe access to outdoor and indoor PA resources for neighborhood residents (CDC, 2011). Improving neighborhood factors brought on by disadvantaged areas can also lead to increases in social support and community connectedness, further contributing to an environment that supports PA (Griffin et al., 2008; McDonald, 2008).

Strategies that encourage social support, social connectedness, and collective efficacy within one's neighborhood can be used to minimize the impact of neighborhood disadvantage on peer social support. Practical strategies such as community events and/or organizations encourage that community members to interact with one another in the neighborhood setting (Gasevic et al., 2011; Griffin et al., 2008). Improving social support and social interactions at the community level can promote PA by discouraging the negative effects of a disadvantaged neighborhood and decreasing feelings of vulnerability and fear for safety (Ball et al., 2010; Foster & Giles-Corti, 2008).

Future studies should consider the participant's perceptions of micro-level factors. Previous studies have shown that perceived safety from crime and incivilities is independently associated with PA from objective measures of crime and incivilities (Evenson et al., 2012). Subjective perceptions of one's neighborhood may provide insight on the neighborhood factors that inhibit PA and social support, and can also guide investigators towards intervention strategies that work to diminish feelings that are produced from disadvantaged, crime-ridden neighborhoods such as fear and stress (Foster & Giles-Corti, 2008). Future studies should also use objective measures of PA to obtain more reliable measures of PA as well as an accompanying activity log or similar tool to document the location of all PA performed in order to distinguish between PA performed within the neighborhood or PA performed outside of the neighborhood.

Environmental barriers in the micro-environment discourage PA and disproportionately affect minority women. Social support did not mediate the relationship between negative environmental barriers and PA, but remains an important, culturally relevant factor for overcoming environmental barriers such as neighborhood disadvantage. The use of ecologic models such as the EMPA provide a useful framework for mapping associations and interactions among factors from multiple levels of environment with health behaviors. Ecologic approaches also allow investigators to identify potential mediating factors, which can aid in the development of effective solutions to overcoming negative factors in the micro-environment that inhibit PA in this population.

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HIGHLIGHTS

- Neighborhood disadvantage, crime, and incivilities discourage PA and social support.
- Social support did not mediate disadvantage, crime, incivilities, and PA.
- Neighborhood disadvantage is associated with social support.
- Social support is a potential strategy for overcoming neighborhood disadvantage.
- Strategies for overcoming negative environment barriers to PA are needed.

Figure 1. Mediation model illustrating the relationships among negative environment factors in the micro-environment, social support at the meso and exo environment level and physical activity.

Table 1
Descriptive characteristics of the study population

Demographic Variable	Mean (SD)
Age	45.47 (9.42)
Ethnicity (%)	61.9% = AA, 38.1% = H/L
BMI (kg/m ²)	34.32 (7.97)
Education (%)	
High School Education or Less	11.1%
Some College	47.1%
College Degree or Higher	41.7%
Income (% greater than federal poverty level)	
0-200%	14.8%
201-400%	35.3%
401% +	49.8%
Neighborhood Disadvantage	1.67 (.18)
Crime	8.02 (1.52)
Incivilities	2.39 (.36)
Peer Social Support	12.9 (3.54)
Total Physical Activity (MET-min)	40.68 (23.92)

Table2
Pearson correlations of variables significantly correlated with physical activity

Physical activity, neighborhood disadvantage, crime, and incivilities were square root transformed from their original scales.

	Neighborhood Disadvantage	Crime	Incivilities	Peer Social Support
Neighborhood Disadvantage				
Crime	-.275**			
Incivilities	-.049	-.058		
Peer Social Support	-.125*	.017	-.001	
Total PA	-.134*	.103	.04	.108

* Correlation is significant at the .05 level,

** Correlation is significant at the .01 level

Table 3
Linear regression analyses of the association of social support and physical activity with neighborhood disadvantage, crime, and incivilities, after controlling for site, ethnicity, age, income, and education

Model	Independent Variables	Beta	<i>p</i>	Dependent Variable	<i>F</i>	<i>p</i>
1	Neighborhood Disadvantage	-.102	.115	Physical Activity	2.22	.086
	Crime	.096	.124			
	Incivilities	.027	.656			
2	Neighborhood Disadvantage	-.157	.017*	Social Support	2.02	.111
	Crime	-.016	.802			
	Incivilities	.019	.754			
3	Peer Social Support	.118	.052	Physical Activity	3.8	.052
4	Neighborhood Disadvantage	-.086	.188	Physical Activity	2.4	.051
	Crime	.098	.679			
	Incivilities	.025	.117			
	Peer Social Support	.103	.092			

* Correlation is significant at the .05 level