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Neighborhood Social Cohesion as a Mediator of Neighborhood Conditions on Mothers' Engagement in Physical Activity: Results From the Geographic Research on Wellbeing Study

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Abstract

Objectives.—The purpose of this study was to determine if social cohesion mediates the effects of neighborhood and household-level socioeconomic status (SES), perceptions of neighborhood safety, and access to parks on mothers' engagement in physical activity (PA).

Method.—Secondary analyses were conducted on cross-sectional data from The Geographic Research on Wellbeing (GROW) study. GROW includes survey data from a diverse sample of 2,750 California mothers. Structural equation modeling was used to test a conceptual multilevel mediation model, proposing social cohesion as a mediator of known predictors of PA.

Results.—Social cohesion fully mediated the pathway from perceived neighborhood safety to mothers' PA. Social cohesion also mediated the significant relationship between neighborhood SES and PA; however, this mediation finding was not practically significant when considered in the context of the full model. Household SES was significantly positively related to both social cohesion and PA. Park access contributed significantly to social cohesion but not directly to PA Social cohesion did not significantly mediate relationships between park access or household SES and PA.

Conclusions.—There is a need for public health interventions to improve engagement in PA among individuals and neighborhoods with lower levels of socioeconomic resources. Interventions that create social cohesion within neighborhoods may have positive effects on mothers' PA, particularly in neighborhoods perceived as unsafe.

Keywords

community health; community health promotion; health disparities; health promotion; physical activity/exercise; social determinants; women's health

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Authors' Note

The GROW study was reviewed and approved by the Institutional Review Board at The University of Texas at Austin and the California Committee for the Protection of Human Subjects.

Declaration of Conflicting Interests

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The majority of adults and approximately half of children in the United States do not achieve minimum recommendations for physical activity (PA; U.S. Department of Health and Human Services, 2008), resulting in high rates of overweight and obesity and over $14 billion in annual health care expenditures (Cawley & Meyerhoefer, 2012). Socioecological approaches to health are rooted in the idea that behaviors are affected by multiple levels of influence, including the interpersonal, organizational, community, and policy levels of the social environment (McLeroy, Bibeau, Steckler, & Glanz, 1988). Studies have found correlates of PA are indeed present across socioecological domains (Bauman et al., 2012; Giles-Corti & Donovan, 2002; Sallis, Floyd, Rodríguez, & Saelens, 2012), indicating a need for investigation of PA correlates and intervention approaches at multiple ecological levels. Individual and community-level correlates of PA in adult women are explored.

Individual-Level Correlates of PA in Women

At the individual level, socioeconomic and biological characteristics have demonstrated significant relationships with PA. Socioeconomic status (SES) is positively associated with PA (Parks, Housemann, & Brownson, 2003; Sternfeld, Ainsworth, & Quesenberry, 1999; Trost, Owen, Bauman, Sallis, & Brown, 2002). In the 2012 National Health Interview Survey, non-Hispanic White adults (23%) were more likely to have met the full guidelines for participation in leisure-time PA than Hispanic adults (16%) or non-Hispanic Black adults (17%; Blackwell, Lucas, & Clarke, 2014). Parents engage in significantly less PA than nonparents, and consistent with an overall gender disparity across the lifespan, mothers engage in less PA than fathers (Bellows-Riecken & Rhodes, 2008). PA is inversely related to age and positively correlated with better health status and previous experience with PA (Bauman et al., 2012; Kaewthummanukul & Brown, 2006; Trost et al., 2002). Adults who are overweight or obese engage in significantly less PA than adults of healthy weight (Blanchard et al., 2005).

Neighborhood-Level Correlates of PA in Women

Many studies have found that individuals living in neighborhoods with lower SES are less physically active than those in neighborhoods with higher SES (Gordon-Larsen, Nelson, Page, & Popkin, 2006; Greves Grow et al., 2010; Lee & Cubbin, 2002; Sallis et al., 2012; Sallis & Glanz, 2006; Sallis, Johnson, Calfas, Caparosa, & Nichols, 1997; Sallis, Prochaska, & Taylor, 2000; Stimpson, Ju, Raji, & Eschbach, 2007); however, this relationship is not present for all forms of PA or in all communities. For instance, the nature of PA varies by neighborhood economic status, as adults in disadvantaged communities walk more for active transportation and less for leisure than adults in wealthy neighborhoods (Hearst et al., 2013; Miles, Panton, Jang, & Haymes, 2008).

Disadvantaged neighborhood conditions may provide fewer opportunities for PA, because of lower quality parks and recreational facilities, safety concerns, and walkability (Diez Roux & Mair, 2010; Ellen, Mijanovich, & Dillman, 2001; Kawachi & Berkman, 2003; Lee & Cubbin, 2002; Macintyre & Ellaway, 2003). Given higher levels of neighborhood socioeconomic disadvantage among populations of color (Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010; Williams & Jackson, 2005), racial/ethnic disparities in PA may

be related to access to parks, recreational facilities, and safe forms of active transportation (Bauman et al., 2012; Sallis et al., 2012; Sallis & Glanz, 2006). In particular, access to parks, both perceived (Brownson, Baker, Housemann, Brennan, & Bacak, 2001) and by distance to and density of parks (Bedimo-Rung, Mowen, & Cohen, 2005), is correlated with PA. Access to parks does not affect PA equally among all groups; non-White racial/ethnic groups, females, and lower income families are less frequent users of parks for PA than other groups (Bedimo-Rung et al., 2005). These are also the groups most likely to have lower levels of PA and higher rates of overweight and obesity (Centers for Disease Control and Prevention, 2013, 2014).

Neighborhoods with lower SES are also more likely to be perceived by residents as unsafe. Fear of crime has been shown to be inversely correlated with PA (Brownson et al., 2001), although this association is not consistent across all studies. The association is stronger among groups known to exhibit greater anxiety about crime, such as women, the elderly, members of deprived communities, and those who have been victims or vicarious victims of crime (Foster & Giles-Corti, 2008). Subjective assessment of crime and fear of crime are stronger predictors of behaviors than objective rates of crime (Kawachi & Berkman, 2003).

Social cohesion, or the extent of connectedness and solidarity among residents in a neighborhood, can support or discourage social interactions among neighbors (Kawachi & Berkman, 2000; Pebley & Sastry, 2004; Sampson, Morenoff, & Gannon-Rowley, 2002). Such actions establish a societal structure that may be able to discourage delinquent and unhealthy behaviors (Cradock, Kawachi, Colditz, Gortmaker, & Buka, 2009) and strengthen the community's ability to take action against threats (Sampson, Morenoff, & Earls, 1999; Sampson, Raudenbush, & Earls, 1997). A socially cohesive neighborhood is able to enforce social norms for positive health behaviors, including PA, and provide tangible support to people within the neighborhood (McNeill, Kreuter, & Subramanian, 2006), creating social norms that encourage fitness (Cradock et al., 2009). For example, women who frequently see other women exercising in their neighborhood engage in PA more often (King et al., 2000).

It is not yet known if social cohesion can actually mediate the effects of other known individual- and neighborhood-level influences on engagement in PA among mothers. The purpose of this study was to explore the potential mediating role of social cohesion in the pathways between neighborhood- and household-level SES, perceptions of neighborhood safety, access to parks, and mothers' engagement in PA.

Method

Study Sample

The data used in this study were collected as part of the Geographic Research on Wellbeing (GROW) study, a follow-up to the statewide representative Maternal and Infant Health Assessment (MIHA). MIHA included California mothers delivering live infants from February to May annually from 2003 to 2007, selected from birth certificates using a stratified random sampling method. Mothers were stratified by region and then by education, oversampling African American mothers. Eligible mothers for MIHA were English or

Spanish speaking; aged 15 or older; with single, twin, or triplet births; and an address provided on the birth certificate. The mothers received the MIHA survey approximately 10 to 14 weeks after giving birth. Participation in GROW was offered to all mothers who participated in MIHA from a six-county region (Alameda, Los Angeles, Orange, Sacramento, Santa Clara, and San Diego counties), who agreed to be recontacted, and who could be located. Mothers answered questions about the same child in both surveys. Out of 9,256 eligible mothers from MIHA, 4,026 were located and invited to participate in GROW. A total of 3,016 (74.9% of the mothers who were located) completed the survey. Data are weighted to be representative of the target population. The GROW study was reviewed and approved by the institutional review board at The University of Texas at Austin and the California Committee for the Protection of Human Subjects; all participants provided informed consent. Further details about the GROW study are available (Cubbin, 2015).

Participants who moved out of California after participating in MIHA (n = 134) were excluded from the analyses, as the neighborhood-level SES measure used in the analyses were not calculated for these participants. Mothers whose children who were not living with them at least half of the time or whose children were no longer living were also excluded (n = 39). Participants for whom we could not assign accurate geocodes for home address were also excluded (n = 93). The final sample size for remaining analyses was 2,750.

Measures

Latent factors tested using confirmatory factor analysis in the measurement model included: Perceived Neighborhood Safety, Household SES, Neighborhood SES, Park Accessibility, and Social Cohesion.

Perceived Neighborhood Safety.—The exogenous latent factor for perceived neighborhood safety was measured using three indicators: (a) the extent to which participants felt safe from crime on a 4-point Likert-type scale, (b) the extent to which participants felt safe walking in their neighborhood at night on a 4-point Likert-type scale, and (c) whether or not the participants moved to their neighborhood because it felt safe.

Household SES.—The exogenous latent factor for household SES is measured using four indicators. Household income was based on income self-reports and household size and categorized as 0% to 100%, 101% to 200%, 201% to 400%, or >400% of the federal poverty level. Mother's education was categorized into six categories based on earned credentials. Food security was assessed using responses to six questions about the participants' ability to purchase food and provide meals for themselves and their families in relation to monetary resources (Blumberg, Bialostosky, Hamilton, & Briefel, 1999). Homeownership was dichotomous and referred to whether or not the respondent owned her home. All indicators were coded so that higher values would indicate higher household SES.

Neighborhood SES.—Five indicators at the census tract level from the American Community Survey, 2005 to 2009, an ongoing annual survey conducted by the U.S. Census that collects data similar to that obtained in the decennial census, were used to measure the exogenous latent factor for neighborhood SES: median family income, median housing

value, the percentage of adults over age 25 who have graduated from college, the percentage of unemployed adults over age 16 who are in the civilian workforce, and the percentage of adults in the blue-collar workforce (i.e., those who work in construction or production jobs). Census tract–level variables were linked to the GROW database via census geocodes based on residential addresses. All indicators were coded so that higher values would indicate higher neighborhood SES.

Park Accessibility.—The indicators contributing to this exogenous latent factor include respondents' assessment of whether there are good parks or playgrounds in the neighborhood and whether respondents feel comfortable going to the park or playground closest to where she lives during the day. Both indicators are coded on a 4-point scale with higher levels indicating higher agreement. Additionally, the Euclidean (straight line) distance from the respondent's home to the nearest park border (in feet) and the park area (in acres) were calculated for respondents living in the six county area. Respondents who no longer lived in the six counties at the time of GROW (n = 149, 5.4%) were coded as missing this park data.

Social Cohesion.—Six indicators contributed to the latent factor estimating participants' subjective ratings of social cohesion in their neighborhoods, hypothesized to mediate the relationships between the four exogenous latent factors and mother's engagement in PA. Each was measured on a 4-point Likert-type scale and scored so that higher scores indicate higher levels of social cohesion. The indicators measure the extent to which respondents feel: at home in their neighborhoods, their neighbors are willing to help one another, their neighbors feel connected to each other, their neighbors get along, their neighbors share values, and their neighbors can be trusted. In this study, the latent factor for Social Cohesion is tested as a mediator in the relationships between the latent factors Perceived Neighborhood Safety, Household and Neighborhood SES, and Park Accessibility.

Physical Activity.—Physical activity was a self-report response to a single question asking respondents to identify the best of 6 descriptions of their PA outside of work over the past 30 days. The item has been found to be valid, reliable, and sensitive to change in levels of PA in a previous study (Kiernan et al., 2013).

Covariates.—The effects of a number of covariates known to have relationships with women's PA were controlled in the structural equation model, including: race/ethnicity (White as the referent category), age, mothers' obesity status, mothers' depression, whether the mother lived with a partner or spouse, and the number of children under the age of 10 in the household. Each of these has demonstrated a previous relationship to attainment of PA in the literature (Allender, Hutchinson, & Foster, 2008; Bauman et al., 2012; Blackwell et al., 2014; Blanchard et al., 2005; Kaewthummanukul & Brown, 2006; Ströhle, 2009; Trost et al., 2002).

Statistical Analysis

Analyses describing the sample were conducted in SPSS. A one-way analysis of variance was used to assess mean differences between racial/ethnic groups on the PA outcome.

Structural equation modeling using Mplus with a robust weighted least squares (WLSMV) estimator was used to examine the relationships between five latent factors: individual and neighborhood level socioeconomic status (SES), park access, perceived neighborhood safety, and social cohesion, and their relationship with the dependent variable, PA. The WLSMV estimator is reliable when there are both categorical and continuous indicators in the model (Muthén & Muthén, 2012). Model fit indices reported and criteria used to assess a "good" model fit included: chi-square (χ^2, not significant), comparative fit index (≥.95), root mean square error of approximation (≤.05), and the Tucker–Lewis index (≥.95; Hu & Bentler, 1999; Kline, 2011).

Results

Descriptive Statistics

Descriptive statistics for the participants in the study, California mothers with 4- to 10-year-old children, and the census tracts they lived within, are provided in Table 1. In terms of individual characteristics, 42.8% of the sample had a high school education or less. Approximately half (50.1%) reported income at or below 200% of the federal poverty level. Most reported having food secure households (76.0%) and 43.7% were homeowners. The sample included 52.8% Latina, 24.1% White, 14.4% Asian, and 6.2% Black mothers. In terms of neighborhood-level characteristics, census tracts included in the study had 29.7% college graduates, 7.8% unemployment, 21.6% working in construction or production ("blue collar") jobs, a median annual family income of $75,445, and a median housing value of approximately $526,000. The sample is representative of California mothers who gave birth from 2003 to 2007 (Cubbin, 2015).

Bivariate analyses revealed significant relationships between PA and all covariates and exogenous variables in the model. The correlation matrix describes the relationships between the latent factors (Table 2). The exogenous factors estimating perceived neighborhood safety, household SES, neighborhood SES, and park accessibility were significantly positively related to the hypothesized mediator, participants' subjective assessment of social cohesion in their neighborhoods. All latent factors, including social cohesion, were significantly positively correlated with mothers' PA scores. In terms of the covariates, PA scores were positively associated with White race/ethnicity, having a spouse or partner, lack of depressive symptoms, not qualifying as obese (body mass index ≥ 30), having fewer children under the age of 9 in the home, and the mothers' age. A one-way analysis of variance examining PA scores by racial/ethnic groups revealed that PA was significantly different between groups, $F(3, 2{,}672) = 39.90$, $p < .001$. Post hoc comparisons using Tukey's HSD found mothers of White race had significantly higher mean scores on the measure of PA ($M = 3.16$, $SD = 1.69$) than Latina mothers ($M = 2.41$, $SD = 1.47$), Black mothers ($M = 2.53$, $SD = 1.60$), and Asian mothers ($M = 2.58$, 1.75). There were no significant differences on mean PA scores between the non-White groups.

Measurement Model

The measurement model with no modifications had a moderate fit to the data (Figure 1). Modification indices suggested three within-construct error term covariance paths: one in the

neighborhood SES latent factor (between the percentage of construction/production workers and the percentage of college graduates) and two in the park accessibility latent factor (park density within 0.5 miles of home with comfort going to park in daytime, and park density with distance to nearest park). As these modifications made conceptual sense and improved model fit, they were retained in the final measurement model; final fit of the measurement model was adequate (Figure 1).

All indicators loaded well (factor loadings ≥ 0.30 and $p \leq .001$) onto the hypothesized factors in the expected direction, with the exception of one indicator. Although distance to the nearest park loaded poorly onto the latent factor estimating park accessibility (a standardized factor loading of −0.144 [0.025], $p < .001$), the indicator was retained due to its conceptual significance and a desire to minimize modifications to the model.

Structural Equation Model

The hypothesized structural equation model had a relatively good fit to the data (Figure 2). The chi-square statistic was statistically significant, which is usually the case with a large sample size (Kline, 2011). The other fit indices indicated the model had an acceptable fit to the data, with root mean square error of approximation = .047, comparative fit index = .950, and Tucker–Lewis index = .934.

In the structural equation model, the direct pathways from all four exogenous latent factors and the mediator, social cohesion, were statistically significant, and social cohesion was significantly related to PA. The indirect paths to PA, through social cohesion, for both perceived neighborhood safety and neighborhood SES were significant (Table 3), indicating that the relationships of these factors to PA were mediated by social cohesion. However, the indirect path from neighborhood SES through cohesion to PA, while statistically significant, is not practically meaningful. Although neighborhood SES and social cohesion were positively correlated, the path coefficient between them in the structural equation model is negative. This is likely due to collinearity, rather than a true inverse relationship between neighborhood SES and social cohesion. When collinearity is present, the introduction of additional predictors into the model can diminish the regression coefficient and significance of a predictor, and the regression coefficient can even reverse in sign (Pedhazur, 1997). In this case, the inclusion of the other predictors in the model caused the relationship to between NSES and SC to diminish to nearly zero and reverse in sign. While statistically significant, the indirect effect of the path from Neighborhood SES → Social Cohesion → PA is too small to be practically meaningful.

Household SES was significantly directly related to both social cohesion and PA. The indirect pathway from household SES to PA through social cohesion was not significant, indicating that social cohesion did not mediate the relationship. Park access had no direct relationship to PA and the indirect pathway through social cohesion was not significant.

Discussion

The results of this structural equation model testing social cohesion as a mediator suggest social cohesion is an important component of mothers' engagement in PA. The significant

indirect pathway from perceived neighborhood safety to PA indicates strong social cohesion may be able to reduce the impact low perceptions of neighborhood safety have on mothers' engagement in PA. These findings are compelling given that women engage in less PA then men, engage in even less PA as mothers than as nonmothers (Bellows-Riecken & Rhodes, 2008), and are less likely to engage in PA in neighborhoods they perceive to be unattractive or unsafe (Foster & Giles-Corti, 2008). This finding is consistent with other studies that have also found social cohesion to be an important factor in PA for adults, women in particular (McNeill et al., 2006). Social cohesion also contributes to higher assessments of park availability and safety (Wen, Hawkley, & Cacioppo, 2006), and to higher perceptions of neighborhood safety (Austin, Furr, & Spine, 2002; Ferreira et al., 2007; Franzini, Caughy, Nettles, & O'Campo, 2008; Sampson & Raudenbush, 2004), both of which contribute to increased engagement in PA.

In this study, the participants' ratings of social cohesion in their neighborhoods did not significantly mediate the effects of household SES on PA ($p = .088$). Hardships associated with living in a low-income household may not modifiable by the positive social conditions of one's neighborhood. Findings from a qualitative research study of Black and Latina mothers in low-income households describe the challenges of dealing with health issues, economic hardship, caretaking demands, and inflexible work policies, all of which contribute to both substantial stress and difficulty engaging in health-related behaviors (Shelton, Goldman, Emmons, Sorensen, & Allen, 2011). Such challenges may not be influenced by neighborhood social cohesion.

The positive relationship between indicators of individual-level socioeconomic status, such as education and income, and engagement in PA by adults has been demonstrated in other studies (Bauman et al., 2012; Dowda, Ainsworth, Addy, Saunders, & Riner, 2003; Eyler et al., 2002; Trost et al., 2002). These collective findings indicate a need for public health interventions to improve engagement in PA among individuals living in households with lower SES. Women with lower incomes are more likely to live in disadvantaged neighborhoods, which have fewer health-supporting services and resources, fewer opportunities for PA due to safety concerns and decreased walkability, increased stress, greater exposure to acute and chronic disease, and neighborhood violence (Diez Roux & Mair, 2010; Ellen et al., 2001; Kawachi & Berkman, 2003; Lee, Cubbin, & Winkleby, 2007; Macintyre & Ellaway, 2003), all of which serve as barriers to engagement in PA. Women in low income households within low income neighborhoods are therefore particularly at risk for lack of PA, especially if they perceive their neighborhood to be unsafe.

Limitations

A limitation of this study is that the outcome measures for PA attainment were not restricted to PA in the neighborhood. Therefore, the impact of neighborhood factors on PA may be underestimated in the current study, as some proportion of mothers were surely engaging in PA outside of their neighborhoods. Some researchers suggest engagement in PA outside the neighborhood is likely, especially among adults who do not perceive their neighborhood

conditions to be supportive of PA (Sallis et al., 1997). This issue has been identified by systematic reviews of studies of neighborhood effects on PA (Foster & Giles-Corti, 2008).

Another issue regarding assessment of PA in our study concerns the performance of self-report measures. Assessments of PA using self-report have been unreliable when compared with objective measures of PA (e.g., accelerometers; Prince et al., 2008; Troiano et al., 2008). These studies have found self-report measures to be substantially inflated compared to accelerometer about 60% of the time. The measure of PA used in the current study was found to be valid, reliable and quite sensitive to change in levels of PA in a previous evaluation (Kiernan et al., 2013). In GROW, 38.1% of mothers reported sedentary activity. Approximately 27% reported moderate PA five times per week or more; this response may best approximate achievement of the recommended 150 minutes of moderate PA per week (U.S. Department of Health and Human Services, 2008). A nationally representative study of more than 3,400 adults found that only 7% of women were meeting the minimum criteria of 150 minutes a week of moderate activity when measured using an accelerometer (Tucker, Welk, & Beyler, 2011). In that study, adults self-reported a weekly average of 372 minutes of moderate activity and 45 minutes of vigorous activity; accelerometers measured an average of only 74 minutes moderate activity and 19 minutes vigorous activity. Comparison of the GROW findings and the Tucker et al. study findings suggest there may be some self-report bias occurring in the GROW study, but given the high selection of inactivity (nearly 40%), not all the participants appear to be affected, and there appears to be less bias with this measure than with the other self-report measures discussed in the Tucker et al. study. For comparison, in the Tucker et al. report only about 14% of women self-reported no engagement in PA, while 59% of women were found to participate in no PA when measured by accelerometer. The demographics of the GROW study, which are representative of California mothers, do vary from the demographics of the nationally representative Tucker et al. study in that they are composed of younger women and have a higher proportion of Latinas; therefore, group differences may also contribute to the variations in findings.

Previous research has demonstrated disparities in recreational resources, such as parks, community centers, fitness centers, and gyms in neighborhoods with lower SES (Gordon-Larsen et al., 2006; Powell, Slater, Chaloupka, & Harper, 2006) and these resources were related to PA. The GROW study accounted for park availability but not for access to other kinds of recreational or the facilities available within each park. Other individual-level factors, such as self-efficacy (Bauman et al., 2012; Kaewthummanukul & Brown, 2006; Trost et al., 2002) and social support (Eyler et al., 1999; Eyler et al., 2002; Sternfeld et al., 1999; Trost et al., 2002), known to be correlated with PA in adult women, were also not included in this analysis.

Strengths

This study also has a number of strengths that warrant discussion. Perhaps the foremost strength is the comprehensive nature of the GROW study. The analyses presented in this research study included multiple measures of SES at both the individual- and neighborhood-levels; many other studies have used only single-level measures, single indicators or inaccurate substitutes (e.g., health insurance status; Braveman et al., 2005). Second, GROW

is a large six-county study of women who originally participated in a state-wide study (MIHA) that was representative of all women giving birth in California from 2003 to 2007. The response rate for GROW of MIHA participants who could be located (n = 5,161) was high at 74.9%. The sample represents a demographically and socioeconomically diverse group of women and their children. The geocoding accuracy to census tracts for the GROW respondent addresses was high, at 97%, and the survey data was weighted to ensure data in GROW was representative of the MIHA sample in the GROW counties.

Implications for Public Health

The results of this study support a need to develop and test interventions to build social cohesion in communities with the goal of improving women's engagement in PA. Based on the findings, interventions to create social cohesion within neighborhoods may have positive effects on PA as well as other individual and neighborhood benefits, but for the most part these strategies have not yet been evaluated. A 2012 systematic review found only 13 prospective studies of social capital (inclusive of social cohesion) and individual health outcomes (Murayama, Fujiwara, & Kawachi, 2012); while none of the studies examined PA specifically, all studies reviewed demonstrated positive effects of area and/or workplace social capital and cohesion on health outcomes. In a 2016 search no studies evaluating interventions to build neighborhood social cohesion to improve PA specifically could be located, and as stated by Murayama et al. (2012) in their review, "Prospective epidemiologic evidence on the effect of social capital on health is very limited" (p. 186). Evaluation of programs working to build social cohesion and other social capital resources in communities for is called for.

Promising findings do exist for community-based interventions for PA. For instance, interventions focused on creating walking or other PA support groups in community settings have demonstrated effectiveness (Heath et al., 2012; Kahn et al., 2002), particularly among adult women. Community-based interventions that build collective impact (Kania & Kramer, 2011) using multisector and multisite PA promotion activities have also been successful in increasing PA (Heath et al., 2012).

The physical environment is also important to women's engagement in PA. As in other research, results from the present study indicate that the presence of safe, quality parks may contribute to higher social cohesion, and programs to improve park spaces and access are indicated. Other studies also indicate the importance of safe streets and pedestrian features for women to engage in PA (Lee et al., 2007; Lee, Mama, Medina, Ho, & Adamus, 2012). The models presented in this study provide valuable information about the roles of household and neighborhood socioeconomic conditions but there may be other constructs and methods that might strengthen our understanding of how perceived neighborhood safety and social cohesion relate to PA. Future studies including recreational resources beyond parks, objective measurement of PA, and objective observation of neighborhood physical conditions, as well as additional aspects of the individual's physical condition may be able to provide more information about effects on PA. The review of 107 studies of neighborhood environments and PA by Ding et al. found that studies with objectively measured environmental attributes found more consistent associations to PA

(Ding, Sallis, Kerr, Lee, & Rosenberg, 2011). Additionally, qualitative inquiries into how perceived neighborhood safety and social cohesion impact mothers' engagement in PA could be especially illuminating and useful for intervention design and implementation. This study found significant relationships between the covariates for race/ethnicity and age and the perceived neighborhood safety, social cohesion and PA factors. The current study found Latina and African-American mothers had significantly lower PA than their White counterparts. This is consistent with the findings of other national U.S. studies (Blackwell et al., 2014). Future studies of the roles of social cohesion and perceived neighborhood safety should consider multigroup analyses to assess how these demographic variables may moderate relationships to PA.

In conclusion, lack of PA can lead to serious health conditions that can be life-limiting. Correlates for PA exist across individual, social, and environmental domains. This study found social cohesion mediated the pathway between perceptions of safety to engagement in PA for a diverse sample of mothers, indicating neighborhood social cohesion may be a beneficial target for public health intervention. It is imperative to continue public health research and intervention across ecological levels to promote engagement in PA.

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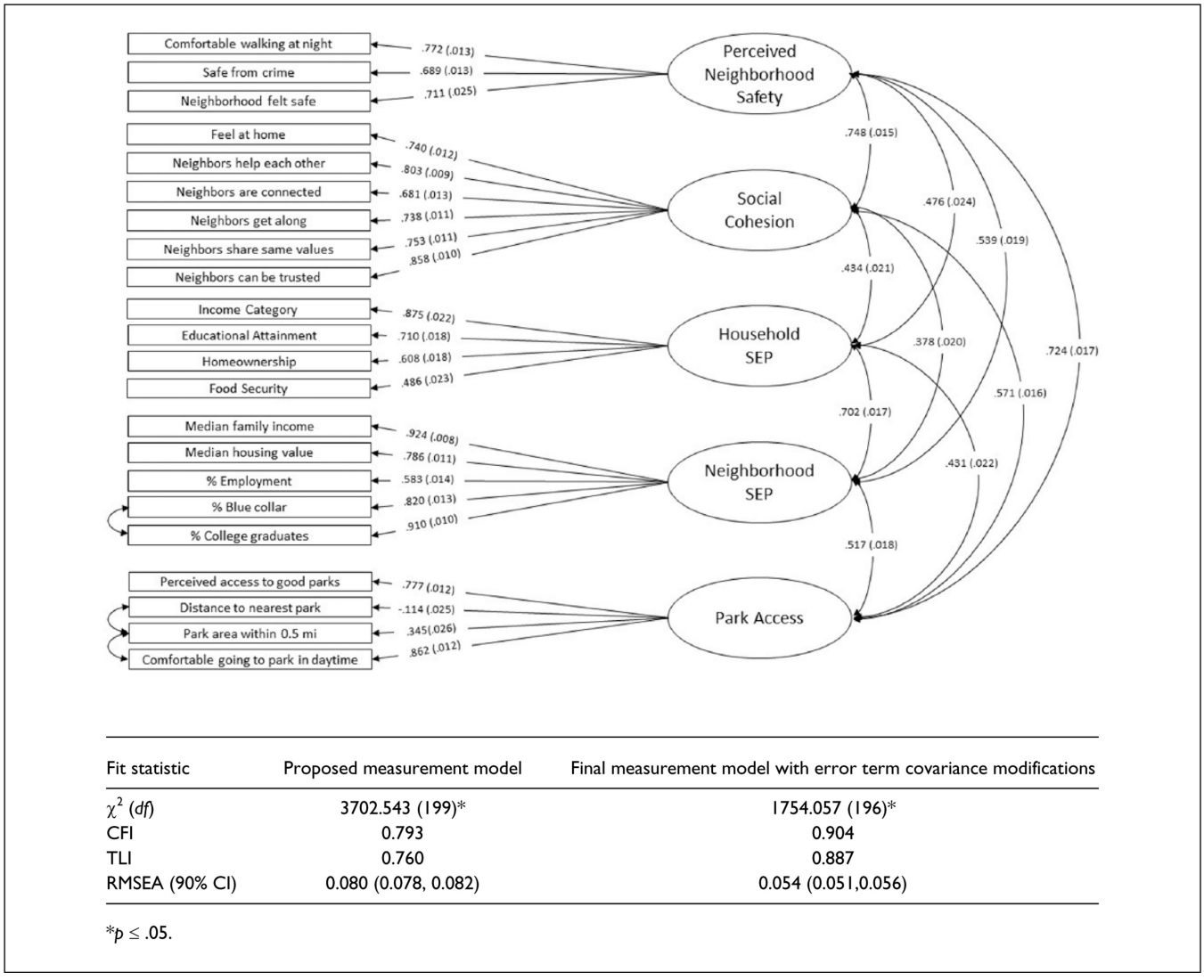
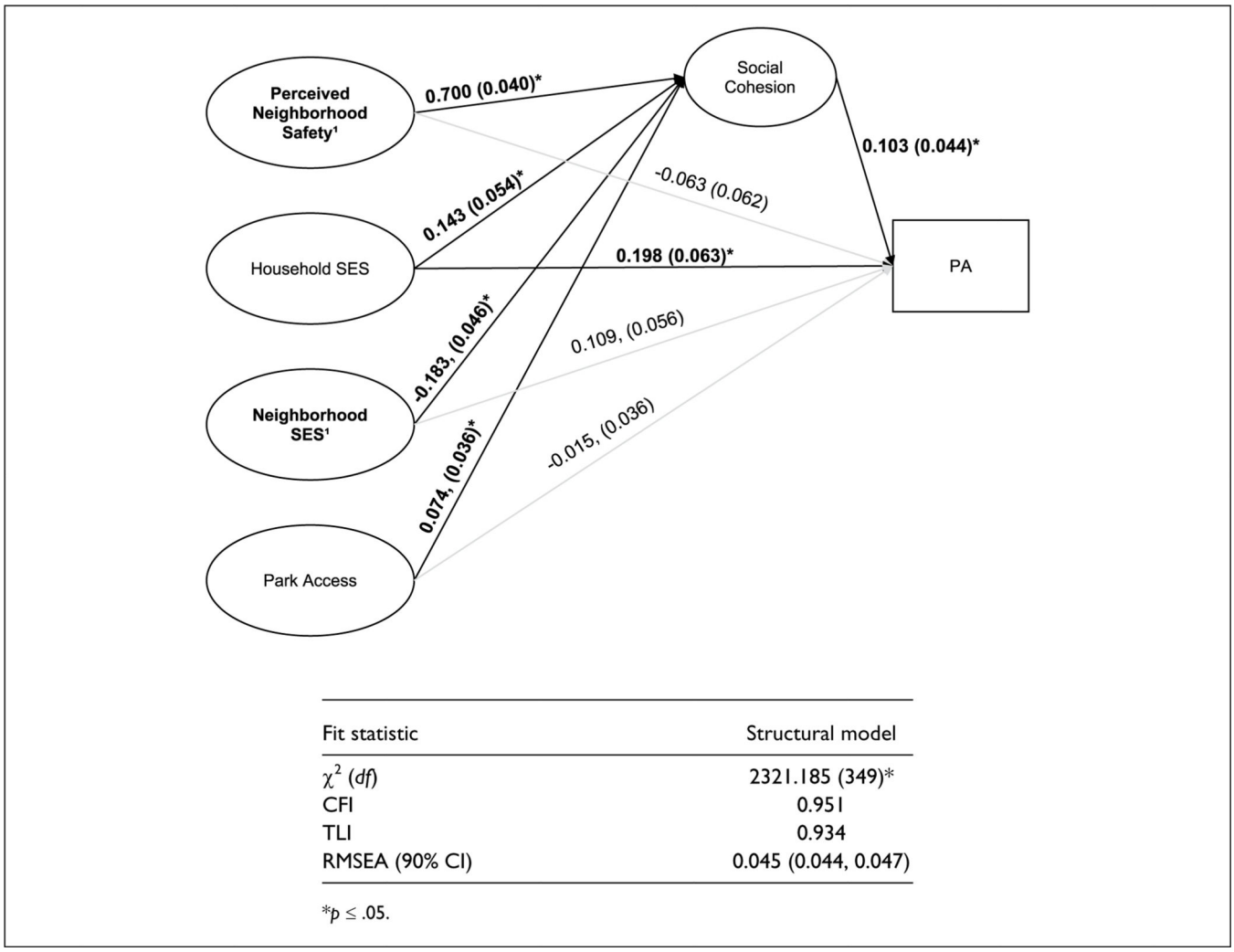


Fit statistic	Proposed measurement model	Final measurement model with error term covariance modifications
χ^2 (*df*)	3702.543 (199)*	1754.057 (196)*
CFI	0.793	0.904
TLI	0.760	0.887
RMSEA (90% CI)	0.080 (0.078, 0.082)	0.054 (0.051,0.056)

*$p \leq .05$.

Figure 1.
Final measurement model, showing standardized estimates (STDYX).



Fit statistic	Structural model
χ^2 (*df*)	2321.185 (349)*
CFI	0.951
TLI	0.934
RMSEA (90% CI)	0.045 (0.044, 0.047)

*$p \leq .05$.

Figure 2.

Results of full structural equation model, showing standardized estimates.

Note. Covariates: Race/ethnicity, age, marital status, number of children in the home, depressive symptoms, obesity status.

*Black lines with asterisks indicate statistically significant paths, $p \leq .05$. Grey lines indicate nonsignificant paths.

[1]The indirect pathway to PA is significant ($p \leq .05$) indicating the relationship is fully mediated by social cohesion.

Table 1.

Characteristics of the GROW Participants and Their Neighborhoods (N = 2,750).

Characteristics	Frequency	Weighted %
Indicators of household SES		
Mothers' education		
Eighth grade or less	243	10.3
Some high school	230	9.9
High school graduate or equivalent	491	21.9
Some college	667	22.9
College graduate or more	1,107	33.8
Household income as percentage of federal poverty level		
0–100	742	31.6
101–200	480	18.5
201–300	291	10.3
301–400	261	8.5
>400	712	20.7
Missing	264	10.5
Food security		
Food secure	2,145	76.0
Low food security	399	16.2
Very low food security	182	6.9
Homeownership		
Homeowner	1,347	43.7
Does not own home	1,371	55.0
Indicators of park availability/safety		
Feel comfortable going to park in daytime		
Strongly agree	1,030	34.2
Agree	1,426	54.5
Disagree	204	8.2
Strongly disagree	61	1.9
Good parks in neighborhood		

Characteristics	Frequency	Weighted %
Strongly agree	970	32.3
Agree	1,397	53.4
Disagree	272	10.4
Strongly disagree	82	2.6
	M	***SD***
Distance to nearest park (Euclidian, feet)	448.56	360.93
Park area within 0.5 miles of home (acres)	25.39	41.44
	M	***SD***
Indicators of neighborhood SES (by census tract)		
Percentage of adults aged 25+ graduated from college	29.24	20.19
Percentage of adults age 16+ in civilian labor force unemployed	7.77	3.84
Percentage of adults in construction/production jobs	21.55	12.66
Median family income (dollars)	75,445	37,115
Median housing value (dollars)	524,928	193,729
Covariates		
Child age (4–10 years)	6.78	1.52
Mother age (15–48 years)	37.08	6.55
	Frequency	**Weighted %**
Mother’s race/ethnicity		
Latina	1,230	52.8
White	880	24.1
Black	311	6.2
Asian	269	14.4
Other/missing	60	0.6
Family structure (two parents)		
Mother lives with spouse or partner	2,274	83.5
Mother not married or living with partner	462	16.4
Number of children under 10 years of age in the home;		

Characteristics	Frequency	Weighted %
None	29	1.1
1	940	35.2
2	1,125	40.9
3 or more	579	21.7
Mothers's depressive symptoms		
No	2,390	86.6
Yes	355	13.3
Child gender		
Female	1,328	49.0
Mother's weight status		
Mothers with BMI > 30 (obese)	570	21.1
Missing	213	8.9
Dependent variable		
Mothers' PA during the past 30 days		
PA ≤1 to 2 days/month (sedentary)	1,053	40.3
Light PA 1–2 times/week	145	5.5
Moderate PA 3 times/week	811	29.6
Moderate PA ≥5 times/week	255	8.4
Vigorous PA 3 times/week	272	8.8
Vigorous PA 5 times/week	200	6.8

Note. GROW = Geographic Research on Wellbeing study; SES = socioeconomic status; BMI body mass index; PA = physical activity.

Table 2.

Correlation Matrix of Latent Factors in the Structural Model, All Statistically Significant at $p < .05$.

Factor	Perceived neighborhood safety	Social cohesion	Household SES	Neighborhood SES	Park access
Perceived neighborhood safety	—				
Social Cohesion	0.749 (0.015)	—			
Household SES	0.477 (0.024)	0.434 (0.021)	—		
Neighborhood SES	0.536 (0.019)	0.375 (0.020)	0.698 (0.017)	—	
Park access	0.646 (0.018)	0.510 (0.016)	0.404 (0.021)	0.480 (0.017)	—

Note. SES = socioeconomic status.

Table 3.

Results of Indirect Paths With Social Cohesion as a Mediator.

Indirect effects	β	B	SE	p value
Perceived neighborhood safety → SC → Mother's PA	.072	.184	.031	.022*
Household SES → SC → Mother's PA	.015	.016	.008	.088
Neighborhood SES → SC → Mother's PA	−0.019	−0.009	.009	.031*
Parks → SC → Mother's PA	0.008	0.022	.005	.103

Note. SC = social cohesion; SES = socioeconomic status; PA = physical activity.

*$p \leq .05$, indicating statistical significance of the indirect path.

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