Published in final edited form as:

J Phys Act Health. 2018 May 01; 15(5): 361–368. doi:10.1123/jpah.2017-0202.

Independent Associations and Interactions of Perceived Neighborhood and Psychosocial Constructs on Adults' Physical Activity

Laura A. Dwyer, PhD^{1,2}, Minal Patel, PhD, MPH³, Linda C. Nebeling, PhD, MPH, RD², and April Y. Oh, PhD, MPH⁴

¹Cape Fox Facilities Services, Manassas, VA

²Behavioral Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute, Rockville, MD

³Health Behaviors Research Branch, Behavioral Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute, Rockville, MD

⁴Health Communication and Informatics Research Branch, Behavioral Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute, Rockville, MD

Abstract

Background—Neighborhood and psychosocial variables are related to physical activity (PA), yet interactions between these factors in predicting PA are infrequently studied

Methods—This analysis examines independent associations and interactions between self-reported neighborhood and psychosocial variables in relation to moderate-to-vigorous PA (MVPA) among adults from a United States panel sample.

Results—In adjusted models, neighborhood social capital was positively associated with meeting MVPA guidelines. Fewer barriers, greater self-efficacy, and greater autonomous motivation also corresponded with greater odds of meeting MVPA guidelines. An interaction between social capital and autonomous motivation showed that social capital was only associated with MVPA when autonomous motivation was high. Participants who reported both high autonomous motivation and high social capital were most likely to meet MVPA guidelines.

Conclusions—Neighborhood social capital, barriers, self-efficacy, and autonomous motivation, may be important correlates in promoting adults' PA. Future directions include using objective neighborhood and PA data in similar analyses and investigating associations of neighborhood and psychosocial variables with multiple PA activities. Intervention research to promote PA should also examine whether effects of interventions targeting psychosocial constructs are moderated by features of an individual's neighborhood, or whether perceived social capital can be addressed in interventions in conjunction with psychosocial variables.

Keywords

physical activity; psychology; environment; health behavior

Only 49.2% of adults in the United States self-report meeting national recommendations for aerobic physical activity (PA),¹ despite numerous PA benefits including: weight control, reduced risk of chronic diseases (cardiovascular disease, type 2 diabetes, colon cancer and breast cancer), and promotion of mental health.² Understanding factors that promote PA and are potentially malleable via interventions is crucial. Variables to consider in these efforts include psychosocial and environmental attributes, such as features of one's neighborhood.

The interplay of psychosocial and environmental variables related to health behaviors is conceptualized in several frameworks. Neighborhood and psychosocial factors are jointly considered in social cognitive theory (SCT) and ecological models which conceptualize behavior as a product of multiple levels of influence. SCT specifies that the individual, environment, and behavior reciprocally interact, and that both promoting self-efficacy and providing environmental supports are potential targets for intervention.^{3,4} Interactions across multiple levels of influence (including individual, social, organizational, community, environmental, and policy influences) are central to ecological models, and building awareness of these interactions to guide intervention development is an important area for further research.⁵ Ecological approaches have been widely applied to understanding PA and other health behaviors. In one ecological framework, multiple PA behaviors are tied to policy, perceived and objective environments, interpersonal factors, and psychological and other individual-level variables.⁶

Environmental and Psychosocial Correlates

Independent associations with PA

While there are mixed findings of the associations between environmental variables and PA, both across populations and by types of PA (e.g., walking or leisure time PA), physical features of the environment (e.g., availability and access to spaces and facilities for engaging in PA, and walkability) are often associated with greater total PA or moderate-vigorous physical activity (MVPA) among US adults.⁷⁻¹⁰ Social capital, or “the resources available to individuals and to society through social relationships”^{11, p.650} is a social feature of the environment that also may facilitate healthy behaviors through shared norms, goals, and social support.¹² Aspects of social capital (such as neighborhood trust, social networks and involvement, and reciprocity)¹² have been positively associated with adults' PA in several studies.¹³⁻¹⁵ In addition to environmental correlates, multiple psychosocial constructs are associated with PA. While results have varied across studies, theoretically-driven psychosocial variables that have been associated with PA behaviors or intentions include (among others): self-efficacy and goals,¹⁶ autonomous motivation,¹⁷ barriers,^{18,19} and attitudes.^{20,21}

Psychosocial by environmental interactions on PA

Although neighborhood and psychosocial variables are regularly assessed as PA correlates, ecological models propose that these variables interact. A few existing studies that have examined this interaction on leisure time PA have found mixed results. Some research has found synergistic effects of both living in a supportive environment and reporting favorable psychosocial variables. In one study, walkability was associated with MVPA among

individuals perceiving high social support,²² and more favorable neighborhood aesthetics were positively associated with MVPA among individuals perceiving less barriers to physical activity.²² Other studies have not found any interactions between neighborhood and psychosocial variables on leisure-time PA^{23,24} or have found the environment to be more important for those with less favorable psychosocial factors.^{25,26} For example, one study found that access to outdoor recreation facilities was positively associated with vigorous PA among people who reported lower enjoyment and self-efficacy for PA.²⁵ Another study found that neighborhood aesthetics and barriers were more strongly associated with MVPA among adults who reported less perceived social support, enjoyment, and self-efficacy.²⁶ Other research found that psychosocial variables were more positively associated with PA among participants living in rural, versus urban, environments.²⁷ While these findings are mixed, they support further research on interactions of neighborhood-level factors and psychosocial factors that may be associated with adult physical activity.

The Current Study

We examined independent associations and interactions between neighborhood and psychosocial variables with adults' MVPA using data from a United States national online panel survey funded by the National Cancer Institute: The Family Life, Activity, Sun, Health, and Eating (FLASHE) study. FLASHE surveys contained self-report neighborhood variables (crime, social capital, and neighborhood availability of PA facilities and food stores), psychosocial variables (barriers, attitudes, self-efficacy, and motivations for engaging in PA), and PA behaviors. We first analyzed each neighborhood and psychosocial factor as a potential correlate of meeting MVPA guidelines, to identify potential intervention targets for consideration with similar samples. To enhance understanding of the relationships identified in the tests of the main effects, we investigated whether the significant neighborhood factor(s) moderate the associations between the statistically significant psychosocial variable(s) and meeting MVPA guidelines.

Hypotheses

We expected more favorable neighborhood features (lower perceived crime, but greater social capital and perceived availability of PA resources and food stores) and more favorable psychosocial variables (fewer barriers, but greater self-efficacy, positive attitudes, and autonomous motivation) to correspond with greater PA than less favorable neighborhood features and psychosocial variables. Given mixed findings of environment and psychosocial interactions in prior research, the moderation analyses were exploratory.

Method

Family Life, Activity, Sun, Health, and Eating (FLASHE) Study

FLASHE is a cross-sectional United States panel study consisting of two internet surveys (a PA-focused survey and a diet-focused survey) administered to dyads of parents and their adolescent child between April and October 2014. Although the FLASHE sample is not nationally representative, it is a national sample recruited from the Ipsos online panel, and efforts were made to balance the recruited sample on Census division and select

demographics. Selected adult panel members of Ipsos were screened for eligibility requirements, which included being age 18 or older and living with a 12-17 year old adolescent at least 50% of the time. Among eligible parents, one adolescent meeting criteria for the study was randomly selected from the household. This procedure continued until recruitment quotas defined by adolescent age and gender and parent race were met. Of dyads invited to the study, 16% were from the Northeast United States; 25% from the Midwest; 40% from the South; 19% from the West. FLASHE participants represented all states except Alaska.²⁸ The FLASHE protocol was approved by the Westat, Inc. and the NIH Special Studies IRBs. The current analysis focuses on the adult sample only. Details about the study recruitment and methodology are described elsewhere.²⁸

Participants

To be included in this analysis, adult participants needed to complete both FLASHE surveys, not report an extremely high response for physical activity, and have complete data on all of the variables included in the regression models. Of 1,699 adults who completed both FLASHE surveys, 24 were excluded for having outlying responses for PA (> 16 hours per day of combined moderate PA, vigorous PA, and walking).²⁹ An additional 270 participants were excluded due to having missing data on any of the variables in this analysis (either demographics and/or the PA, psychosocial, or neighborhood variables.) The analytic sample size was 1,405.

Physical Activity (PA) Measures

The short form of the International Physical Activity Questionnaire (IPAQ) measured moderate and vigorous PA.²⁹ These items included: “During the last 7 days, on how many days did you [do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling / do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis]?” Participants indicating any engagement in these activities answered, “How much time did you usually spend [doing vigorous physical activities / doing moderate physical activities] on one of those days?” Responses were first converted into minutes of moderate and vigorous PA per week. We also followed IPAQ guidelines, excluding participants who answered “don’t know” or had missing data and people who indicated 16 daily hours of all PA types combined (moderate, vigorous, and walking). Consistent with IPAQ scoring guidance, daily minutes of PA were top-coded at 240 minutes, and responses of < 10 daily minutes were recoded as zero (http://www.institutferran.org/documentos/scoring_short_ipaq_april04.pdf).

The PA outcome was defined as meeting or not meeting PA guidelines for weekly minutes of moderate to vigorous physical activity. This variable was defined consistently with the recommended weekly minutes of MVPA in the US 2008 physical activity guidelines for adults.³⁰ Self-reported weekly minutes of vigorous PA were multiplied by two and added to weekly minutes of moderate PA to reflect combined weekly minutes of MVPA. Participants were categorized as either meeting MVPA guidelines (≥ 150 minutes per week) or not meeting MVPA guidelines (< 150 minutes per week).

Psychosocial Measures

All psychosocial variables were measured on five-point Likert scales (1 = *strongly disagree*; 5 = *strongly agree*), and multi-item measures were combined into mean scores.

Barriers—Participants answered items that began with “I don’t exercise as much as I’d like to because...” and were followed with five statements³¹: “I don’t like to sweat,” “I don’t like to exercise,” “I don’t want to mess up my hair,” “My family doesn’t like to exercise,” and “I’m not athletic” ($\alpha = .79$).

Attitudes—Six items assessing attitudes³² read: “If I were to be physically active on most days, it would...,” followed by: “be fun,” “help me cope with stress,” “help me make new friends,” “get or keep me in shape,” “make or keep me more attractive,” and “give me more energy” ($\alpha = .75$).

Motivation—Motivation items were adapted from the Treatment Self-Regulation Questionnaire³³ and began with the phrase: “I would exercise most days of the week because...” The two items assessing *autonomous motivation* were: “I have thought about it and decided that I want to exercise,” and “It is an important thing for me to do,” and the mean was taken of these two items ($r = .63$). Two items also assessed *controlled motivation*: “I would feel bad about myself if I didn’t” and “Others would be upset with me if I didn’t” ($r = .30$).

Self-efficacy—A single item assessed self-efficacy for engaging in physical activity: “I feel confident in my ability to exercise regularly.”³⁴

Neighborhood Environment Measures

Participants answered items assessing social capital, neighborhood crime, and availability of PA resources on a four-point scale (1 = *strongly disagree*; 4 = *strongly agree*).

Social capital—Two items that were drawn from the National Survey of Children’s Health assessed social capital³⁵: “People in this neighborhood help each other out,” and “We watch out for each other’s children in the neighborhood.” These items were combined into a mean score ($r = .68$).

Neighborhood crime—One item assessed crime: “The crime rate in my neighborhood makes it unsafe to go on walks at night.”³⁶

Availability of PA resources—Four items assessed availability of resources for PA in the neighborhood and were informed from the Neighborhood Environment Walkability Scale for Youth (NEWS-Y)³⁶: “Many shops, stores, markets or other places to buy things I need are within a 10-15 minute walk of my home,” “A transit stop like a bus, train or trolley is within a 10-15 minute walk of my home,” “There are sidewalks on most of the streets in my neighborhood,” and “My neighborhood has several free or low cost recreation facilities, such as parks, walking trails, bike paths, recreation centers, playgrounds, etc.” Items were combined into a mean ($\alpha = .74$).

Availability of food stores—Five items asked participants which of the following they have in the local area around one's home, within a 10-15 minute walk in any direction: convenience/corner store/small grocery store/bodega, supermarket (or mid-size grocery store), fruit/vegetable market/Farmer's market/co-op/Community Supported Agriculture, fast food restaurant, non-fast food restaurant.³⁶ The number of "yes" responses comprised the total score.

Demographic Measures

Regression models controlled for several demographic variables, including: age, sex, race/ethnicity, education, residential tenure, and self-rated health status.

Statistical Analysis

Data were analyzed using SAS 9.3. To test the independent associations between each neighborhood and psychosocial variable with MVPA, simple logistic regressions were run predicting the odds of meeting MVPA guidelines from each neighborhood and psychosocial variable. Next, two multiple logistic regressions regressed meeting MVPA guidelines on: 1) all neighborhood variables and demographics, and 2) all psychosocial variables and demographics. Multiple logistic regressions also examined interactions between significant neighborhood and psychosocial correlates. For each moderation analysis, meeting MVPA guidelines was regressed on: demographics, the significant neighborhood correlate, the significant psychosocial correlate, and the interaction between the two. Continuous predictors were mean-centered. To interpret significant interactions, each variable in the interaction term was examined at low and high (± 1 *SD*) values of the other variable. Sample weights were applied in all analyses.²⁸

Results

Descriptive Statistics and Simple Logistic Regressions

After applying IPAQ scoring guidelines, 936 participants (70.57%) reported meeting PA guidelines, while 469 participants (29.43%) did not meet PA guidelines. Sample demographics are shown in Table 1.

In unadjusted analyses, all neighborhood variables were correlated with MVPA (see Table 2). Greater accessibility of food stores, accessibility of recreation facilities, and social capital were associated with greater odds of meeting MVPA guidelines (*ORs* 1.09, *ps* 0.02).

Participants reporting more neighborhood crime had lower odds of meeting MVPA guidelines (*OR* = 0.82, *p* = .002). Each psychosocial variable was also associated with MVPA. Participants reporting more favorable attitudes, autonomous and controlled motivation, and self-efficacy were more likely to meet MVPA guidelines (*ORs* 1.84, *ps* < .001). In contrast, greater perceived barriers corresponded to lower odds of meeting MVPA guidelines (*OR* = 0.34, *p* < .001).

Multiple Logistic Regressions

Adjusted neighborhood and psychosocial regression models predicting MVPA are shown in Table 3. These models controlled for age, sex, race/ethnicity, education, residential tenure, and self-rated health status. In the neighborhood model, greater social capital was the only significant neighborhood correlate and was positively associated with meeting MVPA guidelines ($OR = 1.23$, $p = 0.02$). In the psychosocial model, barriers were negatively associated ($OR = 0.61$, $p < .001$), and self-efficacy and autonomous motivation positively associated ($ORs = 1.64$, $ps < .001$) with meeting MVPA guidelines. Demographic correlates of MVPA that were significant in both models included sex and health status. Females had lower odds than males of meeting MVPA guidelines ($ORs = 0.48$, $ps < .001$), and better self-reported health status was associated with a greater odds of meeting MVPA guidelines ($ORs = 1.40$, $ps < .001$).

Interaction Models

Social capital was the only significant neighborhood correlate of MVPA in the adjusted model, and was examined as a moderator of the three significant psychosocial correlates (self-efficacy, barriers, and autonomous motivation). There was no evidence of significant interactions between social capital and either barriers ($p = 0.79$), or self-efficacy ($p = 0.72$). However, there was a significant social capital X autonomous motivation interaction ($p = 0.04$; see Figure 1).

Autonomous motivation was associated with meeting MVPA guidelines at both high levels (+1 SD) of social capital ($OR = 3.86$, $p < .001$) and low levels (-1 SD) of social capital ($OR = 2.64$, $p < .001$). However, greater social capital was associated with a greater odds of meeting MVPA guidelines only when autonomous motivation was high ($OR = 1.49$, $p = .003$). When autonomous motivation was low, the association between social capital and MVPA was not statistically significant ($OR = 0.99$, $p = 0.95$).

Discussion

Neighborhood Variables, Psychosocial Variables, and Physical Activity

The present analysis found that correlates of meeting MVPA guidelines across simple and multiple logistic regressions were social capital, autonomous motivation, self-efficacy, and fewer barriers. The association between social capital and MVPA is consistent with prior findings that social capital is associated with PA^{13-15,37} and can be health-promoting.^{38,39} This association could reflect the social nature of many types of PA. Stronger neighborhood social networks could facilitate social engagement in PA activities or increase feelings of comfort with exercising outside. Neighborhoods high in social capital may also have stronger social norms for PA.¹² Promoting social capital and neighborhood interactions might be possible approaches to encourage PA.⁴⁰

The associations between psychosocial attributes and MVPA are also generally consistent with prior research and behavioral theories demonstrating that constructs like self-efficacy, barriers, and autonomous motivation are important in promoting PA and weight control.^{16,17,18,19,41-43} Intervention approaches based on self-determination theory, which facilitate

the development of personally held values for engaging in PA, may be effective in promoting behavior initiation and maintenance.¹⁷ In addition, perceiving few barriers and/or having high self-efficacy to handle existing barriers can promote PA behaviors.⁴³ Promoting self-efficacy in the face of barriers may encourage goal-setting and planning which, in turn, facilitate engagement in PA.⁴¹

Neighborhood X psychosocial interactions on PA—There was a significant interaction between social capital and autonomous motivation in relation to meeting MVPA guidelines. The interaction suggests that effects of social capital may show the largest gains among people who are autonomously motivated to engage in PA (i.e., engage in PA for personally valued reasons). This interaction implies that autonomous forms of motivation should be considered across environmental contexts (low versus high social capital). In addition, intervention research can determine whether complementing environmental interventions by facilitating autonomous motivation can change behavior.

Specific ways to expand on these findings include examining the specific subtypes of PA for which this particular interaction holds, and continuing to investigate other interactions to inform intervention development. For example, walking is an outcome to consider in future analyses. Some studies have examined the interplay of neighborhood and psychosocial variables for walking,^{22-24,27,44-47} but none have focused on how the association between motivation and walking is moderated by the local environment. For example, some studies have found that favorable neighborhood features are associated with walking when psychosocial variables for walking are also favorable (and vice versa).⁴⁶ However, other studies have found that the environment is more strongly associated with walking among those with less favorable psychosocial variables,²³ or that psychosocial factors are more influential when neighborhood environments are less conducive to walking.^{27,45} There are also opportunities to examine neighborhood and psychosocial variables as related to specific MVPA activities. The present study did not assess participants' specific physical activities. This information would be useful for developing intervention recommendations that are tailored to specific activities and contexts. Another future research direction is examining whether the correlates of physical activity identified in this paper, and interactions among them, vary by residential locations and other neighborhood characteristics not included in this survey dataset.

Limitations and Strengths

There are limitations in using survey data. First, not all dimensions of social capital were examined. For example, social participation was not directly assessed, and participation in one's neighborhood may partly explain the association between social capital and PA. Second, all variables were self-report. There can be low agreement in self-report versus objective data on neighborhood features,^{48,49} and the IPAQ-SF can overestimate PA and has low correlations with objective measures.⁵⁰ Third, this is a highly educated sample whose perceptions of neighborhood social capital may be higher than the general population. The FLASHE adult sample is also predominantly female and is not nationally representative.²⁸ The cross-sectional design also limits conclusions about directionality and causality. For example, while neighborhood factors (e.g., social capital) might drive PA, engagement in PA

may drive people to seek PA-promoting neighborhoods.^{51,52} Finally, this project had multiple hypothesis tests and exploratory analyses, which can increase type I error.

Strengths of this study include the large national sample and the many behavioral correlates included in the surveys. In addition, although neighborhood correlates are self-reported, perceived neighborhood features are potential correlates of PA,^{48,53} and in some cases, can be stronger correlates of PA than objective measures.⁵⁴ This analysis also contributes to a relatively small body of literature on interactions between neighborhood and psychosocial correlates in predicting PA.

Conclusions

Social capital was a consistent neighborhood correlate of meeting MVPA guidelines, while self-efficacy, barriers, and autonomous motivation were consistent psychosocial correlates. These findings suggest that social features of one's neighborhood and one's ability and motivation to engage in PA (in conjunction with personal PA barriers) should be considered in interventions. Further analyses revealed an example of how neighborhood and psychosocial factors can interact to predict PA and suggest that positive effects of social capital on meeting MVPA guidelines may be seen when individuals are also autonomously motivated to engage in PA. Fostering positive neighborhood social interactions while encouraging personally valued reasons for engaging in PA is a potential combined intervention approach to consider for further study. Future research should conduct similar analyses using objective neighborhood and PA data and examine whether these associations hold for other PA outcomes.

Acknowledgments

Funding Source

The FLASHE Study was funded by the National Cancer Institute under contract number HHSN261201200039I issued to Westat.

Dr. Dwyer and Dr. Patel received research support from the National Cancer Institute through a Cancer Research Training Award Fellowship (Dwyer) and the Cancer Prevention Fellowship Program (Patel).

References

1. [September 1, 2015] Exercise or physical activity. Centers for Disease Control and Prevention website. <http://www.cdc.gov/nchs/fastats/exercise.htm> Updated July 20 2015
2. [September 1, 2015] Physical activity and health. Centers for Disease Control and Prevention website. <http://www.cdc.gov/physicalactivity/basics/pa-health/>. Updated June 4, 2015
3. Bandura A. Social cognitive theory: an agentic perspective. *Annu Rev Psychol.* 2001; 52:1–26. [PubMed: 11148297]
4. McAlister, AL., Perry, CL., Parcel, GS. How individuals, environments, and health behaviors interact: Social cognitive theory, *Health Behavior and Health Education*. 4. Glanz, K.Rimer, BK., Viswanath, K., editors. San Francisco, CA: Jossey-Bass; 2008. p. 169-188.
5. Sallis, JF., Owen, N., Fisher, EB. Ecological models of health behavior, *Health Behavior and Health Education*. 4. Glanz, K.Rimer, BK., Viswanath, K., editors. San Francisco, CA: Jossey-Bass; 2008. p. 465-485.

6. Sallis JF, Cervero RB, Ascher W, Henderson KA, Kraft MK, Kerr J. An ecological approach to creating active living communities. *Annu Rev Public Health*. 2006; 27:297–322. [PubMed: 16533119]
7. Ferdinand AO, Sen B, Rahurkar S, Engler S, Menachemi N. The relationship between built environments and physical activity: a systematic review. *American J Public Health*. 2012; 102(10):e7–e13.
8. Van Holle V, Deforche B, Van Cauwenberg J, et al. Relationship between the physical environment and different domains of physical activity in European adults: a systematic review. *BMC Public Health*. 2012; 12:807. [PubMed: 22992438]
9. Wendel-Vos W, Droomers M, Kremers S, Brug J, van Lenthe F. Potential environmental determinants of physical activity in adults: a systematic review. *Obes Rev*. 2007; 8(5):425–440. [PubMed: 17716300]
10. Renalds A, Smith TH, Hale PJ. A systematic review of built environment and health. *Fam Community Health*. 2010; 33(1):68–78. [PubMed: 20010006]
11. Kawachi I, Subramanian SV, Almeida-Filho N. A glossary for health inequalities. *J Epidemiol Community Health*. 2002; 56(9):647–652.
12. McNeill LH, Kreuter MW, Subramanian SV. Social environment and physical activity: a review of concepts and evidence. *Soc Sci Med*. 2006; 63(4):1011–1022. [PubMed: 16650513]
13. Nieminen T, Prättälä R, Martelin T, et al. Social capital, health behaviours and health: a population-based associational study. *BMC Public Health*. 2013; 13:613. [PubMed: 23805881]
14. Legh-Jones H, Moore S. Network social capital, social participation, and physical inactivity in an urban adult population. *Soc Sci Med*. 2012; 74(9):1362–1367. [PubMed: 22410270]
15. Lindström M. Social capital, desire to increase physical activity and leisure-time physical activity: a population-based study. *Public Health*. 2011; 125(7):442–447. [PubMed: 21771550]
16. Young MD, Plotnikoff RC, Collins CE, Callister R, Morgan PJ. Social cognitive theory and physical activity: a systematic review and meta-analysis. *Obes Rev*. 2014; 15(12):983–995. [PubMed: 25428600]
17. Teixeira PJ, Carraça EV, Markland D, Silva MN, Ryan RM. Exercise, physical activity, and self-determination theory: a systematic review. *Int J Behav Nutr Phys Act*. 2012; 9:78. [PubMed: 22726453]
18. Mailey EL, Huberty J, Dinkel D, McAuley E. Physical activity barriers and facilitators among working mothers and fathers. *BMC Public Health*. 2014; 14:657. [PubMed: 24974148]
19. Cerin E, Leslie E, Sugiyama T, Owen N. Perceived barriers to leisure-time physical activity in adults: an ecological perspective. *J Phys Act Health*. 2010; 7(4):451–459. [PubMed: 20683086]
20. Vo PT, Bogg T. Testing Theory of Planned Behavior and Neo-Socioanalytic Theory models of trait activity, industriousness, exercise social cognitions, exercise intentions, and physical activity in a representative U.S. sample. *Front Psychol*. 2015; 6:1114. [PubMed: 26300811]
21. Wasserkampf A, Silva MN, Santos IC, et al. Short- and long-term theory-based predictors of physical activity in women who participated in a weight-management program. *Health Educ Res*. 2014; 29(6):941–952. [PubMed: 25274719]
22. Carlson JA, Sallis JF, Conway TL, et al. Interactions between psychosocial and built environment factors in explaining older adults' physical activity. *Prev Med*. 2012; 54(1):68–73. [PubMed: 22027402]
23. Ding D, Sallis JF, Conway TL, et al. Interactive effects of built environment and psychosocial attributes on physical activity: a test of ecological models. *Ann Behav Med*. 2012; 44(3):365–374. [PubMed: 22899301]
24. Van Holle V, Van Cauwenberg J, Deforche B, et al. Do psychosocial factors moderate the association between objective neighborhood walkability and older adults' physical activity? *Health Place*. 2015; 34:118–125. [PubMed: 26022772]
25. Cerin E, Vandelanotte C, Leslie E, Merom D. Recreational facilities and leisure-time physical activity: An analysis of moderators and self-efficacy as a mediator. *Health Psychol*. 2008; 27(2 Suppl):S126–135. [PubMed: 18377154]

26. Van Dyck D, Cerin E, Conway TL, et al. Interacting psychosocial and environmental correlates of leisure-time physical activity: a three-country study. *Health Psychol.* 2014; 33(7):699–709. [PubMed: 24245836]
27. Van Dyck D, Cardon G, Deforche B, De Bourdeaudhuij I. Urban-rural differences in physical activity in Belgian adults and the importance of psychosocial factors. *J Urban Health.* 2011; 88(1): 154–167. [PubMed: 21274644]
28. Oh AY, Davis T, Dwyer LA, et al. Recruitment, enrollment, and response of parent-adolescent dyads in the FLASHE study. *Am J Prev Med.* 2017; 52(6):849–855. [PubMed: 28526361]
29. Craig CL, Marshall AL, Sjöström M, et al. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc.* 2003; 35(8):1381–1395. [PubMed: 12900694]
30. [December 13, 2016] U.S. Department of Health and Human Services. 2008 Physical Activity Guidelines for Americans. <https://health.gov/paguidelines/guidelines/>
31. Resnicow K, Taylor R, Baskin M, McCarty F. Results of Go Girls: A weight control program for overweight African-American adolescent females. *Obes Res.* 2005; 13(10):1739–1748. [PubMed: 16286521]
32. Motl RW, Dishman RK, Trost SG, et al. Factorial validity and invariance of questionnaires measuring social-cognitive determinants of physical activity among adolescent girls. *Prev Med.* 2000; 31(5):584–94. [PubMed: 11071840]
33. Levesque CS, Williams GC, Elliot D, Pickering M, Bodenhamer B, Finley PJ. Validating the theoretical structure of the Treatment Self-Regulation Questionnaire (TSRQ) across three different health behaviors. *Health Educ Res.* 2007; 22(5):691–702. [PubMed: 17138613]
34. [September 1, 2017] Self Determination Theory. Perceived Competence Scales. <http://selfdeterminationtheory.org/perceived-competence-scales/>
35. Blumberg SJ, Olson L, Frankel MR, et al. Design and operation of the National Survey of Children's Health, 2003. *Vital and Health Statistics.* 2005; Series 1:1–131.
36. Rosenberg D, Ding D, Sallis JF, et al. Neighborhood Environment Walkability Scale for Youth (NEWS-Y): reliability and relationship with physical activity. *Prev Med.* 2009; 49(2-3):213–8. [PubMed: 19632263]
37. Lindström M, Hanson BS, Ostergren PO. Socioeconomic differences in leisure-time physical activity: the role of social participation and social capital in shaping health related behaviour. *Soc Sci Med.* 2001; 52(3):441–451. [PubMed: 11330778]
38. Kim D, Kawachi I. A multilevel analysis of key forms of community- and individual-level social capital as predictors of self-rated health in the United States. *J Urban Health.* 2006; 83(5):813–826. [PubMed: 16810567]
39. Gilbert KL, Quinn SC, Goodman RM, Butler J, Wallace J. A meta-analysis of social capital and health: a case for needed research. *J Health Psychol.* 2013; 18(11):1385–1399. [PubMed: 23548810]
40. Ball K, Cleland VJ, Timperio AF, Salmon J, Giles-Corti B, Crawford DA. Love thy neighbour? Associations of social capital and crime with physical activity amongst women. *Soc Sci Med.* 2010; 71(4):807–814. [PubMed: 20561727]
41. Rovniak LS, Anderson ES, Winett RA, Stephens RS. Social cognitive determinants of physical activity in young adults: a prospective structural equation analysis. *Ann Behav Med.* 2002; 24(2): 149–156. [PubMed: 12054320]
42. Juniper KC, Oman RF, Hamm RM, Kerby DS. The relationships among constructs in the health belief model and the transtheoretical model among African-American college women for physical activity. *Am J Health Promot.* 2004; 18(5):354–357. [PubMed: 15163135]
43. Teixeira PJ, Carraca EV, Marques MM, et al. Successful behavior change in obesity interventions in adults: a systematic review of self-regulation mediators. *BMC Med.* 2015; 13:84. [PubMed: 25907778]
44. Beenackers MA, Kamphuis CB, Prins RG, Mackenbach JP, Burdorf A, van Lenthe FJ. Urban form and psychosocial factors: do they interact for leisure-time walking? *Med Sci Sports Exerc.* 2014; 46(2):293–301. [PubMed: 24051658]

45. Beenackers MA, Kamphuis CB, Mackenbach JP, Burdorf A, van Lenthe FJ. Why some walk and others don't: exploring interactions of perceived safety and social neighborhood factors with psychosocial cognitions. *Health Educ Res.* 2013; 28(2):220–233. [PubMed: 23393100]
46. Friederichs SA, Kremers SP, Lechner L, de Vries NK. Neighborhood walkability and walking behavior: the moderating role of action orientation. *J Phys Act Health.* 2013; 10(4):515–522. [PubMed: 22975667]
47. Van Dyck D, Deforche B, Cardon G, De Bourdeaudhuij I. Neighbourhood walkability and its particular importance for adults with a preference for passive transport. *Health Place.* 2009; 15(2): 496–504. [PubMed: 18974020]
48. McGinn AP, Evenson KR, Herring AH, Huston SL, Rodriguez DA. Exploring associations between physical activity and perceived and objective measures of the built environment. *J Urban Health.* 2007; 84(2):162–184. [PubMed: 17273926]
49. Ball K, Jeffery RW, Crawford DA, Roberts RJ, Salmon J, Timperio AF. Mismatch between perceived and objective measures of physical activity environments. *Prev Med.* 2008; 47(3):294–298. [PubMed: 18544463]
50. Lee PH, Macfarlane DJ, Lam TH, Stewart SM. Validity of the International Physical Activity Questionnaire Short Form (IPAQ-SF): a systematic review. *Int J Behav Nutr Phys Act.* 2011; 8:115. [PubMed: 22018588]
51. Boone-Heinonen J, Gordon-Larsen P, Guilkey DK, Jacobs DR Jr, Popkin BM. Environment and physical activity dynamics: the role of residential self-selection. *Psychol Sport Exerc.* 2011; 12(1): 54–60. [PubMed: 21516236]
52. McCormack GR, Shiell A. In search of causality: a systematic review of the relationship between the built environment and physical activity among adults. *Int J Behav Nutr Phys Act.* 2011; 8:125. [PubMed: 22077952]
53. Arvidsson D, Kawakami N, Ohlsson H, Sundquist K. Physical activity and concordance between objective and perceived walkability. *Med Sci Sports Exerc.* 2012; 44(2):280–287. [PubMed: 21716148]
54. Gebel K, Bauman A, Owen N. Correlates of non-concordance between perceived and objective measures of walkability. *Ann Behav Med.* 2009; 37(2):228–238. [PubMed: 19396503]

Figure 1.
Autonomous Motivation X Social Capital Interaction on Physical Activity

Table 1

Demographic Characteristics of the Analytic Sample (N = 1,405)

Continuous Demographics	Weighted Mean (SD)	95% CI for Weighted Mean
Self-Rated Health Status	3.64 (0.03) ^I	3.59 – 3.69
Categorical Demographics	Unweighted n	Weighted % (SE)
Sex		
Male	365	43.42 (1.70)
Female	1040	56.58 (1.70)
Age		
18 – 34	159	10.03 (0.93)
35 – 44	612	43.45 (1.62)
45 – 59	592	43.02 (1.62)
60 +	42	3.50 (0.63)
Race / Ethnicity		
Non-Hispanic White	995	60.33 (1.71)
Non-Hispanic Black	226	11.41 (0.82)
Hispanic	99	15.66 (1.53)
Other Race / Ethnicity	85	12.61 (1.38)
Education		
Less than college degree	741	47.33 (1.62)
College degree or higher	664	52.67 (1.62)
Residential Tenure		
0 – 3 years	303	21.28 (1.29)
3 – 10 years	526	39.58 (1.62)
10 – 15 years	298	21.35 (1.34)
>15 years	278	17.78 (1.20)

Note.^I In the present analysis, self-rated health status is rated from 1 (*poor*) to 5 (*excellent*).

Table 2

Unadjusted Logistic Regressions Predicting Odds of Meeting MVPA¹ Guidelines from Neighborhood and Psychosocial Variables

Predictor	<i>B</i> (<i>SE</i>)	<i>OR</i> (95% <i>CI</i>)	<i>p</i>
<i>Neighborhood Variables</i>			
Accessibility of Food Stores	0.09 (0.04)	1.09 (1.01, 1.18)	0.02 [*]
Accessibility of Facilities	0.22 (0.07)	1.24 (1.08, 1.43)	0.003 ^{**}
Social Capital	0.41 (0.08)	1.51 (1.28, 1.78)	<.001 ^{***}
Crime	-0.21 (0.07)	0.82 (0.72, 0.93)	0.002 ^{**}
<i>Psychosocial Variables</i>			
Barriers	-1.02 (0.08)	0.34 (0.30, 0.42)	<.001 ^{***}
Attitudes	0.88 (0.13)	2.42 (1.86, 3.13)	<.001 ^{***}
Autonomous Motivation	1.07 (0.09)	2.92 (2.43, 3.52)	<.001 ^{***}
Controlled Motivation	0.61 (0.08)	1.84 (1.58, 2.15)	<.001 ^{***}
Self-Efficacy	0.80 (0.06)	2.22 (1.98, 2.49)	<.001 ^{***}

^{*}
p < .05,

^{**}
p < .01,

^{***}
p < .001

^a MVPA = Moderate-to-vigorous physical activity

Table 3
Adjusted Neighborhood and Psychosocial Logistic Regression Models Predicting Odds of Meeting MVPA¹ Guidelines

	Neighborhood Model				Psychosocial Model			
	B (SE)	OR (95% CI)	p		B (SE)	OR (95% CI)	p	
Age ²			0.86					0.77
35 – 44	-0.01 (0.15)	0.82 (0.47, 1.39)	0.96		-0.01 (0.19)	1.05 (0.57, 1.93)	0.97	
45 – 59	-0.04 (0.15)	0.80 (0.46, 1.38)	0.78		-0.17 (0.20)	0.89 (0.47, 1.69)	0.39	
60 +	-0.14 (0.34)	0.72 (0.27, 1.97)	0.68		0.24 (0.48)	1.35 (0.34, 5.34)	0.62	
Sex (female) ¹	-0.42 (0.09)	0.43 (0.30, 0.61)	<0.001***		-0.36 (0.10)	0.48 (0.34, 0.73)	<0.001***	
Health Status	0.54 (0.08)	1.71 (1.47, 1.99)	<0.001***		0.34 (0.10)	1.40 (1.16, 1.69)	<0.001***	
Race / Ethnicity ¹			0.12				0.02*	
Hispanic	0.23 (0.22)	1.11 (0.63, 1.93)	0.28		0.06 (0.24)	0.82 (0.45, 1.51)	0.79	
Non-Hispanic Black	-0.27 (0.15)	0.67 (0.47, 0.95)	0.07		-0.39 (0.18)	0.53 (0.35, 0.79)	0.03*	
Other Race/ethnicity	-0.09 (0.22)	0.80 (0.45, 1.41)	0.67		0.06 (0.26)	0.82 (0.43, 1.56)	0.81	
Education (college degree) ¹	0.14 (0.08)	1.33 (0.99, 1.79)	0.06		-0.02 (0.09)	0.97 (0.69, 1.35)	0.84	
Residential tenure ¹			0.43				0.21	
3 – 10 years	0.04 (0.11)	0.97 (0.66, 1.43)	0.70		0.14 (0.13)	1.14 (0.73, 1.77)	0.29	
10 – 15 years	-0.23 (0.14)	0.74 (0.47, 1.16)	0.10		-0.29 (0.15)	0.74 (0.45, 1.21)	0.05*	
>15 years	0.12 (0.15)	1.05 (0.66, 1.67)	0.43		0.15 (0.17)	1.15 (0.68, 1.95)	0.38	
Accessibility of Food Stores	0.08 (0.05)	1.08 (0.98, 1.19)	0.13					
Accessibility of Facilities	0.10 (0.10)	1.11 (0.92, 1.34)	0.28					
Social Capital	0.21 (0.09)	1.23 (1.03, 1.47)	0.02*					
Crime	-0.04 (0.08)	0.96 (0.82, 1.12)	0.58					
Barriers					-0.49 (0.10)	0.61 (0.51, 0.75)	<0.001***	
Attitudes					0.16 (0.17)	1.17 (0.84, 1.61)	0.35	
Autonomous Motivation					0.57 (0.13)	1.77 (1.38, 2.27)	<0.001***	
Controlled Motivation					0.17 (0.10)	1.18 (0.97, 1.44)	0.09	
Efficacy					0.49 (0.07)	1.64 (1.43, 1.87)	<0.001***	

Note.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

¹ MVPA – Moderate-to-vigorous physical activity;

² Categorical variables have the following reference categories: Age (18-34), Sex (Male), Race/Ethnicity (Non-Hispanic White), Education (Less than a college degree), Residential tenure (0-3 years);

* $p < .05$,

** $p < .01$,

*** $p < .001$;

Bolded statistics are statistically significant at $p < .05$.