ACTA UNIVERSITATIS CAROLINAE
KINANTHROPOLOGICA, Vol. 52, 2 – 2016 Pag. 5–18

WAYNE STATE UNIVERSITY, COLLEGE OF EDUCATION, DIVISION OF KINESIOLOGY, HEALTH, AND SPORT STUDIES, DETROIT, MI, USA[1]
FLORIDA INTERNATIONAL UNIVERSITY, STEMPEL COLLEGE OF PUBLIC HEALTH & SOCIAL WORK, DEPARTMENT OF DIETETICS AND NUTRITION, MIAMI, FL, USA[2]
WAYNE STATE UNIVERSITY SCHOOL OF MEDICINE; PEDIATRIC PREVENTION RESEARCH CENTER, DEPARTMENT OF PEDIATRICS, DETROIT, MI, USA[3]
WAYNE STATE UNIVERSITY, DEPARTMENT OF NUTRITION AND FOOD SCIENCE, DETROIT, MI, USA[4]

INDIVIDUAL, SOCIAL AND ENVIRONMENTAL PREDICTORS OF PHYSICAL ACTIVITY IN SEVERE TO MORBID OBESE AFRICAN AMERICAN ADOLESCENTS

JEFFREY J. MARTIN[1], KATHRYN BROGAN-HARTLIEB[2], ANGELA J. JACQUES-TIURA[3], SYLVIE NAAR-KING[3], DEBORAH A. ELLIS[3], KAI-LIN CATHERINE JEN[4]

ABSTRACT

The purpose of this study was to predict low, moderate, hard and very hard physical activity (PA) and walking/biking/jogging based PA. One-hundred and fifty-nine severe to morbid obese African-American adolescents participated. We predicted 8% of the variance in hard PA largely due to family support and 10% of the variance in very hard PA due to other support (e.g. counselor) and having home PA equipment. We also predicted 10% of the variance in walking/biking/jogging due to the walkability of the neighborhood. Our findings support the value of social support and environmental supports in helping obese African American adolescents increase PA.

Keywords: health; self-esteem; adolescents; obesity; minority

DOI: 10.14712/23366052.2016.7

INDIVIDUAL, SOCIAL AND ENVIRONMENTAL PREDICTORS OF PHYSICAL ACTIVITY IN SEVERE TO MORBID OBESE AFRICAN AMERICAN ADOLESCENTS

Obesity is a major health issue leading to the existence of co-morbid conditions, reduced quality of life, and premature death. Obesity is especially prevalent in African Americans (Ogden, Flegal, Carroll, & Johnson, 2002). In particular, African American adolescents have higher rates of overweight and obesity relative to Caucasian children (Crawford,

Story, Wang, Ritchie, & Sabry, 2001; Gomez, Johnson, Selva, & Sallis, 2004; Gordon-Larsen, McMurray, & Popkin, 2000). Obesity and sedentary behavior also represent almost 10% of the USA national health care costs and the direct costs of no physical activity (PA) are estimated at 24 billion dollars (Colditz, 1999).

PA is a potentially important mechanism to both reduce and prevent obesity (Goran, Reynolds, & Lindquist, 1999). Unfortunately African American adolescents do not meet national standards for moderate to vigorous PA (Wong et al., 2012). Given the recent increase in overweight and obesity and the lack of PA among African American adolescents, there has been heightened interest in understanding the antecedents of PA. The beneficial outcomes of PA, in addition to obesity prevention are well documented and include cognitive (e.g. enhanced neurocognitive function), emotional (e.g. reduced stress), social (e.g. increased social support) and physiological (e.g. reduced heart disease) benefits (Friedenreich & Orenstein, 2002; United States Department of Health and Human Services: USDHHS; 2000). However, not all types and forms of PA are equally beneficial as there appear to be differential benefits associated with varying levels of PA intensity. For instance, African American adolescents with higher levels of vigorous PA have demonstrated stronger cardiovascular fitness (CF) and lower body fat percent compared to individuals with lower vigorous PA (Gutin, Yin, Humphries, & Barbeau, 2005). In contrast, moderate intensity PA was much more weakly related to CF (Gutin et al., 2005). Moderate-vigorous PA, relative to light PA, is also associated with a greater reduction in cardiometabolic risk factors in Canadian youth (Carson et al., 2013). Moderate to vigorous PA is also associated with greater cognitive benefits compared to lighter intensity PA (Castelli, Hillman, Hirsch, Hirsch, & Drollette, 2011). Researchers have also shown that light PA is unrelated to mortality whereas moderate PA has trended towards lower mortality with vigorous PA predictive of mortality (Lee & Paffenbarger, 2000).

Although the evidence suggests that moderate-vigorous PA compared to light intensity PA produces greater physiological, cognitive and health benefits there are some drawbacks to vigorous PA. People are often reluctant to engage in hard and very hard PA because of the discomfort associated with such efforts. High intensity PA can induce negative mood states and fatigue and serve to reduce future PA engagement (Pronk, Crouse, & Rohack, 1995). In contrast, low to moderate PA can result in reduced feelings of fatigue post-exercise (Loy, O'Connor, & Dishman, 2014) and promote positive affect (Hall, Ekkekakis, & Petruzzello, 2002). Given the high rates of obesity and the low rates of PA in obese African American adolescents, and the differential benefits of PA intensity, it is important to determine the antecedents of light, moderate, hard and very hard PA and if they vary (Yancey, Ory, & Davis, 2006).

Social cognitive, ecological, and personality theories have been employed to understand PA antecedents among non-obese African American adolescents (Martin & McCaughtry, 2008; Martin, McCaughtry, Shen, Fahlman, Garn, & Ferry, 2012). However, to our knowledge similar research has not been conducted with obese African American adolescents. To address this research gap, we sought to determine which social cognitive and ecological theory based constructs, classified as individual, social, or environmental variables, would best predict low, moderate, hard and very hard PA. Furthermore the limited research examining predictors of PA in African American adolescents has typically been cross-sectional in nature hence the current study is longitudinal in design.

We examined two individually based constructs. We first examined hope (Snyder, Sympson, Ybasco, Borders, Babyak, & Higgins, 1996). As defined by Snyder et al. (1996) individuals high in hope have important goals and persevere in their efforts to obtain their goals by developing plans and strategies. Possessing high levels of hope is similar to having strong self-regulation skills which should aid adolescents in their efforts to engage in PA. We also examined self-efficacy given its long history of research support in many domains (e.g. sport, education, etc.) and in particular weight loss (e.g. Warziski, Sereika, Styn, Music, & Burke, 2008). Individuals with strong self-efficacy for engaging in PA are more likely to develop strategies to fit PA into their day, to work harder and longer, and seek social support for PA compared to individuals with weaker self-efficacy. We hypothesized that individuals expressing stronger hope and efficacy would engage in more PA, at all levels of intensity, compared to individuals with weaker hope and efficacy.

Social support from both family and friends are important antecedents of PA for children in general (Duncan, Duncan, & Strycker, 2005) and in particular for obese youth (Murtagh, Dixey, & Rudolf, 2006). Therefore, we examined multi-dimensional social support by obtaining data on friend, family and other social support for PA. We hypothesized that participants reporting greater social support from all three sources would be more physically active at all intensity levels than participants experiencing weaker social support.

Participants in the current study were from a major city where poverty and unsafe neighborhoods are particularly salient barriers to PA (McCaughtry, Barnard, Martin, Shen, & Hodges Kulinna, 2006). For many obese individuals walking is a convenient, inexpensive, and preferred PA and countries with the highest rates of active transportation (e.g. walking, biking) have lower rates of obesity compared to countries with lower rates of active transport (Bassett, Pucher, Buehler, Thompson, & Crouter, 2008). Hence, we assessed participant's perceptions of the walkability of their neighborhood. Additionally we assessed home PA equipment as another feature of the environment given that home exercise equipment facilitates engaging in short bouts of PA (Jakicic, Winters, Lang, & Wing, 1999). We hypothesized that participants who viewed their neighborhood as facilitative of walking and who had PA equipment in the home would engage in more PA compared to participants reporting less PA equipment in the home and who perceived their neighborhood as less walkable. Participants in the current study were too young to drive and lived in a city with limited and unreliable public transportation. Hence, they often walked or biked for functional reasons (e.g. going to the store or school). The neighborhood walkability scale (NEWS; Saelens, Sallis, Black, & Chen, 2003) we employed has received limited use in urban environments and with obese African American youth. Additionally, the rationale for the NEWS is that PA friendly neighborhoods are more likely to promote lifestyle PA such as walking, biking and jogging. A PA friendly neighborhood is thought to have limited influence on PA such as traditional sports played at school or exercise done in the home. Hence a secondary purpose of the current study was to determine if participant's perceptions of the PA walkability of the neighborhood specifically predicted walking, biking and jogging PA.

In summary, we sought to predict various levels of PA intensity and walking/biking/jogging PA using individual, social and environmental based constructs to determine which ones are important in predicting PA.

METHOD

Procedures

We received permission from the University Internal Review Board, parents, and children to conduct our study. Participants' parents completed informed consent forms whereas participants provided assent. A team of data collectors met with participants to obtain psychosocial and ecological data at the study start. Our outcome measures (i.e., low, moderate, hard, very hard PA, and walking/jogging/biking PA) were obtained approximately 1, 7 and 9 months later at Times 1, 3 and 4.

Participants and Setting

Complete data on sample of 159 severe to morbid obese African American adolescents (*M* years = 13.8, *SD* = 1.6) from a major city in a Midwestern state in the United States (U. S.) participated. Our participants resided in a city that recently declared bankruptcy and is facing a significant economic depression (U. S. Census Bureau, 2008) as thirty-eight percent of the city residents live below the poverty level (U. S. Census Bureau, 2008). Approximately two-thirds of our participants were girls (*n* = 107) and the rest boys (*n* = 52). Participants had an average height of 65 inches (*SD* = 2.68, range = 58–73 inches) weight of 104.33 kilograms (*SD* = 23.65, range = 63.77–205.25), 58.9 percent body fat (*SD* = 106.5, range = 29.7–65.6), and a BMI of 38.2 (*SD* = 7.64, range = 25.7–60.5), which placed them in at the 98.9th percentile. BMI was calculated as weight in kilograms divided by height in meters squared and rounded to the nearest tenth (Flegal, Kit, Orpana, & Graubard, 2013). Using the standard formula of height and weight BMI's of greater than 35 and 40 are often referred to as severe or morbid obesity (Sturm, 2007). BMI's over 35 are also referred to as Grade 2 obesity (Flegal, Kit, Orpana, & Graubard, 2013).

Participants were part of a weight loss intervention study (Naar-King et al., 2014). Originally, 186 families enrolled in the trial but five were removed from the study, for a sample of 181 families. The current sample of 159 includes those who completed their follow-up data collection. Families were randomized between receiving the intervention at home or at the physician's office. Furthermore, children were also randomized across three types of weight loss intervention treatments.

Instruments

Demographic scale. The demographic information provided by adolescents included their age, gender, and ethnicity.

Individual Measures.

Hope Scale. The State Hope Scale (Snyder et al., 1996) is an 8 item scale. An example item is "I can think of many ways to reach my current goals." Scores range from 1 (definitely false) to 8 (definitely true). Adequate reliability and validity has been established (Curry & Snyder, 2000; Curry, Snyder, Cook, Ruby, & Rehm, 1997; Snyder et al., 1996).

Efficacy. We used a 5 item adolescent self-efficacy to change adapted from Rollnick's Readiness Ruler (Stott, Rollnick, & Pill, 1995). Items were tailored to the behaviors most

critical to physical activity (e.g. how sure are you that you can set aside time for regular physical activity. Items were scored from 1 to 10 and summed and divided by 5 to obtain a mean efficacy score. Higher values indicated higher efficacy to change. The original scale has demonstrated reliability and validity with minority youth with chronic conditions (Ellis, Berio, Idalski-Carcone, & Naar King, 2001; MacDonell, Naar-King, Murphy, Parsons, & Harper, 2009).

Social Measures.

Social Support Scale. Participants responded to the following, "Exercising may sometimes be easier with support from other people. We want to know who supports you in your efforts to exercise. Who are your supports? List the names of the people who support you in increasing the amount you exercise" List up to 6 different individuals and their relationship to you. Three social support scores ranging from 1 to 6 were then determined for friends, family and other (e.g. teacher, counselor, religious leader, coach).

Environmental Measures.

Neighborhood Environment Walkability Scale (NEWS). The NEWS was designed to examine neighborhood environmental factors that are important to physical activity (Saelens, Sallis, Black, & Chen, 2003). The NEWS has 72 items across 8 subscales. Because the current study was part of a larger project we sought to reduce subject burden. As a result we often dropped the weakest performing items (Saelens et al., 2003) from various subscales. The first subscale, residential density (6 items), assesses the type of residences in participant's neighborhood. The second subscale, land use mix-diversity (23 items), assesses how long it takes people to walk from their home to common business's or facilities (e.g. fast food restaurant, post office). We added an additional item representing a popular local chain restaurant often used by our participants. This resulted in a 24 item subscale. The third subscale, land use mix access (7 items) reflects respondent's perceptions about how easy it is to walk in their neighborhoods. We eliminated one item that was not relevant for our sample resulting in a 6 item sub-scale. The fourth subscale, street connectivity (3 items, reduced from the original 5 items as 2 items were not relevant, measures street connectivity (e.g. alternative routes from place to place). The fifth subscale, walking/cycling facilities, measures how easy it is to walk or jog and bike ride in the neighborhood and we used 3 of the 5 original items. The sixth subscale measures the aesthetics of the neighborhood (e.g. interesting things to see) and we used 4 of the 6 original items. The seventh subscale, pedestrian/traffic safety, reflects perceptions of neighborhood safety (e.g. well lit streets) and uses 4 items. The eight and last subscale, safety from crime, has 6 items and we used 5 items. For subscale one, residential density, respondent's indicate how long it takes them to walk to various places by checking one of 5 boxes with time ranges (i.e., 1–5 minutes to 30 plus minutes). Higher scores indicate further proximity, a longer time to walk, and therefore lower perceived walkability. All remaining subscales are answered according to a 1 (strongly disagree) to 4 (strongly agree) point Likert scale. Higher scores indicate greater walkability. Adequate reliability and validity has been established (Cerin, Conway, Saelens, Frank, & Sallis, 2009; Saelens et al., 2003). Finally it should be noted that the caregivers and not the adolescents completed the NEWS.

Physical Activity Equipment in the Home (PAEH). The PAEH was designed to assess the prevalence of physical activity in the home (e.g. jump rope) (Rosenberg et al., 2010). The PAEH list 14 common pieces of PA equipment that respondents answer with a yes or no to indicate its presence or absence in the home. The scale is scored by summing the yes answers and scores range from 0 to 14. Higher scores indicate more PA equipment in the home. Adequate test-retest reliability and construct validity have been established (Rosenberg et al., 2010).

Outcome Measures.

Physical activity (PA). We obtained measures of light, moderate, hard and very hard intensity physical activity (PA) using the 3-day Physical Activity Recall Instrument (3DPAR) developed by Pate, Ross, Dowda, Trost and Sirard (2003). At Times 1, 3 and 4 participants recalled their PA engagement over the last 3 days in 30 min blocks of time starting at 7 am and ending at midnight. Fifty-five common activities are supplied that reflect activities related to school, work, sport, hobbies, eating, transportation, etc. For each 30 minute segment respondents enter the main activity they did during that time and rate its intensity as light, moderate, hard or very hard (Pate et al., 2003). Each 30 minute time period is assigned a MET value. Further data reduction results in a MET value for each of the 3 days which is totaled for the 3 day period. Based on MET values, activity is categorized as light, moderate, hard or very hard. PA data was obtained at Times 1, 3 and 4 and averaged across the three time periods to obtain the most representative measure of PA possible based on 9 days (i.e., 3 days from each period). Criterion validity and factorial invariance has also been established for the 3DPAR (Pate et al., 2003).

Data Analysis

The Statistical Package for the Social Sciences 22.00 was used for all analyses. We first examined for missing data and then tested for multicollinearity, skewness and kurtosis. Internal reliability via alpha coefficients (where relevant) and descriptive analyses were then conducted. Our major set of analyses, a series of 5 multiple regression equations, were then conducted. In all analyses we entered predictor variables in three blocks representing 3 models. For the first model we entered the individual level variables (i.e., hope, efficacy). The second model then included the individual variables followed by social level variables (i.e., friend, family and other support). Finally the third model included the prior individual and social variables and added in the environmental level constructs (i.e., neighborhood walkability, home PA equipment). This analytical strategy was designed to see what level and which particular constructs within each level accounted for significant variance in our outcome variables. Finally, given the dearth of research in this area it was determined that making a Type II error would be more serious than making a Type I error (Franks & Huck, 1986). Therefore a p value of 0.10 was selected for determining statistical significance. Additionally we believe that effect size (i.e., variance accounted for) is of value and should not be dismissed simply because $p > 0.05$ (see Cohen, 1994).

Preliminary Analyses

A missing value analysis with SPSS indicated that no variables had more than 5% or more missing values and mean substitution was then used. Means, SDs, kurtosis, skewness and alphas were then computed for each subscale (see Table 1). Five NEWS subscales had very poor internal consistency ($\alpha = 0.05$ to 0.41) and were not retained for future analyses. Subsequent analyses using the NEWS was based on the mix-diversity subscale ($\alpha = 0.95$), aesthetics of the neighborhood subscale ($\alpha = 0.77$) and the safety from crime subscale ($\alpha = 0.87$).

Table 1. Means, Standard Deviations, Ranges, Skewness, Kurtosis, Alpha's and Pearson Product-moment Correlations for all Predictor Variables

Variable	1	2	3	4	5	6	7	8	9
1. Hope	–								
2. Efficacy	0.10	–							
3. Family SS	0.03	0.00	–						
4. Friend SS	0.01	0.17	–0.16	–					
5. Other SS	0.09	–0.05	–0.20	0.04	–				
6. News A	–0.18	0.04	0.15	0.11	–0.09	–			
7. News B	0.33	0.16	–0.03	0.04	0.03	–0.12	–		
8. News C	0.35	0.17	0.02	–0.01	0.05	–0.11	0.51	–	
9. Home PA	0.07	0.04	0.14	0.04	–0.09	0.20	0.02	–0.09	–
Mean	5.98	6.96	2.65	0.77	0.31	3.38	2.83	2.59	4.80
SD	1.42	1.76	1.49	1.07	0.74	0.64	0.72	0.74	2.71
Skewness	–0.97	–0.67	0.24	1.36	4.04	–0.74	–0.28	–0.12	0.57
Kurtosis	0.78	–0.11	–0.64	1.11	23.70	0.48	–0.82	–0.81	0.69
Alpha	0.78	0.71	NA	NA	NA	0.95	0.77	0.87	NA

Note. Family SS = Family Social Support; Friend SS = Friend Social Support; Other SS = Other Social Support; News A = Mix-Diversity; News B = Aesthetics of the Neighborhood; News C = Safety from Crime; Home PA = Physical Activity Equipment in the Home. All correlations at $r = 0.16$ or above are significant at $p < 0.05$. NA = one item scales.

Descriptive Statistics

Descriptive data for all predictor variables and internal consistency (i.e., Cronbach's alpha; Cronbach, 1951) can be found in Table 1. Skewness ranged from −0.97 to 4.04 and kurtosis from −0.82 to 23.70. With four exceptions skewness and kurtosis values fell between −1.0 and +1.0 indicative of normality. Furthermore, with large samples slight deviations from normality do not make significant differences in analyses (Tabachnick & Fidell, 2001, p. 74).

For individual level constructs our participants expressed moderate levels of hope and self-efficacy as they scored approximately 6 and 7 on 8 and 10 point scales, respectively. For social support participants noted far more family members ($M = 2.75$ compared to friends ($M = 0.77$) and other ($M = 0.31$). For the environmental constructs we examined walkability dimensions of the neighborhood and PA equipment in the home. The most common type of equipment reported was a bike by 64% of the participants. Basketball hoops and jump ropes, sports equipment, roller skates, yoga mats, and weight lifting equipment were found in less than half of the homes. Less than 20% of the participants had a play, recreation or exercise room, fixed play equipment (e.g. swing set), a swimming pool, trampoline, or water or snow equipment. Participant's mean scores ($M = 3.38$) for residential density (e.g. how close or far away stores and parks were) indicated an average ranging from 11 to 30 minutes. Participants answers about the aesthetics of the neighborhood indicated that they "somewhat agreed" that their neighborhood was attractive and interesting. Finally, safety from crime subscale scores were in the neutral range suggesting mixed opinions about how safe, as a group, our study participants perceived their neighborhood.

Correlational and Regression Analyses

We next conducted a correlation analyses found in Table 1 followed by our multiple regression analyses found in Tables 2 to 4. Before conducting our multiple regression analysis we tested for multicollinearity. Both tolerance (0.68–0.94) and variance inflation factors (1.08–1.47) were acceptable as tolerance values were not under 0.10 and the VIF was not over 10. Additionally, participants were part of a larger randomized control trial so we conducted ANOVA's to determine if PA at Time 1, 3, and 4 varied across intervention type and intervention location. METs for Time 1 ($F (2, 178) = 0.62$, $p < 0.54$), Time 3 ($F (2, 178) = 0.21$, $p < 0.81$) and Time 4 ($F (2, 178) = 1.72$, $p < 0.18$) did not vary according to intervention type. METs for Time 1 ($F (1, 179) = 1.2$, $p < 0.28$), Time 3 ($F (1, 179) = 0.01$, $p < 0.98$) and Time 4 ($F (1, 179) = 3.02$, $p < 0.08$), also, in general, did not vary according to intervention location. As a result we did not control for intervention location or type in the multiple regression equations.

The first two regression equations predicting low and moderate PA were not significant. The third equation, for hard PA, was significant for model two ($F (5, 153) = 1.96$, $p < 0.09$)* which included the individual and social level constructs only. The fourth regression, for very hard PA, was significant for model three including all three levels ($F (9, 149) = 1.92$, $p < 0.05$). The last regression equation predicting walking, biking and jogging was significant for model three ($F (9, 149) = 1.82$, $p < 0.06$)* which included individual, social and environmental level constructs.

Results for the model summary with R, R^2, R^2 change, F change, and significance of F change can be found in the top portion of Tables 2, 3 and 4 and the bottom part of each Table includes standardized Beta coefficients, t's and significance levels for each construct within each block. Based on significant beta-weights our results varied according to the type of PA behavior examined. We predicted 8% of the variance for hard PA with only family support at the social variable level having a significant beta weight. For very hard PA we accounted for 10% of the variance with both other support from the social construct level and home equipment from the environmental level being the most important predictors

based on their significant beta weights. Last, we accounted for 10% of the variance in walking, biking and jogging with the NEWS subscale of mixed diversity land use having the only significant beta-weight.

Table 2. Multiple regression results predicting Hard Physical Activity:

Model Summary

Step	Variable	R	R^2	F	*df*	*p* <	ΔR^2	F change	Sig of F change
1	IND	0.10	0.010	0.77	2.156	0.463	0.010	0.77	0.463
2	SOC	0.25	0.060	1.96	3.153	0.088*	0.050	2.73	0.046*
3	ENV	0.28	0.080	1.45	4.149	0.171	0.021	0.84	0.505

Note. IND = Individual Level Constructs; SOC = Social Level Constructs; ENV = Environmental Level Constructs; Or filter your current search.

Coefficients for Final Model Individual and Social Constructs only

Step	Variable	Standardized Beta	t	Significance
1	Hope	0.072	0.91	0.362
	Efficacy	0.059	0.74	0.460
2	Family SS	0.155	1.91	0.058*
	Friends SS	–0.120	–1.48	0.141
	Other SS	0.128	1.58	0.115

Note. Step 1 = Individual Level Constructs; Step 2 = Social Level Constructs; Family SS = Family Social Support; Friend SS = Friend Social Support; Other SS = Other Social Support.

Table 3. Multiple regression results predicting Very Hard Physical Activity:

Model Summary

Step	Variable	R	R^2	F	*df*	*p* <	ΔR^2	F change	Sig of F change
1	IND	0.08	0.006	0.51	2.156	0.603	0.006	0.51	0.603
2	SOC	0.25	0.063	2.07	3.153	0.072*	0.057	3.10	0.029*
3	ENV	0.32	0.104	1.92	4.149	0.053*	0.041	1.68	0.157

Note. IND = Individual Level Constructs; SOC = Social Level Constructs; ENV = Environmental Level Constructs; Or filter your current search.

Coefficients Final Model with Individual, Social and Environmental Constructs

Step	Variable	Standardized Beta	t	Significance
1	Hope	0.048	0.551	0.582
	Efficacy	0.077	0.952	0.343

Step	Variable	Standardized Beta	t	Significance
2	Family SS	0.060	0.731	0.466
	Friends SS	0.033	0.411	0.681
	Other SS	0.252	3.156	0.002*
3	Home PA	0.166	2.047	0.042*
	News A	−0.065	−0.792	0.430
	News B	−0.039	−0.420	0.675
	News C	−0.090	−0.955	0.341

Note. Family SS = Family Social Support; Friend SS = Friend Social Support; Other SS = Other Social Support; News A = Mix-Diversity; News B = Aesthetics of the Neighborhood; News C = Safety from Crime; Home PA = Physical Activity Equipment in the Home.

Table 4. Multiple regression results predicting Walking, Biking & Jogging:

Model Summary

Step	Variable	R	R^2	F	*df*	*p* <	ΔR^2	F change	Sig of F change
1	IND	0.06	0.004	0.28	2.156	0.755	0.004	0.28	0.755
2	SOC	0.18	0.033	1.04	3.153	0.395	0.029	1.54	0.205
3	ENV	0.32	0.099	1.82	4.149	0.068*	0.066	2.74	0.031*

Note. IND = Individual Level Constructs; SOC = Social Level Constructs; ENV = Environmental Level Constructs; Or filter your current search.

Coefficients Final Model with Individual, Social and Environmental Constructs

Step	Variable	Standardized Beta	t	Significance
1	Hope	−0.063	−0.732	0.466
	Efficacy	−0.009	−0.113	0.910
2	Family SS	0.005	0.059	0.953
	Friends SS	−0.102	−1.262	0.209
	Other SS	−0.117	−1.458	0.147
3	Home PA	0.108	1.326	0.187
	News A	0.207	2.508	0.013*
	News B	0.082	0.884	0.378
	News C	0.056	0.594	0.554

Note. Step 1 = Individual Level Constructs; Step 2 = Social Level Constructs; Family SS = Family Social Support; Friend SS = Friend Social Support; Other SS = Other Social Support; News A = Mix-Diversity; News B = Aesthetics of the Neighborhood; News C = Safety from Crime; Home PA = Physical Activity Equipment in the Home.

DISCUSSION

The major purpose of this investigation was to predict various levels of PA intensity in severe to morbid obese African American adolescents using individual, social and environmental level constructs. We were also particularly interested in predicting some of the most common forms of PA (e.g. walking) engaged in that we hypothesized would be related to positive perceptions of neighborhood walkability.

Both regression equations for light and moderate intensity PA were not significant and failed to support our hypotheses. In contrast, the regression equations for hard and very hard intensity PA were significant. For hard PA the individual level block of variables was not significant but when the social level variables were added the equation became significant and accounted for 8% of the variance. Adding the environmental level constructs did not result in a significant regression equation. The only significant beta weight was family support. The positive beta weight indicates that participants who had more family members supporting them engaged in harder PA than participants reporting less family member support. The finding that family support was the only significant predictor of hard PA is consistent with research on middle school children where Hsu and colleagues found that family support was the only significant predictor of moderate to vigorous PA in mostly Latina female middle school students (Hsu, Chou, Nguyen-Rodriguez, McClain, Belcher, & Spruijt-Metz, 2011).

For very hard PA the individual level block of variables was not significant but when the social level variables were added the equation became significant and the addition of the environmental constructs was also significant accounting for 10% of the variance. The two significant beta weights were other support from the social level constructs and home equipment from the environmental level block of variables. These findings indicate that participants with the strongest other social support and who had the most PA equipment at home engaged in the most very hard PA. For many participants the most common sources of other support were their school teachers, counselors, sport coaches and religious leaders. It may be that highly active individuals were able to engage in very hard PA in two ways: while at home they could rely on easily accessible equipment and when outside of the home they were able to count on significant others outside of their family and friends to help them engage in PA.

The inability to predict light and moderate PA may reflect the ease with which obese individuals, experience feelings of effort and fatigue commensurate with light and moderate PA. For instance, small and common everyday lifestyle PA such as walking from one room to another room in the house or going up the stairs can feel like light and moderate PA. As a result such activities do not require strong self-efficacy, high levels of social support or an environment that is PA friendly. In contrast PA's such as brisk walking (a very common PA for our participants) can produce feelings commensurate with hard and very hard PA for obese individuals relative to non-obese individuals (Ekkekakis, Lind, & Vazou, 2010). Hence, as illustrated in the current study, support from both family members and significant others may be important in helping severe to morbid obese individuals engage in hard and very hard PA that may feel quite physiologically uncomfortable. In addition to the functional support (e.g. encouragement to complete a one mile walk) it is also plausible that family and significant other support is a source of critical emotional support serving to

minimize or alleviate social physique anxiety that might occur in the presence of strangers in more public settings. Obese individuals can be reluctant to engage in PA in settings (i.e., the neighborhood) where social evaluation is high (Zabinski, Saelens, Stein, Hayden-Wade, & Wilfley, 2003). As a result the ability to engage in PA while in the privacy of their home was likely quite important to our participants as substantiated by the significant beta weight associated with the regression equation in which home PA equipment predicted very hard PA.

For the regression equation predicting common outside PA's such as walking, biking and jogging, one neighborhood walkability subscale had a significant beta weight. Participants who viewed stores, businesses, and various facilities as being close if walked to engaged in more walking, biking and jogging compared to participants who viewed the same destinations as being farther away to walk to.

Our participants were too young to drive and lived in a city lacking reliable mass transportation. As a result many of our participants relied on walking and biking to visit friends, shop, get to school, and engage in extra-curricular activities. Hence, it seems reasonable that our participants were more likely to engage in the above PA's if various common locations (e.g. library, stores, park) were close to participants' homes compared to if they were farther away.

In summary, our research study is one of the first to examine constructs spanning individual, social and environmental constructs and their ability to predict various forms of PA. In addition to our comprehensive conceptual framework, our study also makes a unique contribution to the literature in this area by focusing on severe to morbid obese African American youth living in an underserved urban area. Our findings suggest that both family and support from important others (e.g. teachers, extended family, coaches) may be critical determinants in helping obese African American adolescents engage in hard and very hard PA. The amount of variance accounted for in both hard and very hard PA by family and significant others was small based on objective criteria for labeling effect sizes (Fritz, Morris, & Richler, 2012). However, within the context of our participants' who, as a result of their morbid obesity levels, were at risk for many severe health challenges (e.g. heart disease, diabetes) the value of understanding the determinants of even small to moderate amounts of PA behavior is clearly quite important for health and medical reasons. Given the non-experimental design of our study we cannot assert causality but, based on the longitudinal nature of our research and prior research, our findings are supportive of a causal link from social support and features of the environment to PA.

ACKNOWLEDGEMENTS

This work was funded by the National Heart, Lung, and Blood Institute and the Eunice Kennedy Shriver National Institute of Child Health and Human Development (U01HL097889), Principal Investigators: S. Naar-King and K.-L. C. Jen.

REFERENCES

Bassett Jr, D. R., Pucher, J., Buehler, R., Thompson, D. L., & Crouter, S. E. (2008). Walking, cycling, and obesity rates in Europe, North America, and Australia. *Journal of Physical Activity and Health*, *5*(6), 795–814.

Carson, V., Rinaldi, R. L., Torrance, B., Maximova, K., Ball, G. D. C., Majumdar, S. R., … & McGavock, J. (2013). Vigorous physical activity and longitudinal associations with cardiometabolic risk factors in youth. *International Journal of Obesity*, *38*(1), 16–21.

Castelli, D. M., Hillman, C. H., Hirsch, J., Hirsch, A., & Drollette, E. (2011). FIT Kids: Time in target heart zone and cognitive performance. *Preventive Medicine*, *52*, S55–S59.

Cerin, E., Conway, T. L., Saelens, B. E., Frank, L. D., & Sallis, J. F. (2009). Cross-validation of the factorial structure of the Neighborhood Environment Walkability Scale (NEWS) and its abbreviated form (NEWS-A). *International Journal of Behavioral Nutrition and Physical Activity*, *6*(1), 32, 1–10.

Cohen, J. (1994). The earth is round ($p < 0.05$). *American Psychologist*, *49*(12), 997–1003.

Colditz, G. (1999). Economic costs of obesity and inactivity. *Medicine and Science in Sports and Exercise*, *31*, S663–S667.

Crawford, P. B., Story, M., Wang, M. C., Ritchie, L. D., & Sabry, Z. I. (2001). Ethnic issues in the epidemiology of childhood obesity. *Pediatric Clinics North America*, *48*(4), 855–878.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*(3), 297–334.

Curry, L. A., & Snyder, C. R. (2000). Hope takes the field: Mind matters in athletic performances. In: C. R. Snyder (Ed.), *Handbook of hope: Theory, measures, and applications* (pp. 243–259). San Diego, CA, US: Academic Press, XXV, 440 pp.

Curry, L. A., Snyder, C. R., Cook, D. L., Ruby, B. C., & Rehm, M. (1997). Role of hope in academic and sport achievement. *Journal of Personality and Social Psychology*, *73*(6), 1257–1267.

Duncan, S. C., Duncan, T. E., & Strycker, L. A. (2005). Sources and types of social support in youth physical activity. *Health Psychology*, *24*(1), 3–10.

Ekkakakis, P., Lind, E., & Vazou, S. (2010). Affective responses to increasing levels of exercise intensity in normal-weight, overweight, and obese middle-aged women. *Obesity*, *18*(1), 79–85.

Ellis, D. A., Berio, H., Idalski-Carcone, A., & Naar-King, S. (2011). Adolescent and parent motivation for change affects psychotherapy outcomes among youth with poorly controlled diabetes. *Journal of Pediatric Psychology*, *37*(1), 75–84.

Flegal, K. M., Kit, B. K., Orpana, H., & Graubard, B. I. (2013). Association of all-cause mortality with overweight and obesity using standard body mass index categories: a systematic review and meta-analysis. *Journal of American Medical Association*, *309*(1), 71–82.

Franks, B. D., & Huck, S. W. (1986). Why does everyone use the. 05 significance level? *Research Quarterly for Exercise and Sport*, *57*(3), 245–249.

Friedenreich, C. M., & Orenstein, M. R. (2002). Physical activity and cancer prevention: etiologic evidence and biological mechanisms. *The Journal of Nutrition*, *132*, 3456S–3464S.

Fritz, C. O., Morris, P. E., & Richler, J. J. (2012). Effect size estimates: Current use, calculations, and interpretation. *Journal of Experimental Psychology: General*, *141*(1), 2–18.

Gomez, J. E., Johnson, B. A., Selva, M., & Sallis, J. F. (2004). Violent crime and outdoor physical activity among inner city youth. *Preventative Medicine*, *39*(5), 876–881.

Goran, M. I., Reynolds, K. D., & Lindquist, C. H. (1999). Role of physical activity in the prevention of obesity in children. *International Journal of Obesity*, *23*, S18–S33.

Gordon-Larsen, P., McMurray, R. G., & Popkin, B. M. (2000). Determinants of adolescent physical activity and inactivity patterns. *Pediatric Exercise Science*, *105*(6), e83.

Gutin, B., Yin, Z., Humphries, M. C., & Barbeau, P. (2005). Relations of moderate and vigorous physical activity to fitness and fatness in adolescents. *The American Journal of Clinical Nutrition*, *81*(4), 746–750.

Hall, E. E., Ekkekakis, P., & Petruzzello, S. J. (2002). The affective beneficence of vigorous exercise revisited. *British Journal of Health Psychology*, *7*(1), 47–66.

Hsu, Y. W., Chou, C. P., Nguyen-Rodriguez, S. T., McClain, A. D., Belcher, B. R., & Spruijt-Metz, D. (2011). Influences of social support, perceived barriers, and negative meanings of physical activity on physical activity in middle school students. *Journal of Physical Activity and Health*, *8*(2), 210–219.

Jakicic, J. M., Winters, C., Lang, W., & Wing, R. R. (1999). Effects of intermittent exercise and use of home exercise equipment on adherence, weight loss, and fitness in overweight women: a randomized trial. *Journal of the American Medical Association*, *282*(16), 1554–1560.

Lee, I. M., & Paffenbarger, R. S. (2000). Associations of light, moderate, and vigorous intensity physical activity with longevity The Harvard Alumni Health Study. *American Journal of Epidemiology*, *151*(3), 293–299.

Loy, B. D., O'Connor, P. J., & Dishman, R. K. (2013). The effect of a single bout of exercise on energy and fatigue states: a systematic review and meta-analysis. *Fatigue: Biomedicine, Health & Behavior*, *1*(4), 223–242.

MacDonell, K. E., Naar-King, S., Murphy, D. A., Parsons, J. T., & Harper, G. W. (2010). Predictors of medication adherence in high risk youth of color living with HIV. *Journal of Pediatric Psychology*, *35*(6), 593–601.

Martin, J. J., & McCaughtry, N. (2008). Using social cognitive theory to predict physical activity in inner city African American school children. *Journal of Sport and Exercise Psychology*, *30*(4), 378–391.

Martin, J. J., McCaughtry, N., Shen, B., Fahlman, M., Garn, A., & Ferry, M. (2012). Resiliency, control, enjoyment, and physical activity in African American high school students. *Sport Science Review*, *20*(5–6), 53–71.

McCaughtry, N., Barnard, S., Martin, J., Shen, B., & Kulinna, P. H. (2006). Teachers' perspectives on the challenges of teaching physical education in urban schools: The student emotional filter. *Research Quarterly for Exercise and Sport*, *77*(4), 486–497.

Murtagh, J., Dixey, R., & Rudolf, M. (2006). A qualitative investigation into the levers and barriers to weight loss in children: opinions of obese children. *Archives of Disease in Childhood*, *91*(11), 920–923.

Naar-King, S., Ellis, D., Idalski Carcone, A., Templin, T., Jacques-Tiura, A. J., Brogan, K., Cunningham, P., & Jen, K.-L. C. (2016). Sequential multiple assignment randomized trial (SMART) to construct weight loss interventions for African American adolescents. *Journal of Clinical Child and Adolescent Psychology*, *45*(4), 428–41.

Ogden, C. L., Johnson, C. L., Carroll, M. D., Curtin, L. R., & Flegal, K. M. (2004). Prevalence of overweight and obesity among US children, adolescents, and adults, 1999–2002. *Journal of the American Medical Association*, *291*(23), 2847–2850.

Pate, R. R., Ross, R., Dowda, M., Trost, S. G., & Sirard, J. R. (2003). Validation of a 3-day physical activity recall instrument in female youth. *Pediatric Exercise Science*, *15*(3), 257–265.

Pronk, N. P., Crouse, S. F., & Rohack, J. J. (1995). Maximal exercise and acute mood response in women. *Physiology and Behavior*, *57*(1), 1–4.

Rosenberg, D. E., Sallis, J. F., Kerr, J., Maher, J., Norman, G. J., Durant, N., Harris, S. K., & Saelens, B. E. (2010). Brief scales to assess physical activity and sedentary equipment in the home. *International Journal of Behavioral Nutrition and Physical Activity*, *7*(10).

Saelens, B. E., Sallis, J. F., Black, J. B., & Chen, D. (2003). Neighborhood-based differences in physical activity: an environment scale evaluation. *American Journal of Public Health*, *93*(9), 1552–1558.

Snyder, C. R., Sympson, S. C., Ybasco, F. C., Borders, T. F., Babyak, M. A., & Higgins, R. L. (1996). Development and validation of the State Hope Scale. *Journal of Personality and Social Psychology*, *70*(2), 321–335.

Stott, N. C., Rollnick, S., Rees, M. R., & Pill, R. M. (1995). Innovation in clinical method: diabetes care and negotiating skills. *Family Practice*, *12*(4), 413–418.

Sturm, R. (2007). Increases in morbid obesity in the USA: 2000–2005. *Public Health*, *121*(7), 492–496.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Boston: Allyn and Bacon.

U. S. Census Bureau. (2008). Retrieved May 14, 2008, from http://www.census.gov/cgi-bin/saipe/saipe.cgi.

U. S. Department of Health and Human Services and United States Department of Education. (2000). *Promoting better health for young people through physical activity and sports: A report to the President from the Secretary of Health and Human Services and the Secretary of Education.* Silver Spring, MD: Centers for Disease Control and Prevention.

Yancey, A. K., Ory, M. G., & Davis, S. M. (2006). Dissemination of physical activity promotion interventions in underserved populations. *American Journal of Preventive Medicine*, *31*, S82–S91.

Warziski, M. T., Sereika, S. M., Styn, M. A., Music, E., & Burke, L. E. (2008). Changes in self-efficacy and dietary adherence: the impact on weight loss in the PREFER study. *Journal of Behavioral Medicine*, *31*(1), 81–92.

Wong, W. W., Ortiz, C. L., Lathan, D., Moore, L. A., Konzelmann, K. L., Adolph, A. L., Smith, O., & Butte, N. F. (2012). Underserved minority children are not meeting the US public health recommendation for moderate-vigorous physical activity. *Journal of Obesity & Weight Loss Therapy*, *2*(4), 1–5.

Zabinski, M. F., Saelens, B. E., Stein, R. I., Hayden-Wade, H. A., & Wilfley, D. E. (2003). Overweight children's barriers to and support for physical activity. *Obesity Research*, *11*(2), 238–246.

Jeffrey J. Martin
aa3975@wayne.edu