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Preventive strategies to reduce depressive symptoms in overweight and obese young adults

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Abstract

This study examined the relationships among problem-solving, physical activity self-efficacy, leisure-time physical activity, and depressive symptoms in overweight/obese young adults vulnerable to many health risks. Data from 96 young adults were used. The mean age and body mass index were 24.0 ± 3.3 years old, and 36.9 ± 7.9 , respectively. There was a positive association between physical activity self-efficacy and leisure-time physical activity in African Americans, but not in non-African Americans. Better problem solving was associated with fewer depressive symptoms regardless of gender and race.

Keywords

Problem solving; depressive symptoms; self-efficacy; physical activity; young adults

Depressive symptoms and major depression are prevalent psychological problems in young adulthood (Ohayon & Roberts, 2014; Substance Abuse and Mental Health Services Administration, 2013). About 9% of young adults ages 18–25 are diagnosed with major depression (Substance Abuse and Mental Health Services Administration, 2013). Millions more American young adults have depressive symptoms (sub-threshold depression) that fall below the diagnostic definition of major depression, but affect individuals' functionality and quality of life (Greer, Kurian, & Trivedi, 2010). A population study estimated that about 23.5% of young adults between 18–25 years exhibit depressive symptoms (Ohayon & Roberts, 2014).

Despite high prevalence of depressive symptoms in community-dwelling young adults, persons experiencing depressive symptoms rarely use health care services, which increases their risk of developing major depression with psychosocial impairment later in life (Cuijpers, de Graaf, & van Dorsselaer, 2004; Ingram & Siegle, 2009; Shankman et al., 2009). Accumulated evidence warns of a kindling effect in depression, which indicates that

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each episode of depression makes persons more vulnerable to recurrence and relapse of depression even by a mild stressor (De Raedt & Koster, 2010; Monroe & Harkness, 2005). Since the majority of persons who develop major depression in their lifetime begin manifesting symptoms before age 25 (Frisco, Houle, & Lippert, 2013; Kessler et al., 2005), early prevention and treatment to reduce depressive symptoms are important for young adults who are in a transitional period with many developmental challenges and stressful events (e.g., new social network and setting, cohabiting, academic commitments, employment instability, financial stress, and time management demands) (Frisco et al., 2013; Ohayon & Roberts, 2014). Learning effective strategies to desensitize stressors and improving physical and psychological well-being whilst establishing long-term healthy behavior are important developmental tasks for young adults to become well functioning mature adults (Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008; Yeung, Feldman, & Fava, 2010).

Obese young adults are particularly at risk for developing depressive symptoms and depression during their lifetime (de Wit et al., 2010). Research has illustrated a reciprocal relationship between obesity and depression with depression predicting the presence of obesity and obesity increasing risk for depression; however, findings are inconsistent (de Wit et al., 2010; Frisco et al., 2013; Luppino et al., 2010). A meta-analysis using cross-sectional studies (N=204,507) found a significant relationship between obesity and depressive symptoms in community-based samples (de Wit et al., 2010). Specifically, a stronger positive relationship between obesity and depressive symptoms was found in women than men (de Wit et al., 2010). Another meta-analysis examining the longitudinal relationship of both variables (N = 58,745) had similar findings (Luppino et al., 2010). Depression incidence was 7–51% higher in overweight and obese adults ages 20–59, but not in overweight and obese youth ages 19 or younger (Luppino et al., 2010). A longitudinal study using a nationally representative sample, however, identified a significant relationship between obesity and depression even in adolescents: obese adolescent females who were obese by young adulthood exhibited twice the odds of developing depression compared to females who were never obese (Frisco et al., 2013). Although similar findings have not yet been found in a male sample, there is a pressing need for an intervention targeting overweight and obese young adults who are doubly vulnerable to physiological and psychological unhealthy conditions (Ohayon, 2007).

The etiology of depression and its corresponding symptoms are thought to stem from a complex interplay of genetics, environment and psychosocial factors (Ingram & Siegle, 2009; Keyes et al., 2013; Krishnan & Nestler, 2008). Exploring genetic and biological factors, however, was beyond the scope of this current investigation. Rather, this study focused on the potential influences of selected modifiable variables (i.e., problem-solving, self-efficacy) and moderating effects of gender and race on leisure-time physical activity and depressive symptoms in overweight and obese young adults. According to Bandura, rewards for learning are informative and motivating (Bandura, 1986). Anticipation of desirable outcomes motivates individuals to persist. Individuals often learn which actions lead to success and failure through problem solving. Rewards through problem solving experiences enhance self-efficacy when linked with individual accomplishments and convey progress in learning (Bandura, 1986).

Problem-solving, which includes a five step iterative process: problem definition and formulation, generation of alternative solutions, decision making, solution implementation, and verification, is a powerful strategy to improve psychological and physical health despite the stressful events experienced than those without (Bell & D’Zurilla, 2009; Heppner & Baker, 1997; Sheets & Kraines, 2014). Through the steps, individuals choose the most pertinent problem and work toward the best solution (Heppner & Peterson, 1982). Problem solving provides individuals with important personal resources and skills to reduce the negative impact of stressors and promote healthy psychosocial adjustments (Bell & D’Zurilla, 2009; Heppner & Baker, 1997; Silverstein et al., 2011). Improved problem solving has reduced depressive symptoms in diverse populations including young adults (Bell & D’Zurilla, 2009; Silverstein et al., 2011; Stice, Shaw, Bohon, Marti, & Rohde, 2009). Individuals with greater problem solving capability have been found to be more physically active, with enhanced confidence (self-efficacy) for engaging in healthy living (Artistico, Pinto, Douek, Black, & Pezzuti, 2013).

A well-documented strategy effective to reduce depressive symptoms and obesity simultaneously is physical activity (Centers for Disease Control and Prevention; Mammen & Faulkner, 2013; Strohle, 2009). When persons engage in regular leisure-time physical activity, they become more energetic and experience reduced depressive symptoms (Abu-Omar, Rutten, & Lehtinen, 2004; Mammen & Faulkner, 2013; Strohle, 2009). Previous research in Europe (N=16,230) has shown a dose-response relationship between depression and physical activity (Abu-Omar, Rutten, & Lehtinen, 2004). Self-efficacy, a key aspect provided in Social Cognitive Theory, is a significant predictor of successfully performing a given behavior (herein physical activity) (Bandura, 1989). When persons have high physical activity self-efficacy, they proactively make efforts to enhance their knowledge and skills to overcome barriers in order to increase physical activity and engage in regular exercise (Bandura, 1986). Because overweight and obese individuals may experience additional physical activity barriers than normal weight individuals, they may need additional strategies to increase physical activity self-efficacy.

In light of the existent literature, this study re-visited the relationships among problem-solving, physical activity self-efficacy, leisure-time physical activity, and depressive symptoms for community-dwelling overweight/obese young adults (See figure 1). This study also examined potential effects of gender, race, and the body mass index (BMI) on the hypotheses. The intent of the study was to delineate key areas for designing a future trial to promote optimal mental and physical health in this population. The hypotheses were:

H1: Physical activity self-efficacy is positively associated with problem solving.

H2: Leisure-time physical activity is positively associated with problem solving and physical activity self-efficacy.

H3: Depressive symptoms are negatively associated with problem solving and leisure-time physical activity.

Method

Design

A secondary data analysis was used for the current, cross-sectional correlational study. The aim of the parent study was to identify and describe the characteristics of young adults at risk for type 2 diabetes (Cha, Umpierrez, Kim, Bello, & Dunbar, 2013).

Participants

Between 2011 and 2012, participants were recruited from the metro Atlanta area (students attending 8 colleges and universities, and community-dwelling young adults). Prior to the study, IRB approval from appropriate institutions and informed consent from participants were obtained. Diverse recruiting methods (i.e., flyers posted around campus, at a diabetes clinic, student e-mail lists, peer/self-referral) were used to recruit 234 individuals. Then, these potential participants went through phone screenings to check their eligibility to be invited to cardiometabolic risk screening at Clinical Research Unit in the Atlanta Clinical and Translational Clinical Institute. The inclusion criteria were physically inactive (< 90 minutes of leisure-time physical activity in a usual week in the past month), overweight or obese young adults (≥ 25 Body Mass Index) ages 18–29. Individuals diagnosed with diabetes, cardiovascular diseases, serious illness and unstable conditions requiring physician-supervised dietary and exercise regimens, conditions affecting erythrocyte turnover (e.g., hemolysis, blood loss), or pregnancy were excluded.

Measures

Socio-demographics—Age, race/ethnicity, and gender were measured using a socio-demographic questionnaire developed by the first author.

Problem-solving—Participants' confidence, attitudes, and behaviors in solving problems were measured with the *Problem-Solving Inventory (PSI)* consisting of 3 subscales: problem solving confidence (11 items, $\alpha = .85$), approach-avoidance style (16 items, $\alpha = .84$), and personal control (5 items, $\alpha = .72$) (Heppner & Peterson, 1982). These 32 items were rated on a 6-point scale, where higher scores indicate lower problem-solving self-assurance (confidence subscale), higher tendency to avoid problem/lower tendency to approach problem (approach-avoidance style subscale), and lower belief individuals are in emotional and behavioral control when they perform a behavior to solve a problem (personal control subscale). Item examples in each subscales are: "I am usually able to think up creative and effective alternatives to solve a problem" (confidence subscale); "when I have a problem, I think up as many possible ways to handle it as I can until I can't come up with any more ideas" (approach-avoidance style subscale); "I make snap judgments and later regret them" (personal control subscale). In the current study, the Cronbach's alphas were .88 for the problem solving confidence subscale, $\alpha = .82$ for the approach avoidance style subscale, $\alpha = .76$ for the personal control subscale, and $\alpha = .90$ for the total scale.

Depressive symptoms—Depressive symptoms were measured with a depression subscale of the *Depression Anxiety Stress Scale 21 (DASS -21)*, a 21-item self-report instrument. The obtained score were multiplied by two based on the scoring manual

directions. Cronbach's alpha of the DASS-21 depression subscale was .88 (7 items) with a large non-clinical adult population aged 18–91 years ($N = 1,794$) (Henry & Crawford, 2005). In the current study, the Cronbach's alpha of the depression subscale was .85.

Physical activity (PA) self-efficacy—PA self-efficacy was measured with a *modified PA self-efficacy scale* consisting of Barrier (8 items) and Task PA-self efficacy (4 items) subscales. As the original scale was developed for measuring PA self-efficacy in breast cancer survivors, an item from barrier PA self-efficacy scale that asks about participants' confidence to do physical activity when they are nauseated was deleted with the author's permission. An example of items is: "I am confident that I do exercise when the weather is bad". The reported Cronbach's alphas of the original scale were $\alpha = .95$ for the barrier subscale (9 items) and $\alpha = .92$ for the task subscale (4 items) (Rogers, McAuley, Courneya, & Verhulst, 2008). In the current study, the Cronbach's alphas were .89 for the barrier subscale (8 items), .84 for the task subscale (4 items) and .85 for the total scale (12 items).

Leisure-time physical activity (PA)—Leisure-time PA was measured with an item from an interview administered questionnaire, the *Modifiable Activity Questionnaire (MAQ)* (Kriska, 1997). The first author or a trained research assistant assessed leisure-time physical activity in the past year using this scale. Then, the reported leisure-time physical activity was calculated as Metabolic Equivalent of Task (MET) per hour per week (MET-hour/week) (Kriska et al., 2006).

Anthropometric assessment—Anthropometric assessments were conducted by a trained research nurse in a university clinical research unit. Using this collected information, body mass index ($BMI = Kg/m^2$) was calculated using weight (Kg) and height (cm).

Data Analysis

Of 107 participants enrolled in the parent study identifying the characteristics of young adults with prediabetes, data from 97 participants who completed the DASS-21 were used for this secondary data analysis. We compared the means of study variables between those who completed DASS-21 and those who did not complete the DASS-21. There were no significant differences on each study variable between the groups, and thus we excluded the 10 participants who did not complete the DASS-21 for the final data analysis. Since one participant reported extremely high physical activity amount, the person was also deleted for the final data analysis. Thus, the final data analyses were performed with 96 young adults.

Data analysis was conducted with IBM SPSS version 20.0 (IBM Corp., Armonk, NY) and STATA version 12 (StataCorp, College Station, TX). Pearson's correlation coefficients were computed to examine the bivariate associations among problem solving, physical activity self-efficacy, leisure-time physical activity, and depressive symptoms by gender and race for the samples. A standard multiple regression was performed on each dependent variable (i.e., physical activity self-efficacy, leisure-time physical activity, and depressive symptoms) predicted by varying independent variables based on our hypotheses along with gender, race, and BMI. The moderation effects of sex and race were examined and these were only reported if they were significant. Bootstrap adjusted p-values were reported adjusting for

influential and non-normality. Overall tests of model fit were tested and reported in each model using Wald χ^2 .

Results

Sample Characteristics

Of 96 participants, about 78.1% of the participants ($N = 75$) were female. There was a significant difference on race between males and females. About 75% of females ($N = 56$) were African Americans, while only 33% of males ($N = 7$) were African Americans. The mean age and BMI were 24.01 years old ($SD = 3.26$), and 36.86 ($SD = 7.85$), respectively. There were no significant differences on age and BMI between males and females. There were also no significant differences on physical activity variables and depressive symptoms between males and females.

With regard to problem solving, the overall mean Problem Solving Inventory (PSI) score in our participants was lower than a normative group, undergraduate students majoring in psychology, that the original developers presented (Heppner & Peterson, 1982). In particular, our female participants had significantly lower scores than the normative group (Cohen's $d = .71$), which referred to better problem solving. In comparison of the PSI subscale scores between men and women, women showed a higher tendency to approach problems. Also, women reported higher belief than the men (referring to lower personal control score) that they could control their emotion and behavior when they perform a behavior to solve a problem (See Table 1).

Correlations among Study Variables

With regard to the problem solving, there were moderate positive correlations ($r = .36 - .40$) between depressive symptoms and problem solving in men and women although the levels of statistical significance were different by gender due to sample size. With regard to the men, there was no statistically significant relationship among study variables (most likely due to low power). But, moderate relationships between: 1) problem solving and depressive symptoms ($r = .40$, $p = .07$) and 2) leisure-time physical activity and depressive symptoms ($r = -.30$, $p = .19$) were observed (see Table 2). Physical activity self-efficacy was positively correlated with leisure-time physical activity for women; when women had higher self-efficacy, they had higher leisure-time physical activity. However, there was no significant relationship between physical activity and depressive symptoms even in women.

Positive relationships between problem solving and depressive symptoms were significant in both African Americans and non-African Americans ($r = .28 - .47$). While there was a moderate positive correlation between physical activity self-efficacy and leisure-time physical activity among African Americans in the sample, there was no statistically significant correlation among the non-African American group (See Table 3).

Regression Analyses Results

The association between physical activity self-efficacy and problem solving was insignificant; thus H1 was rejected. However, H2 and H3 were partially accepted; about

22% and 30% of variability on leisure-time physical activity and depressive symptoms were explained by the predictors, respectively (See Table 4).

With regard to hypothesis 2, leisure-time physical activity was insignificantly associated with problem solving while the association between leisure-time physical activity and physical activity self-efficacy was moderated by race. When African Americans had higher physical activity self-efficacy, they reported greater leisure-time physical activity. In the non-African Americans, no significant association between physical activity self-efficacy and leisure-time physical activity was identified.

With regard to hypothesis 3, a significant association between depressive symptoms and problem solving was identified regardless of gender and race: When individuals had better problem solving, they experienced fewer depressive symptoms. The association between depressive symptoms and physical activity, however, was insignificant in both men and women although marginal moderation effect by gender was identified ($p = .062$). These regression coefficients, interestingly, were in opposite directions ($-.13$ in men, and $.13$ in women).

Discussion

The current study successfully delineated key areas for designing a health promotion program for community-dwelling overweight and obese young adults in the future. There is a theoretical link about how to utilize a problem solving approach to support young adults' coping with a myriad of issues and to becoming functioning adults (Bandura, 1986; Heppner & Baker, 1997). Empirical studies also show the utilization of problem solving training to prevent psychological distress and to improve self-care in diverse populations (e.g., students, older adults, patients, and community dwellers) (Heppner & Baker, 1997; Stice et al., 2009). For instance, a psychoeducational program for college students' assertiveness in a classroom produced a higher yield of individuals' problem solving capability in other uncomfortable situations (Heppner & Baker, 1997; Stice et al., 2009). Public health practitioners and health care providers, therefore, need to be aware of the benefits of problem solving training that is supported by an expanding body of evidence to which the current study adds.

As previous studies addressed, enhancing problem-solving skills seemed more beneficial for a subgroup of individuals than others (Stice et al., 2009). For instance, stronger associations between problem solving and depressive symptoms were found in men and non-African Americans compared to women and African Americans (See Table 2 and 3). Better problem solving, however, was associated with fewer depressive symptoms regardless of gender and race. Therefore, problem-solving training may be an effective approach for all young adults, though the program needs to be more tailored by young adults' gender and race/ethnicity. A study showed that men often use a cognitive and behavioral approach (logical analysis to confront problems and find solutions to deal with the problems) to solve their problems while women use cognitive avoidance (denial and imagination to avoid a crisis and its consequences) and behavioral avoidance (e.g., try to help others who confront a similar problem rather than themselves, get involved in new activities) coping strategies (Blalock &

Joiner Jr., 2000). A future intervention needs to consider these differences to make problem-solving training more effective.

There was no significant association between physical activity self-efficacy and problem solving (H1 was rejected) although our problem-solving inventory included a confidence subscale. The potential reason for this may be related to the measure of self-efficacy that specifically addressed behaviors related to physical activity. Self-efficacy is task specific, and each domain of self-efficacy is related to a specific performance, not general behaviors (Bandura, 1986, 1989). In the current study, there was a significant relationship between the Problem Solving confidence subscale and the Physical Activity Self-Efficacy scale ($r = .32$, $p = .002$), but no multicollinearity issue was identified in our overall models (variance inflation factors $VIF = 1.078-1.300$). Since each measure assessed different domains of self-efficacy (i.e., physical activity and problem solving), the rejection of H1 was not surprising.

Interestingly, the relationship between physical activity and depressive symptoms showed an inconsistent finding by gender. For men, higher leisure-time physical activity was associated with fewer depressive symptoms ($r = -.30$), but this was not found in women. Plausible explanations to explain this finding are the following. First, there was a tendency difference to report physical activity by gender (Rangul, Holmen, Kurtze, Cuypers, & Midthjell, 2008). While men reported a higher level of physical activity (e.g., moderate/ vigorous level), women often remembered very light physical activity (e.g., a short walk) (Rangul et al., 2008). To reduce this methodological issue, future research needs to employ an objective physical activity measure (accelerometers/pedometer) along with a subjective measure (a self-reported/ interviewer-administered physical activity questionnaire) to accurately measure physical activity. Second, there may be a threshold to produce a positive effect of physical activity on reducing depressive symptoms or a dose-response relationship between depressive symptoms and physical activity (Abu-Omar, Rutten, & Lehtinen, 2004) although the threshold to see the effects of physical activity on depressive symptoms may be different by age and /or gender. A follow-up study needs to be done to answer this question. Next, young adult men and women may have different basal levels of activity, and it may generate the study findings. The current physical activity recommendation is 150 minutes (30 minutes for 5 days) per week of moderate-intensity aerobic activity (Health gov, 2008). However, this guideline assumes basal levels of activity (around 5900–6900 steps per day), which excludes the 150 minute moderate-level activity equivalent to 3000–4000 steps per day (Tudor-Locke, 2010). When we consider this basal level of activity, the recommended physical activity for physical and psychological well-being is 23 MET hour/week equivalent to 9000–11000 steps per day, not 8 MET-hour/week equivalent to 150 minutes per week in moderate physical activity (Abu-Omar, Rutten, & Robine, 2004; Tudor-Locke et al., 2011). Since men and women often report physical activity differently, this may have affected the findings of the current study. A future study with a larger sample is needed to clarify this study's findings on the relationships between physical activity and depressive symptoms.

Another implication from this study is possible lessons for developing a gender- or culture-specific intervention to improve physical activity. Self-efficacy based intervention may be effective for women, especially African Americans, but a problem solving training may be more useful to non-African Americans or men. For instance, an intervention which provides

content based individualized exercise tips to deal with costs of exercising (e.g. joint pains, uncomfortable/shameful feeling to exercise in front of normal weight people, shortness of breath even in a short period of light exercise) may yield more positive effects in non-African American young men (Korkiakangas, Alahuhta, & Laitinen, 2009). Future research needs to explore this possibility with a larger sample size.

Despite the great potential of this study to design a prevention program for overweight and obese young adults to improve their physiological, psychological, and behavioral outcomes, there are limitations. First, all our participants were overweight and obese physically inactive young adults. Thus, we failed to explore the dose-response effects between physical activity and depressive symptoms. Also, we do not know whether the implications from our study (i.e., a self-efficacy based intervention for African American young women and problem solving training for non-African American young men to improve physical and psychological well-being) can be generalized to normal weight young adults. Second, our cross-sectional study design is a limitation. As Bandura noted, the physiological reactions (e.g., better mood after exercise) enhances the self-efficacy in a feedback loop which eventually produces positive behavioral and clinical outcomes (Bandura, 1994; Resnick, 2004). However, the feedback loop was not tested in this study, and thus a longitudinal study needs to follow. A small sample size also limits the generalizability of the study findings. However, this study is a pioneering study addressing the need to develop a readily accessible health promotion program for community-dwelling overweight/obese young adults who frequently do not seek out care or do not know how to obtain advice on healthy physical and mental health, despite a huge public health impact. Thus, the findings of this study need to be considered as a pilot study for a larger trial, and the value of this study should not be underestimated due to small sample size. Additionally, our findings may be useful for an intervention for community-dwelling young adults who are vulnerable to mild depressive symptoms, not persons who are diagnosed with major depression and/or mental health illness. The causes of major depression and/or mental health disease are very diverse and complicated (Keyes et al., 2013; Krishnan & Nestler, 2008), and our findings are not applicable to these clinical populations. Finally, we used linear relationships among variables to test hypotheses, which warrants further investigation to detect bidirectional or non-linear causal relationships among variables aforementioned.

Conclusions

A health promotion program employing simple activities in a short period can produce many psychological and behavioral benefits in high-risk young adults (Stice et al., 2009). Thus, such a program needs to be designed, implemented and disseminated to target overweight and obese young adults vulnerable to many health risks. The findings of the study showed the potential of problem solving and self-efficacy training as well as physical activity intervention in order to improve physical and mental health in overweight and obese young adults.

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Figure 1.
Variables (measures) in the conceptual framework of this study.

Table 1

Descriptive statistics of study variables stratified by sex.

	Male (N = 21)		Female (N = 75)		p	Cramer's V
Race						
Non-African Americans	66.7% (n=14)		25.3% (n=19)		<.001	.360
African Americans	33.3% (n=7)		74.7% (n=56)			
	Obtained Ranges		M	SD	M	SD
Age	18.8–29.9	24.3	3.8	23.9	3.1	.687
Problem Solving (overall)	37.0–127.0	83.0	20.3	74.9	18.4	.085
- Subscale 1: confidence	11–48	24.24	9.64	23.65	7.85	.800
- Subscale 2: approach avoidance style	18–66	43.24	10.74	38.16	9.89	.044
- Subscale 3: personal control	5–25	15.48	4.08	13.07	5.10	.049
Physical Activity self-efficacy	9.2–100.0	38.4	18.3	38.5	17.0	.979
Leisure-time physical activity (MET-hour/week)	0.0–97.2	10.3	12.8	11.2	17.8	.825
Depressive symptoms	0.0–32.0	5.9	6.6	6.3	7.1	.809
Body Mass Index	26.8–57.6	35.9	7.3	37.1	8.0	.543
						.126

Table 2

Correlations among problem solving, physical activity variables and depressive symptoms by sex

Variable	Problem Solving	Physical activity self-efficacy	Leisure-time physical activity	Depressive symptoms
Problem Solving		-.20	-.21	.36**
Physical activity self-efficacy	-.21		.31**	-.03
Leisure-time physical activity	.08	.001		.18
Depressive symptoms	.40	-.11	-.30	

**
 $p < .01$.

[†] Upper diagonal indicates correlation coefficients in young adult women while lower diagonal indicates correlation coefficients in young adult men.

^{††} Bold indicates correlations showing opposite directions.

Table 3

Correlations among problem solving, physical activity variables and depressive symptoms by race.

	Problem Solving	Physical activity self-efficacy	Leisure-time physical activity	Depressive symptoms
Problem Solving		-.11	-.21	.28*
Physical activity self-efficacy	-.40*		.43**	-.04
Leisure-time physical activity	.17	-.14		.12
Depressive symptoms	.47**	-.09	.006	

*
 $p < .05$;**
 $p < .01$.

† Upper diagonal indicates correlation coefficients in African Americans while lower diagonal indicates correlation coefficients in non-African Americans.

†† Bold indicates correlations showing opposite directions.

Table 4

Unstandardized (and standardized) regression coefficients for physical activity variables and depressive symptoms

	Physical activity (PA) self-efficacy	Leisure-time physical activity	Depressive symptoms
Gender (ref: male)	-.77 (-.02)	-1.10 (-.03)	-1.34 (-.08)
Race (ref: other)	-.64 (-.02)	-8.85 (-.25)	.12 (.01)
BMI	-.10 (-.04)	.05 (.02)	.08 (.09)
Problem solving	-.16 (-.17)	.10 (.11)	.16 (.44) ***
PA self-efficacy		.05 (.05)	
Leisure-time physical activity			-.13 (-.32)
Race × PA self-efficacy		.42 (.60) *	
Gender × Leisure-time physical activity			.27 (.63) p=.062
Simple slope			
Male			-.13 (-.32)
Female			.13 (.30)
Other		.05 (.02)	
African American		.47 (.65) ***	
Model fit			
Wald χ^2	2.66	16.14	22.98
<i>p</i>	.616	.013	<.001
R ²	.029	.215	.302

*
p < .05;

**
p < .01;

p < .001.