


Correlates of Moderate-to-Vigorous Physical Activity and Exercise Motivation in Underserved African American Men

American Journal of Men's Health
 May-June 2019: 1–11
 © The Author(s) 2019
 Article reuse guidelines:
sagepub.com/journals-permissions
 DOI: 10.1177/1557988319855155
journals.sagepub.com/home/jmh


Demetrius A. Abshire, PhD¹ , Dawn K. Wilson, PhD²,
 Allison M. Sweeney, PhD², and Bernardine M. Pinto, PhD¹

Abstract

Effective interventions are needed to increase physical activity (PA) in African American men, but little is known about correlates of PA and exercise motivation in this population. Using an ecological approach that considers cognitive, social, and environmental factors, correlates of moderate-to-vigorous physical activity (MVPA) and exercise motivation in underserved African American men were examined. Greater exercise motivation, greater social support for exercise, and more favorable environmental perceptions were hypothesized to be associated with higher MVPA, and greater social support and environmental perceptions were hypothesized to be associated with higher exercise motivation. This secondary analysis used baseline data from the Positive Action for Today's Health (PATH) trial. African American men ($n = 166$, aged 48 ± 15 years) completed surveys that assessed cognitive, social, and environmental factors theoretically relevant to MVPA. Accelerometers were used to obtain a 7-day estimate of MVPA. Hierarchical linear regression analyses showed that exercise motivation was positively associated with MVPA ($B = 1.15$, $SE = .41$, $p = .006$). Exercise attitudes ($B = .16$, $SE = .07$, $p = .037$), exercise self-concept ($B = .28$, $SE = .06$, $p < .001$), exercise support from friends ($B = .12$, $SE = .06$, $p = .048$), and places for walking and cycling ($B = .13$, $SE = .06$, $p = .032$) were positively associated with exercise motivation. Interventions that improve exercise motivation and associated variables may be warranted to increase MVPA in underserved African American men.

ClinicalTrials.gov # NCT01025726

Keywords

African American men, motivation, moderate-to-vigorous physical activity, environment

Received January 30, 2019; revised April 9, 2019; accepted May 13, 2019

Health benefits associated with physical activity (PA) are well documented and include favorable effects on body weight (Conn, Hafdahl, Phillips, Ruppert, & Chase, 2014; Jakicic, 2009), triglycerides (Kelley, Kelley, Roberts, & Haskell, 2012), blood pressure (Whelton, Chin, Xin, & He, 2002), and lower mortality risk (Matthews et al., 2016). Evidence for increasing moderate-to-vigorous physical activity (MVPA) is particularly compelling. Replacing 30 min of sedentary behavior per day with light activity or MVPA has been reported to decrease all-cause mortality risk by 14% and 50%, respectively; additionally, replacing 30 min of light activity per day with MVPA reduces all-cause mortality risk by 42% (Schmid, Ricci, Baumeister, & Leitzmann, 2016). Despite the health benefits associated with MVPA, only about half of U.S. adults report engaging

in enough activity consistent with meeting aerobic activity recommendations (Blackwell, Lucas, & Clarke, 2014; Centers for Disease Control and Prevention, 2013). Compared to other racial and ethnic groups, non-Hispanic Black/African American adults (hereafter referred to as Black) engage in less MVPA (Blackwell et al., 2014; Centers for Disease Control and Prevention, 2013; Liao

¹University of South Carolina, College of Nursing, Columbia, SC, USA

²Department of Psychology, University of South Carolina, College of Arts and Sciences, Columbia, SC, USA

Corresponding Author:

Demetrius Abshire, University of South Carolina, College of Nursing,
 1601 Greene Street, Columbia, SC 29208, USA.

Email: abshired@mailbox.sc.edu



et al., 2011). Based on accelerometry-derived estimates of MVPA, roughly 59% of Black adults engage in no MVPA compared to nearly 53% of non-Hispanic White adults (Tucker, Welk, & Beyler, 2011).

There is growing recognition that little is known about how to increase PA among Black men (Griffith, Bergner, Cornish, & McQueen, 2018). Evidence suggests that Black men engage in less MVPA and fewer achieve ≥ 150 min/week of MVPA compared to White men (Benjamin et al., 2018; Hooker et al., 2016). Black–White disparities in men meeting PA recommendations exist across most regions of the United States (Sohn, Porch, Hill, & Thorpe, 2017). These disparities are particularly concerning for middle-aged Black men given that the association between physical inactivity and all-cause mortality in this population persists after adjusting for alcohol consumption, diet, body weight status, sociodemographic characteristics, and chronic conditions (Thorpe et al., 2013). Efforts directed at understanding how to increase MVPA in middle-aged Black men are therefore needed to improve the health of this population.

Multiple qualitative studies have been conducted to provide insight into the barriers Black men encounter in engaging in PA. Lack of motivation is frequently reported as a major barrier to being physically active in this population (Bopp et al., 2007; Griffith, Gunter, & Allen, 2011; Hood et al., 2015; Hooker, Wilcox, Rheume, Burroughs, & Friedman, 2011). Black men have reported that limited social support and lack of access to PA resources decrease motivation (Griffith et al., 2011; Hooker, Wilcox, et al., 2011), while having family and peer support can enhance motivation (Bopp et al., 2007). Male peer support has also been described as an important factor for increasing motivation for PA, yet some Black men lack male peer support and must rely on self-motivation (Griffith, King, & Ober Allen, 2013). These facilitators and barriers to engaging in PA represent multiple theoretical constructs from Self-Determination Theory (SDT; Ryan & Deci, 2000) and Social Cognitive Theory (SCT; Bandura, 1978, 2004) that may have implications in promoting PA in this population. SDT is a theory of human motivation that addresses how individuals self-regulate behavior through a range of processes such as external rewards and punishment, personal importance, and inherent satisfaction. Self-regulatory processes vary by different types of motivation. Individuals may lack motivation or may be extrinsically or intrinsically motivated to engage in a particular behavior. Those who are extrinsically motivated engage in a behavior in pursuit of a certain outcome, whereas those who are intrinsically motivated experience enjoyment and satisfaction by engaging in the behavior. SCT is a theory of human development that addresses how individuals learn and regulate behavior in part through interactions between individual-level cognitive factors and

socio-environmental factors. Although self-efficacy is a core construct in SCT, there is mixed evidence on whether self-efficacy influences PA among Black men. Self-efficacy has been associated with self-reported PA (Bopp et al., 2006) and exercise motivation (Mohammed et al., 2016) in samples of Black men, but scholars have noted that self-efficacy does not emerge as a prevalent theme affecting PA in this population (Hood et al., 2015).

Consistent with Ecological Systems Theory (Bronfenbrenner, 1994), there is growing awareness that features of the built and social environment have an important role in influencing PA and related health outcomes (Diez Roux, Mujahid, Hirsch, Moore, & Moore, 2016; McNeill, Kreuter, & Subramanian, 2006; Sallis, Floyd, Rodriguez, & Saelens, 2012). Evidence suggests that adults who live in areas with a higher density of recreation resources are more likely to engage in PA, particularly for minority groups including Black adults (Diez Roux et al., 2007) who report that access to facilities and programs are important facilitators of PA (Kosma & Cardinal, 2016). In addition to access and availability of PA resources, perceptions of the environment play an important role in influencing MVPA (Cerin et al., 2014). Environmental factors including safety from crime and presence of sidewalks have been inconsistently associated with PA among Black adults and largely studied in samples of Black women (see review by Casagrande, Whitt-Glover, Lancaster, Odoms-Young, & Gary, 2009). In a sample of Black men and women, neighborhood walkability was only associated with objectively measured MVPA among women < 65 years of age, and green space and crime were not associated with MVPA for men or women (Richardson et al., 2017). Among Black men and women in the Positive Action for Today's Health (PATH) trial, social support for PA and neighborhood walkability were positively associated with MVPA (Coulon, Wilson, & Egan, 2013). Additional evidence from the PATH trial indicates that environmental perceptions of safety from crime, access to services, aesthetics, and neighborhood satisfaction were not associated with walking for pleasure among Black men and women, whereas a positive association was observed for perceived access (Trumpeter & Wilson, 2014). Sex moderated the relationship between neighborhood satisfaction and walking such that the association was positive for men and negative for women.

To expand on previous research addressing PA in Black men, this study adopted a broad ecological framework that considers cognitive, social, and environmental factors that are theoretically relevant to promoting MVPA in this population. The primary objective of this study was to determine ecological correlates of MVPA among Black men. Variables of interest include cognitive factors relevant to SDT (exercise motivation and self-concept

regarding PA) and SCT (exercise attitudes and exercise self-efficacy), social factors relevant to SCT (family and friend support for exercise), and environmental factors that may influence SDT and SCT constructs and MVPA (perceptions regarding places for exercise, safety from crime, and neighborhood satisfaction). Given the major role of motivation on behavior change (Teixeira, Silva, Mata, Palmeira, & Markland, 2012) and that lack of motivation is a substantial PA barrier for Black men, a secondary objective of this study was to determine ecological correlates of exercise motivation. Greater motivation, social support, and environmental support for PA were hypothesized to be associated with greater MVPA and greater social support and environmental support for PA were hypothesized to be associated with greater exercise motivation in Black men.

Methods

Design, Setting, and Sample

Baseline data from the PATH trial (ClinicalTrials.gov #NCT01025726) were used for these secondary analyses. Details of the trial including study design, eligibility criteria, recruitment, and data collection procedures have been reported elsewhere (Trumpeter & Wilson, 2014; Wilson et al., 2010). In brief, the PATH trial tested the effects of an environmental intervention on MVPA among low-income Black adults residing in three South Carolina communities. The communities were matched according to rates of crime, poverty, percent minority, physical inactivity, and health status and were randomized to receive one of three interventions: (a) a police-patrolled walking program plus social marketing intervention, (b) a police-patrolled walking-only intervention, and (c) a general health education intervention. As previously reported, although there were greater increases in the number of walkers in the full intervention condition (vs. walking program only), there were only significant treatment effects for the full intervention on MVPA among older adults ages 55 years and older (Sweeney, Wilson, & Van Horn, 2017; Wilson et al., 2015). The University of South Carolina Institutional Review Board approved the trial (approval # Pro00005110), and all participants provided signed informed consent.

Independent Variables

Exercise motivation. An eight-item version of the Behavioral Regulation in Exercise Scale was used to assess exercise motivation (Mullan, Markland, & Ingledew, 1997). Evidence indicates the scale has acceptable reliability among older Black adults (Sweeney et al., 2017). Sample questions include “I enjoy my exercise sessions,” “I think it is important to make the effort to exercise

regularly,” and “I feel ashamed when I miss an exercise session.” Response options are on a 5-point scale ranging from *not true for me* to *very true for me*. The average score was computed with larger scores reflecting higher exercise motivation. Cronbach’s α for this scale was 0.65.

Exercise self-concept. The 10-item Self-Concept and Motivation to Exercise Scale (Wilson et al., 2002) was used to assess self-concept concerning the importance of increasing PA and motivation to change PA. Evidence indicates the scale has acceptable reliability among older Black adults (Sweeney et al., 2017). Sample questions include “Exercising regularly is a very important part of my everyday life,” “Exercising regularly is not one of my big concerns,” and “I am the kind of person who gets excited about exercising every day.” Response options are on a 6-point scale ranging from *strongly disagree* to *strongly agree*. Negatively worded questions are reverse coded for computing the average score. Larger scores reflect higher exercise self-concept. Cronbach’s α for this scale was 0.90.

Exercise attitudes. Five questions from a validated scale about consequences of being physically active were used to assess exercise attitudes. The original scale was validated in a sample of White and Black adolescent girls (Motl et al., 2000). Sample questions include “If I were to be physically active during my free time on most days it would help me cope with stress,” and “If I were to be physically active during my free time on most days it would give me more energy.” Response options are on a 5-point scale ranging from *disagree a lot* to *agree a lot*. The average score was computed with larger scores reflecting more favorable attitudes toward exercise. Cronbach’s α for this scale was 0.56.

Exercise self-efficacy. A 16-item Self-Efficacy for Exercise Questionnaire, adapted from Garcia and King (1991), was used to assess exercise self-efficacy. Evidence indicates the scale has acceptable reliability among older Black adults (Sweeney et al., 2017). For each item, participants rated their confidence for engaging in exercise when faced with a particular barrier on an 11-point scale ranging from 0% (*I cannot do it at all*) to 100% (*Certain that I can do it*). Sample questions include “I am confident I could exercise over the next 6 months when tired” and “I am confident I could exercise over the next 6 months when I have a lot of work to do.” The average score was computed with higher scores indicating greater exercise self-efficacy. Cronbach’s α for this scale was 0.96.

Exercise support from family. Twelve items from the validated Family Support for Exercise Habits scale were used to assess family support for exercise (Sallis, Grossman,

Pinski, Patterson, & Nader, 1987). Evidence indicates the scale has good reliability among Black adults (Gothe, 2018). Questions assess how often family provided exercise support over the past 3 months. Sample questions assessed how often family “did physical activity with me,” “gave me encouragement to do physical activity,” “talked about how much they like to exercise,” and “made positive comments about my physical appearance.” Response options were rated on a 5-point Likert scale ranging from *never* to *very often*. The average score was computed with larger scores reflecting higher family support for exercise. Cronbach’s α for this scale was 0.94.

Exercise support from friends. The 5-item Friend Support for Exercise Habits scale was used to assess friend support for exercise (Sallis et al., 1987). Evidence indicates the scale has acceptable reliability among Black adults (McDaniel, Wilson, Coulon, Hand, & Siceloff, 2015; Siceloff, Coulon, & Wilson, 2014). Questions assessed how often friends provided exercise support over the past 3 months. Sample questions assessed how often friends “did physical activity with me” and “gave me helpful reminders to exercise.” Response options were rated on a 5-point Likert scale ranging from *never* to *very often*. The average score was computed with larger scores reflecting higher friend support for exercise. Cronbach’s α for this scale was 0.90.

Environmental perceptions. Environmental perceptions for this study were subscales from the Neighborhood Environmental Walkability Survey (NEWS), which has been reported to be a reliable and valid measure of neighborhood factors related to PA (Saelens, Sallis, Black, & Chen, 2003). Subscales used in this analysis include places for walking and cycling, safety from crime, and neighborhood satisfaction. Evidence indicates these subscales have acceptable reliability among Black adults (McDaniel et al., 2015; Trumpeter & Wilson, 2014). Response options for questions in each subscale were rated on a 4-point Likert scale ranging from *strongly disagree* to *strongly agree* except for neighborhood satisfaction in which options ranged from *strongly dissatisfied* to *strongly satisfied* on a 5-point scale. Items were coded such that higher scores represent more favorable perceptions. Average scores were computed for each subscale, with higher scores reflecting more favorable perceptions of each environmental characteristic.

Places for walking and cycling. The 5-item NEWS places for walking and cycling subscale was used to assess perceptions of environmental factors that could influence MVPA levels. Sample questions include “There are sidewalks on most of the streets in my neighborhood,” “There are bicycle or walking trails in or near my neigh-

borhood that are easy to get to,” and “Sidewalks are separated from the road/traffic in my neighborhood by parked cars.” Cronbach’s α for this scale was 0.75.

Safety from crime. The 6-item NEWS crime safety subscale was used to assess perceptions of environmental factors related to crime. Sample questions include “My neighborhood streets have good lighting at night,” “I see and speak to other people when I am walking in my neighborhood,” and “The crime rate in my neighborhood makes it unsafe to go on walks during the day.” Cronbach’s α for this scale was 0.74.

Neighborhood satisfaction. The 17-item NEWS neighborhood satisfaction subscale was used to assess participants’ satisfaction with multiple aspects of their environment. Sample questions include “How satisfied are you with how easy and pleasant it is to walk in your neighborhood?”; “How satisfied are you with your neighborhood as a good place to live?”; and “How satisfied are you with the number and quality of restaurants in your neighborhood?” Cronbach’s α for this scale was 0.78.

Sociodemographics and Body Mass Index

Sociodemographic information including age, education level, employment status, and marital status were collected by questionnaires. Height and weight were measured in duplicate by trained and certified research staff using a portable measuring board and scale, respectively. The average height and weight were used to calculate body mass index (BMI; kg/m^2).

Dependent Variable

Omni-directional Actical accelerometers were worn on participants’ right hip using an elastic belt for 7 consecutive days to obtain a daily average of MVPA. Participants were instructed to only remove devices during sleep and for water-based activities. An activity count of 1,075 per minute that was previously validated in this population was used to define MVPA (Trumpeter et al., 2012). Daily activity was coded within four periods (6:00 a.m.–noon, noon–4:00 p.m., 4:00 p.m.–8:00 p.m., and 8:00 p.m.–midnight). Sixty consecutive zero counts were used to define non-wear, and a period was considered missing if non-wear time reached 20% (Wilson et al., 2015).

Data Analyses

Descriptive statistics were used to characterize the sample, assess the distribution of variables, and identify potential outliers. Consistent with other analyses involving MVPA from the PATH trial (Sweeney et al., 2017;

Wilson et al., 2015), a positively skewed MVPA distribution was normalized using a square root transformation. No outliers were identified. Correlations were used to determine whether multicollinearity was likely to be present in the regression model. Correlations between the cognitive, social, and environmental variables were small to modest. Therefore, all variables were included in the final regression model. Multiple imputation was used to address missing accelerometer data in the PATH trial (Wilson et al., 2015).

A hierarchical linear regression was used to determine cognitive, social, and environmental correlates of MVPA controlling for sociodemographic factors and BMI. The sociodemographic factors of age, marital status, education, and BMI were included in the first block. Cognitive variables of exercise motivation, attitudes, self-efficacy, and self-concept were entered in the second block. Social variables of exercise support from family and friends were entered in the third block, while environmental variables including neighborhood satisfaction, perceived safety from crime, and perceived access to places for walking and cycling were entered in the fourth block. A second and similar hierarchical linear regression was used to determine cognitive, social, and environmental correlates of exercise motivation. Analyses were conducted using SPSS version 25, and an alpha of 0.05 was used to determine statistical significance. Continuous-level predictors were mean centered for analysis.

Results

Sample Baseline Characteristics

Baseline characteristics of the sample are presented in Table 1. On average, participants were 48 years of age ($SD = 15$) and overweight ($M_{BMI} = 27.43$, $SD = 6.48$). Using standard BMI cut points, 40% of the sample were normal or underweight, 29% were overweight, and 31% were obese. Roughly 30% of the sample were married, 45% were employed, 69% had a high school education or less, and 54% had a household income less than \$24,000.

Correlations Among Cognitive, Social, and Environmental Variables

Small-to-moderate correlations were observed between multiple cognitive, social, and environmental variables. Correlations were largest between exercise self-efficacy and self-concept for PA ($r = .567$, $p < .001$), exercise motivation and self-concept for PA ($r = .525$, $p < .001$), family support and friend support for exercise ($r = .529$, $p < .001$), and safety from crime and neighborhood satisfaction ($r = .477$, $p < .001$). Additional correlations

Table 1. Baseline Sociodemographic Characteristics ($N = 166$).

Characteristic	Mean \pm SD or n (%)
Age	48.17 \pm 15.00
Marital status	
Married	48 (29%)
Separated	26 (16%)
Divorced	22 (13%)
Widowed	11 (7%)
Never married	43 (26%)
Unmarried couple	16 (10%)
Children living in household	
No	117 (70%)
Yes	49 (30%)
Employment	
Working	75 (45%)
Laid off	12 (7%)
Unemployed	36 (22%)
Retired	26 (16%)
Disabled	14 (8%)
Other	3 (2%)
Education	
<HS degree	47 (28%)
HS degree or GED	68 (41%)
>HS degree	51 (31%)
Income	
<\$10K	35 (21%)
\$10K–24K	55 (33%)
\$25K–39K	39 (24%)
\$40K+	37 (22%)
Health factors	
BMI	27.43 \pm 6.48
<25	67 (40%)
25–<30	48 (29%)
>30	51 (31%)
MVPA (min/day)	50.64 \pm 50.48

Note. Percentages may not add to 100% due to rounding. BMI = body mass index; GED = Graduate Equivalent Degree; HS = high school; MVPA = moderate-to-vigorous physical activity.

between the cognitive, social, and environmental variables and MVPA are provided in Table 2.

Predictors of Moderate-to-Vigorous Physical Activity

The hierarchical regression model of the cognitive, social, and environmental factors associated with MVPA is presented in Table 3. In Step 1, the covariates of age, education, marital status, and BMI explained 29% of the variance in MVPA. In Step 2, the cognitive variables of exercise motivation, exercise attitudes, exercise self-efficacy, and exercise self-concept explained an additional 5.9% of the

Table 2. Pearson Correlations Among Cognitive, Social, and Environmental Variables ($n = 166$).

Variable	1	2	3	4	5	6	7	8	9	10
1. Exercise motivation	1									
2. Exercise attitudes	.323**	1								
3. Exercise self-efficacy	.293**	.242**	1							
4. PA self-concept	.525**	.319**	.567**	1						
5. Family support	.314**	.180*	.184*	.341**	1					
6. Friend support	.271**	.052	.222**	.336**	.529**	1				
7. Places for walking/cycling	.206**	.105	.075	.095	.295**	.173*	1			
8. Safety from crime	.166*	.024	.216**	.262**	.174*	.073	.186*	1		
9. Neighborhood satisfaction	.113	.068	.091	.216**	.125	.180*	.099	.477**	1	
10. MVPA	.081	-.036	.088	.042	.092	.161*	.158*	-.034	-.014	1

Note. MVPA = moderate-to-vigorous physical activity; PA = physical activity.

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

Table 3. Linear Regression Analysis for Predictors of Moderate-to-Vigorous Physical Activity.

Step	Variable	Unstandardized coefficient		Standardized coefficient		T	R^2
		B	SE	B			
1	Intercept	6.88	.32			21.63*	.290
	Age	-.08	.02	-.36		-4.56*	
	Education	-.58	.53	-.08		-1.10	
	Marital status	-1.74	.57	-.23		-3.04*	
	BMI	-.10	.04	-.19		-2.82*	
2	Exercise motivation	1.15	.41	.23		2.78*	.349
	Exercise attitude	-.39	.39	-.07		-1.00	
	Exercise self-concept	-.21	.33	-.06		-.62	
	Exercise self-efficacy	.02	.01	.15		1.85	
3	Exercise support (family)	.16	.32	.04		.48	.353
	Exercise support (friends)	-.31	.31	-.09		-1.01	
4	Places for walking/cycling	.07	.32	.02		.23	.354
	Crime safety	-.08	.45	-.01		-.17	
	Neighborhood satisfaction	-.01	.47	-.00		-.03	

Note. Coefficients shown for Step 4. Model: $F = 6.399$, $p < .001$. Square root transformation used for Moderate-to-Vigorous Physical Activity (MVPA). Continuous predictors centered for analysis. B = beta; BMI = body mass index; SE = standard error; T = t value;

* $p \leq .01$.

variance ($F\Delta = 3.54$, $p = .009$). In Step 3, the addition of social support variables explained an additional 0.4% ($F\Delta = .56$, $p = .575$). The addition of environmental variables in Step 4 explained an additional 0.1% of the variance in MVPA ($F\Delta = .03$, $p = .994$).

In the full regression model, the covariates of age ($B = -.08$, $p < .001$), marital status ($B = -1.74$, $p = .003$), and BMI ($B = -.10$, $p = .005$) were associated with MVPA. Among the cognitive, social, and environmental variables included in the model, only exercise motivation was associated with MVPA ($B = 1.15$, $p = .006$).

Predictors of Exercise Motivation

The hierarchical regression model of the cognitive, social, and environmental factors associated with exercise

motivation is presented in Table 4. In Step 1, covariates explained approximately 5% of the variance in exercise motivation. In Step 2, exercise attitudes, exercise self-efficacy, and exercise self-concept explained an additional 28.6% of the variance in exercise motivation ($F\Delta = 22.65$, $p < .001$). The addition of social support variables in Step 3 explained an additional 3.5% of the variance in exercise motivation ($F\Delta = 4.27$, $p = .016$), and the addition of environmental variables in Step 4 ($F\Delta = 2.11$, $p = .101$) explained an additional 2.5% of the variance.

In the full regression model, age was the only covariate associated with exercise motivation ($B = .01$, $p = .001$). Exercise attitudes ($B = .16$, $p = .037$) and exercise self-concept ($B = .28$, $p < .001$) were both associated with exercise motivation. Exercise support from friends

Table 4. Linear Regression Analysis for Predictors of Exercise Motivation.

Step	Variable	Unstandardized coefficient		Standardized coefficient		<i>T</i>	<i>R</i> ²
		<i>B</i>	<i>SE</i>	<i>B</i>			
1	Intercept	3.31	.06			53.32*	.049
	Age	.01	.00	.25		3.40*	
	Education	-.05	.10	-.03		-.45	
	BMI	.01	.01	.05		.82	
	Marital status	.01	.11	.01		.13	
2	Exercise attitude	.16	.07	.14		2.11**	.335
	Exercise self-concept	.28	.06	.40		4.71*	
	Exercise self-efficacy	.00	.00	-.01		-.15	
3	Exercise support (family)	.04	.06	.04		.55	.370
	Exercise support (friends)	.12	.06	.17		1.99**	
4	Places for walking/cycling	.13	.06	.15		2.16**	.395
	Crime safety	.04	.09	.04		.47	
	Neighborhood satisfaction	-.11	.09	-.09		-1.24	

Note. Coefficients shown for step 4. Model: $F = 8.315$, $p < .001$. Continuous predictors centered for analysis. *B* = beta; BMI = body mass index; *SE* = standard error; *T* = *t* value.

* $p \leq .01$. ** $p \leq .05$.

($B = .12$, $p = .048$) but not exercise support from family ($B = .04$, $p = .583$) was associated with exercise motivation. Places for walking and cycling was the only environmental variable associated with exercise motivation ($B = .13$, $p = .032$).

Discussion

In this study, an ecological approach was used to determine cognitive, social, and environmental correlates of objectively measured MVPA in a sample of low-income Black men participating in the PATH trial. The primary finding was that exercise motivation was positively associated with MVPA, but there were no associations between MVPA and other cognitive, social, or environmental variables. Factors positively associated with exercise motivation included exercise attitudes, exercise self-concept, friend support for exercise, and having places to exercise.

Greater exercise motivation was associated with higher MVPA among Black men in this study. The positive association between exercise motivation and MVPA is consistent with qualitative studies in which Black men reported lack of motivation as a barrier to engaging in PA (Griffith et al., 2011; Hooker, Wilcox, et al., 2011). Lack of exercise motivation among Black men has been attributed to having multiple competing commitments and demands involving family, work, and the community as well as social norms that prioritize work and neglect PA (Griffith et al., 2011). In addition, Black men have also reported limited social support and lack of access as barriers to PA (Hooker, Wilcox, et al., 2011). In the present study, greater

friend support for exercise and more favorable perceptions regarding access were associated with greater exercise motivation. This finding may have implications for the development of future PA interventions and is congruent with evidence that PA programs tailored to addressing these and other factors among Black men can be effective in helping this population overcome PA barriers and increase MVPA (Hooker, Harmon, Burroughs, Rheaume, & Wilcox, 2011).

SDT postulates that relatedness or connectedness with others is critical to fostering the autonomous regulation of extrinsically motivated activities (Ryan & Deci, 2000) such as engaging in exercise (Edmunds, Ntoumanis, & Duda, 2006). Given that inadequate male peer support for PA has been implicated in low motivation to exercise among Black men (Griffith et al., 2013), the positive association between friend support for PA and exercise motivation is particularly notable and may have implications in promoting MVPA in this population. Some evidence suggests that Black men prefer male-only behavioral intervention programs (Hurt, Seawell, & O'Connor, 2015) rather than spouse-based (Hooker, Wilcox, et al., 2011) or mixed-gender (Realmuto et al., 2018) programs. Indeed, investigators of the Power Up for Health trial have noted the importance of male-only groups in behavioral intervention programs targeting men of color (Gary-Webb et al., 2018). Enlisting male peer support to increase exercise motivation may therefore be an important strategy associated with increasing MVPA among Black men and should be examined in future research.

Consistent with the findings in this study, past evidence suggests that Black men's motivation to engage in PA is

related to a variety of factors (e.g., their values and life goals such as increasing energy levels, becoming healthier, improving quality of life, and improving family relationships) (Cornish, McKissic, Dean, & Griffith, 2015). Such findings indicate that Black men experience identified regulation with respect to engaging in PA. Identified regulation represents a more autonomous form of extrinsic motivation that reflects the importance and value of an activity (Ryan & Deci, 2000) and has been deemed the best correlate of exercise (Teixeira, Carraca, Markland, Silva, & Ryan, 2012). Interventions designed to increase PA may need to be tailored to address Black men's identities and values in addition to focusing on the positive health effects of PA. Addressing Black men's identities and values as part of PA interventions may assist in fostering identified and integrated regulations of PA. Integrated regulation is the most autonomous form of extrinsic motivation and is achieved when behavioral regulation occurs within the context of one's personal values and needs (Ryan & Deci, 2000). A greater understanding of the relationships between different forms of exercise motivation and MVPA will be valuable for researchers who design and test motivational interventions aimed at increasing MVPA in Black men.

In contrast to existing literature on the importance of the built and social environment on PA (Diez Roux et al., 2016; McNeill et al., 2006; Sallis et al., 2012), neighborhood perceptions and social support with MVPA in the present cross-sectional study. These findings are consistent with previous research in which social and safety-related environmental variables were not associated with PA among Southern rural Black adults (Hooker, Wilson, Griffin, & Ainsworth, 2005) and previous research in which family support, social support, and environmental perceptions did not predict PA among urban Black adults (Gothe, 2018). Although environmental perceptions and social support were not associated with MVPA in the present study, more positive perceptions regarding access and peer support were positively associated with greater exercise motivation. These findings provide evidence that previously observed associations of environmental factors and social support with PA may be mediated by exercise motivation. Future longitudinal studies are needed to determine whether motivation mediates associations between environmental and social supports for PA. However, findings from the present study are consistent with evidence that crime-related safety perceptions are not associated with walking among a sample of diverse adults (Kerr, Evenson, Moore, Block, & Diez Roux, 2015) and Black men and women (Trumpeter & Wilson, 2014). In contrast, neighborhood satisfaction was not associated with MVPA in the present study but has been positively associated with walking among Black men (Trumpeter & Wilson, 2014). This discrepant

finding may suggest that neighborhood satisfaction is an important factor influencing lower intensity leisure activities such as leisure walking among Black men but not higher intensity activities that meet MVPA thresholds.

In this sample of underserved Black men, multiple sociodemographic factors were associated with MVPA. Age was inversely associated with MVPA, which is consistent with evidence that older adults are less physically active than younger adults (Blackwell et al., 2014; Watson et al., 2016). The inverse association between BMI and MVPA is also consistent with evidence that a higher BMI is associated with physical inactivity (Watson et al., 2016) and that overweight and obese adults engage in fewer minutes of MVPA compared to normal and underweight adults (Tucker et al., 2011). Finally, being married was associated with lower MVPA, which is consistent with evidence that Black married men are less likely than White married men to meet PA guidelines (Porch et al., 2016). Black men have reported that being a good spouse/partner is one of their top core values (Cornish et al., 2015) and that being the family provider and participating in family activities often takes priority over PA (Griffith et al., 2011). The association between being married and lower MVPA may therefore reflect increased family responsibilities that limit married Black men's available time for PA. As recommended by Black men in one qualitative study, PA interventions for this population should emphasize the importance of being healthy to enhance their ability to support their families (Friedman, Hooker, Wilcox, Burroughs, & Rheume, 2012). Black men have also reported that lack of spousal or partner support is a substantial barrier for PA, with some men being actively discouraged from participating in PA (Hooker, Wilcox, et al., 2011). While Black men are largely underrepresented in behavioral trials involving PA (Newton, Griffith, Kearney, & Bennett, 2014; Whitt-Glover et al., 2014), PA interventions that help men overcome these barriers have been effective in increasing MVPA (Hooker, Harmon, et al., 2011).

Limitations

Several limitations to this study should be noted. First, causal relationships between the cognitive, social, and environmental factors and MVPA cannot be determined, given the cross-sectional study design. Second, participants were Black men from three South Carolina communities, and findings may not be generalizable to Black men who reside in other geographically diverse areas. Finally, complex interactions among the demographic, cognitive, social, and environmental barriers were not assessed due to the modest sample size of Black men in this study. Nonetheless, new insights have been provided on potential relationships that should be considered in

future research. Additional strengths of the study include the assessment of multiple ecological factors that are theoretically relevant to MVPA in Black men and the objective assessment of MVPA.

Conclusions

Although social and environmental influences on PA have been the focus of a growing body of research addressing PA disparities, findings from this study suggest that exercise motivation was the only correlate of MVPA among multiple cognitive, social, and environmental factors. Multiple individual, social, and environmental factors were associated with exercise motivation and therefore may be important targets to consider for future interventions to increase motivation for MVPA in Black men.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was supported by a grant awarded to Dawn K. Wilson from the National Institute of Diabetes and Digestive and Kidney Diseases (R01 DK067615).

ORCID iD

Demetrius A. Abshire  <https://orcid.org/0000-0002-4234-128X>

References

- Bandura, A. (1978). Self-efficacy: Toward a unifying theory of behavioral change. *Advances in Behaviour Research and Therapy, 1*, 139–161.
- Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior, 31*(2), 143–164. doi:10.1177/1090198104263660
- Benjamin, E. J., Virani, S. S., Callaway, C. W., Chamberlain, A. M., Chang, A. R., Cheng, S., ... Stroke Statistics, S. (2018). Heart disease and stroke statistics-2018 update: A report from the American Heart Association. *Circulation, 137*(12), e67–e492. doi:10.1161/CIR.0000000000000558
- Blackwell, D. L., Lucas, J. W., & Clarke, T. C. (2014). Summary health statistics for U.S. adults: National Health Interview Survey, 2012. *Vital and Health Statistics, 10*(260), 1–161.
- Bopp, M., Lattimore, D., Wilcox, S., Laken, M., McClorin, L., Swinton, R., ... Bryant, D. (2007). Understanding physical activity participation in members of an African American church: A qualitative study. *Health Education Research, 22*(6), 815–826. doi:10.1093/her/cyl149
- Bopp, M., Wilcox, S., Laken, M., Butler, K., Carter, R. E., McClorin, L., & Yancey, A. (2006). Factors associated with physical activity among African-American men and women. *American Journal of Preventive Medicine, 30*(4), 340–346. doi:10.1016/j.amepre.2005.11.007
- Bronfenbrenner, U. (1994). *Ecological models of human development* (2 ed. Vol. 3). Oxford: Elsevier.
- Casagrande, S. S., Whitt-Glover, M. C., Lancaster, K. J., Odoms-Young, A. M., & Gary, T. L. (2009). Built environment and health behaviors among African Americans: A systematic review. *American Journal of Preventive Medicine, 36*(2), 174–181. doi:10.1016/j.amepre.2008.09.037
- Centers for Disease Control and Prevention. (2013). Adult participation in aerobic and muscle-strengthening physical activities—United States, 2011. *Morbidity and Mortality Weekly Report, 62*(17), 326–330.
- Cerin, E., Cain, K. L., Conway, T. L., Van Dyck, D., Hinckson, E., Schipperijn, J., ... Sallis, J. F. (2014). Neighborhood environments and objectively measured physical activity in 11 countries. *Medicine and Science in Sports and Exercise, 46*(12), 2253–2264. doi:10.1249/MSS.0000000000000367
- Conn, V. S., Hafsdahl, A., Phillips, L. J., Ruppard, T. M., & Chase, J. A. (2014). Impact of physical activity interventions on anthropometric outcomes: Systematic review and meta-analysis. *The Journal of Primary Prevention, 35*(4), 203–215. doi:10.1007/s10935-014-0352-5
- Cornish, E. K., McKissic, S. A., Dean, D. A., & Griffith, D. M. (2015). Lessons learned about motivation from a pilot physical activity intervention for African American men. *Health Promotion Practice, 18*(1), 102–109. doi:10.1177/1524839915614800
- Coulon, S. M., Wilson, D. K., & Egan, B. M. (2013). Associations among environmental supports, physical activity, and blood pressure in African-American adults in the PATH trial. *Social Science & Medicine, 87*, 108–115. doi:10.1016/j.socscimed.2013.03.018
- Diez Roux, A. V., Evenson, K. R., McGinn, A. P., Brown, D. G., Moore, L., Brines, S., & Jacobs, D. R., Jr. (2007). Availability of recreational resources and physical activity in adults. *American Journal of Public Health, 97*(3), 493–499. doi:10.2105/AJPH.2006.087734
- Diez Roux, A. V., Mujahid, M. S., Hirsch, J. A., Moore, K., & Moore, L. V. (2016). The impact of neighborhoods on CV risk. *Global Heart, 11*(3), 353–363. doi:10.1016/j.ghheart.2016.08.002
- Edmunds, J., Ntoumanis, N., & Duda, J. L. (2006). A test of self-determination theory in the exercise domain. *Journal of Applied Social Psychology, 36*(9), 2240–2265. doi:10.1111/j.0021-9029.2006.00102.x
- Friedman, D. B., Hooker, S. P., Wilcox, S., Burroughs, E. L., & Rheame, C. E. (2012). African American men's perspectives on promoting physical activity: "We're not that difficult to figure out!". *Journal of Health Communication, 17*(10), 1151–1170. doi:10.1080/10810730.2012.665424
- Garcia, A. W., & King, A. C. (1991). Predicting long-term adherence to aerobic exercise: A comparison of two models. *Journal of Sport & Exercise Psychology, 13*, 394–410. doi:10.1123/jsep.13.4.394
- Gary-Webb, T. L., Walker, E. A., Realmuto, L., Kamler, A., Lukin, J., Tyson, W., ... Weiss, L. (2018). Translation of the National Diabetes Prevention Program to engage men in

- disadvantaged neighborhoods in New York City: A description of Power Up for Health. *American Journal of Men's Health*, 12(4), 998–1006. doi:10.1177/1557988318758788
- Gothel, N. P. (2018). Correlates of physical activity in urban African American adults and older adults: Testing the Social Cognitive Theory. *Annals of Behavioral Medicine*, 52(9), 743–751. doi:10.1093/abm/kax038
- Griffith, D. M., Bergner, E. M., Cornish, E. K., & McQueen, C. M. (2018). Physical activity interventions with African American or Latino men: A systematic review. *American Journal of Men's Health*, 12(4), 1102–1117. doi:10.1177/1557988318763647
- Griffith, D. M., Gunter, K., & Allen, J. O. (2011). Male gender role strain as a barrier to African American men's physical activity. *Health Education & Behavior*, 38(5), 482–491. doi:10.1177/1090198110383660
- Griffith, D. M., King, A., & Ober Allen, J. (2013). Male peer influence on African American men's motivation for physical activity: Men's and women's perspectives. *American Journal of Men's Health*, 7(2), 169–178. doi:10.1177/1557988312465887
- Hood, S., Linnan, L., Jolly, D., Muqueeth, S., Hall, M. B., Dixon, C., & Robinson, S. (2015). Using the PRECEDE planning approach to develop a physical activity intervention for African American men who visit barbershops: Results from the FITShop Study. *American Journal of Men's Health*, 9(4), 262–273. doi:10.1177/1557988314539501
- Hooker, S. P., Harmon, B., Burroughs, E. L., Rheaume, C. E., & Wilcox, S. (2011). Exploring the feasibility of a physical activity intervention for midlife African American men. *Health Education Research*, 26(4), 732–738. doi:10.1093/her/cyr034
- Hooker, S. P., Hutto, B., Zhu, W., Blair, S. N., Colabianchi, N., Vena, J. E., ... Howard, V. J. (2016). Accelerometer measured sedentary behavior and physical activity in white and black adults: The REGARDS study. *Journal of Science and Medicine in Sport*, 19(4), 336–341. doi:10.1016/j.jsams.2015.04.006
- Hooker, S. P., Wilcox, S., Rheaume, C. E., Burroughs, E. L., & Friedman, D. B. (2011). Factors related to physical activity and recommended intervention strategies as told by midlife and older African American men. *Ethnicity & Disease*, 21(3), 261–267.
- Hooker, S. P., Wilson, D. K., Griffin, S. F., & Ainsworth, B. E. (2005). Perceptions of environmental supports for physical activity in African American and white adults in a rural county in South Carolina. *Preventing Chronic Disease*, 2(4), A11.
- Hurt, T. R., Seawell, A. H., & O'Connor, M. C. (2015). Developing effective diabetes programming for Black men. *Global Qualitative Nursing Research*, 2, 2333393615610576. doi:10.1177/2333393615610576
- Jakicic, J. M. (2009). The effect of physical activity on body weight. *Obesity (Silver Spring)*, 17(Suppl 3), S34–S38. doi:10.1038/oby.2009.386
- Kelley, G. A., Kelley, K. S., Roberts, S., & Haskell, W. (2012). Comparison of aerobic exercise, diet or both on lipids and lipoproteins in adults: A meta-analysis of randomized controlled trials. *Clinical Nutrition*, 31(2), 156–167. doi:10.1016/j.clnu.2011.11.011
- Kerr, Z., Evenson, K. R., Moore, K., Block, R., & Diez Roux, A. V. (2015). Changes in walking associated with perceived neighborhood safety and police-recorded crime: The multi-ethnic study of atherosclerosis. *Preventive Medicine*, 73, 88–93. doi:10.1016/j.ypmed.2015.01.017
- Kosma, M., & Cardinal, B. J. (2016). Theory-based physical activity beliefs by race and activity levels among older adults. *Ethnicity & Health*, 21(2), 181–195. doi:10.1080/13557858.2015.1047741
- Liao, Y., Bang, D., Cosgrove, S., Dulin, R., Harris, Z., Taylor, A., ... Centers for Disease Control and Prevention. (2011). Surveillance of health status in minority communities - Racial and Ethnic Approaches to Community Health Across the U.S. (REACH U.S.) Risk Factor Survey, United States, 2009. *Morbidity and Mortality Weekly Report. Surveillance Summaries*, 60(6), 1–44.
- Matthews, C. E., Keadle, S. K., Troiano, R. P., Kahle, L., Koster, A., Brychta, R., ... Berrigan, D. (2016). Accelerometer-measured dose-response for physical activity, sedentary time, and mortality in US adults. *The American Journal of Clinical Nutrition*, 104(5), 1424–1432. doi:10.3945/ajcn.116.135129
- McDaniel, T. C., Wilson, D. K., Coulon, S. M., Hand, G. A., & Siceloff, E. R. (2015). Neighborhood social predictors of weight-related measures in underserved African Americans in the PATH Trial. *Ethnicity & Disease*, 25(4), 405–412. doi:10.18865/ed.25.4.405
- McNeill, L. H., Kreuter, M. W., & Subramanian, S. V. (2006). Social environment and physical activity: A review of concepts and evidence. *Social Science & Medicine*, 63(4), 1011–1022. doi:10.1016/j.socscimed.2006.03.012
- Mohammed, A., Harrell, J. P., Makambi, K. H., Campbell, A. L., Jr., Sloan, L. R., Carter-Nolan, P. L., & Taylor, T. R. (2016). Factors associated with exercise motivation among African-American men. *Journal of Racial and Ethnic Health Disparities*, 3(3), 457–465. doi:10.1007/s40615-015-0158-z
- Motl, R. W., Dishman, R. K., Trost, S. G., Saunders, R. P., Dowda, M., Felton, G., ... Pate, R. R. (2000). Factorial validity and invariance of questionnaires measuring social-cognitive determinants of physical activity among adolescent girls. *Preventive Medicine*, 31(5), 584–594. doi:10.1006/pmed.2000.0735
- Mullan, E., Markland, D., & Ingledew, D. K. (1997). A graded conceptualisation of self-determination in the regulation of exercise behaviour: Development of a measure using confirmatory factor analytic procedures. *Personality and Individual Differences*, 23(5), 745–752. doi:10.1016/S0191-8869(97)00107-4
- Newton, R. L., Jr., Griffith, D. M., Kearney, W. B., & Bennett, G. G. (2014). A systematic review of weight loss, physical activity and dietary interventions involving African American men. *Obesity Reviews*, 15(Suppl 4), 93–106. doi:10.1111/obr.12209
- Porch, T. C., Bell, C. N., Bowie, J. V., Usher, T., Kelly, E. A., LaVeist, T. A., & Thorpe, R. J., Jr. (2016). The role of marital status in physical activity among African American and White Men. *American Journal of Men's Health*, 10(6), 526–532. doi:10.1177/1557988315576936

- Realmuto, L., Kamler, A., Weiss, L., Gary-Webb, T. L., Hodge, M. E., Pagan, J. A., & Walker, E. A. (2018). Power Up for Health—participants' perspectives on an adaptation of the National Diabetes Prevention Program to engage men. *American Journal of Men's Health, 12*(4), 981–988. doi:10.1177/1557988318758786
- Richardson, A. S., Troxel, W. M., Ghosh-Dastidar, M. B., Beckman, R., Hunter, G. P., DeSantis, A. S., ... Dubowitz, T. (2017). One size doesn't fit all: Cross-sectional associations between neighborhood walkability, crime and physical activity depends on age and sex of residents. *BMC Public Health, 17*(1), 97. doi:10.1186/s12889-016-3959-z
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *The American Psychologist, 55*(1), 68–78. <http://dx.doi.org/10.1037/0003-066X.55.1.68>
- 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.
- Sallis, J. F., Floyd, M. F., Rodriguez, D. A., & Saelens, B. E. (2012). Role of built environments in physical activity, obesity, and cardiovascular disease. *Circulation, 125*(5), 729–737. doi:10.1161/CIRCULATIONAHA.110.969022
- Sallis, J. F., Grossman, R. M., Pinski, R. B., Patterson, T. L., & Nader, P. R. (1987). The development of scales to measure social support for diet and exercise behaviors. *Preventive Medicine, 16*(6), 825–836.
- Schmid, D., Ricci, C., Baumeister, S. E., & Leitzmann, M. F. (2016). Replacing sedentary time with physical activity in relation to mortality. *Medicine and Science in Sports and Exercise, 48*(7), 1312–1319. doi:10.1249/MSS.0000000000000913
- Siceloff, E. R., Coulon, S. M., & Wilson, D. K. (2014). Physical activity as a mediator linking neighborhood environmental supports and obesity in African Americans in the path trial. *Health Psychology, 33*(5), 481–489. doi:10.1037/a0032758
- Sohn, E. K., Porch, T., Hill, S., & Thorpe, R. J., Jr. (2017). Geography, race/ethnicity, and physical activity among men in the United States. *American Journal of Men's Health, 11*(4), 1019–1027. doi:10.1177/1557988316689498
- Sweeney, A. M., Wilson, D. K., & Van Horn, M. L. (2017). Longitudinal relationships between self-concept for physical activity and neighborhood social life as predictors of physical activity among older African American adults. *International Journal of Behavioral Nutrition and Physical Activity, 14*(1), 67. doi:10.1186/s12966-017-0523-x
- Teixeira, P. J., Carraca, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 9*, 78. doi:10.1186/1479-5868-9-78
- Teixeira, P. J., Silva, M. N., Mata, J., Palmeira, A. L., & Markland, D. (2012). Motivation, self-determination, and long-term weight control. *International Journal of Behavioral Nutrition and Physical Activity, 9*, 22. doi:10.1186/1479-5868-9-22
- Thorpe, R. J., Jr., Wilson-Frederick, S. M., Bowie, J. V., Coa, K., Clay, O. J., LaVeist, T. A., & Whitfield, K. E. (2013). Health behaviors and all-cause mortality in African American men. *American Journal of Men's Health, 7*(4 Suppl), 8S–18S. doi:10.1177/1557988313487552
- Trumpeter, N. N., Lawman, H. G., Wilson, D. K., Pate, R. R., Van Horn, M. L., & Tate, A. K. (2012). Accelerometry cut points for physical activity in underserved African Americans. *International Journal of Behavioral Nutrition and Physical Activity, 9*, 73. doi:10.1186/1479-5868-9-73
- Trumpeter, N. N., & Wilson, D. K. (2014). Positive Action for Today's Health (PATH): Sex differences in walking and perceptions of the physical and social environment. *Environment and Behavior, 46*(6), 745–767. doi:10.1177/0013916513480860
- Tucker, J. M., Welk, G. J., & Beyler, N. K. (2011). Physical activity in U.S.: Adults compliance with the Physical Activity Guidelines for Americans. *American Journal of Preventive Medicine, 40*(4), 454–461. doi:10.1016/j.amepre.2010.12.016
- Watson, K. B., Carlson, S. A., Gunn, J. P., Galuska, D. A., O'Connor, A., Greenlund, K. J., & Fulton, J. E. (2016). Physical inactivity among adults aged 50 years and older - United States, 2014. *Morbidity and Mortality Weekly Report, 65*(36), 954–958. doi:10.15585/mmwr.mm6536a3
- Whelton, S. P., Chin, A., Xin, X., & He, J. (2002). Effect of aerobic exercise on blood pressure: A meta-analysis of randomized, controlled trials. *Annals of Internal Medicine, 136*(7), 493–503.
- Whitt-Glover, M. C., Keith, N. R., Ceaser, T. G., Virgil, K., Ledford, L., & Hasson, R. E. (2014). A systematic review of physical activity interventions among African American adults: Evidence from 2009 to 2013. *Obesity Reviews, 15*(Suppl 4), 125–145. doi:10.1111/obr.12205
- Wilson, D. K., Friend, R., Teasley, N., Green, S., Reaves, I. L., & Sica, D. A. (2002). Motivational versus social cognitive interventions for promoting fruit and vegetable intake and physical activity in African American adolescents. *Annals of Behavioral Medicine, 24*(4), 310–319. doi:10.1207/S15324796ABM2404_07
- Wilson, D. K., Trumpeter, N. N., St George, S. M., Coulon, S. M., Griffin, S., Van Horn, M. L., ... Gadson, B. (2010). An overview of the "Positive Action for Today's Health" (PATH) trial for increasing walking in low income, ethnic minority communities. *Contemporary Clinical Trials, 31*(6), 624–633. doi:10.1016/j.cct.2010.08.009
- Wilson, D. K., Van Horn, M. L., Siceloff, E. R., Alia, K. A., St George, S. M., Lawman, H. G., ... Gadson, B. (2015). The results of the "Positive Action for Today's Health" (PATH) Trial for increasing walking and physical activity in underserved African-American communities. *Annals of Behavioral Medicine, 49*(3), 398–410. doi:10.1007/s12160-014-9664-1