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Barriers to physical activity as moderators of intervention effects

Michael E. Schoeny, PhD *, Louis Fogg, PhD, Susan W. Buchholz, PhD, RN, FAANP, Arlene Miller, PhD, RN, FAAN, JoEllen Wilbur, PhD, RN, FAAN

Rush University, College of Nursing, 600 S. Paulina St., Chicago, IL 60612, USA

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ABSTRACT

The impact of interventions to increase physical activity (PA) may vary as a function of participants' barriers to PA. The aim of this paper is to determine whether individual barriers (demographic, physical health, psychological health, neighborhood factors, perceived barriers to PA, social support for PA) moderate treatment effects on increases in PA. Three treatment conditions tested the relative efficacy of a group-based PA intervention alone or supplemented by either personal or automated phone calls made between group meetings. From 2010 to 2012, 284 African American women (ages 40–65) living in the Chicago, IL, area were randomized to one of the three treatment conditions. Data collection occurred at baseline as well as 24 and 48 weeks after baseline. Moderation of intervention effects by barriers to PA were tested across four outcome measures (self-reported moderate-vigorous PA, self-reported walking, accelerometer steps, and aerobic fitness) using multilevel mixed-effects analyses. Significant condition by barrier interaction effects for the accelerometer steps outcome were found for material hardships, general health, depressive symptoms, neighborhood crime rate, and perceived barriers to PA. For aerobic fitness, intervention effects were moderated by material hardships and perceived pain. Increases in the outcome variables were greater for the conditions in which group sessions were supplemented with personal and/or automated calls. Among participants with greater barriers to PA, supplementing the intervention group meetings with between-session personal and/or automated phone calls may be an effective way to strengthen intervention effects. These results may inform the use of treatment supplements in the context of adaptive interventions.

1. Introduction

African American women have a higher prevalence of hypertension, cardiovascular disease, diabetes and obesity compared to non-Hispanic White women (Mozaffarian et al., 2015). Physical activity (PA) is a well-established method of reducing disease risks associated with inactivity and obesity (Mozaffarian et al., 2015). Current guidelines recommend participating in moderate PA (brisk walking) for 150 min/week in episodes of at least 10 min (US Department of Health and Human Services, 2008). However, only 35% of Chicago-area African American women meet these recommendations compared to 47% of women countywide (Liao et al., 2011).

Many African American women have substantial barriers to PA. Frequently reported barriers to leisure-time PA include demands of work, school, home, children, partners, and social obligations (Pekmezi et al., 2013; Siddiqi et al., 2011); mental fatigue from physically demanding jobs (Forthofer et al., 2016); perceptions that "leisure time" does not exist for them (Airhihenbuwa et al., 1995; Yeager et al., 1993); or is an unaffordable indulgence (Kriska and Rexroad, 1998; Wilbur et al., 2002); and that adequate PA is obtained by living a "busy life" (Wilbur et al., 2002). Additional barriers include health problems (Bopp et al., 2006) that may develop or worsen when obese, sedentary individuals increase their PA. Neighborhood environmental characteristics also present barriers to PA, including concerns about harassment, feeling unsafe at local parks, and gang activity (Baruth et al., 2014). Neighborhood socioeconomic factors have been linked to health behaviors such as PA (Diez Roux, 2016). Inequitable distribution of resources such as exercise facilities, walkable sidewalks, and street lights may present additional barriers to increasing PA among lower income African American women (Mama et al., 2015).

In addition to limiting levels of PA, barriers to PA may also moderate the impact of interventions to increase PA. To date, few studies examine moderators of intervention effects on PA among adults (Luten et al., 2016). The existing studies of moderation in PA interventions often focus on demographic factors such as gender (Luten et al., 2016; Wilcox et al., 2009), age (van Stralen et al., 2010; Wilcox et al., 2009), and education (Luten et al., 2016). These studies also have identified psychosocial moderators, including self-efficacy (Luten et al., 2016), motivation (van Stralen et al., 2010), and social support (Wilcox et al., 2009).

* Corresponding author.
E-mail address: Michael_Schoeny@rush.edu (M.E. Schoeny).

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A review of 29 PA interventions with African American women finds that, although many interventions used some type of cultural adaptation, participants generally received the same intervention regardless of their individual barriers to PA (Whitt-Glover and Kumanyika, 2009). Evidence from moderation analyses, coupled with recent developments in adaptive interventions, suggest that participants may benefit from customizing interventions based on characteristics of the individual (Wilbur et al., 2016).

Among the recommendations provided by the 2010 Scientific Statement from the American Heart Association for interventions to promote PA changes are (a) use of group sessions with cognitive-behavioral strategies; (b) use of motivational interviewing (MI) for individuals resistant to behavioral change; and (c) use of electronic-based programs (Artinian et al., 2010). A review of PA interventions confirmed that theory-driven group interventions combining guidance, self-management and on-going support were effective in increasing PA among disadvantaged African American women (Cleland et al., 2012). MI is a client-centered counseling approach designed to explore and resolve ambivalence about changing behavior (Miller and Rollnick, 2002). A study of the use of MI telephone in healthy African Americans found an increase in PA, but the effect was not greater than culturally targeted materials alone (Resnicow et al., 2005). Group support supplemented by MI either by phone or in person may be successful in helping women overcome barriers to becoming more physically active. For women who report being self-conscious and/or feeling guilty when they do not become more physically active, automated telephone systems offer anonymity liked by participants (Ingram et al., 2011; Kaplan et al., 2003) and have the advantage of reducing reliance on reading skills needed for mailed materials.

Building upon focus groups with African American women (Wilbur et al., 2002), we developed a culturally relevant PA intervention, the Women's Lifestyle PA Program (Ingram et al., 2011). Using a randomized clinical trial (RCT), we tested three study conditions designed to increase adherence to lifestyle PA in midlife (ages 40–65) African American women. Women in all three conditions attended six group meetings. In addition to group meetings, one condition received 11 MI telephone calls, one condition received 11 automated telephone calls with motivational problem-solving tips, and one condition received no additional support. All three conditions had significant improvements in PA, but there were no significant differences between conditions (Wilbur et al., 2015). By testing moderators of the three intervention conditions within this RCT, we expect to identify specific factors that may explain variation in treatment effects and inform development of future customization in the context of adaptive interventions.

The aim of this paper is to determine whether individual barriers (demographic, physical health, psychological health, neighborhood factors, perceived barriers to PA, social support for PA) moderate treatment effects on increases in PA. The specific research question is: What are the modifiers of treatment impact on change in adherence to PA?

2. Methods

2.1. Design

Three treatment conditions were compared using a cluster-randomized, Latin-square design in which the order of intervention delivery was counterbalanced across six sites (Winer, 1971). Full details of the design are available elsewhere (Wilbur et al., 2015). Institutional Review Boards from two universities approved the study (registered clinical trial NCT01700894).

2.2. Sample

The sample consisted of 288 African American women between the ages of 40 and 65, who were sedentary (participated in moderate-vigorous PA <3 times per week), had access to a telephone, and could attend group meetings (Wilbur et al., 2015, 2013). Those with health issues that interfered with PA were excluded. Six sites were in areas that were either predominantly African American (>90%) or near low-income census tracts (U. S. Census Bureau, 2014).

To maximize study retention, women provided multiple means of contacting them and were compensated $40 for completing each study assessment (baseline, 24, and 48 weeks). At study completion, participants were given a pedometer.

2.3. Intervention

2.3.1. Group meetings

The group meeting component of the intervention was identical across all study conditions and consisted of five, two-hour group meetings over a 24-week adoption phase followed by a sixth "booster" meeting midway through the 24-week maintenance phase (Fig. 1). The intervention was manualized and six group facilitators were predominately female African American registered nurses.

2.3.2. Individual goal-setting and feedback

The goal was to increase each woman's PA above baseline by at least 3000 steps per day (Wilde et al., 2001), at a moderate walking pace to reduce joint load in individuals who may be overweight or obese (Browning and Kram, 2007). Baseline steps were obtained from blocked (no data displayed) accelerometers worn the week before the first group meeting. Weight loss was not mentioned with participants; rather, the primary goal was maintaining one's weight.

2.3.3. Group discussion

Consistent with the social cognitive theory (Bandura, 1997), group discussions began with a short DVD featuring African American women demonstrating skills, sharing experiences, and talking about challenges. The facilitator then led a 40-minute discussion, providing role-modeling and encouraging problem solving. All discussions addressed barriers and misinformation identified in earlier focus groups (Ingram et al., 2011; Wilbur et al., 2002). The last group discussion focused on anticipating such disincentives and handling relapses.

2.3.4. Personal motivational telephone calls

Six groups (96 participants) received the personal call condition (Group + PC). Between group meetings, these women received calls from their nurse facilitator, who used motivational interviewing techniques to help participants explore and resolve ambivalence about increasing their PA (Emmons and Rollnick, 2001) and tailored the discussion to match each woman's needs, experiences, barriers, motivation, and confidence (Resnicow et al., 1999). During maintenance, one

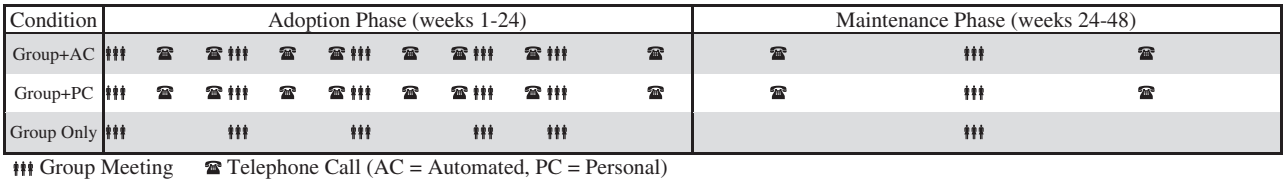

Fig. 1. Phases of the intervention by treatment condition.