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Mediation of effects of a theory-based behavioral intervention on self-reported physical activity in South African men

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ABSTRACT

Objective. Increasing physical activity is an important public-health goal worldwide, but there are few published mediation analyses of physical-activity interventions in low-to-middle-income countries like South Africa undergoing a health transition involving markedly increased mortality from non-communicable diseases. This article reports secondary analyses on the mediation of a theory-of-planned-behavior-based behavioral intervention that increased self-reported physical activity in a trial with 1181 men in Eastern Cape Province, South Africa.

Method. Twenty-two matched-pairs of neighborhoods were randomly selected. Within pairs, neighborhoods were randomized to a health-promotion intervention or an attention-matched control intervention with baseline, immediate-post, and 6- and 12-month post-intervention assessments. Theory-of-planned-behavior constructs measured immediately post-intervention were tested as potential mediators of the primary outcome, self-reported physical activity averaged over the 6- and 12-month post-intervention assessments, using a product-of-coefficients approach in a generalized-estimating-equations framework. Data were collected in 2007–2010.

Results. Attitude, subjective norm, self-efficacy, and intention were significant mediators of intervention-induced increases in self-reported physical activity. The descriptive norm, not affected by the intervention, was not a mediator, but predicted increased self-reported physical activity.

Conclusion. The results suggest that interventions targeting theory-of-planned-behavior constructs may contribute to efforts to increase physical activity to reduce the burden of non-communicable diseases among South African men.

Introduction

Increased physical activity is an important public health goal worldwide, both in developed countries and increasingly in developing countries, as a strategy to reduce rates of chronic non-communicable diseases (NCDs), including type 2 diabetes (Jefferis et al., 2012), heart disease (Sattelmair et al., 2011; Tanasescu et al., 2002), stroke (Lee et al., 2003), and colon cancer (Boyle et al., 2012), which have been linked to physical inactivity. Even though the benefits of physical activity are well established, and resolutions to be physically active are abundant, 31% of adults worldwide are physically inactive (Hallal et al., 2012).

Although evidence suggests that physical-activity interventions can be efficacious, studies evaluating their efficacy have not been conducted in all populations that could benefit from them. The large majority of participants in physical-activity intervention trials have been White and female (Waters et al., 2011). Few trials have specifically targeted adult men (George et al., 2012) or adults in developing countries like South Africa that are undergoing a health transition involving markedly increased NCD-mortality rates, especially among men (Cecchini et al., 2010; Mayosi et al., 2009; Mayosi et al., 2012). One of the few randomized controlled trials (RCTs) of a health-promotion intervention in South Africa found that the intervention did not increase physical activity compared with a control group (Edries et al., 2013).

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Many physical-activity interventions have been based upon behavior-change theories; accordingly, there is growing interest in whether the theoretical constructs the interventions targeted were mediators, variables the interventions changed that, in turn, changed behavior (Fjeldsoe et al., 2013; Lubans et al., 2008; Plotnikoff et al., 2014; Rhodes and Pfaeffli, 2010). Mediation analyses (Baron and Kenny, 1986; MacKinnon et al., 2002) of efficacious interventions can suggest ways to improve the interventions' efficacy by remediating the interventions' failure to change targeted constructs or their efficiency by removing ineffective components, making the resulting interventions more cost-effective. Mediation analyses of ineffective interventions are also valuable, for they can identify reasons why the interventions failed to change behavior (Baruth et al., 2010; Lubans et al., 2009).

The "Men Together Making a Difference" health-promotion intervention aimed to increase physical activity and other healthful behaviors among South African men. The efficacy of the intervention was tested in a cluster-RCT. Randomly selected neighborhoods were randomized to the Men Together Making a Difference health-promotion intervention or a HIV/STI risk-reduction intervention, which in this article serves as an attention-matched control group. The health-promotion intervention was developed based on the theory of planned behavior (Ajzen, 1991; Armitage and Conner, 2001; Hagger et al., 2002; McEachan et al., 2011), a theory selected for its ease of adaptation to different cultures and behaviors (Jemmott, 2012) and its utility in efficacious interventions (Darker et al., 2010; Montanaro and Bryan, 2014; Plotnikoff et al., 2014; Zhang et al., 2009), including interventions in South Africa (Heeren et al., 2013; Jemmott et al., 2011; Jemmott et al., 2014c). The health-promotion intervention significantly increased self-reported adherence to physical-activity guidelines averaged over the 6- and 12-month post-intervention assessments, which was the primary outcome, compared with the attention-control group (Jemmott et al., 2014a).

The primary purpose of this article is to report secondary analyses to identify the theory-of-planned-behavior constructs that mediated the intervention's effects. According to the theory of planned behavior (Ajzen, 1991), attitude toward the behavior, subjective norm regarding the behavior, and perceived behavior control or self-efficacy to perform the behavior (Bandura, 1997; Fishbein and Ajzen, 2010) determine intention, and intention determines behavior. Research suggests that descriptive norms should be included along with subjective norms as a predictor of intention (Fishbein and Ajzen, 2010; Rivis and Sheeran, 2003). We hypothesized that theory-of-planned-behavior constructs, particularly attitude toward physical activity, subjective norm regarding physical activity, and self-efficacy for physical activity, which the intervention targeted, would mediate the intervention's effects on self-reported adherence to physical-activity guidelines. In addition, consistent with the structural model the theory of planned behavior specifies, we hypothesized that intention would mediate the effects of the other theoretical constructs on self-reported adherence.

Methods

The University of Pennsylvania's Institutional Review Board (IRB) #8, the designated IRB under the federalwide assurance of the University of Pennsylvania and the University of Fort Hare, approved this study, which was conducted in Eastern Cape Province, South Africa, where more than 98% of the residents are Black Africans whose first language is isiXhosa. We identified 206 neighborhoods defined as geographical clusters tied to census data in the catchment area, created 103 matched pairs of neighborhoods similar on population size and the percentage isiXhosa-speaking, married, male, unemployed, and living in informal dwellings, and randomly selected 22 pairs.

In a cluster-RCT, we used computer-generated random number sequences to randomize the neighborhoods within pairs to the health-promotion intervention or an attention-matched control intervention, using concealment of allocation techniques designed to minimize bias in assignment. The biostatistician conducted the computer-generated random assignments, and the project director implemented the assignments. We enrolled the neighborhoods during a 25-month period beginning in November 2007, with all data collection completed by December 2010.

As described in more detail elsewhere (Jemmott et al., 2014b), we recruited men at different hours of the day and days of the week at a variety of venues (e.g., taxi ranks, streets, marketplaces, shebeens [informal drinking establishments]) to reach a diversity of men. At the time of recruitment, potential participants and recruiters were blind to the neighborhood's randomized intervention condition, and recruiters followed a common, standardized scripted protocol. Eligibility criteria were based on the HIV/STI risk-reduction intervention (Jemmott et al., 2014b), which was the primary intervention the trial was designed to test. Men aged 18 to 45 years living in a selected neighborhood, reporting sex in the previous 3 months, not reporting plans to relocate beyond a reasonable distance from the study site within the next 15 months, and either having a photo ID or being willing to have their picture taken for identification purposes, were eligible. We enrolled men who completed the baseline questionnaire and returned the subsequent week for intervention session 1. We conducted data-collection and intervention sessions at the University of Fort Hare in East London and provided transportation to the sessions.

Interventions

We developed the interventions based on the theory of planned behavior (Ajzen, 1991) and extensive formative research (Wainberg et al., 2007), including 15 focus groups and 4 pilot tests of the interventions with the target population, as well as the social cognitive theory (Bandura, 1986). The theory of planned behavior guided the formative research to elicit the population-specific beliefs relevant to attitude, subjective norm, and perceived behavioral control or self-efficacy and provided the structural model for how the theoretical constructs would together affect behavior. The social cognitive theory suggested strategies to increase self-efficacy and skill required to perform a behavior, including guided practice with performance accomplishments providing reward and observational learning or vicarious experience, for instance, through having participants view specially designed videos depicting men similar to them engaging in the targeted behaviors.

Each intervention consisted of six 75-min modules, with 2 modules delivered during each of 3 sessions in 3 consecutive weeks. Each intervention was highly structured and implemented in a small group of 9 to 15 men led by a male facilitator using standardized manuals. We translated the interventions into isiXhosa, back-translated them from isiXhosa to English, pilot tested them in isiXhosa, and delivered them in isiXhosa in the trial. Each intervention included interactive exercises, games, brainstorming, role-playing, take-home assignments, group discussions, and videos, produced specifically for the interventions, filmed in authentic township settings, including a shebeen.

We designed the health-promotion intervention to increase knowledge, attitudes, perceived behavioral control or self-efficacy (Fishbein and Ajzen, 2010), and skills to practice healthful behaviors, including increasing physical activity and fruit-and-vegetable consumption and limiting fat and alcohol intake, behaviors linked to risk of heart disease, hypertension, stroke, diabetes, and certain cancers—leading causes of morbidity and mortality among South Africans (Alberts et al., 2005; Asfaw, 2006; Joubert et al., 2007; Schneider et al., 2007). Each session began with "Circle of Men," an activity designed to increase the subjective norm in which the men could express their thoughts and feelings in a fellowship of Xhosa men where age, education, or profession did not matter, but a bond as brothers was important. A brainstorming activity, also designed to affect the subjective norm, explored what it means to be a man and how men together can make a difference in protecting themselves, their families, and their communities against health problems. A powerful activity, "Diseases that Impact South African Men and Their Home," addressed attitudes toward health behaviors by illuminating the devastating effect health problems can have on home and family. Participants used their creativity to construct the best house they could fashion from shoeboxes and contact paper. Then, to their surprise, the facilitator directed them to destroy it with a brick bearing the label "heart disease," "stroke," "hypertension," or "diabetes."

A video magazine, "The Subject is: Health," designed to influence attitude and self-efficacy regarding physical activity and other healthful behaviors, included a storyline about Khusela, a man approximately 40 years of age, just home from the hospital after a stroke, who makes healthful behavior changes with the help of his family and friends. Khusela addressed beliefs and barriers regarding physical activity identified in focus groups, including lack of will power, interest, time, and physical ability and how men can exercise in their