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Research Article

Impact of Baseline BMI upon the Success of Latina Participants Enrolled in a 6-Month Physical Activity Intervention

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High rates of obesity in Latinas highlight the need to determine if physical activity interventions are equally effective across the body mass index (BMI) range. Thus, this study assessed how BMI impacts success of Spanish-speaking Latinas in a culturally and linguistically adapted theory-based physical activity intervention ($N = 45$). Longitudinal regression models tested the relationship between baseline BMI and outcomes. Overall, a trend for a negative association was found between baseline BMI and self-reported physical activity and theoretical constructs targeted by the intervention over time. For example, someone with a 25 kg/m^2 BMI would report, on average, 27.5 more minutes/week of activity compared to someone with a 30 kg/m^2 BMI at followup. Furthermore, higher baseline BMI was significantly associated with lower self-efficacy, behavioral and cognitive processes of change, and family social support over time. These findings suggest that participants with higher BMI may need additional intervention to promote physical activity.

1. Introduction

Rates of obesity and related medical conditions (e.g., diabetes) are high in the Latino population, particularly among Latinas [1]. Lifestyle factors, such as inactivity, contribute to this public health crisis. Sedentary behaviors (i.e., television viewing) are often an integral part of family life in this community. For example, in past studies, Latina focus group participants reported frequently watching telenovelas in the evening with family, watching TV during meals, and using TV as babysitter and tool to learn English [2, 3]. On the other hand, finances, gender roles, and caretaking responsibilities can be major barriers to Latinas engaging in the recommended levels of physical activity (150 minutes of weekly moderate or vigorous physical activity). According to recent CDC data [4], 53.4% of Latinos reported engaging in no leisure time activity, compared to 35.3% non-Hispanic Whites. Effective interventions are obviously needed, yet the high (and rising) rates of obesity in this group highlight the need to determine if existing physical activity interventions are equally effective across the body mass index (BMI) range.

While previous research has shown that higher BMI is associated with less physical activity [5, 6], there is limited evidence regarding the relationship between baseline BMI on subsequent change in a physical activity intervention. King and colleagues found that individuals with BMI > 31 kg/m^2 were engaging in, on average, far less than the recommended activity levels at every measurement point over a 2-year intervention. In contrast, participants with BMI < 31 kg/m^2

were, on average, exceeding the guidelines. While this study was conducted with predominantly White, non-Hispanic men and women, such findings emphasize the need to understand the role of BMI on adoption of physical activity and raises questions about whether general physical activity interventions will meet the needs of obese participants as well as nonobese participants. As prevalence rates of obesity among Latinas are much higher than non-Hispanic Whites, investigation into how BMI might specifically affect the success of Latinas in a physical activity intervention is needed and will help inform future efforts to better serve this population.

The Transtheoretical Model (TTM) [7] and the Social Cognitive Theory (SCT) [8] are two theoretical models frequently used in physical activity promotion. TTM states that individuals move through a series of stages (i.e., Precontemplation, Contemplation, Preparation, Action, and Maintenance) when starting and maintaining physical activity. As individuals move through the stages, TTM states that people weigh the pros and cons of becoming active. In addition, individuals use behavioral and cognitive processes or strategies to help them move through the stages. Behavioral processes refer to engaging in activities such as enlisting social support, rewarding yourself, and reminding yourself. Cognitive processes refer to activities such as increasing knowledge, comprehending benefits, and increasing healthy opportunities. Similarly the SCT states that there are behavioral and cognitive factors that influence individual's behaviors, such as social support and self-efficacy. Self-efficacy is one of the most central factors to behavior change for the SCT and refers to an individual's confidence about being physically active. Using a theoretical framework, such as SCT, is important for being able to properly implement and test an intervention. A review of physical activity interventions with Latinas found that only 6 out of the 12 interventions used any theoretical model, and the model that was most commonly used was the Social Cognitive Theory (Sharma, 2008 obesity reviews). Four out of those 6 studies used the SCT and all 4 studies that used SCT were successful in increasing physical activity, further supporting the need for theory-based interventions.

Thus, using data from the intervention arm of a trial of a six-month, culturally and linguistically adapted intervention for Latinas ($N = 45$) [9], that was developed and individually tailored based on TTM and SCT, the current study assessed whether baseline BMI predicted changes in minutes of at least moderate intensity physical activity and changes in associated SCT and TTM theoretical constructs (self-efficacy, cognitive and behavioral processes, and social support) targeted by the intervention over time. The two aims of the study were (1) to assess how BMI impacts Latinas' success in increasing physical activity and (2) to assess how BMI impacts success in changing theoretical constructs targeted by the intervention. We hypothesized that participants with lower BMIs would report greater increases in physical activity and greater changes to the theoretical constructs self-efficacy, cognitive and behavioral processes, and social support, in response to a theory-based physical activity intervention than women with higher BMIs.

2. Method

2.1. Design. Data are taken from a subsample of a larger parent study testing the efficacy of a culturally and linguistically adapted, individually tailored physical activity intervention ($N = 93$; [9]). The physical activity intervention was designed to impact health behavior (minutes of physical activity) through changes in targeted TTM and SCT constructs (see Section 2.3). The current study focuses on the subgroup of Latina participants ($N = 45$) who received the theory-based physical activity intervention. We focused these analyses on the participants who received the intervention in order to test if the intervention was equally successful in increasing physical activity and changing the targeted theoretical constructs across the BMI range. Written informed consent was obtained, and the protocol was approved by the institutional review board of Brown University.

2.2. Participants. This sample was comprised of 45 Spanish-speaking women between 18 and 65 years old who self-identified as Latina/Hispanic and who were engaging in less than two days of moderate or vigorous physical activity for 30 minutes or less each day. Participants were recruited through community-based organizations and Spanish-language newspapers and radio stations. Exclusion criteria included any serious medical condition that would make physical activity unsafe (history of coronary heart disease, diabetes, stroke, orthopedic problems), current or planned pregnancy, BMI above 40 kg/m^2, consuming three or more alcoholic drinks per day on five or more days per week, current suicidal ideation or psychosis, current clinical depression, hospitalization due to a psychiatric disorder in the past three years, and/or taking medication that may impair physical activity tolerance or performance (e.g., beta blockers).

2.3. Intervention. The physical activity intervention was based on the TTM [7] and SCT [8] and emphasized behavioral strategies for increasing activity levels, such as goal setting, self-monitoring, problem-solving barriers, increasing social support, and rewarding oneself for meeting physical activity goals. This six-month intervention consisted of monthly mailings of physical activity manuals that were matched to the participant's current TTM level of motivational readiness and individually tailored computer expert system feedback reports based on TTM and SCT constructs, including stages and processes of change, decisional balance, and self-efficacy [10–13]. To further encourage participants to use behavioral techniques pedometers and physical activity logs were provided, along with tip sheets on topics such as stretching. Details of the culturally and linguistically adapted physical activity intervention are described in detail elsewhere [9]. Delivery channel and intervention approach were informed by feedback from focus groups participants who indicated that this mail-based, tailored intervention was an appropriate, appealing delivery modality that addresses the preferences and needs expressed by Latinas [9].

2.4. Measures. At baseline, demographic information (age, education, income, race, ethnicity, language preference, nativity, marital status) was collected. At baseline and six months height and weight were measured. Height and weight were measured by the research staff at our facility using a digital Health-o-Meter medical scale that measured body weight to the quarter pound and a stadiometer to measure height to the quarter inch. The same scale and stadiometer were used for all participants and all assessments.

Physical activity was assessed at baseline, three months, and six months using the 7-day Physical Activity Recall (PAR). The PAR is an interviewer-administered instrument that provides an estimate of weekly minutes of physical activity [14, 15]. The PAR uses multiple strategies for increasing accuracy of recall, such as breaking down the week into daily segments (i.e., morning, afternoon, evening) and asking about many types of activities, including time spent sleeping and in moderate, hard, and very hard activity. This measure has consistently demonstrated acceptable reliability, internal consistency, and congruent validity with other more objective measures of activity levels [16–19], as well as sensitivity to changes in moderate intensity physical activity over time [20, 21].

Monthly, stages and processes of change and self-efficacy were measured through the mail and used to generate tailored intervention materials. The Stages of Change for Physical Activity (SCPA) [22] has demonstrated reliability (Kappa = 0.78; intraclass correlation $r = 0.84$) and shown acceptable concurrent validity with measures of self-efficacy and current activity levels [22]. The Processes of Change (POC) [23] measures behavioral processes (i.e., substituting alternatives, enlisting social support, rewarding yourself, committing yourself, and reminding yourself), and cognitive processes (increasing knowledge, warning of risks, caring about consequence to others, comprehending benefits, and increasing healthy opportunities). The behavioral process subscale and the cognitive processes subscale each consist of 20 items that are scored on a 5-point Likert scale from 1 to 5 and then averaged to get a total subscale score. The Processes of Change has been shown to have a high internal consistency of 0.83 [23]. Self-Efficacy (SE) to become physically active across diverse contexts was measured with a 5-item instrument scored on a 5-point Likert scale from 1 to 5. Items are averaged to create a total score (alpha = 0.82) [23].

At baseline and six months social support was measured using the Social Support for Exercise (SSE) scale [24]. This instrument has three subscales: Family Participation, Family Rewards and Punishment, and Friends Participation. Items are scored on a 6-point Likert scale from 0 to 5 and summed. The three subscales have acceptable internal consistencies (alphas range 0.61 to 0.91) and demonstrate good criterion validity [24].

All of the measures were delivered in Spanish and were previously tested during a demonstration trial and vetted in individual interviews and focus groups.

2.5. Statistical Analyses. Descriptive statistics were calculated. Means and corresponding standard deviations are reported for continuous variables and percentages for categorical variables. Using longitudinal regression models implemented with Generalized Estimating Equations (GEEs) with robust standard errors, we tested the association between baseline BMI and mean minutes/week of physical activity at followup (months 3, 6). Similarly, we tested whether baseline BMI was associated with mean process variable outcomes at followup. Models adjusted for baseline values of the outcome (self efficacy, cognitive and behavioral strategies, social support) and time, as well as demographics significantly correlated with baseline BMI (education and number of young children in the home). We assumed an autoregressive working correlation matrix. When monthly outcomes data was not available (for Social Support Measures which were measured at baseline and 6 months), we used a linear regression model to test the association between BMI and change in outcome over 6 months, controlling for

Table 1: Demographic characteristics ($N = 45$).

Characteristic	Intervention
Born outside of continental U.S	91%
Speak only Spanish or more Spanish than English at home	89%
BMI	
Obese (BMI ≥ 30)	42%
Overweight (BMI = 25–29.9)	38%
Normal (BMI =18.5–24.9)	20%
Educational level	
High school graduate or less	47%
Some college/technical school	22%
College graduate or more	31%
*Employment status**	
Unemployed	44%
Full time	31%
Part time	24%
*Yearly household income***	
< $10,000	22%
≥ $10,000 but < $20,000	36%
≥ $20,000 but < $30,000	22%
≥ $30,000 but < $40,000	9%
$40,000+	9%
Marital status	
Married/living with partner	49%
Single	31%
Divorced	16%
Separated	4%
Children ages 6–18 living with you?	
Yes	71%
No	29%
Children ages 5 or younger living with you?	
Yes	38%
No	62%

* 2 participants did not answer, ** 1 participant did not answer.

Table 2: Effects of time and baseline BMI use on targeted theoretical constructs over time ($n = 45$).

	Parameter Estimate	Standard Error	Z	P value
Model 1: self-efficacy				
Month	0.06	0.03	2.17	0.03
Baseline BMI	−0.05	0.02	−2.75	0.006
Model 2: cognitive processes				
Month	0.01	0.02	0.58	0.57
Baseline BMI	−0.04	0.02	−1.97	0.05
Model 3: behavioral processes				
Month	0.04	0.02	2.35	0.02
Baseline BMI	−0.04	0.01	−2.62	0.009
Model 4: social support (Family) baseline BMI	−0.89	0.33	−2.74	0.009

* Model adjusts for baseline value of outcome, education and number of young children.

baseline education and number of young children in the home. All analyses were carried out using SAS 9.2 and were run on the intent-to-treat sample of $N = 45$ participants randomized to the physical activity intervention arm. Eighty-seven percent ($N = 36$) of participants returned for the postintervention evaluation. Results were compared to a simple imputation scheme (baseline value carried forward).

3. Results

3.1. Demographic Characteristics. The sample was comprised of mostly overweight (38%) or obese (42%) Latinas with a mean BMI of 29.32 kg/m^2 (SD = 4.71). Mean age was 41 years old (SD = 11.18) and 80% reported a household income of less than $30,000 per year. Most of the women were married (49%), unemployed (44%) and had a high school education or less (47%). Ninety-one percent were born outside of the Continental U.S and primarily immigrants from the Dominican Republic, Colombia, Puerto Rico, and Guatemala. See Table 1 for complete demographic information.

3.2. Association between BMI and Physical Activity. Results suggested a trend between baseline BMI and mean minutes/week of moderate intensity or greater physical activity at followup ($b = -5.64$, se = 3.39, $P = 0.09$), after adjusting for time, baseline activity, education and number of young children in the home (see Table 2). More specifically, in response to the same 6-month physical activity intervention, someone with a 25 kg/m^2 BMI would report, on average, 27.5 more minutes/week of activity compared to someone with a 30 kg/m^2 BMI at followup.

3.3. Association between BMI and Targeted Theoretical Constructs. Results showed a significant negative association between baseline BMI and mean self-efficacy, cognitive processes, and behavioral processes at any given month ($P < 0.05$). Specifically, participants with higher baseline BMI report lower mean scores on self-efficacy ($b = -0.05$, se = 0.02, $P < 0.01$), behavioral processes ($b = -0.04$, se = 0.01, $P < 0.01$), and cognitive processes ($b = -0.04$, se = 0.02, $P = 0.04$) at any given month. In addition, there was a significant association between baseline BMI and change in social support (family) from baseline to 6 months ($b = -0.89$, se = 0.33, $P < 0.01$). No significant association was found for the other measures of social support (friends, rewards, and punishments). Results have been summarized in Table 2.

4. Discussion

The obesity epidemic has disproportionately impacted Latinas, and adoption of regular physical activity is a known way to help prevent weight gain [25, 26]. It is important to assess whether our physical activity interventions are successful for all women regardless of BMI and meet the needs of those most at risk for obesity-related health disorders. Higher BMI was associated with lower average change in minutes of at least moderate intensity physical activity at followup. While statistically only a trend was found, the results suggest that, in response to the same 6-month physical activity intervention, someone with a BMI of 25 kg/m^2 reported increasing their average physical activity by about 27.5 more minutes per week than someone with a BMI of 30 kg/m^2. This finding suggests that physical activity interventions may need to be augmented for individuals with higher BMIs to increase their success in changing their level of physical activity.

When examining the process variables that may underlie the changes in activity level, there was a significant relationship between baseline BMI and self-efficacy, behavioral and cognitive processes, and family social support, but not for social support from friends or rewards and punishments. These findings suggest that physical activity interventions for Spanish-speaking Latinas with higher BMIs may need to have additional focus on improving these behavioral processes in order to increase their effectiveness. For example, obese individuals may not feel as confident about their ability to participate in physical activity under certain conditions and may benefit from messages specifically addressing these concerns. Also, certain family dynamics or norms, perhaps

even disapproval of physical activity by family or other obese family members who are not encouraging or supportive of physical activity, may serve as additional barriers and require direct intervention and/or participation of the full family unit in the program for optimal efficacy. Limitations to the current study include use of a small convenience sample and lack of objective data for physical activity.

In sum, findings from the current study suggest that participants with higher BMIs may need additional intervention to promote physical activity. Future directions should include larger studies to corroborate these findings regarding the influence of BMI on potential intervention efficacy (e.g., changes to physical activity and related process variables) among Latinas. If validated, qualitative research involving focus groups and in-depth individual interviews could help pinpoint what needs are not being met, solicit suggestions on how best to address these barriers, and improve the efficacy of future physical activity programs for individuals with higher BMIs. Such research would be particularly relevant to Latinas due the high prevalence of obesity and related health disparities in this group.

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