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Changing overweight Latino preadolescent body mass index: the effect of the parent-child dyad

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Keywords

Trial; Obesity; Hispanic

Background

Obesity rates have tripled among children and adolescents over the past thirty years.¹⁻³ According to the Center for Disease Control and Prevention, childhood overweight is defined as having a body mass index (BMI) percentile, between the 85th to 95th % range, and childhood obesity as above the 95th% for age and gender groups. Nader et al found that 80% of school-age children with BMIs 85th% went on to become overweight adolescents.⁴ At the current rates of childhood obesity, 30-40% of children may eventually develop type 2 diabetes and reduce their life expectancy.⁵ The significance of mounting risk for sustained overweight and its consequences cannot be overstated. In the Harvard Growth Study, overweight adolescents as adults had a twofold increase in all-cause mortality and increased morbidity due to cardiovascular disease.⁶ Consequently, the Institute of Medicine (IOM)⁵ and the *Strategic Plan for NIH Obesity Research*⁶ call for a community-engaged, culturally-relevant, family-centered approach to obesity prevention.

Although obesity continues to rise in all populations, Latinos are disproportionately at risk.^{3, 7} According to the Third National Health and Nutrition Examination Survey (NHANES III), Mexican-Americans are the least physically active group with 65% of men and 74% of women having little or no leisure time physical activity.⁸ Moreover, Trost reports that Latino children of all ages have more inactivity and less moderate and vigorous physical activity than any other ethnic group.⁹ Psychosocial determinants (such as, self-efficacy and social influences,) influence physical activity in African-American and White populations,⁹⁻¹¹ however, limited data exist on what works with Latinos.¹²

Promising approaches to reduce childhood weight gain include family-based interventions.¹³⁻¹⁵ Epstein noted that when parents lost weight, their child's overweight

decreased as well.¹⁶ Moreover, work conducted by Wrotniak et al found that parent BMI-z score is an independent predictor of child BMI-z score.¹⁷ These studies did not include large numbers of Latinos nor did they include many families with limited maternal education.

In this study, guided by the *NIH Strategic Plan for Obesity Research*,⁶ we investigated the effect of a community-based intervention aimed at the parent-child dyad compared to an enhanced office-based counseling approach on child BMI change over time. Given prior literature,^{13, 17, 18} we hypothesized that preadolescent overweight/obese Latinos change in BMI would reflect that of their participating parent. Moreover, we hypothesized that utilizing a recreation center as an extension of the doctor's office would result in better outcomes than an office-based counseling approach.

Methods

Participants

Subjects for this study were 106 Latino parent-child (preadolescent) dyads. Participants were self-described as Latino. Preadolescents aged 8-11 years old with a BMI 85% adjusted for age and gender were eligible for participation if a parent (> 18 years) committed to participating in all assigned sessions. Participants were identified from community sources in Forsyth County, North Carolina including a primary care clinic, radio advertising, and local churches from August 2005-June 2006. Recruitment and retention strategies have been reported previously.¹⁹

Of the 183 families initially contacted who verbally met study eligibility criteria, 159 families expressed interest in study participation and were randomly assigned to either the control or intervention group. At the first session, after assessing BMI eligibility criteria with standard measurements, 106 eligible parent-child dyads were identified. Of these 106 parent-child dyads, 72 completed both baseline and 6-month data collection. Figure 1 displays the participant flow through the study.

Prior to initiation, the Institutional Review Board of Wake Forest University Health Sciences reviewed and approved the study. Informed consent for adults and assent for children were obtained verbally in their preferred language (Spanish or English). All informed consent and assent materials were available in both languages. Likewise, study instruments were completed in the participants' preferred language.

Study Design

We conducted an exploratory, prospective randomized control trial based on the Transtheoretical Model (TTM).²⁰ The unit of randomization was the parent-child dyad.

Intervention Condition—Parent-child dyads participated in six sessions over the course of six months; the initial session at the community-based primary care clinic and the subsequent five sessions at the YWCA recreational center. At the initial clinic visit, each family received behavior modification counseling by a physician trained in brief principles of motivational interviewing.^{21, 22} During this visit, both parent and child completed a goal setting contract and participated in a 45-minute group health education session, led by a

trained bilingual study member, on increasing daily physical activity. This was followed by five monthly one-hour sessions held at the recreation center on the topic of increasing physical activity for both parents and their preadolescent child.

Prior to the initiation of the study, the session content and methodology of the intervention condition were developed with input from Latino children and families. Three focus groups of 8-12 individuals lasting one hour (two groups included children and one included parents) led by a bilingual study member were audio-taped, transcribed, and reviewed for common themes. Questions included: “How does physical activity affect health?”; “What are some physical activities you enjoy doing?”; “What are physical activities you enjoy doing with your child/children?” For methodology refinement questions were added such as, “What do you think about having a Latino health educator talking with many Latino families all together about their ideas and questions about how to help children be healthier?”, “How long should it be?”, “What time of day could you go with your child to be active together with other Latino families?” Based on our findings, the content and methodology were finalized.

Intervention sessions were led by a bilingual trained Latina program manager and included activities such as: soccer, dance, volleyball, and outdoor games, all deemed inexpensive and accessible by focus group participants. Each session included: 1) 20 minute skills-building didactic based on American Heart Association educational materials; 2) 30 minute group physical activity session; and 3) 10 minute of parent-child goal setting, setting concrete physical activity goals in the intervening month prior to the next session.

Control Condition: Unlike the intervention condition, parent-child dyads randomly assigned to this condition consisted of two sessions (baseline and six months later), all located at the community-based primary care clinic. Families in this control group received standard of care counseling from physicians trained using AAP guidelines, addressing both nutrition *and* activity.¹³ These sessions were enhanced by a subsequent 45-minute group health education session led by a trained bilingual Latina program manager who provided general information about healthy lifestyles who then responded to group questions.

Data Collection

Data were collected at two time points: baseline, and six months from both preadolescents and their participating parent. All sessions from the control group and the baseline data collection point for the intervention group were collected at a community-based primary care clinic. The data collection for the remaining five monthly intervention sessions occurred at the recreation center. Demographic information was collected from both the child and the participating adult, including: adult's relationship to the child, parent's highest level of education completed, parent's country of origin, language spoken most at home, and language spoken most with friends. For both parents and children, survey items were written at a 3rd grade reading level and were translated and back-translated through a professional translation company (Language Links). Acculturation was measured by two items adapted from the widely used Short Acculturation Scale, “What language do you speak most at home? “What language do you speak most with your friends?”¹⁸ Children and parents

completed self-administered surveys separately from one another in the language of their choice.

Body Mass Index (BMI) served as the primary measure of adiposity. BMI is defined as weight in kilograms divided by the square of height in meters.¹⁴ Standing height was measured using a portable direct-reading stadiometer and body weight was measured using a digital scale. For children, BMI percentile for age and gender was calculated by using the CDC calculator.² Free transportation and childcare for other children were available to participating families.

Statistical Analysis

We examined change in absolute BMI units for adults and children from baseline to six months. Because approximately two-thirds of children were over the 95th percentile, we utilized absolute BMI instead of BMI percentile to avoid a compressed percentile scale bounded by 100. We conducted an intention-to-treat analysis. Descriptive statistics were first obtained on key variables in the study. We studied, through scatterplots, the correlation between absolute BMI change in preadolescents and their participating parent. We examined a linear model to examine the factors that were predictive of the child's change in absolute BMI from baseline to six months. The independent variables of interest included intervention status and change in adult BMI. Other covariates included gender, age of child, maternal education, media use, and BMI of child at baseline. Although each variable contained a small percentage of missing values (average percentage of missing value was 7.5%), using complete-case only for the linear model would have reduced the sample size to N=50. In order to make full use of information contained within cases that have partially missing values, we applied multiple imputation to the data set.²³ The procedure was implemented using the programs SAS Proc MI and PROC MIanalyze (SAS Inc., Cary, NC). The procedure was implemented using the program SAS Proc mixed.

Results

Demographics

Baseline descriptive statistics for Latino parent-child dyads are presented in **Table 1**. At baseline, 106 parent- preadolescent child dyads participated, most of whom had parents who reported low levels of acculturation (almost all of whom spoke Spanish both at home and with their friends). Moreover, the majority of participating families had limited levels of maternal education, with almost two-thirds of the sample not completing high school. Almost two-thirds of the participating preadolescents were obese with a BMI ≥ 95% and almost two-thirds of participating parents were also obese with a BMI ≥ 30.

Parent-child Body Mass Index Change Over Time for Overweight/Obese Preadolescents

Over the course of the study, 47% of children lost weight (mean BMI change -0.37, s.d. 2.48) and 63% of parents lost weight (mean BMI change -0.88, s.d. 3.53). Refer to **Table 2**. In **Figure 2** below, we examined change in absolute BMI over time and compared how this correlated with their participating parent's change in BMI over the study course. Each scatterplot point represents a parent-child dyad and the change in their absolute BMI over

six months. The circles indicate male children and the asterisks indicate female children. There is a significant correlation between adult and child dyad weight change over time. For example, one morbidly obese preadolescent female lost 9 BMI units and this was correlated highly with her parent partner who also decreased her BMI more than 13 BMI units. Likewise, on the other end of the continuum, in a parent-female child dyad, where the adult increased almost 5 BMI units, her child increased her absolute BMI by 2 units. The correlation was significant with an $r = 0.53$, $p = 0.001$. It appears from Figure 2 that this correlation was stronger for male versus female preadolescents.

Predicting Overweight/Obese Latino Preadolescent Weight Change Over Time

For this community-based randomized controlled trial, we had a 68% retention rate, consistent with other studies of this kind.^{24, 25} The completers (those that completed both baseline and six month data) did not differ significantly on the variables of interest compared to those who did not complete the study. Refer to **Table 3**.

Table 4 demonstrates our findings from the mixed effects linear regression model. When adjusting for covariates, regression analyses indicated that Latino parent-child dyads in the control group were more likely than those in the intervention to decrease their BMI over the six month study period ($\beta = -0.96$; $p = 0.03$). Moreover, preadolescents were more likely to increase their absolute BMI over time, if their participating parent increased their BMI over the study period ($\beta = 0.17$; $p = 0.008$). As overweight/obese preadolescents aged, their absolute BMI increased ($\beta = 0.65$; $p = 0.002$). Latino preadolescent's baseline BMI also predicted later BMI. Over the six month study period, Latino preadolescents participants that had a higher baseline BMI were more likely to decrease their absolute BMI ($\beta = -0.22$; $p < 0.0001$).

Discussion

This study suggests that a physical activity skills-based monthly intervention over the course of six months did not outperform enhanced office-based standard of care for this population. In fact, those Latino parent- preadolescent child dyads who participated in the office-based enhanced approach, that included a group health education session following a routine exam focused on activity and nutrition, was *more* effective. It is possible for Latino families of this particular demographic (with limited acculturation from Mexico), that more credibility is conferred when information is provided in the office setting versus the recreation center setting. In fact the Latino cultural notion of *respeto* (respect), seems consistent with this interpretation.²⁶ Another explanation derives from our prior work,¹² where we noted that social influences significantly predicted self-reported baseline physical activity for Latino parent- preadolescent child dyads. Studies of Latino adults have demonstrated the importance of social and family support.^{27, 28} Perhaps, creating an enhanced office-based approach that allowed groups of families to meet and discuss their nutrition and physical activity increased social influences, supporting change. In fact, prior studies support the effectiveness of group visits.²⁹⁻³¹ This might be especially promising with Latino parent-child dyads.^{27, 28}

Alternatively, the recreation center intervention likely had a weak dose with only monthly sessions. In fact, a recent meta-analysis indicated trials with interventions lasting more than 6 months, and including weekly sessions for at least 12 weeks, demonstrate larger effects.³² We chose a relative weak dose of a one-hour monthly intervention that lasted six months. This decision was directly influenced by the qualitative research we conducted prior to launching the trial wherein Latino families indicated that a program occurring more often than monthly would preclude their participation. There are current trials underway based in recreation centers with a weekly dose that will shed further light on utilizing this setting to intervene upon pediatric obesity.

Similar to studies with Whites and African-Americans from middle income families,^{14, 16, 17} Latino preadolescent child weight loss and gain fluctuates in association with their parent's loss or gain. Epstein et al demonstrated that direct involvement of at least one parent as an active participant improves short and long-term weight regulation.^{25, 17, 33} Studies that work with parent-child dyads demonstrate more promise for effective behavioral interventions. Parental obesity is considered to be one of the strongest and most reliable predictors of later obesity in children.^{34, 35} Wrotniak et al also noted a correlation between parent weight loss and child weight loss, concluding that the more weight parents are able to lose, the more beneficial it is for the child.¹⁷ To our knowledge, our study is the first to demonstrate that this relationship also exists for Latino parent-pre-adolescent child dyads with limited acculturation. As others have reported, change in child behavior may be due to parent modeling or environmental factors.^{36, 37} Our data highlight the significance of targeting parent and child dyads to improve child health outcomes.

Limitations

In this pilot study, we did not have objective measures to examine what specifically changed in successful parent-child dyads that resulted in weight loss. Additionally, most of the families participating were transient inhabitants of Forsyth County making retention in the study challenging. Through extensive efforts we retained 68% of our sample size. This is consistent with other high quality community-based studies.²⁴ Moreover, the completers and non-completers did not differ significantly on variables of interest. However, we cannot know in what other ways they may have differed.

Comment

For overweight/obese Latino preadolescents, BMI change over time is correlated with change in parental BMI. Clinic-based interventions with a group education component appear to be more effective than monthly recreation-center based interventions for Latino parent-pre-adolescent child dyads with limited acculturation. Interventions in this obesity epidemic that disproportionately affects Latinos should include the parent-child dyad.

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The Corresponding Author (The Study P.I.) had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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Figure 1.
 Flow of participants through the trial

Figure 2.
BMI change over time in Latino parent- preadolescent dyad

Table 1

Baseline Demographic Characteristics of Latino Parent-Child Dyads (N=106)

Domain	Total Sample
Child (n=106)	
Age *	9.3 (1.2)
Gender (% male)	45.9
BMI *	25.8 (4.9)
BMI % *	94.7 (7.6)
Overweight (BMI 85 < 95%)	22.7
Obese (BMI 95%)	64.2
Media use *	3.1 (2.6)
Adult (n=106)	
Age *	33.5 (11.2)
Spanish mostly at home (%)	97.0
Spanish mostly with friends (%)	99.0
Relationship to child (% mother)	79.3
Maternal education (%):	
< High school	63.4
= High school	18.8
> High school	17.8
BMI *	33.6 (7.8)
Overweight (BMI 27 < 30) (%)	18.9
Obese (BMI 30) (%)	64.2

* Data are given as mean (s.d.)

Table 2

Baseline Values and Changes through 6 Months for Obese Child and Parent Anthropometric Measures (N=72)

Measure	Baseline	0-6 mo change
Child BMI *	25.6 (5.2)	-0.4 (2.5)
Adult BMI *	32.9 (7.2)	-0.9 (3.5)

* Data are given as mean (s.d.)

Table 3

Baseline Data on Completers versus Non-completers

Domain	Completers	Non-Completers	P-value
Child			
Age	9.2 (1.2)	9.4 (1.2)	0.54
Gender (% male)	51.4		0.20
Baseline BMI	25.6 (5.2)	26.0 (4.5)	0.53
Media use	2.9 (2.2)	3.4 (2.6)	0.31
Adult			
Age	32.9 (11.5)	34.1 (10.7)	0.54
Maternal education (%):			0.62
< High School	61.1	66.67	
HS < College	22.0	13.89	
College	17.0	19.45	
Baseline BMI	32.9 (7.1)	26.0 (4.5)	0.29

*Data are given as mean (s.d.)

Table 4

Mixed effects linear Regression Model Predicting Child Absolute BMI Unit Change from Baseline to 6 months for Parent-Child Dyads (N=72)

	0-6 months	
Variable	Coefficients β (95% CI)	P Value
Intercept	0.88 (−2.97 to 4.72)	0.65
Control Wave *	−0.96 (−1.81 to −0.11)	0.03
Male **	−0.29 (−1.27 to 0.69)	0.56
Child's age	0.65 (0.25 to 1.05)	<0.01
Maternal education	−0.28 (−0.86 to 0.30)	0.34
Adult BMI change	0.17 (0.05 to 0.29)	<0.01
Media use	−0.14 (−0.35 to 0.08)	0.21
Baseline BMI	−0.22 (−0.31 to −0.13)	<0.0001

* Reference = Intervention group

** Reference= Female