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A Culturally Appropriate Intervention To Improve Health Behaviors in Hispanic Mother–Child Dyads

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Abstract

Background: Obesity interventions targeting Hispanic preschool children are still nascent, and few are culturally appropriate. We evaluated the feasibility of a culturally relevant 9-month intervention program to improve health behaviors in low-income Mexican mothers with 3- to 5-year-old children.

Methods: A community engagement approach was used to culturally and linguistically tailor an intervention program that was pilot tested with 33 mother–child dyads enrolled from a large California urban health center. A one-group, pretest–posttest design assessed changes in children’s consumption of sugar-sweetened beverages (SSB), mothers’ pedometer steps, and BMI. Data were collected at baseline, postintervention and at 6 months postintervention.

Results: At postintervention, SSB consumption had significantly decreased for soda and other sugary drinks with a modest reduction for 100% juice. Consumption of water had significantly increased, whereas milk had an increased trend. Maternal step counts significantly increased for weekdays by 69% and weekend days by 49%. Overall, maternal BMI decreased while children’s BMI% remained stable. At 6 months postintervention, children’s soda and juice consumption reverted toward baseline levels, as did maternal step counts, but children’s consumption of sugary drinks remained lower, while water and milk remained higher.

Conclusions: Findings suggest that a culturally relevant intervention was feasible for improving target health behaviors in a low-income Mexican community. Future work should assess an enhanced intervention including a maintenance phase for long-term adherence to health behavior changes and influence on maternal and child BMI.

Introduction

The prevalence of overweight and obesity is higher in low-income households compared to affluent households and among Hispanic children compared to other ethnic groups.¹ Obesity prevalence among preschoolers is highest in Mexican Americans (13.7%), followed by non-Hispanic blacks (11.4%), and non-Hispanic whites (9.1%).²

Recent reviews found few obesity interventions focused on low-income ethnically diverse children and even fewer on preschoolers.^{3–5} The *White House Task Force on Childhood Obesity* report⁶ offers intervention directives for early prevention targeting at-risk ethnic populations and low-income communities. Among these directives are three important intervention strategies. The first is developing culturally appropriate interventions for ethnic pop-

ulations. For example, trained promotoras (community health workers who know the culture and language) have effectively promoted health behavior change in Hispanic populations.⁷ The second is promoting healthy nutrition and physical activity (PA). Weight gain has been associated with high consumption of sugar-sweetened beverages (SSB), *e.g.*, soda, 100% fruit juice, and other sugary drinks, and decreased PA, particularly among Hispanic children.^{8–12} Replacing SSB with water and increasing PA can decrease total energy intake and increase energy output, thus reducing obesity risks.⁸ Third is empowering parents to teach their children lifelong healthy behaviors.⁵ Parental modeling of behaviors can influence children’s food preferences and PA participation.^{7,13}

Vida Saludable (Healthy Living), a culturally appropriate 9-month, promotora-led childhood obesity intervention program was developed in response to these national

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directives and the paucity of research on at-risk, ethnically diverse preschool children. This study evaluated the feasibility of *Vida Saludable*, an intervention focused on low-income Hispanic mothers as primary change agents to influence health behaviors in their children. The primary aims were to decrease children's consumption of SSB and increase maternal walking. A secondary aim was to assess change in the participant's BMI. The knowledge gained from this study will help inform future research on the effectiveness of a culturally appropriate intervention to improve health behaviors in low-income Hispanic populations.

This study's theoretical framework, the social cognitive learning theory, posits learning occurs through observing behaviors of significant role models.¹⁴ Children's reproduction of observed behaviors are predominantly dependent on feedback received from the social environment (*e.g.*, family).

Methods

A one-group, pretest–posttest design was used to determine differences in the outcome variables from baseline to postintervention (9 months) and 6 months post-intervention (15 months).

Setting/Sample

The study was conducted at a southern California urban health center providing health and social services along with health promotion programs using promotores for a primarily (60%) low-income Hispanic clientele. Low-income Hispanic mothers (18 to 35 years old) with preschool children (3 to 5 years old) were eligible. Children on special diets and mothers or children unable to walk together were excluded. A convenience sample of $n=43$ mother–child dyads were recruited from the community health center. A final sample of $n=33$ mother–child dyads completed the program. We note that southern California's Mediterranean climate with little variation in temperature and limited rainfall allowed outdoor walking throughout the year, with rare exceptions.

Institutional Review Board approval was obtained from the University of California, San Diego. Participants completing the program received \$70 gift cards. Those attending the 6-month follow-up received an additional \$20 gift card.

Intervention Background

Vida Saludable was a two-phase intervention delivered over 9 months. Phase I included four biweekly interactive group lessons delivered over 2 months. During the third month, we offered participants with absences four additional make-up lessons prior to starting Phase II. A trained promotora delivered the lessons in Spanish and English. The lessons promoted: (1) Healthy drinks (water and 1% low-fat milk) in place of SSB, (2) physical activity especially with children, and (3) parental role modeling for

healthy behaviors. Lessons were tailored, including visual images of typical Hispanic families and women walking, and children drinking water and milk. Each 2-hour lesson included 1-hour concurrent lessons for mothers and for children, followed by a 1-hour mother–child activity [*e.g.*, consuming healthy drinks (water or 1% milk) and physical activity (dancing to cultural music)]. The lessons focused on the benefits of healthy drinks, ways to limit children's consumption of SSB, and parental role modeling.

Phase II consisted of six monthly group community activities to reinforce target health behaviors. Activities were promotora-led, including local field trips to grocery stores, a fast-food restaurant, a park, a trail walk, group community walks, and a cooking class with cultural foods. To improve participant engagement and retention, each group lesson and community activity was offered on three different days and times with an additional make-up session. At postintervention, a final review lesson was given. A 6-month postintervention evaluation was conducted to determine if improved health behaviors were sustained.

We followed recommended guidelines to culturally adapt and tailor *Vida Saludable*,¹⁵ incorporating “five categories of adaptation strategies”¹⁶ and “surface and deep structure concepts.”¹⁷ Using a community engagement approach, we integrated these strategies and concepts to design and develop a culturally appropriate intervention program. Although not the main focus of this article, a brief overview of the process used to develop and culturally tailor the *Vida Saludable* intervention program is presented below.

First, preprogram stakeholders' (community members, healthcare providers, promotoras, and health promotion coordinators) input, focus group feedback, and results from a pilot test of the measurement tool were incorporated to develop a culturally relevant intervention. Second, an experienced promotora was recruited from the health center and trained by investigators to enroll participants, facilitate the program, assist with data collection, and provide participant support. A bilingual investigator supervised all program meetings, data collection procedures, and study activities to insure fidelity of treatment process and measures collected. Finally, community stakeholders and four research experts (in childhood obesity and ethnically diverse populations) reviewed several validated survey instruments^{18–20} measuring beverage consumption, but found them to be culturally and linguistically unsuitable for our population. Using these validated instruments as a foundation, the experts developed a customized tool [Health Behavior Questionnaire (HBQ)] to measure children's beverage intake amounts (ounces/serving) and frequency (servings/day). The HBQ was pilot-tested in a community population similar to our sample and further adapted and linguistically tailored based on the pilot-test feedback. In response to stakeholder input, all program materials and curriculum were designed with special attention to culture, low literacy (less than 3rd grade), and education levels. According to Eremenco and colleagues'

translation guidelines,²¹ study materials were forward-translated into Spanish by two independent translators and back-translated for comparison to the original documents. The developers then reviewed the translated document for continuity and stakeholders performed a final review for consensus.

Measures

HBQ. Mothers reported on their children's SSB consumption levels based on 24-hour recall for soda (not diet or sugar-free), 100% fruit juice, other sugary drinks (e.g., punch, sports drinks, and flavored juices), water, and milk (whole, 2%, 1%, nonfat). Serving size questions included illustrations and a display of colored cups corresponding to 4-, 6-, 8-, and 12-ounce serving sizes. Frequency questions used a simple scale ranging from 0 to 6 servings/day. Just prior to baseline measurements, mothers were trained on how to report children's beverage consumption. To accommodate participants' language preference and literacy levels, we administered the HBQ in Spanish and had the promotora read each question aloud while projecting it on a screen. Individual assistance was also provided for low-literacy participants.

Pedometers. Mothers were asked to walk with their children at least 30 minutes/day. Mothers were instructed on how to use and store an Omron HJ-113 pedometer (www.omronhealthcare.com) that measured maternal step-counts. For this pilot study, pedometers were used primarily to motivate mothers' walking behavior rather than to assess intervention effectiveness. Based on evidence indicating differences in weekday versus weekend day steps,²² we measured step-counts for 1 weekday (Tuesday) and 1 weekend day (Saturday).

Mother and child demographic data were collected at enrollment. A registered nurse recorded participants' anthropometric measures [weight (kg) and height (cm)] at baseline and postintervention. Beverage consumption levels and step-counts were collected at three time points: Baseline, postintervention, and 6-months postintervention. The data were stored in locked storage cabinets and encrypted computers and flash drives, with access available only to study investigators.

Statistical Analysis

Descriptive statistics were evaluated for all variables. Linear mixed modeling was used to assess patterns of change in children's beverage consumption and maternal step-counts across three time points. Significance for these reported results was set at $p < 0.0167$. For those variables demonstrating a significant difference, pairwise contrasts were conducted to identify where the difference existed. We then analyzed the model fit by testing for deviance between the null model (means only, using full maximum likelihood) against the linear mixed model with the fixed effect of time (using restricted maximum likelihood). The time model fit

the data better than the null model. To address concerns about nonnormal distributions and to confirm the reported linear mixed-model results, we performed an alternative bootstrap analyses with 500 replications for each outcome. The bootstrap results were consistent with the linear mixed-model analyses. The McNemar chi-squared test was employed to determine changes in categorical variables. For categorical data, sample sizes were $n = 33$ for analysis from baseline to postintervention (all participants who completed the study) and $n = 30$ for analysis from baseline to 6-months postintervention (only those participants who returned for the 6-month postintervention). Significance for these reported results was set at $p < 0.05$.

BMI was calculated as weight (kilograms)/[height (meters)]² according to CDC/National Center for Health Statistics (NCHS) calculations for adults and children. Adult BMI categories were defined: Normal weight = 18.5–24.9,

Table 1. Demographic Descriptors of Participants

N=33	
Characteristic	Frequency % or Mean (SD)
Mothers	
Age (year)	27.0 (3.7)
Born in Mexico	100
Gravida ≤ 3	88
< 100% Poverty level	88
Primary language, Spanish	97
Years of education	
≤ 4	76
5–6	18
≥ 7	6
Employment, none	100
Medical insurance, none	97
Marital status	
Married	24
Cohabiting	76
Children	
Age (years)	3.6 (0.7)
Gender	
Female	52
Male	48
In preschool, none	100
Medical insurance	
Medi-Cal	97
Private	3
SD, standard deviation.	

overweight=25.0–29.9, or obese=30.0 and above. For children, adiposity was calculated as BMI-for-age and gender in percentiles using 2000 CDC age- and sex-specific growth charts.²³ Healthy weight percentiles were defined as 5th to <85th, overweight as 85th to <95th, and obese as ≥95th.

Results

Results provided in the text and tables are model implied from estimated marginal means. Table 1 displays participants' sociodemographic profiles. Table 2 displays: (1) Children's beverage consumption levels in ounces/day, (2) milk and water type, and (3) maternal Tuesday and Saturday step-counts for baseline, postintervention and 6-month postintervention along with changes across the three time points. Of the 43 dyads enrolled, 10 dropped out the first week due to work commitments. Of the intervention group ($n=33$), 100% completed the 9-month intervention program with 100% attendance and 91% completed the 6-month postintervention follow-up (15 months from the beginning of the intervention).

Beverage Consumption. At baseline, children were drinking on average 3.3 ounces/day of soda, 8.8 ounces/day of 100% juice, 6.4 ounces/day of other sugary drinks, 19.8 ounces/day of water, and 14.3 ounces/day of milk. By

postintervention, SSB consumption declined significantly for soda by 82%, and other sugary drinks by 73%, whereas decreased consumption for juice by 30% was not significant. Water consumption increased significantly by 46%, and milk consumption showed a nonstatistical significant increase of 17%. At 6 months postintervention, children maintained improvement in consumption levels for sugary drinks, water, and milk. However, soda and 100% juice consumptions reverted toward baseline levels.

Milk and Water Type. At baseline, 85% of children drank 2% milk and 15% drank 1% milk. By postintervention, significantly more children consumed 1% milk (67%) compared to 2% milk (33%) and sustained this behavior at 15 months. At baseline, children drank more bottled water (94%) than tap water (6%). This behavior remained unchanged over 15-months.

Maternal Walking. By postintervention, maternal step-counts increased for Tuesdays and Saturdays. Maternal step-counts increased more during the week (69%; 4302 steps) compared to the weekend (49%; 3151 steps). However, by 6 months postintervention, Tuesday steps reverted to baseline levels whereas Saturday steps, although not significant, continued to show improvement.

Table 2. Children's Beverage Consumption and Maternal Walking over 15 Months

Variable N=33	Baseline Mean (SE)	Postintervention Mean (SE)	6 Months postintervention Mean (SE)	Change baseline to postintervention Mean (95% CI)	Change baseline to 6 months postintervention Mean (95% CI)	Change postintervention to 6 months postintervention Mean (95% CI)
Children's beverage consumption (ounces/day)						
Soda	3.3 (0.76)	0.6 (0.27)	1.6 (0.40)	-2.8 (-4.2, -1.3)**	-1.7 (-3.4, -0.05)	1.0 (-2.0, 0.1)
100% Juice	8.8 (0.94)	6.1 (0.79)	8.8 (1.4)	-2.6 (-5.2, -0.1)	0.03 (-3.1, 3.1)	2.6 (-0.3, 5.6)
Sugary drinks	6.4 (0.95)	1.7 (0.60)	2.5 (0.66)	-4.7 (-6.0, -2.0)**	-3.0 (-6.9, -2.5)**	0.8 (-0.6, 2.2)
Water	19.8 (2.1)	29.0 (2.8)	36.0 (3.3)	9.2 (2.3, 16.1)**	16.2 (9.7, 22.7)**	7.0 (-1.1, 15.0)
Milk	14.3 (0.96)	16.8 (2.1)	18.1 (1.3)	2.5 (-1.5, 6.5)	3.8 (1.1, 6.5)**	1.3 (-1.8, 4.4)
Beverage type (ratio)				(χ^2)	(χ^2)	(χ^2)
Water (tap/ bottled)	2/31	3/29	4/26 ^a	(1.0)	(0.625) ^a	(1.0) ^a
Milk (1%/2%)	5/28	22/11	18/12 ^a	(0.0001)*	(0.002)**	(0.754) ^a
Maternal walking (step counts)						
Tuesday	6278 (802)	10,580 (947)	5513 (804)	4302 (1650, 6953)**	-766 (-2971, 1440)	-5067 (-2695, 7439)**
Saturday	6479 (870)	9630 (944)	9400 (2932)	3151 (788, 5514)**	2921 (-3329, 9171)	-230 (-6374, 5913)

* $p < 0.05$.

** $p < 0.0167$.

^aCalculated with sample ($n=30$).

SE, standard error; CI, confidence interval.

Table 3. Participants' BMI at Baseline and 9 Months

N=33 Variable	Baseline Frequency % or Mean (SD)	Postintervention Frequency % or Mean (SD)
Mothers' BMI	30.7 (6.4)	29.2 (5.1)*
Healthy weight (18.5–24.9)	12	18
Overweight (25.0–29.9)	39	39
Obese (≥ 30)	49	43
Children's BMI %ile	67.6 (23.2)	62.2 (26.0)
Healthy weight (5 to < 85)	79	79
Overweight (85 to < 95)	12	9
Obese (≥ 95)	9	12

* $p < 0.05$.
SD, standard deviation.

Body Mass Index. At baseline, Table 3 shows over 88% of mothers and 21% of children were either overweight or obese. By postintervention 82% of mothers and 21% of children were either overweight or obese. Overall, mothers (70%) lost weight. Mean maternal BMI significantly decreased 1.5 points, reducing the overall BMI classification from obese to overweight.

Discussion

Postintervention findings indicated that the intervention was feasible. Children's SSB consumption decreased while consumption of water and milk improved. However, at the 6-month postintervention, some improved behaviors were sustained while others had regressed to baseline levels. Maternal BMI was reduced, possibly due to improved maternal walking and role modeling of healthy nutrition. Our findings were consistent with other studies reporting the impact of parental influence on improving health behaviors in children.

Using a community engagement approach to develop culturally appropriate interventions is an important strategy to improve program relevance, and recruitment and retention of ethnically diverse research participants.²⁴ Incorporating community stakeholders' input to culturally adapt and linguistically tailor *Vida Saludable* may have influenced our success in recruiting and retaining this highly mobile immigrant population ($n = 33$ mother-child dyads), illustrated by the 100% attendance and completion rate and 91% participation rate at the 6 month postintervention.

Children's Outcomes

Evidence indicated mothers receiving education on healthy nutrition and PA were more likely to offer their children healthy drinks in place of SSB and participate

in PA with their children.^{25,26} By postintervention, water consumption increased, largely replacing SSB consumption, and two-thirds of the children were drinking 1% milk (in place of 2% milk) at the recommended volume.

Previous studies have reported that drinking water and milk instead of SSB resulted in lower energy intake, reduced weight gain, and improved nutrition in preschool children.^{8,27} In our study, children's postintervention intake of soda and other sugary drinks decreased, while juice consumption declined close to the daily recommended allowance (4–6 ounces/day).²⁸ Although soda and juice consumption in our study reverted to baseline levels by 6 months postintervention, other sugary drinks, water, and 1% milk consumption remained significantly improved over baseline levels, suggesting the intervention's potential for long-term healthy behavior change.

Mothers reported the primary barrier to reducing their children's SSB consumption was other household adults (spouses and partners) who drank SSB in front of the children. Role modeling and family members can influence behavior change in children^{7,13} and should be addressed in future studies. Including all family members in the intervention program may improve and help maintain improved health behaviors.

One study found Hispanic families (particularly lowest-income families) drank less tap water than non-Hispanic families for fear it caused illness.²⁹ Our participants' possible distrust of tap water may have accounted for children drinking more bottled water than tap water. Future exploration into participants' perceptions about tap water will help inform future health promotion education.

Maternal Outcomes

Social support is important for maintaining healthy behaviors, particularly among US Spanish speakers.³⁰ After learning the safe walking routes during the program, mothers reported they liked walking in the community and parks. The participants also formed their own walking groups and were excited to compare their step-counts for each week. They also reported satisfaction with the promotora support received during the program. These factors may have played an important role in motivating mothers' walking during the program.

Mothers were walking more by postintervention. Based on a previous intervention with ethnically diverse mothers and preschoolers, Clarke and colleagues³¹ postulated that pedometers and social support could motivate increased walking. Because parental obesity is a risk factor for childhood obesity, reducing mother's weight could also reduce their children's obesity risk.³² At 6 months postintervention, all pedometers needed replacement batteries. This may have been one factor in reducing motivation to walk.

Limitations

This pilot study has several limitations. We studied a small sample of mother-child dyads without a comparison group. Therefore, we did not aim to test the effectiveness

of the intervention. The small sample size limited the ability to detect and quantify all changes. The homogeneous sample of low-income Mexican mothers limited the generalizability to other populations. It is also possible only the most interested mothers enrolled, introducing another selection bias.

The intervention's dynamic nature (*i.e.*, mid-program adaptations) may have introduced a threat to internal validity. Although our customized HBQ met rigorous face validity by four research experts, it did not undergo formal psychometric testing. Further validity and reliability testing is needed in a similar Hispanic population.

Typically, pedometer data are averaged for several weekdays and several weekend days for a more accurate representation of walking patterns. For our pilot study, pedometer step-counts were measured for a Tuesday and Saturday at three time points. We acknowledge the limitation of this measure for PA. However, our pilot study was not designed with power or tools to measure change in PA.

Walking with other mothers and seeing their own step-counts increase may have boosted maternal self-efficacy for walking, as self-efficacy for a behavior is likely to support the continuation of that behavior.¹⁴ Although we did not measure self-efficacy for walking in our study, it would be useful for future studies to evaluate this parameter's effect in improving and sustaining participants walking over time.

A systematic review of interventions to promote walking found tailored interventions were highly effective in changing health behaviors.³³ Strategies used to culturally adapt and implement the intervention may have minimized bias and measurement errors, thus strengthening internal validity and the intervention's effectiveness.

The Vida Saludable intervention program did not include a maintenance phase, which may have contributed to the regression of some health behaviors. Including a maintenance phase in future studies is warranted, because previous intervention studies for weight management and physical activity have shown maintenance to be effective in sustaining positive health behavior change.^{34,35}

Conclusion

Although difficult to quantify potential benefits from individual intervention elements, improved behavioral outcomes indicate Vida Saludable was feasible and improved health behaviors in a Mexican-American community. Regression of some behaviors in our study suggests including a maintenance phase that emphasizes social support to help sustain long-term healthy behavior change. Findings lend support for a larger, randomized controlled trial to test the intervention's effectiveness on long-term adherence to important health behaviors and impact on maternal and child BMI.

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Author Disclosure Statement

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