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VERONICA ISABEL GONZALEZ
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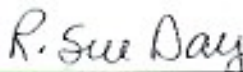
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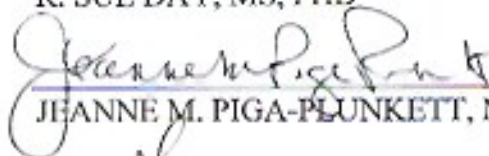
by

VERONICA ISABEL GONZALEZ, BS

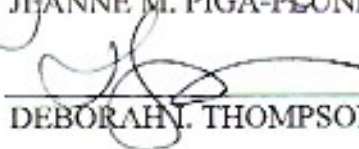
APPROVED:



R. SUE DAY, MS, PHD



JEANNE M. PIGA-PLUNKETT, MS, RD, LD


DEBORAH L. THOMPSON, PHD, RD

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Veronica Isabel Gonzalez, BS, MPH
2019

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INTO THE HISPANIC MOTHER'S PERSPECTIVE

by

VERONICA ISABEL GONZALEZ
BS, UNIVERSITY OF TEXAS AT AUSTIN, 2017

Presented to the Faculty of The University of Texas

School of Public Health

in Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF PUBLIC HEALTH

THE UNIVERSITY OF TEXAS
SCHOOL OF PUBLIC HEALTH
Houston, Texas
August 2019

MHEALTH CHILDHOOD OBESITY PREVENTION: A LOOK
INTO THE HISPANIC MOTHER'S PERSPECTIVE

Veronica Isabel Gonzalez, BS, MPH
The University of Texas
School of Public Health, 2019

Thesis Chair: R. Sue Day, MS, PHD

Along with increasing physical activity, improving nutrition is an important behavior to target to reduce the risk of obesity in children and adolescents. To date, a nutrition-focused mHealth intervention used to promote obesity prevention and healthy living among Hispanic children and adolescents has not been specifically developed for Hispanic mothers. The purpose of this study was to provide information on feasibility and acceptability of a mHealth child nutrition intervention among Hispanic mothers. The data was collected from an online survey and telephone interviews from 30 mothers of 8-12-year-old Hispanic girls. Most mothers were 40 years old or younger (70%), identified race as white (76.7%), and married (86.7%). Ninety three percent of mothers had post-high school education, and most had more than one child under 21 years of age living in their home (86.7%). There was no statistically significant association between Hispanic mothers' beliefs about their child's daily fruit and vegetable servings and parent-reported child daily consumption of fruit and vegetables. There was no statistically significant association between mothers' actions for providing frequency of fruits and vegetables via meals or snacks with the parent-reported child daily consumption

of fruit and vegetables. Hispanic mothers' attitudes of the importance to eat healthy foods and their attitude to encourage healthy eating were not able to be assessed because everyone felt these were both important. The relationship between Hispanic mothers' perception of control in what their child eats and their attitude to encourage healthy eating was not able to be assessed because all mothers felt it was very important for parents to encourage healthy eating in children. These findings indicate the feasibility of this methodology because parents who participated in this study have access to the needed technology, are familiar with texting, and that texting would be an acceptable child obesity prevention method. Although the study population did not provide the ability to address all the study questions, the results indicate Hispanics are viable research participants to use mHealth and support healthy eating strategies. Texting may be part of the solution for providing health promotion messages relevant for Hispanics.

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BACKGROUND

Literature Review

Adolescent Obesity in the United States

In the United States, adolescent obesity remains a growing public health concern. According to the 2013–2014 National Health and Nutrition Examination Survey (NHANES), 16.2% of children and adolescents, ages 2-19 years, are overweight and 17.2% are obese (Centers for Disease Control and Prevention [CDC], 2016). Over the last two decades, the prevalence has increased from 14.9% and 16.9%, respectively. Additionally, the prevalence of overweight and obese adults ages 20 and over has increased from 65.1% to 71.6% over the last two decades (CDC, 2017a). Various health problems are associated with obesity including type 2 diabetes, certain types of cancers, heart disease, and stroke (CDC, 2018). Because children with obesity are more likely to be obese as adults, these chronic health problems may impact overweight and obese children in the future (World Health Organization, 2018). Obesity disproportionately affects ethnic-minority groups, particularly Hispanics who have a 23% increased risk of obesity compared with whites (CDC, 2015). Hispanic adults have the highest prevalence of overweight or obesity among all racial/ethnic groups at 79.6% (CDC, 2017c). Additionally, Hispanic children and adolescents have the highest total obesity prevalence among racial/ethnic groups (25.8% in 2-19-year-olds; CDC, 2017b). Hispanics in the United States are vulnerable to various obesity-related health problems because of their high prevalence of obesity.

Lowering the risk of obesity and obesity-related health problems has been accomplished through interventions focused on nutrition and physical activity (Xu et al., 2017). Along with increasing physical activity, improving nutrition is an important behavior to target to reduce the risk of obesity in children and adolescents. According to a 2014 report by the Produce for Better Health Foundation (PBH), 45% and 59% of mothers believe their families eat too few fruits and vegetables, respectively (2014). In addition, 45% of mothers report getting their family to eat more fruits and vegetables is among their most pressing concerns when ensuring their family's health and welfare and 80% agreed they would like to be able to include a greater variety of fruits and vegetables in their family's meals (PBH, 2014). Thus, providing mothers with information to increase their family's consumption of fruits and vegetables may help them to achieve their goals (PBH, 2014). In their systematic review and meta-analysis of digital interventions promoting vegetable intake, Nour et al. (2016) found electronic and mobile phone-based interventions "may have a positive impact on fruit and vegetable intake among [Australian] young adults" (p. 12). However, given the unique sociocultural characteristics of Hispanics, nutrition-focused obesity prevention interventions for Hispanics should be tailored to their cultural beliefs and values (Bender & Clark, 2011). In fact, culturally tailored interventions have been shown to be effective in improving health behaviors in Hispanic communities (Bender et al., 2013, Gertner et al., 2010). For example, Bender et al. (2013) found a significant reduction in sugar sweetened beverages from sodas and other sugary drinks and an increase in water consumption in children as a result of a culturally relevant intervention for low-income Mexican mothers of 3-5-year-old children. Group lessons and activities, such as, field trips to the grocery stores

and restaurants, were promotor-led in English and Spanish. Additionally, Cameron et al. (2017) translated and culturally adapted an mHealth diet program developed by the U.S. National Cancer Institute into Spanish and found that over 70% of their sample of Hispanic adults reported a strong interest in the diet program. Thus, there is a need for and interest in culturally tailored diet programs among Hispanics, which could help to promote healthy eating behaviors and facilitate weight loss in this population.

mHealth Technology Use to Prevent Adolescent Obesity

As mentioned above, mobile health, also known as “mHealth,” technology incorporates many facets of mobile phone technology, such as Internet and Bluetooth capabilities, offers a powerful medium to improve health outcomes, such as increasing fruit and vegetable intake (Nour et al., 2016). Applications (“apps”), short message service (SMS) also known as “text messaging,” and Internet usage via mobile phones are increasingly being used to disseminate health education and implement behavioral interventions across all races/ethnicities and ages (Turner et al., 2015). For example, mHealth technology is being utilized for behavioral interventions for pediatric weight loss (Tripicchio et al., 2017, Taveras et al., 2017) and adolescent weight loss (Patrick et al., 2013). Specifically, SMS text messaging is a promising mHealth tool for weight loss, as studies show the use of SMS in weight loss interventions for adults has yielded a statistically significant effect ($p < 0.05$) on weight loss-specific variables such as diet and weight (Shaw & Boesworth, 2012, Fischer et al., 2016).

Formative research on mHealth interventions using SMS text messages for obesity prevention suggest these interventions hold great promise and appeal among ethnic-minority populations. For example, Callender and Thompson (2018) conducted a feasibility and acceptability study of a mHealth text-message obesity prevention program among parents of young African American girls via a mixed methods approach. In this study, 19 African American mothers of 8-10-year-old girls received 36 text messages over a 12-week period. The mothers found the text messages on obesity-related behaviors (i.e., healthy eating, physical activity, reducing stress, and obtaining adequate sleep) to be “helpful,” “educational,” and “appropriate.” All mothers reported using the information from the text messages and made changes related to their daughters’ eating behavior because the texts made them conscious of practicing healthy behaviors. Given the promising initial results of this parent-focused mHealth intervention among African Americans, similar interventions are needed for Hispanics, another ethnic-minority population disproportionately affected by obesity.

mHealth Among Hispanics

Research indicates there is a strong interest for mHealth tools among U.S. populations, especially the use of mobile phone technology in Hispanics (Krebs et al., 2015). A cross-sectional survey of 1604 mobile phone users across the United States (27.9% were Hispanic) revealed many users have downloaded apps to help them reach specific health goals (Krebs et al., 2015). In terms of race/ethnicity, Latinos/Hispanics were significantly

more likely than non-Hispanic whites to have used health-related apps (risk ratio = 1.19, $P = .002$). Thus, mHealth holds great promise for helping improve Hispanic health.

Text Messaging Among Hispanics

Cell phone ownership and text-message usage increased among Hispanics, even among those from a low socioeconomic background. For example, Arora et al. (2016) found in 2014 79% of low-income Hispanic participants owned a cell phone and, of these, 63% used text messages. Both percentages are higher than they were in 2010 (Pew Research Center, 2010). Additionally, Swindle et al. (2014) found 80.6% of low-income parents utilized text messages daily. Of those participants, 53.8% indicated they would be interested in receiving “healthy eating” text messages. Swindle et al. also reported Hispanics’ use of cell phones for texting was significantly higher than cell phone use for Internet, e-mail, and blogs. Thus, the high prevalence of Hispanics use of daily text messages and their interest in receiving healthy eating text messages provides a starting point for investigating text-message interventions in this population.

Educating the Hispanic community, particularly Hispanic mothers, with healthy nutrition and physical activity information and facilitating dietary change in families through their mobile phones could be a powerful tool for intervention dissemination. The use of text messages in obesity prevention interventions has been explored as an intervention component (Haines et al., 2013), but, to our knowledge, there is no current research on the effects of an

obesity prevention text-messaging intervention targeting Hispanic mothers on the eating behaviors of Hispanic children.

Public Health Significance

In the United States, obesity remains highly prevalent among Hispanics, highlighting the need for effective obesity prevention interventions culturally tailored for this at-risk population. Due to the ubiquity of mobile phones and high use of text-messaging services among Hispanics, mHealth tools, such as SMS text messaging, represent an important means of increasing intervention reach to this population (Anderson-Lewis et al., 2018). To date, a nutrition-focused mHealth intervention used to promote obesity prevention and healthy living among Hispanic children and adolescents has not been specifically developed for Hispanic mothers. In addition to filling this current gap in knowledge by providing information on the feasibility and acceptability of mHealth nutrition interventions among Hispanic mothers, this study is an important first step in refining efforts to improve minority health by preventing obesity.

Objectives

The objectives of this study using the Family TXT Study for Hispanic Families (FTS) data are: (1) Describe the sociodemographic characteristics of Hispanic mothers participating in the FTS; (2) Describe the association between Hispanic mothers' beliefs about their child's fruit and vegetable daily servings and parent-reported child daily consumption of fruit

and vegetables; (3) Describe the mothers' actions for providing frequency of fruits and vegetables via meals and fruits and vegetables via snacks with the parent-reported child daily consumption of fruit and vegetables; (4) Describe the association between Hispanic mothers' attitude of the importance to eat healthy foods and their attitude to encourage healthy eating; and (5) Determine the association between Hispanic mothers' perception of control in what their child eats and their attitude to encourage healthy eating.

METHODS

Study Design

The purpose of the Family TXT Study for Hispanic Families was to conduct formative research with mothers of 8-12-year-old Hispanic girls to identify beliefs, values, and practices related to childhood obesity prevention and their receptivity to mHealth programs aimed at childhood obesity prevention. The study design was an explanatory sequential mixed methods design utilizing an online survey and telephone interview data. Questions spanned obesity related factors such as sleep, nutrition, physical activity, sedentary behavior, and stress. The institutional approval review board at Baylor College of Medicine approved of the protocol (H-37904) (see attached). Round one, consisting of a survey followed by a telephone interview, collected information related to parent and family characteristics, accessibility, and thoughts related to a text message intervention to help parents of 8-12 year old Hispanic girls modify the home environment to promote and support obesity prevention. A second round of data collection assessed parents' reactions to the text messages. This study uses secondary data from round one of data collection from the Family TXT Study (FTS) with the permission of the principal investigator Dr. Thompson (see attached letter). Select nutrition related belief and attitude data from first round of online surveys and interview data to examine if a pre-adolescent obesity prevention intervention via text messaging is an acceptable child obesity prevention method for Hispanic families.

Recruitment

The desired sample size for the parent study was thirty. This sample size was selected because of the exploratory nature of the research. This sample size was also expected to attain theoretical saturation in the qualitative component, which is the point at which no new information emerges (Morgan, 1998). Parents were recruited using standard methods including the United States Department of Agriculture/Agricultural Research Center (USDA/ARS) Children's Nutrition Research Center (CNRC) volunteer database. The volunteer database is constructed of community members who have expressed interest in participating in research studies. Inclusionary criteria included: (1) parent self-identifies as Hispanic, (2) has an 8-12-year-old daughter, (3) has Internet access and a personal email address, (4) has access to a mobile phone to send and receive text messages, and (4) speaks and understands English. During recruitment, the study research coordinator explained the study in detail to parents, and if the parent was interested, they were screened for eligibility and were mailed a consent packet. The packet contained a parent letter describing the study, parent consent form, compensation forms, participant information form, and a stamped envelope with which to return the completed forms.

Study Subjects

The data for this study includes the 30 mothers of 8-12-year-old Hispanic girls who participated in the first round of data collection for the FTS formative research study. Parents who provided written informed consent were contacted to complete the initial online survey.

Participants were compensated via a \$40 money order for their time after the telephone interview was completed.

Data Collection

Online surveys were completed over a secure, password protected website. Interviewers were trained in the survey data collection protocol as well as in qualitative data collection techniques regarding use of non-leading prompts. Participants could start and stop the survey at any-time. After completing the survey, the parent was contacted to schedule a telephone interview, led by a trained research staff member. Interviews were digitally recorded. The purpose of the interview was to understand the context of survey responses and to ask additional questions to provide further insight into parent perspectives regarding child obesity prevention, mobile technology, and obesity-related behaviors.

Data Analysis

This study utilizes select questions from the FTS survey. STATA Statistical Software (SAS) (version 9.4, SAS Institute Inc., Cary, NC, USA, 2010) was used for the quantitative data. Descriptive statistics were used to describe the participant's survey responses. A p-value of 0.05 was used to determine significance.

Objective 1 utilizes descriptive statistics to describe the characteristics (age, race, marital status, education, children in the household, and mobile phone information) of Hispanic mothers of 8-12-year-old girls for inclusion in Table 1.

Objective 2 and objective 3 use descriptive statistics to describe the individual nutrition behaviors, beliefs and attitudes for Table 2. A Fisher's Exact Test was used to determine the relation between the variables. The test results are displayed in Table 3. Objectives 4 and 5 were not able to be addressed because there was no variation in the variables.

Interviewers created summaries of key points and/or ideas that emerged from the phone interviews (Schneider et al., 2009). The key point summaries were used in this research, along with verbatim quotes, to support quantitative results and provide context.

RESULTS

Participant Characteristics

Thirty mothers of 8-12-year-old Hispanic girls were enrolled in the Family TXT Study. All completed the online survey and telephone interview. Most mothers were 40 years old or younger (70%), identified race as white (76.7%), and married (86.7%) (Table 1). All mothers self-identified their ethnicity as Hispanic. Ninety three percent of mothers had post-high school education, including technical school or some college, and most had more than one child under 21 years of age living in their home (86.7%).

Cell Phone Characteristics

All mothers reported having text message capability on their current cell phone and texting daily (100%) (Table 1). Most also reported having an “unlimited” mobile phone (86.7%) and texting plan (90%).

Nutrition Survey Question Results

Two-thirds of the mothers (66.7%) reported their child consumed 1 to 2 servings of fruits and vegetables a day, while fewer reported their child consumed 3-5 servings a day (33.3%) (Table 2). Most mothers believed the appropriate daily intake of fruits and vegetables for an 8-12-year-old child was 3 to 4 servings. Most mothers (83.3%) reported it was very important or somewhat important (16.7%) for children to eat healthy. All mothers felt it was very important for parents to encourage healthy eating in children. Most of the

mothers (73.3%) reported believing they had a lot of control over their child's eating habits. All but one mother thought text message tips may be useful in helping their child eat healthier (96.7%).

Relationship of Beliefs, Behaviors, and Attitudes

There was not a significant association between mothers' belief of necessary fruit and vegetable servings and parent reported child's daily consumption of fruit and vegetable servings (Table 3). There was also not a significant association between the frequency of fruits or vegetables via meals provided to the child or via snacks and parent reported child's daily consumption of fruit and vegetables.

The relationship between Hispanic mothers' attitudes of importance to eat healthy and their attitude to encourage healthy eating could not be assessed because all thirty mothers selected very important for their attitude of encouraging healthy eating. As well, the association between Hispanic mothers' perception of control in what their child eats and their perception of usefulness of text message tips helping their child eat healthier could not be evaluated because almost all mothers (96.67%) responded yes to text message helpfulness.

Qualitative Data

When asked about whether a text message program would be feasible to receive obesity prevention messages, one mother shared text messaging *"is the best form of communication for me. That's just my preference. It's so much easier and quick[er]."* One

mom suggested quick messages on better eating habits would be helpful because *“I think the Hispanic community lacks knowledge.”*

The qualitative interviews found common reasons their child ate healthy including: to maintain good health, whether it be for physical or digestive reasons, to have energy for the day, to help them do well academically, to aid in their mind and body development, to setting healthy lifestyle choices early in life, and to benefit their overall health to live a long life.

In this study the common reason given by the parents during the qualitative phone interview to explain encouraging their child to eat healthily was: *“If I let my kids eat whatever they want they will not be healthy, they won’t eat healthy. I have to be the role model for them.”* Another mother suggested, *“If they don’t learn from you, then they’re just going to learn from what they see on TV or other people, and that’s how it’s going to start... once you’re addicted to soda and sweets, it’s downhill from there.”* Additionally, a mother provided a personal reason into the importance of encouraging healthy eating by providing a personal story. She said, *“To me, it’s important because I’ve been overweight most of my adult life and it’s always a struggle trying to lose the weight. What I tell my daughter is if you work on it now, you know, that won’t be a struggle you have as an adult. Because you’ll set yourself up for watching what you eat and being active.”* Most mothers share the mutual feelings of, *“I’m the one either preparing or purchasing the food, so she’s got to eat whatever I cook”* and, *“my kids eat whatever I cook.”* One mother even said she has a lot of control, *“Because I’m the mom... I’m the boss. I control what she eats.”* Those that mentioned they had some control over what their child eats mentioned they are not always

with their child, especially when they are at school. One mother mentioned, *“I’m not standing over her watching.”*

DISCUSSION

This study investigated the FTS data and revealed Hispanic parents are interested in mHealth obesity prevention interventions for their child. The mothers of this study had phones, text message capability, and were compliant. These findings indicate the feasibility of this methodology because parents who participated in this study have access to the needed technology, are familiar with texting, and agree texting would be an acceptable child obesity prevention method. Although the proposed relationship between the parents knowledge of fruit and vegetable required servings and the parent’s reported child consumption of fruit and vegetables was not significant, the study revealed the lack of parent knowledge surrounding the appropriate servings of fruits and vegetables, as well as, their lack of knowledge on ways to incorporate fruits and vegetables into meals and snacks. This suggests that child obesity prevention interventions directed towards parents should include a focus on the amount of fruits and vegetables recommended for 8-12 year old girls, as well as a focus on knowledge and skill regarding how to incorporate fruits and vegetables into meals and snacks in ways likely to appeal to pre-adolescent children.

Swindle et al. (2014) found 80.6% of the low-income population (19.5% Hispanic) in their study texted daily. This percentage is lower than the 100% reported in this study. This may be due to race, ethnicity, phone plan availability at the time, and the requirement for the FTS to have a phone with text message ability. In the FTS, all but one mother perceived text message tips may be useful in helping their child eat healthier because they would provide

quick, motivational, tips on sample sizes, recipes tailored for kids, recipes for lunch boxes, healthy meal, and snack ideas, and healthy eating tips. The desire to gain more knowledge in preparing healthier food in this study is similar to the majority interest (73%) of mothers in 2014 agreeing they were interested in knowing how to prepare fruits and vegetables in different ways (PBH, 2014).

Although there was no statistically significant association between Hispanic mothers' beliefs about their child's daily fruit and vegetable servings and parent-reported child daily consumption of fruit and vegetables, survey results were supported by the qualitative data and provide insight into the reasoning behind the selection of each survey answer choice. For example, those preparing meals with vegetables and fruits often had a routine meal structure for how they packed lunch and made dinner to include these foods. Types of methods or systems the mother used included a fruit with every packed lunch or vegetable at dinner every day. Smith et al. (2015) found that parents of 9 to 18-year-old children served fruit most frequently as a snack during the day (52%) and vegetables as a snack during the day (22%), but not in the mornings.

Children often do not meet the national recommendation for fruits and vegetables (Moore, Thompson, & Demissie, 2017). Therefore, it is not surprising that most mothers in the FTS reported their child consumed 1-2 servings of fruits and vegetables a day. However, mother's did indicate they did not know how much their child consumed or were not sure. The low intake of fruits and vegetables is consistent with what parents in other studies have reported for their children. For example, almost all Hispanic parents in the Lilo, Munoz, & Cruz (2018) study stated their child ate less than 5 fruit and vegetable servings a day, the

national recommendation. It is also consistent with child self-reported fruit and vegetable intake. In Texas, children in the fourth-grade consumed fruits and vegetables 3.2 times a day (School Physical Activity and Nutrition Survey, 2016). Matheson, Robinson, Varady, & Killen (2006) found Hispanic third, fourth, and fifth graders reported to have a maximum of 3.11 and 6.34 vegetable servings per day for fruits and vegetables, respectively. Some mothers in this study suggested 3-4 servings of fruits and vegetables sounded like a good number for children to eat daily 1-2 servings was not enough. Of note in this study, however, the parents reported being confused about the definition of a serving size. This same serving size confusion has been found among Hispanic parents when they were asked about daily fruit and vegetable recommendations in other studies (Lilo, Munoz, & Cruz, 2018). This suggests child obesity prevention interventions with parents should include a focus on serving size education.

There was no statistically significant association between the frequency with which mothers reported including fruits and vegetables in their child's meals or snacks with parent-reported child daily consumption of fruit and vegetables. Although the qualitative data suggested they include fruits and vegetables in their child's meals and snacks, pre-adolescent children are not with their parents throughout the day, due to school and other activities. Therefore, parents may not be fully aware of their child's daily dietary intake. Collecting dietary information directly from the child would be preferable. However, others have reported it is difficult for children, particularly 8 and 9-years old, to accurately recall what they consume (Baranowski et al., 2012), and there have been calls for more sensitive dietary recall methods to enhance accuracy (Livingstone & Robson, 2019). Given the limitations of

accurate dietary recall in children (Moore, Tapper, Moore, & Murphy, 2008), research to investigate ways to overcome these limitations using technology is needed (Jia, et al., 2019). Although there is still much work to be done in this mHealth area, continued research on methods for obtaining a more complete and accurate way to assess dietary intake among children is needed.

Mothers' food-related attitudes have been associated with child dietary intake. For example, Matheson, Robinson, Varady, & Killen (2006) found mothers' attitudes for making healthy food, particularly fruits, available were significantly positively associated with child's fruit consumption in Mexican American food-secure households. In this study, the association between Hispanic mothers' attitudes of the importance to eat healthy foods and their attitude to encourage healthy eating were not able to be assessed because all reported these were both important.

The relationship between Hispanic mothers' perception of control in what their child eats and their attitude to encourage healthy eating could not be assessed because all mothers reported it was very important for parents to encourage healthy eating in children. Similarly, Matheson, Robinson, Varady, & Killen (2006) found "pressure to eat," or the control a parent has over what their child eats, was significantly positively associated with vegetable consumption in Mexican American food secure households. In this study, mothers reported being in control of what their child consumes at home. This is consistent with findings by others that an authoritative parenting style is the second most common style reported among Hispanic mothers (Turner, Navuluri, Winkler, Vale, & Finley, 2014). It has been found that

children raised with an authoritative parenting style were more likely to make healthy food choices and have a lower BMI (Sleddens et al. 2012).

This study did have some limitations. First, data for some responses were the same for all mothers limiting the analyses. For example, 100% answered the same answer for the mothers' attitude towards encouraging healthy eating in children. Second, the data was collected from a small sample size in a limited geographic region. Therefore, generalizability of these findings to other parents and/or regions is limited. Thirdly, the data was self-reported thus there was no way to validate the answers provided. Additionally, the education level of the group was high, this is not reflective of the general population. Furthermore, health literacy was not addressed and may also be an issue for some. A more diverse study group is needed to know how an mHealth child nutrition intervention will work in the Hispanic population.

Strengths of the study include providing data from Hispanic mothers a population with children at risk of low intake of fruits and vegetables. The mothers were compliant to the study protocol and shared important data about their beliefs, knowledge and behaviors associated with fruit and vegetables and their child's intake. This study provides insight and adds value to the literature by exploring Hispanic mother's behaviors and attitudes for fruit and vegetable consumption in their children and their mother's beliefs for mHealth text message interventions regarding improving healthy eating for their children.

CONCLUSION

A vast majority of Hispanic mothers participating in this study agree text messages could help improve their child's dietary consumption and 100% of the mothers viewed encouraging healthy eating in a child as very important. These data support the inclusion of Hispanic mothers with children in future obesity prevention intervention utilizing mHealth technology because they do believe in this modality of intervention and strongly believe children need to eat healthy. Although the study population did not provide the ability to address all of the study questions, the results indicate some Hispanics are viable research participants to use mHealth and support healthy eating strategies. Further research should be done to identify why the Hispanic children do not eat fruits and vegetables using different types of measurement tools to determine the reasons. As well, mothers report needing help to know how to select and prepare fruits and vegetables their children will consume. Obesity is a serious concern among Hispanics and efforts need to focus to better understand the reasons for their food consumption patterns. Texting may be part of the solution for providing health promotion messages relevant for Hispanics.

Table 1 Demographics of Participants in the Family TXT Study, 2018 (n=30).

	<i>n</i>	<i>Percentage</i>
Age (years)		
40 and under	21	70%
Over 40	9	30%
Race		
White	23	76.7%
Mixed	4	13.3%
Other	3	10%
Marital Status		
Single	4	13.3%
Married	26	86.7%
Highest level of household education		
High school or GED	2	6.7%
Post-high school	15	50%
College graduate	9	30%
Post graduate study	4	13.3%
Children in household (<21 years)		
1	4	13.3%
2	10	33.3%
3	10	33.3%
>4	6	20%
Text-message capability		
Yes	30	100%
Text-message frequency		
Daily	30	100%
Mobile phone data plan		
Unlimited	26	86.7%
Limited	3	10%
I don't know	1	3.3%
Mobile phone texting plan		
Unlimited	27	90%
Limited	1	3.3%
I don't know	2	6.7%

Table 2 Descriptive Statistics of Nutrition-Related Survey Questions in the Family TXT Study, 2018 (n=30).

	<i>n</i>	<i>Percentage</i>
Child's daily consumption of fruit and vegetable servings		
1- 2	20	66.7%
3-5	10	33.3%
Frequency of fruit provided with meals daily		
Everyday	6	20%
5-6 days a week	5	16.7%
3-4 days a week	6	20%
1-2 days a week	10	33.3%
Rarely	2	6.7%
Frequency of vegetables provided with meals daily		
Everyday	4	13.3%
5-6 days a week	4	13.3%
3-4 days a week	11	36.7%
1-2 days a week	7	23.3%
Rarely	3	10%
Frequency of fruits and vegetables provided with snacks daily		
5-7 days a week	7	23.3%
3-4 days a week	6	20%
1-2 days a week	10	33.3%
Rarely	6	20%
Mothers beliefs of daily fruit and vegetable servings 8-12-year-old children need		
At least 2	7	23.3%
3-4	15	50%
5 or more	7	23.3%
I don't know	1	3.3%
Mother's perception towards importance of child eating healthy		
Very important	25	83.3%
Somewhat important	5	16.7%
Mothers attitude towards encouraging healthy eating in child		
Very important	30	100%
Mothers perception of control over child's eating habits		
A lot	22	73.3%
Some	8	26.7%
Mothers perception of usefulness of text message tips helping their child eat healthier		
Yes	29	96.7%
Not sure	1	3.3%

Table 3 Relationship of Participants Beliefs, Behaviors and Attitudes in the Family TXT Study, 2018

	<i>Fisher's Exact Test Statistic</i>
Parent reported child's daily consumption of fruit and vegetable servings & Mothers beliefs of fruit and vegetable servings for children	0.463
Parent reported child's daily consumption of fruit and vegetable servings & Frequency of fruit provided via meals to child daily	0.824
Parent reported child's daily consumption of fruit and vegetable servings & Frequency of vegetables provided via meals to child daily	0.195
Parent reported child's daily consumption of fruit and vegetable servings & Frequency of fruit and vegetable provided via snacks to child daily	0.163

References

- Anderson-Lewis, C., Darville, G., Mercado, R. E., Howell, S., & Di Maggio, S. (2018). mHealth technology use and implications in historically underserved and minority populations in the United States: Systematic literature review. *JMIR mHealth and uHealth*, 6(6), e128. doi:10.2196/mhealth.8383 [doi]
- Arora, S., Ford, K., Terp, S., Abramson, T., Ruiz, R., Camilon, M., . . . Burner, E. (2016). Describing the evolution of mobile technology usage for Latino patients and comparing findings to national mHealth estimates. *Journal of the American Medical Informatics Association : JAMIA*, 23(5), 979-983. doi:10.1093/jamia/ocv203 [doi]
- Baranowski, T., Islam, N., Baranowski, J., Martin, S., Beltran, A., Dadabhoy, H., . . . Subar, A. F. (2012). Comparison of a web-based versus traditional diet recall among children. *Journal of the Academy of Nutrition and Dietetics*, 112(4), 527-532. doi:10.1016/j.jada.2011.10.002 [doi]
- Bender, M. S., & Clark, M. J. (2011). Cultural adaptation for ethnic diversity: A review of obesity interventions for preschool children. *Californian Journal of Health Promotion*, 9(2), 40.
- Bender, M. S., Nader, P. R., Kennedy, C., & Gahagan, S. (2013). A culturally appropriate intervention to improve health behaviors in Hispanic mother-child dyads. *Childhood Obesity (Print)*, 9(2), 157-163. doi:10.1089/chi.2012.0118 [doi]

Callender, C., & Thompson, D. (2018). Family TXT: Feasibility and acceptability of a mHealth obesity prevention program for parents of pre-adolescent African American girls. *Children (Basel, Switzerland)*, 5(6), 10.3390/children5060081. doi:E81 [pii]

Cameron, L. D., Durazo, A., Ramirez, A. S., Corona, R., Ultreras, M., & Piva, S. (2017). Cultural and linguistic adaptation of a healthy diet text message intervention for Hispanic adults living in the united states. *Journal of Health Communication*, 22(3), 262-273. doi:10.1080/10810730.2016.1276985 [doi]

Centers for Disease Control and Prevention (CDC). (2015). Hispanic Health. Retrieved from <https://www.cdc.gov/vitalsigns/hispanic-health/index.html>

Centers for Disease Control and Prevention (CDC). (2016). Prevalence of Overweight and Obesity Among Children and Adolescents Aged 2–19 Years: United States, 1963–1965 Through 2013–2014 Retrieved from https://www.cdc.gov/nchs/data/hestat/obesity_child_13_14/obesity_child_13_14.pdf

Centers for Disease Control and Prevention (CDC). (2017a). Obesity and Overweight. Retrieved from <https://www.cdc.gov/nchs/fastats/obesity-overweight.htm>

Centers for Disease Control and Prevention (CDC). (2017b). Prevalence of Obesity Among Adults and Youth: United States, 2015–2016. Retrieved from <https://www.cdc.gov/nchs/data/databriefs/db288.pdf>

Centers for Disease Control and Prevention (CDC). (2017c). Table 58. Normal weight, overweight, and obesity among adults aged 20 and over, by selected characteristics: United States, selected years 1988–1994 through 2013–2016 Retrieved from <https://www.cdc.gov/nchs/hus/contents2017.htm#058>

Centers for Disease Control and Prevention (CDC). (2018). Adult Obesity Facts. Retrieved from <https://www.cdc.gov/obesity/data/adult.html>

Fischer, H. H., Fischer, I. P., Pereira, R. I., Furniss, A. L., Rozwadowski, J. M., Moore, S. L., . . . Havranek, E. P. (2016). Text message support for weight loss in patients with prediabetes: A randomized clinical trial. *Diabetes Care*, *39*(8), 1364-1370. doi:10.2337/dc15-2137 [doi]

Gertner, E. J., Sabino, J. N., Mahady, E., Deitrich, L. M., Patton, J. R., Grim, M. K., . . . Salas-Lopez, D. (2010). Developing a culturally competent health network: A planning framework and guide. *Journal of Healthcare Management / American College of Healthcare Executives*, *55*(3), 190-204; discussion 204-5.

Haines, J., McDonald, J., O'Brien, A., Sherry, B., Bottino, C. J., Schmidt, M. E., & Taveras, E. M. (2013). Healthy habits, happy homes: Randomized trial to improve household routines for obesity prevention among preschool-aged children. *JAMA Pediatrics*, *167*(11), 1072-1079.

- Jia, W., Li, Y., Qu, R., Baranowski, T., Burke, L. E., Zhang, H., . . . Sun, M. (2019). Automatic food detection in egocentric images using artificial intelligence technology. *Public Health Nutrition*, 22(7), 1168-1179.
doi:10.1017/S1368980018000538 [doi]
- Krebs, P., & Duncan, D. T. (2015). Health app use among US mobile phone owners: A national survey. *JMIR mHealth and uHealth*, 3(4), e101. doi:10.2196/mhealth.4924 [doi]
- Lilo, E. A., Munoz, M., & Cruz, T. H. (2018). Perceptions of healthy eating among Hispanic parent-child dyads. *Health Promotion Practice*, , 1524839918761866.
doi:10.1177/1524839918761866 [doi]
- Livingstone, M. B. E., & Robson, P. J. (2000). Measurement of dietary intake in children. *Proceedings of the Nutrition Society*, 59(2), 279-293.
doi:10.1017/S0029665100000318
- Matheson, D. M., Robinson, T. N., Varady, A., & Killen, J. D. (2006). Do Mexican-American mothers' food-related parenting practices influence their children's weight and dietary intake? *Journal of the American Dietetic Association*, 106(11), 1861-1865.
doi:S0002-8223(06)01828-1 [pii]
- Moore, G. F., Tapper, K., Moore, L., & Murphy, S. (2008). Cognitive, behavioral, and social factors are associated with bias in dietary questionnaire self-reports by schoolchildren

aged 9 to 11 years. *Journal of the American Dietetic Association*, 108(11), 1865-1873.
doi:10.1016/j.jada.2008.08.012 [doi]

Moore, L. V., Thompson, F. E., & Demissie, Z. (2017). Percentage of youth meeting federal fruit and vegetable intake recommendations, youth risk behavior surveillance system, united states and 33 states, 2013. *Journal of the Academy of Nutrition and Dietetics*, 117(4), 545-553.e3. doi:10.1016/j.jand.2016.10.012

Morgan D. (1998). *Planning Focus Groups: Focus Group Kit #2*. Sage Publications, Inc. Thousand Oaks, CA, USA.

Nour, M., Chen, J., & Allman-Farinelli, M. (2016). Efficacy and external validity of electronic and mobile phone-based interventions promoting vegetable intake in young adults: Systematic review and meta-analysis. *Journal of Medical Internet Research*, 18(4), e58. doi:10.2196/jmir.5082 [doi]

Patrick, K., Norman, G. J., Davila, E. P., Calfas, K. J., Raab, F., Gottschalk, M., . . . Covin, J. R. (2013). Outcomes of a 12-month technology-based intervention to promote weight loss in adolescents at risk for type 2 diabetes. *Journal of Diabetes Science and Technology*, 7(3), 759-770. doi:10.1177/193229681300700322 [doi]

Pew Research Center. (2011). *Latinos and Digital Technology, 2010*. PEW Internet & American Life Project. Retrieved from
<http://www.pewhispanic.org/2011/02/09/latinos-and-digital-technology-2010/>

Produce for Better Health Foundation (PBH). (2014). Moms' Attitudes and Beliefs Related to Fruit & Vegetable Consumption (2007-2014). Retrieved from

http://www.pbhfoundation.org/pdfs/about/res/pbh_res/MomReport2014_WEB.pdf

Shaw, R., & Bosworth, H. (2012). Short message service (SMS) text messaging as an intervention medium for weight loss: A literature review. *Health Informatics Journal*, 18(4), 235-250. doi:10.1177/1460458212442422 [doi]

Schneider, M., Hall, W. J., Hernandez, A. E., Hindes, K., Montez, G., Pham, T., ...

HEALTHY Study Group (2009). Rationale, design and methods for process evaluation in the HEALTHY study. *International journal of obesity (2005)*, 33 Suppl 4(Suppl 4),

S60–S67. doi:10.1038/ijo.2009.118

Sleddens, E. F., Gerards, S. M., Thijs, C., de Vries, N. K., & Kremers, S. P. (2011). General parenting, childhood overweight and obesity-inducing behaviors: A

review. *International Journal of Pediatric Obesity: IJPO: An Official Journal of the International Association for the Study of Obesity*, 6(2-2), e12-27.

doi:10.3109/17477166.2011.566339 [doi]

Smith, T. M., Pinard, C. A., Byker Shanks, C., Wethington, H., Blanck, H. M., & Yaroch, A.

L. (2015). *Fruits and vegetables as a healthier snack throughout the day among families with older children: Findings from a survey of parent–child*

*dyads*doi:<https://doi.org/10.1016/j.eatbeh.2015.01.006>

Student Physical Activity and Nutrition (SPAN) Survey. (2016). Child Obesity in Texas

SPAN Survey 2015-2016 Results. Retrieved from

<https://sph.uth.edu/research/centers/dell/assets/resources-images/span%20update%204.pdf>

Swindle, T. M., Ward, W. L., Whiteside-Mansell, L., Bokony, P., & Pettit, D. (2014).

Technology use and interest among low-income parents of young children: Differences by age group and ethnicity. *Journal of Nutrition Education and Behavior*, 46(6), 484-490. doi:10.1016/j.jneb.2014.06.004 [doi]

Taveras, E. M., Marshall, R., Sharifi, M., Avalon, E., Fiechtner, L., Horan, C., . . . Slater, D.

(2017). Comparative effectiveness of clinical-community childhood obesity interventions: A randomized clinical trial. *JAMA Pediatrics*, 171(8), e171325. doi:10.1001/jamapediatrics.2017.1325 [doi]

Tripicchio, G. L., Ammerman, A. S., Neshteruk, C., Faith, M. S., Dean, K., Befort, C., . . .

Davis, A. (2017). Technology components as adjuncts to family-based pediatric obesity treatment in low-income minority youth. *Childhood Obesity (Print)*, 13(6), 433-442. doi:10.1089/chi.2017.0021 [doi]

Turner, B. J., Navuluri, N., Winkler, P., Vale, S., & Finley, E. (2014). A qualitative study of

family healthy lifestyle behaviors of Mexican-American and Mexican immigrant fathers and mothers. *Journal of the Academy of Nutrition and Dietetics*, 114(4), 562-569. doi:10.1016/j.jand.2013.12.010 [doi]

Turner, T., Spruijt-Metz, D., Wen, C. K., & Hingle, M. D. (2015). Prevention and treatment of pediatric obesity using mobile and wireless technologies: A systematic review. *Pediatric Obesity, 10*(6), 403-409. doi:10.1111/ijpo.12002 [doi]

World Health Organization. (2018). Global Strategy on Diet, Physical Activity and Health.

Retrieved from https://www.who.int/dietphysicalactivity/childhood_consequences/en/