

Developing and Testing Nutrition Messages for Asian Indian Mothers

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Abstract

Objective: To develop and test nutrition messages for Asian Indian mothers addressing eight feeding behaviors likely to influence children's dietary intake and weight.

Methods: Based on the previous research, nine nutrition education messages were adapted from those developed by the United States Department of Agriculture and 29 new messages were developed. Cognitive response testing was conducted with ten immigrant Asian Indian mothers of children ages 5-10 years to evaluate core and supporting messages. Comprehensibility, agreement with, and feasibility of acting on nutrition messages was assessed during the cognitive interviews. Content analysis of the data was conducted by generating common themes, organizing the themes in display matrix, and quantifying the responses.

Results: The resulting 38 core and supporting messages for eight feeding behaviors were categorized into three groups: 1) Mealtime environment (family meals, TV viewing while eating, and parental modeling of health eating), 2) Availability and accessibility of healthy food at home, and 3) Controlling child feeding behaviors (restricting consumption of certain food, offering food rewards for finishing meal, and pressuring to eat). Mothers were receptive to 31 messages, with minor revisions made to five messages to improve clarity and increase acceptability. Two messages that received strong negative responses were deemed inappropriate for this population.

Conclusion: Nutrition professionals working with Asian Indian families may use the final messages in education materials to help mothers practice feeding behaviors conducive to healthy eating and overweight prevention in their children. Future research is needed to test the efficacy of these nutrition messages, within a nutrition education curriculum or program, on behavior change in Asian Indian mothers.

Keywords: Parental feeding behaviors; Nutrition education; Asian Indian

Introduction

In the past ten years, the Asian population has grown significantly, at a rate of 43.3%. In 2010, 17.3 million people in the United States (US) were Asian (Asian alone or in combination with one or more races), representing 5.6% of the total US population. Among Asians, the Asian Indian (AI) population is one of the rapidly growing immigrant populations in the US. The AI population has increased by 68% from 2000 to 2010 and represents the 3rd largest Asian immigrant group, followed by Chinese American and Filipino American [1].

Studies have shown that the rates of overweight and obesity increase among immigrants upon migration to the US [2,3]. While obesity rates for AI children are low compared to other Asian ethnic groups [4], current research suggests that obesity rates among AI immigrants in the US are significantly higher compared to the native population living in India [3]. The risk of obesity for AI immigrants increases with length of stay in the US. Furthermore, obesity risk is higher for US born AI than immigrants [2]. With the rapid growth of this population, the proportion of overweight AI children will increase as more AI children are born and raised in the Westernized culture, resulting in a need to target obesity prevention efforts to this group.

Among several factors that contribute to childhood obesity, parental feeding behaviors have a significant impact on children's weight and dietary intake [5-7]. Literature suggests a wide range of feeding behaviors that affect the amount and type of food children eat. Eight feeding behaviors in particular have been shown to positively or negatively influence children's eating outcomes: family meals, parental modeling of healthy eating, making healthy food available and accessible, TV viewing while eating, and controlling feeding behaviors- such as pressuring children to eat, rewarding children with food, and restricting children's consumption of certain foods. Regular family meals are associated with improved dietary intake and lower risk of overweight and disordered eating [8]. Family meals also provide an opportunity for parents to model eating healthy food, which has been shown to increase

children's consumption of such food [6]. Making healthy food available and accessible at home can have a significant effect on children's preference for and intake of such food [6]. On the contrary, studies suggest watching TV while eating may disrupt the ability to regulate energy intake and promote overeating [9-11]. Similarly, controlling behaviors are believed to have harmful impact on children's dietary intake by overriding children's innate internal hunger and satiety cues, resulting in eating problems and overweight [6]. Primary school-aged children begin to have more interactions around food outside the home, for instance in school or after-school settings or with peers. However, they are still very reliant on parental preparation and provision of snacks and meals within the home. Therefore, this age is an important one in which the role of parental interactions with the emerging autonomy of their children should be addressed [12]. Given the significant impact on children's eating and weight status [6,7], a focus on these feeding behaviors could result in successful interventions targeted toward parents to promote healthy eating and to prevent obesity in their school aged children [13].

Our previous research has shown that AI mothers use controlling feeding behaviors. In addition, they let children watch TV while eating as a means to covertly control children's food intake. This is a behavior reported for the first time that could pose a threat to children's eating and weight outcomes in the future. Furthermore, AI mothers' practice of certain feeding behaviors is strongly driven by unique cultural beliefs. For example, extensively pressuring children to eat is related to the strong religious belief of avoiding food waste. Our findings suggested that AI mothers lack appropriate and effective feeding strategies and may benefit from nutrition messages that are culturally sensitive and specifically targeted toward this group [14].

The United States Department of Agriculture (USDA) and Food and Nutrition Service developed and tested nutrition messages to be used in federal nutrition assistance programs to address low-income mothers' feeding behaviors [15]. These messages were developed based on focus group discussions with low-income Caucasian, African American, and Mexican American mothers, and it is unknown whether these messages are appropriate for AI mothers. Furthermore, these messages do not address some of the feeding behaviors we have found which are unique to the AI population [14].

The aim of this study was to develop and test culturally appropriate nutrition education messages for AI mothers of children ages 5-10 years. The goal of these nutrition messages is to help AI mothers identify and practice feeding behaviors that are conducive to healthy eating, and therefore overweight prevention, in their children. This article describes the process of developing nutrition messages related to eight feeding behaviors, as well as the results of testing the messages with the target population.

Methods

Prior to this study, a formative assessment was conducted using a qualitative approach to identify the key factors that influence AI mothers' practice of feeding behaviors [14]. The formative assessment was informed by the Theory of planned behavior (TPB) [16]. According to TPB, behavior and behavioral intentions are influenced by people's underlying beliefs about expected outcomes of a behavior, their perceived control over the particular behavior, and social norms [17]. Using the TPB we identified beliefs about expected outcomes of feeding behaviors, and perceived behavioral control, or perceived barriers and facilitators likely to influence AI mothers' practice of each feeding behavior. Social norms were not identified as significant factors in feeding behaviors.

Based on our formative work, the current study used a two-step approach to develop and test nutrition messages for AI mothers.

Step 1: Message Development

Based on the beliefs about expected outcomes, barriers and facilitators identified during the formative assessment, nine messages developed by the USDA were found appropriate with minor modifications for testing with AI mothers, e.g. "vegetables" replaced the word "veggies" in messages due to preference of the AI mothers. To address beliefs about expected outcomes, barriers, and facilitators related to feeding behaviors that were unique to AI mothers and not found within existing USDA messages, we created 29 new messages. This resulted in 38 messages for the eight feeding behaviors to be used in testing. The new messages were developed to follow a format similar to the USDA messages, consisting of: 1) core messages and 2) supporting messages. For each feeding behavior, a core message for a given behavior was created by incorporating AI mothers' beliefs about an outcome of a behavior with a recommendation for an appropriate action. In this way, the core message asked the audience to take an appropriate action for a given feeding behavior and provided the incentives or reasons linked to the action. The supporting messages provided information to ease the barriers related to feeding behaviors, thus making the behavior easy and feasible to practice.

The reading level of the messages was determined using the simple measure of gobbledygook (SMOG) formula [18]. The average readability score of the messages ranged from 5th to 6th grade reading level. Draft messages were created and revised after being reviewed by experts in the field of health behavior change, nutrition education, and health communication.

Step 2: Message Testing

One-on-one in-depth interviews were conducted to determine how AI mothers understand and respond to the nutrition messages. Mothers who participated in the formative assessment [14] were invited to take part in these interviews. Prior to interviews, informed written consent was obtained. Participants also completed a demographic questionnaire and the Suinn-Lew Asian Self-

Identity Acculturation Scale (SL-ASIA) [19] to measure their acculturation level. The scale is comprised of 21 multiple choice questions to assess language, identity, friendship choice, behaviors, generation and geographic history, and attitudes. Each item is rated on a five-point scale. The final acculturation score ranges from 1 (low acculturation) to 5 (high acculturation).

The interviews were conducted by the first author (SM) with ten AI immigrant mothers of children ages 5-10 years using cognitive response testing [20]. According to the Information Processing Model of McGuire [21], a message is effective and could lead to behavior change when the intended recipient is able to comprehend the information and agree/accept (yield to) the outcomes being presented. Furthermore, we also wanted to test if the recommendations provided in the messages were easy and feasible to practice. A semi-structured interview guide was therefore used to test the following three aspects of the messages: comprehensibility, agreement with the information, and feasibility of acting on the message. A concurrent verbal probing technique [20] was used, with the participant shown one message at a time and concurrently asked questions pertaining to that message to capture her responses. First, the participant was asked to comprehend the meaning of the message by summarizing the message in her own words. Next, she was asked to express words and phrases that would make the message clearer and easier to understand. The participant was then asked how much she agreed with and trusted the information. Finally, feasibility was determined by asking the participant if it would be easy or hard for her to follow the recommendations provided in the message. When testing different ideas in core messages for a given feeding behavior, participants were asked to rank the messages based on their preferences.

The interviews lasted an average of fifty minutes. The sample size was determined by saturation of responses, i.e. the point at which no new responses were obtained. Response saturation was obtained after conducting 8 interviews; however, 2 additional interviews were conducted to ensure saturation had been reached.

The interviews were audio-recorded and notes were taken during the interview. Content analysis of the data was performed in the following steps [22]. First, the transcripts and written notes were qualitatively analyzed and coded by the first author (SM) to identify common themes related to participants' responses for each of the three aspects of a given message. Second, a conceptually clustered matrix [23] was created with the aspect of message being studied on the x-axis and participants on the y-axis. Next, a careful coding of transcripts was followed by filling the matrix cell with the summary of themes for each participant. This was done for all the messages tested. Lastly, these matrices were analyzed and responses were manually quantified to evaluate the extent of agreement and disagreement to a message, preference to a message, coverage of specific themes related to comprehension, and feasibility of practicing the message across all participants. Based on the analysis, the messages were left unchanged, revised to address the issues of ambiguities and disagreements, or deemed inappropriate for this target group.

This study was approved by the Institutional Review Board at Michigan State University. Participants were provided with a \$20 gift card as reimbursement for their participation.

Results

The average acculturation score was 2.05 (from a possible score of 1 to 5) and ranged from 1.38 to 2.85, reflecting a high Asian identification of the participants. The mean age of participants was 35.8 years (range 29 to 42 years) and the average number of years they had lived in the US was 10 years (range 2 to 39 years). Participants were highly educated, with 60% having a graduate or a professional degree and the rest having a bachelor's degree. About 40% of the participants were employed full time and 30% were homemakers. Others were either employed part time (10%) or were students (20%). Annual household income was higher than \$60,000 for 90% of the participants.

The 38 messages were categorized for each feeding behavior and divided into three groups: 1) mealtime environment (Table 1), 2) availability and accessibility of healthy food at home (Table 2) and 3) controlling child feeding behaviors (Table 3). Core messages are indicated by C and supporting messages by an S. Out of 38 total messages, 31 messages (6 from USDA) received consistent positive reactions (one message received mixed responses) and were retained without any modifications. We determined five messages (1 from USDA) needed minor revisions to address the issues of ambiguity and agreement. These revisions were made based on comments provided by the mothers. Two messages (both from USDA) were deemed inappropriate due to poor acceptability of these messages with this target audience.

Mealtime Environment

Family meals (Fm): Although, all core messages addressing the importance of family meals were well accepted (Table 1), the message "when you eat together, your kids can see and get to know the foods your family enjoys" (FmC1) was most preferred among all core messages. The mothers liked incorporating the ideas of exposing children and making them familiar with family foods in one message. The first two supporting messages (FmS1 and FmS2) were well received by mothers. However, they felt that the supporting message "Family meals are possible when everybody is in it together" (FmS3) was ambiguous. They needed more information on how "kids can be great help" in making family meals possible. This message was revised by adding tasks mothers suggested were safe for children to perform and would get them involved in making family meals. The message "Do some tasks a day before" (FmS4) was also revised to clarify that the recommendation applies to meal preparation.

Message number ^a	Message	Participants' response
Behavior Fm: Family Meals		
FmC1	When you eat together, your kids can see and get to know the foods your family enjoys.	Well accepted
FmC2	Eat together. Your kids will learn to eat the foods your family enjoys.	Well accepted
FmC3	Family meals are a great time to talk to your child about health and nutrition.	Well accepted
FmS1	You may not be able to eat together every day. Try to eat dinner together on weekdays or breakfast and lunch during weekends.	Well accepted
FmS2	Involve kids in making meals. Allow your kids to wash fruits and vegetables, mix ingredients, and open packages. Kids like to eat foods they help prepare.	Well accepted
FmS3	<i>Original:</i> Family meals are possible when everybody is in it together. Your spouse and kids can be a great help. <i>Revised:</i> Sometimes family meals are possible when your spouse and kids help. Kids can help with some tasks like setting the table, picking up dishes, and tossing salad.	Needed Revision ^b
FmS4	<i>Original:</i> Do some tasks a day before. Wash and cut vegetables. Have roti dough ready in fridge. Soak lentils the night before or use a slow cooker. <i>Revised:</i> Save some time during making a meal by doing some tasks a day before. Have roti dough ready in fridge. Soak lentils the night before or use a slow cooker.	Needed Revision
Behavior Tv: TV Viewing and Eating		
TvC1	Turn off the TV! Your kids will pay more attention to what and how much they eat.	Well accepted
TvC2	Turn off the TV! When your kids focus on food, they learn to like the taste of food.	Well accepted
TvS1	Set rules of not watching TV during mealtime or snack time in your family when the kids are young. This way, it does not become a habit.	Well accepted
TvS2	Be good role models. Avoid watching TV during mealtime or snack time.	Well accepted
TvS3	Kids like to watch TV while eating when they are eating alone. Try to eat meals and snacks with your kids.	Well accepted
Behavior Mo: Parental Modeling of Healthy Eating		
MoC1	Want your kids to eat new foods? Eat them yourself and your kids will want to try them too.	Well accepted
MoC2	Kids learn from watching you. Make sure you and your spouse eat fruits and vegetables and your kids will too. [Adapted from USDA] ^c	Well accepted
MoC3	When you enjoy a particular food, it shows your child that it is okay to try the food.	Well accepted
MoS1	Showing your dislike or making negative comments about a food in front of your child, teaches the child that the food is not good.	Well accepted
MoS2	It's normal for kids to be picky eaters. Help them increase the type of fruits and vegetables they like by being a good role model. [Adapted from USDA] ^c	Well accepted
MoS3	<i>Original:</i> Do not like a specific fruit or vegetable? Your kids could still have a good role model if your spouse enjoys that food. <i>Revised:</i> If one parent does not like a specific fruit or vegetable, your kids could still have a good role model when the other parent enjoys that food.	Needed Revision

^a The first two alphabets of message number represent the feeding behavior. The third alphabet represents core (C) or supporting (S) message, followed by a number to distinguish more than one message within the same section.

^b Revisions made to the original message based on the responses from the participants to address ambiguity and disagreements.

^c Already existing USDA message¹⁹ that reflected beliefs, barriers, or facilitators reported by AI mothers in the previous formative assessment has been modified by either adding new sentences or words to the part of the message.

Table 1: Nutrition messages related to mealtime environment

Message number ^a	Message	Participants' response
Behavior Av: Making Healthy Food Available at Home^b		
AvC1	Want your kids to eat healthy foods? Make sure you bring fruits and vegetables home.	Well accepted
AvC2	Keep lots of healthy foods at home. When your kids are at home, they will choose and eat from what's available.	Well accepted
AvC3	Let your kids be "produce pickers". Allow them to pick fruits and vegetables at the store. They will love to eat the foods they picked. [Adapted from USDA] ^c	Well accepted

Message number ^a	Message	Participants' response
Behavior Ac: Making Healthy Food Accessible		
AcC1	Want your kids to reach for a healthy snack? Make sure they can see cut fruits and vegetables when they open the refrigerator. [Adapted from USDA]	Well accepted
AcC2	<i>Original:</i> Keep fruits and vegetables where your kids can see them. Keep cut fruits and vegetables in clear plastic bags or boxes on a low shelf in the fridge. <i>Revised:</i> Keep cut fruits and vegetables where your kids can see them. Keep them in clear plastic bags or boxes on a low shelf in the fridge, or in a bowl on a table or kitchen counter.	Needed Revision ^d
AcC3	When your kids come home hungry, have healthy foods such as fruits and vegetables ready-to-eat. [Adapted from USDA]	Well accepted
AcS1	Kids love to dip fresh vegetables in low-fat ranch dressing. Store cut vegetables near their favorite dip on a low shelf in the fridge. [Adapted from USDA].	Well accepted
AcS2	Store cut fruits and vegetables in sealed plastic bags or airtight plastic boxes to keep them fresh.	Well accepted

^aThe first two alphabets of message number represent the feeding behavior. The third alphabet represents core (C) or supporting (S) message, followed by a number to distinguish more than one message within the same section.

^bThis section does not contain supporting message as the barriers in this section are addressed in 'Behavior Re: Restricting children's consumption of certain foods' due to a strong relationship between availability of food and restriction of food.

^cAlready existing USDA message19 that reflected beliefs, barriers, or facilitators reported by AI mothers in the previous formative assessment has been modified by either adding new sentences or words to the part of the message.

^dRevisions made to the original message based on the responses from the participants to address ambiguity and disagreements.

Table 2: Nutrition messages related to food availability and accessibility at home

Message number ^a	Message	Participants' response
Behavior Re: Restricting Consumption of Certain Food		
ReC1	Having junk foods that the kids are not allowed to eat makes the food more tempting. Instead, make healthy snacks available for your kids.	Well accepted
ReC2	Concerned about children eating too much unhealthy food? Try to buy such foods in small amounts only.	Well accepted
ReS1	Stack your pantry with healthy snacks such as cereal bars, nuts, and dry fruits for the kids to choose from.	Well accepted
ReS2	Buy healthier snacks such as baked instead of fried chips or oatmeal instead of chocolate chip cookies.	Well accepted
Behavior Rw: Rewarding with Food		
RwC1	Reward with praise, not food. Teach your child all foods are good by praising them for trying new foods.	Well accepted
RwC2	Reward your kids with things other than food. When you promise a sweet or dessert for finishing the food, your child thinks that sweets or desserts are better than other foods.	Well accepted
RwS1	Let your kids earn points or stickers towards something they value instead of offering sweets or desserts.	Well accepted
RwS2	Instead of dessert, offer to do activities with your child such as reading a story book, doing a coloring activity, or letting your child choose a special outing.	Well accepted
Behavior Pr: Pressuring to Eat		
PrC1	Patience works better than pressure. Offer choices and a variety of healthy foods. Let your kids choose what to eat. Kids enjoy a food when eating is their own choice. [Adapted from USDA] ^b	Inappropriate
PrC2	Patience works better than pressure. Offer choices and a variety of healthy foods. Let your kids choose how much to eat. Kids will eat the right amount when eating is their own choice. [Adapted from USDA]	Inappropriate
PrS1	Sometimes new foods take time. Kids do not always like new foods right away. Offer one new food at a time. Offer new food many times. Tell them to taste at first and be patient with them. [Adapted from USDA]	Well accepted
PrS2	<i>Original:</i> Help your kids learn not to waste food. Let your kids serve themselves at mealtime. Teach them to take small amounts at first. Tell them they can have more if they are still hungry. [Adapted from USDA] <i>Revised:</i> Help your kids learn not to waste food. Serve them small amounts at first. Tell them they can have more if they are still hungry. [Adapted from USDA]	Needed Revision ^c

^a The first two alphabets of message number represent the feeding behavior. The third alphabet represents core (C) or supporting (S) message, followed by a number to distinguish more than one message within the same section.

^b Already existing USDA message19 that reflected beliefs, barriers, or facilitators reported by AI mothers in the previous formative assessment has been modified by either adding new sentences or words to the part of the message.

^c Revisions made to the original message based on the responses from the participants to address ambiguity and disagreements

Table 3: Nutrition messages related to controlling child-feeding behaviors

TV viewing while eating (Tv): All core and supporting messages about not letting children watch TV while eating (Table 1) received strong and consistent positive reactions from the mothers. When asked about their preference for core messages, the message “Your kids will pay attention to what and how much they eat” (TvC1) was preferred by most mothers over the message that stressed kids will like the taste of food (TvC2).

Parental modeling of healthy eating (Mo): Although all three core messages for modeling healthy eating behaviors (Table 1) were well accepted, the message “Want your kids to eat new foods?” (MoC1) suggesting parental modeling to encourage children to eat new foods was most preferred among the three core messages. The supporting message (MoS1) suggesting the effects of making negative comments and showing dislike for a particular food, was very appealing since almost every mother had experienced instances where parents’ negative comments about a food had adversely influenced children’s liking for that food. Although all supporting messages (MoS1, MoS2, and MoS3) were well received by mothers, the message suggesting that “if food likes and dislikes are counter balanced by both parents, parental modeling could still be practiced” (MoS3) was ambiguous to some mothers. The mothers were initially unsure to who the message was referring to (e.g. child or mother). This was clarified with a revision.

Availability and Accessibility of Food at Home

Availability of healthy food at home (Av): Although mothers agreed with both core messages recommending making healthy food available at home (Table 2), they liked and preferred the first message that phrased the outcome as a question: “Want your kids to eat healthy foods?” (AvC1) versus directly stating the outcome: “When kids are home, they will choose and eat from what’s available” (AvC2). Core message 3 (AvC3) was also well accepted by mothers. The mothers felt that the availability of “unhealthy” or “junk” food at home was a major barrier to children’s consumption of healthy food. However, some mothers expressed reluctance to avoid having some unhealthy food (e.g. junk food or treats) in their homes, even though they knew their children would then prefer those foods to healthier options available. Therefore, these mothers reported a lower preference for the latter message “Keep lots of healthy foods...when kids are home, they choose and eat from what’s available” (AvC2).

Accessibility of healthy food at home (Ac): While both core messages (AcC1 and AcC2) addressing accessibility of fruits and vegetables (Table 2) were well accepted, mothers had a stronger preference for “Keep fruits and vegetable where your kids can see them” (AcC2). However, they also felt that fruits and vegetables could be kept in places other than the refrigerator such as the table or kitchen counter, where children can easily see them. This message was revised accordingly. The supporting message “Kids love to dip fresh vegetables in low-fat ranch dressing” (AcS1) received mixed responses. Some mothers agreed with the message, while others didn’t find the use of dip appropriate to their family. The message was retained without any modification for those to whom it was suited. A few mothers shared strong opinions about storing fruits and vegetables in cut form in response to the message “Store cut fruits and vegetables in sealed plastic bags.....” (AcS2). These mothers felt that when fruits and vegetables are cut they start losing freshness and important nutrients.

Controlling Child Feeding Behaviors

Restricting consumption of certain foods (Re): In previous interviews, AI mothers described alternatives to restricting children’s consumption of certain foods. They were divided in their beliefs – some mothers preferred to not buy foods they considered unhealthy (ReC1), while others felt it was appropriate to have small amounts of these foods at home for children to consume in limited amounts (ReC2). When testing both these ideas in two different messages (Table 3), the mothers showed a strong preference for either one or the other message. This suggested that both the messages be kept as a part of nutrition education. The supporting messages suggesting availability of healthy snacks for children to choose from (ReS1) and buying healthier versions of snacks (ReS2), intended to address the barrier of availability of unhealthy food, were also well accepted by all mothers.

Offering food rewards for finishing meal (Rw): The core messages about not using food as a reward for encouraging children to finish their meal (Table 3) were well received by the mothers, with higher preference given to the message “Reward with praise, not food” (RwC1) versus the message “Reward your kids with things other than food” (RwC2). Some mothers who were already rewarding their children with sweets for eating or finishing other foods felt that it would be hard for them to follow these recommendations. However, when testing the supporting content that provided ideas of using alternatives to food rewards, the mothers felt that it was feasible for them to follow the recommendations and were motivated to try the ideas provided in supporting messages (RwS1 and RwS2).

Pressuring to eat (Pr): The core message pressuring children to eat tested the concept of “division of responsibility” (Table 3) – offering a variety of healthy food choices and letting children choose ‘what’ and ‘how much’ to eat, in two different USDA adapted messages (PrC1 and PrC2). Most mothers showed a strong and consistent disagreement with the idea of offering variety and allowing children to choose what and how much to eat. The mothers expressed concern that they did not trust their children to eat enough and felt that it was their responsibility to decide how much their child would eat. The mothers also felt that it was not always possible for them to provide a variety of foods to their children for each meal. When a variety of foods were offered, the mothers felt that children should eat at least a small amount from all the varieties. As a result of lack of receptivity to this concept, these messages were deemed inappropriate for AI mothers.

One of the supporting messages tested the idea of “letting children serve themselves in small amounts” (PrS2) (taken from USDA) and “allowing for a second helping” tied to the concept of “helping children learn not to waste food”. This message was intended to reduce the pressuring behaviors of mothers by advising them to serve small portions of food. The mothers connected very well to this message. Our previous work found that wasting food is a major concern of AI mothers when feeding their children resulting in pressuring children to eat; this may have resulted in the receptivity to smaller portions as a way to address the concern on waste. Although the mothers were receptive to the idea of controlling portion size to avoid food waste, some mothers disagreed with letting children serve themselves (PrS2). Indian foods are mostly in the form of curry. Mothers felt that the children would make a mess if allowed to serve themselves. Some mothers also expressed fear of children hurting themselves if the food was too hot. This message was revised accordingly.

Discussion

This study developed nutrition education messages appropriate for use with AI mothers, starting with messages developed by the USDA and developing new messages based on the previous formative assessment conducted with this population. Therefore, the tested messages included USDA messages on topics of pressuring children to eat, food availability and accessibility at home, and parental modeling. In addition, we expanded the messages to include topics of particular concern for this population. For example, given the extent of TV viewing while eating in AI children and its harmful effects on children’s energy regulation and weight problems [9], five messages related to TV watching and eating were developed specifically for AI mothers. Although addressed by the USDA [24], all messages related to family meals were specifically developed for AI mothers taking into consideration their distinct beliefs about the benefits of family meals and meal preparations related to AI foods [14].

Nine out of 38 messages pertaining to food availability, food accessibility, parental modeling, and pressuring children to eat were adapted from the USDA messages. The majority of these messages used or adapted from the USDA were well accepted by AI mothers. Acceptance of these messages by ethnically diverse group of low-income mothers from the USDA focus groups as well as AI mothers in our study indicates that despite cultural differences, common beliefs and opinions exist regarding child feeding. However, there were differences in the views by these AI mothers about a few messages that were driven by strong cultural beliefs. For example, USDA’s message to control portion size suggests letting children serve themselves. While, this message was well accepted by low-income mothers from USDA focus groups [24], AI mothers did not agree with letting their children serve themselves due to the fear of children making a mess during mealtime or being burned by hot food. Previous research has shown that Asian parents continue to spoon feed their children until they are old enough to eat neatly and efficiently by themselves to prevent messy mealtimes and cleaning up after meals [25]. Another message aimed at enhancing children’s likelihood to choose fruits and vegetables that are accessible by serving them with low-fat ranch dressing (AcS1) was well accepted by low-income mothers [15]. Our study found that only half the mothers shared positive responses about this message since they liked the idea of providing “low-fat” ranch, which was perceived to be healthy. The other half of the mothers disagreed with message since they considered salad dressings and dips as traditional American foods and did not feel a need to have these foods in their homes. AI mothers may currently not be receptive to introducing western foods into their traditional Indian diet due to low acculturation. However, dietary patterns of immigrants change with acculturation resulting in incorporation of more western foods [26]. Such information could thus be helpful to mothers who are likely to incorporate American foods in their diet to do so in a healthy manner.

A few mothers did not believe in cutting fruits and vegetables in advance to preserve freshness and important nutrients. Although these issues emerged with very few mothers, it is still a barrier nutrition educators should consider with this population. Alternatively, educators could provide AI mothers with additional information on how to safely store cut fruits and vegetables for few days in a refrigerator without losing nutrients. To help mothers encourage children’s consumption of fruits and vegetables, the mothers could also be advised to allow fruits and vegetables that do not require cutting (e.g. banana, grapes, plums, baby carrots etc.) to be more accessible to children.

Similar to the responses obtained from low-income mothers from the USDA focus groups [24], AI mothers showed strong and consistent disagreement with the core messages that incorporated the concept of ‘division of responsibility’. Several researchers suggest using this concept in nutrition education and interventions targeted at mothers to help them reduce mother-child conflicts over eating while giving some control to both parents and children [27-29]. However, responses from this study, and focus group findings by USDA [24], suggest that mothers may not be receptive to this idea as presented. Another explanation of this concept is needed before mothers understand the application of this concept. An example is the strategies which may be used to reduce controlling feeding behaviors. One concept, used in this study and well received by the mothers, is to link mothers’ behavior (e.g. serving small portion of food) to their cultural beliefs (helping children avoid food wastage) as the main purpose of behavior. The low acceptance of the core messages for ‘pressuring to eat’ is a concern since this behavior is extensively used by AI mothers [14] and has been associated with impaired ability of children to regulate their own energy intake [6]. We would recommend that the culturally specific supporting messages developed and tested in this category, which are aimed at reducing pressuring behavior, still be used in nutrition education for AI mothers. These supporting messages provided alternative actions mothers could use to avoid pressuring without the core message wording that mothers struggled to accept.

Our study had limitations. Our sample was highly educated and had a high level of income. Therefore, although our study sample reflects the demographic characteristics of the target AI population in the US [30], the findings may not generalize to those AI populations with a lower socioeconomic status. In addition, due to our recruitment strategy and small sample from one geographic area, future research is needed to test these messages with a larger sample of AI mothers in more regions.

Conclusion

Testing of these messages demonstrated that the majority of the messages are culturally appropriate for AI mothers in terms of language, informational content, and feasibility of acting on the message. Other messages were revised to be suitable; only a few messages were so poorly received that they would not be acceptable in nutrition education for this group. In particular, encouraging mothers to accept the concept of 'division of responsibility' is challenging and future research needs to identify ways that could incorporate this concept in an appealing and culturally sensitive manner for AI mothers. It is possible that this concept would be better received within a nutrition education curriculum than it is received as a stand-alone message. In addition, further research is needed to evaluate the effectiveness of these messages incorporated in a nutrition education curriculum or program on behavior change with a large sample of AI mothers and using quantitative measures.

Integrating these messages into existing programs requires identifying appropriate communication channels. Nutrition educators can incorporate these messages into a theory-based intervention targeted for AI mothers in locations they frequent such as cultural centers. Other methods of reaching these mothers would be through online communication (videos) and integration of messages into newsletters and pamphlets distributed through AI religious centers, and schools and physician's offices located in areas with high density of AI population.

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