

# Evaluation of Messages to Promote Intake of Calcium-Rich Foods in Early Adolescents

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## Abstract

Parental practices influence intake of calcium-rich foods and beverages (CRFB) in adolescents. This study aimed to test two posters promoting such parental practices for comprehension, cultural and personal relevance, and ability to motivate parents to encourage CRFB intake. Interviews were conducted with 14 Hispanic and 6 Asian parents to evaluate two posters entitled “Good play starts with calcium” and “Strong families start with good nutrition.” Responses were reviewed for themes. For “Good play,” both racial/ethnic groups of parents understood the message to provide CRFB. Only Hispanics, however, recognized the connection between calcium and strong bones. For “Strong families,” both groups had difficulty understanding that foods pictured were calcium rich. Both posters were considered culturally and personally relevant; however, not all respondents indicated motivation to provide CRFB. Modifications are needed to emphasize the connection between images and taglines and calcium intake for use in a future intervention to improve CRFB-promoting practices.

## Introduction

Though osteoporosis is not considered a childhood disease, it may originate early in life, particularly during the age range of 10 to 13 years, during the period of peak bone acquisition (Fiorito, Mitchell, Smiciklas-Wright, & Birch, 2006; Matkovic, Goel, Badenhop-Stevens, Landol, Li, Ilich, Skurgor, M., Nagode, L.A., Mobley, S.L. Ha, E.J., Hangartner, & Clairmont 2005). As there is no cure for osteoporosis, preventative measures, particularly during childhood and adolescence, are key to preventing bone loss and degradation later in life. Adequate calcium intake during this time is necessary to reach and maintain optimum bone mineralization and density (Burrows, Baxter-Jones, Mirwald, Macdonald, & McKay, 2009; Fiorito et al., 2006; J.O. Fisher, Mitchell, Smiciklas-Wright, Mannino, & Birch, 2004; Huncharek, Muscat, & Kupelnick, 2008; Matkovic et al., 2005; Matkovic, Landoll, Badenhop-Stevens, Ha, Crncevic-Orlic, Li, & Goel, 2004; Vatanparast, Baxter-Jones, Faulkner, Bailey, & Whiting, 2005).

In the USA, intake of calcium-rich food and beverages (CRFB) declines during early adolescence (Larson et al., 2009; Moshfegh, Goldman, Ahuja, Rhodes, & LaComb, 2009). An analysis of data from 2001–2008 of the National Health and Nutrition Examination Survey (NHANES) found that early adolescents aged 9 to 18 years had the greatest incidence of not meeting their calci-

um requirements compared to other age groups (Wallace, Reider, & Fulgoni, 2013). Various factors led to the inadequate CRFB intake observed, including displacement of milk with soda, juices, sports drinks, and sugar-sweetened beverages (Frary, Johnson, & Wang, 2004; Hanson, Neumark-Sztainer, Eisenberg, Story, & Wall, 2005; Nielsen & Popkin, 2004), eating away from home (Briefel & Johnson, 2004; Cluskey, Edelfesen, Olson, Reicks, Auld, Bock, & Zaghloul, 2008), and perceptions, particularly of girls, that milk and other dairy products are unhealthy and fattening (Auld et al., 2002). While osteoporosis prevention and calcium promotion campaigns are often aimed at adult and elderly individuals, focusing on children and adolescents as at-risk populations may prove to be just as effective (Holmstrom, 2013; Lee, Lowden, Patmintra, & Stevenson, 2013; Tussing & Chapman-Novakofski, 2005).

Food and nutrient intake among adolescents are strongly influenced by socioenvironmental factors, with parents playing a key role in influencing calcium intake of youth (Auld et al., 2002; Cluskey et al., 2008; Monge-Rojas, Nunez, Garita, & Chen-Mok, 2002; T.A. Nicklas, 2003; Patrick & Nicklas, 2005; Reicks, Ballejos, Goodell, Gunther, Richards, Wong, Auld, Boushey, Bruhn, Cluskey, Misner, Olson, & Zaghloul, 2011). Family meal patterns, parental attitudes, and encouragement of consumption of CRFB are among the factors

that influence intake in youth (Cluskey et al., 2008; Larson, Story, Wall, & Neumark-Sztainer, 2006). Other feeding practices that have been shown to influence CRFB intake include making CRFB available, role modeling, and setting rules and expectations (Edlefsen, Reicks, Goldberg, Auld, Bock, Boushey, Bruhn, Cluskey, Misner, Olson, Wang, & Zaghoul, 2008; Olson, Chung, Reckase, & Schoemer, 2009; Reicks et al., 2011). CRFB intake also differs according to race and ethnicity and is based on the background and practices of the family, with certain racial/ethnic groups being particularly at risk of low intake (Larsson, Orsini, & Wolk, 2013; Nicklas Qu, Hughes, Wagner, Foushee, & Shewchuk, 2009; Novotny, Boushey, Bock, Peck, Auld, Bruhn, Gustafson, Gabel, Jensen, Misner, & Read, 2003). Several studies have demonstrated that Asian and Hispanic children, for example, have a lower overall median calcium intake compared to non-Hispanic white children (Cluskey, Wong, Richards, Ballejos, Reicks, Auld, Boushey, Bruhn, Misner, Olson, & Zaghoul, 2015; Moshfegh, Goldman, Ahuja, Rhodes, & LaComb, 2009; Novotny et al., 2003).

To address the problem of inadequate intake of CRFB in adolescents and inform the development of interventions, a previous study sought to understand the motivations underlying parenting practices to improve intake of CRFB in adolescents (Richards et al., 2014). The authors describe the motivations to perform three parenting practices (making CRFB available, role modeling, and setting rules and expectations for healthy intake), and note that messages focused on these practices and the motivators of child health benefits and parent emotional rewards should be developed (Richards et al., 2014). Based on these findings, a set of messages with accompanying images was created to promote the three aforementioned parental practices among Asian and Hispanic parents. Preliminary testing is needed to confirm whether the parental motivators and

benefits for each parenting practice featured are appropriately communicated to encourage CRFB intake of early adolescents. This study aimed to test the receptivity of parents to these messages with respect to comprehension, cultural and personal relevance, and potential to motivate parents to encourage CRFB intake in early adolescents, as well as obtain information on overall impressions of messages and suggestions for improvement.

## Methods

This study was conducted at three universities in three states—Minnesota, Oregon, and Utah—and utilized qualitative methods as part of a multistate research project. All research activities were approved by the institutional review board of each participating university.

### Message/Poster Development

The Elaboration Likelihood Model (ELM) guided message development as the underlying theoretical framework (Wilson, 2007). The ELM posits that personal relevance of messages is an important consideration in motivating individuals to act (Petty & Cacioppo, 1986). Ability to comprehend the message also plays a central role in determining whether individuals will process the message and subsequently alter behavior (Wilson, 2007). Thus, both motivating individuals about the topic and ensuring they are capable of understanding the message are key in achieving behavior change (Wilson, 2007).

Using the ELM as the guiding framework, one researcher created poster prototypes based on qualitative data previously collected from parents. Message/poster development was based on three parental factors (making CRFB available, role modeling, setting healthy expectations for CRFB intake) shown to be associated with CRFB intake and involved tailoring of messages to attitudes and characteristics of Asians and Hispanics. To cater to those with limited literacy, the posters relied



**Figure 1.** Good Play Starts With Calcium Poster



**Figure 2.** Strong Families Start With Good Nutrition Poster (Asian)



**Figure 3.** Strong Families Start With Good Nutrition Poster (Hispanic)

on images and metaphorical representation of messages. Messages were titled “Good play starts with calcium” and “Strong families start with good nutrition” (Figures 1–3).

### Participant Recruitment

A convenience sample of 20 parents (MN [n=5]; OR [n=12]; UT [n=3]) was recruited through fliers, email, word-of-mouth, personal contacts, and presentations at various sites, which included after-school programs, schools, community centers and faith-based groups. To be eligible for the study, participants had to be parents or guardians of 10–13 year olds, the primary food preparers/buyers of the household, self-report as either Hispanic or Asian, and able to speak and read English. Each parent provided consent for participation prior to the interview.

### Interviews

The goal of the interviews was to ensure that messages were comprehensible, culturally and personally relevant, and would motivate parents to encourage intake of CRFB in adolescents, as well as to gather information on impressions of the messages and suggestions for improvement. Interviews, which lasted about 15–20 minutes, were conducted with parents and/or caregivers in public and private settings, such as sports complexes, university meeting rooms, parks, community centers, libraries, and homes, dependent on the preferences of the parent.

A standard protocol for message testing was used at each site. Interviewers from each research team were trained on use of procedures to collect the qualitative data. Due to high population densities of certain racial/ethnic groups within the targeted regions, MN and UT research teams interviewed only Hispanic parents, while the OR team recruited both Hispanic and Asian parents. Researchers at each site recruited parents to evaluate 2 out of 3 messages related to calcium availability and intake (Figures 1–3). Both sets of parents were shown the same “Good play” poster (Figure 1). The “Strong families” posters catered to either

Asian (Figure 2) or Hispanic (Figure 3) parents and were presented to parents based on their racial/ethnic background. To maintain consistency across states regarding data collection, periodic meetings were held with principal investigators to ensure compliance with the protocol.

The interview guide was developed by members of the multistate team. Questions elicited information on comprehension of the messages, cultural and personal relevance, and motivation to encourage CRFB intake (Table 1). Further questions asked about the overall impression of the poster, including suggestions on how to improve posters. Individual institutions compensated parents with cash, gift certificates/cards, or promotional products (e.g. water bottles). All interviews were audio recorded, and each site compiled interview data and transcribed interviews verbatim.

### Qualitative Data Analysis

Results from all sites were compiled and two researchers (YM and JB) used the thematic analysis approach (Braun & Clarke, 2006; Miles, 1994) to code the transcripts. Responses pertaining to the three topic areas (comprehension, cultural and personal relevance, and ability to motivate parents to encourage CRFB intake) were open coded independently by parental race/ethnicity and poster. The two researchers then compared and discussed codes to determine recurring concepts and resolve any discrepancies. Common ideas were identified as themes by poster and ethnic group for each topic area.

**Table 1.** All Questions Posed in Interviews With Parents (n=20) of Adolescents

| Topic Area                                 | Items on Interview Guide  |
|--|---|
| <b>Comprehension</b>                       | What is this poster telling you to do?  |
| <b>Cultural Relevance</b>                  | Is this poster culturally acceptable to you? Why or why not?  |
| <b>Personal Relevance</b>                  | Is the information in this poster important to you personally, as a parent? Why or why not?   |
| <b>Motivation to encourage CRFB intake</b> | Would seeing this poster move/get you to do _____?<br><br>[Fill in this blank by referring to “Comprehension”— what they say it’s telling them to do.] (Probe: Are you already doing this?) |
| <b>Impression/Improvement</b>              | What do you like or dislike about this poster?<br><br>(Probe: How could we make this poster better? What about the pictures? What about the words?)   |

**Results**

*Demographics*

Of the 20 parents who participated in the study, 6 self-reported as Asian and 14 as Hispanic. Parents were between 31–40 years of age. The majority had completed some college degree or technical school, were not born in the USA, and had lived in the USA for more than 10 years.

*Interview Findings*

Themes and exemplifying quotations from interviews for each poster are shown in Tables 2 and 3.

Good Play Starts with Calcium

*Comprehension*

While this poster aimed to convey the message that CRFB are important to allow children to be active, and that activity promotes strong bones, most Asian parents did not note the connection between CRFB intake and strong bones, or the importance of activity. Only a few Asian parents commented on the depiction of sports and the importance of calcium to being active. Several Hispanic parents, however, made the connection between calcium intake and being active. Most Asian and Hispanic parents noted that CRFB were necessary in their children’s diets, but those who did not connect calcium and sports made more general statements about the need to eat healthy and encourage physical activity. A few Hispanic parents stated the poster reminded them of foods containing calcium and the importance of consuming CRFB.

*Cultural and Personal Relevance*

The majority of the Asian parents stated that the poster was culturally acceptable, particularly because soccer is universal. It was also educational to them in terms of what foods contain calcium. Hispanic parents reported that soccer is a popular pastime among Hispanic families. These parents said that foods pictured represented foods that everyone ate, so the message was not specific to one ethnic group. The poster was personally relevant because it was important to them for their children to be more active. Several Hispanic parents mentioned that they themselves are active and eat healthy so they would encourage the same type of lifestyle for their children. They stated

**Table 2.** Responses to the “Good Play Starts With Calcium” Message

| Topic Area (By ethnicity)                  | Themes  | Exemplifying Quotations   |
|--|---|---|
| <b>Comprehension</b>                       |   |   |
| Asian                                      | Foods pictured contain calcium                                    | “It shows the milk, orange juice, beans, and yogurt. I can see that they are rich in calcium.”  |
| Hispanic                                   | Foods pictured contain calcium                                    | “I need to include milk, juice with calcium.”   |
|  | Calcium needed for activity                                       | “I think it’s more toward if you are active then you need calcium.”   |
| <b>Cultural Relevance</b>                  |   |   |
| Asian                                      | Soccer is culturally relevant                                     | “Yes, it’s acceptable. My son is playing in a soccer team.”   |
| Hispanic                                   | Soccer is culturally relevant                                     | “Yeah. Soccer. It’s very Latino, it’s very common.”   |
| <b>Personal Relevance</b>                  |   |   |
| Asian                                      | Reminder to buy CRFB  | “Yes, it reminds me to buy those food to my children.”  |
|  | Informative to know sources of calcium                            | “The ball directly tells me that it is about sports and those food tell me about calcium.”  |
| Hispanic                                   | Reminder to buy CRFB  | “If I saw it at the market, it would remind me that I do need to include those foods...they still need the calcium.”                  |
|  | Goal setting for the family for healthy eating and exercise       | “One of my goals every year is to have healthy food and being active.”  |
| <b>Motivation to encourage CRFB intake</b> |   |   |
| Asian                                      | Already providing CRFB to family                                  | “I usually buy a lot of fruit and vegetables for my child, also calcium-rich juice, but not milk.”                                    |
|  | Motivation to buy/consume healthy food and CRFB                   | “The calcium is a big front...there’s also a clue about ‘calcium is an essential part of your healthy child’s everyday diet.’”        |
| Hispanic                                   | Already providing CRFB to family                                  | “...that my kids will be able to play sports and if they fall...I’ll be calmer because I know I already gave my son a glass of milk.” |
|  | Motivation to be active and to buy/ consume healthy food and CRFB | “We have to make sure our kids are active. Also, we need to feed them well. So it’s balanced.”  |
|  | Reminder of what foods have calcium                               | “It’s a reminder that there’s calcium in these foods.”  |

**Table 3.** Responses to the “Strong Families Start With Good Nutrition” Message

| Topic Area<br>(By ethnicity)               | Themes   | Exemplifying Quotations   |
|--|--|---|
| <b>Comprehension</b>                       |  |   |
| Asian                                      | Eat healthy, well-balanced meals   | “Again, healthy eating. A lot of vegetables.”   |
|  | Eat together as a family   | “It is family get-together, at least at mealtime.”  |
| Hispanic                                   | Eat healthy, well-balanced meals   | “There are fruits, veggies, protein in the meat, their juices, and I think their alimentation [elimination] is very well-balanced.”         |
|  | Eat together as a family   | “And to me is very important that they are showing how they are spending time together as a family.”  |
| <b>Cultural Relevance</b>                  |  |   |
| Asian                                      | Poster/foods pictured are culturally relevant  | “Yes, it is [culturally acceptable]. Because the Chinese culture, we try to balance the food and include lots of vegetables in the dishes.” |
| Hispanic                                   | Ethnicity of models is culturally relevant   | “As a Hispanic, when I see the people there, I feel like it’s part of my culture.”  |
| <b>Personal Relevance</b>                  |  |   |
| Asian                                      | Family’s happiness and health are personally relevant                                      | “I like it, the vegetables, health juice, fruits... and the children are happy.”  |
| Hispanic                                   | Eating together as a family is important   | “... it reinforces the fact that eating together is important, which we don’t always do.”   |
| <b>Motivation to encourage CRFB intake</b> |  |   |
| Asian                                      | No motivation to encourage CRFB: Encouragement to cook and eat healthy as a family         | “Yes [the poster is telling me to have balanced food and motivates me to buy fruits and vegetables for my family].”                         |
| Hispanic                                   | Majority did not indicate motivation to encourage CRFB: Encouragement to have family meals | “It would encourage me that family meals are important and eating together is just as important.”   |

*Impression/Suggestions for Improvement*

Asian parents had few suggestions for improvements to the poster. A few parents stated that the image of the soccer ball connected the message to sports and the food images showed foods that contain calcium, so it was easy to relate calcium to being active. Some parents mentioned that text was needed to indicate that foods pictured contained calcium. Hispanic parents stated that images of CRFB were appropriate and reminded them to eat these items. A few parents suggested including images of other sources of calcium, such as soy milk, as well as translating text into Spanish.

that the poster contained information related to the goals that they would like to achieve for their family. Both Asian and Hispanic parents mentioned that the poster was personally relevant as a reminder to buy CRFB.

*Motivation to Encourage CRFB Intake*

Asian parents reported that the poster would motivate them to buy CRFB, including dairy and vegetables. Hispanic parents were also motivated to increase their children’s calcium intake, especially if their child was physically active. Hispanic parents were again reminded which foods contain calcium and to provide them to their families. Both sets of parents stated that they were motivated to cook and eat healthy in general, and mentioned that they already encouraged CRFB intake by purchasing CRFB so they were available at home.

Strong families start with good nutrition

*Comprehension*

Asian parents felt that the poster was encouraging them to consume healthy food, particularly vegetables. They reported that the poster presented foods to be included in family meals, and emphasized the importance of eating together. Hispanic parents also stated that the message was to provide their families with healthy, well-balanced meals, but did not mention the importance of CRFB specifically. They also noted that eating together helps create stronger familial bonds. Hispanic parents better understood the message that calcium was good for their whole family, but there was generally little mention among both Asian and Hispanic parents that the foods pictured contained calcium and should be provided for adequate intake.

### *Cultural and Personal Relevance*

Both groups stated that the message was culturally and personally acceptable. The poster portrayed the Asian cultural values of having balanced food intake and including lots of vegetables in their dishes, though participants noted that salad is usually not part of Asian food preparation. All Hispanic parents also reported that the poster was culturally relevant. The family in the poster looked Hispanic, and participants stated that it was fitting to include some foods, such as beans, related to Hispanic cuisine. More ethnic-appropriate foods were also suggested. Like the “Good play” poster, it reminded Hispanic parents to provide healthy food, especially CRFB, to their children. Both groups said the poster was personally relevant because it was family oriented.

### *Motivation to Encourage CRFB Intake*

Most parents in both groups did not specify that posters would motivate them to encourage CRFB intake in their children. Most indicated motivation to provide healthy food in general, though some Hispanic parents did mention encouraging CRFB intake specifically. Both groups of parents stated that families should prepare and eat meals together. Meals should be healthy, have a variety of options, and contain a balance of nutrients.

### *Impression/Suggestions for Improvement*

Most Asian parents stated that they liked the images in the poster, but some, such as the salad, were not relevant to the Asian culture. They also suggested that the images be made clearer, as they had trouble identifying foods pictured. They stated that it was unclear how the image of a family enjoying a meal related to the text on CRFB intake, and that the text was crucial to understand the poster’s message. Hispanic parents thought it beneficial to include food images showing a variety of CRFB and that the Hispanic family made it more relatable. They did, however, suggest translation into Spanish. They also suggested including more images of culturally sensitive foods.

### **Discussion**

The current study is the first to evaluate messages geared toward parents of early adolescents based on previous findings regarding motivating parents to promote intake of CRFB in their children (Reicks et al., 2011; Richards et al., 2014). While messages performed well in terms of cultural and personal relevance,

modifications are needed to improve comprehension and ability of messages to motivate parents to encourage CRFB intake.

Feedback indicated that messages may be useful in promoting intake of CRFB in this population, as a number of parents found that the posters reminded them to provide CRFB to their children and lead healthy lifestyles. Other studies have also demonstrated that feeding practices featured may improve CRFB intake in adolescents. Regarding making CRFB available, for example, studies demonstrate that calcium intakes are higher among youth whose mothers take and provide calcium supplements and/or drink milk compared to those who rarely or are never served calcium-rich foods and supplements (Fisher, Mitchell, Smiciklas-Wright, & Birch, 2001; Ulrich, Georgiou, Snow-Harter, & Gillis, 1996).

In addition to making CRFB available, role modeling has also been shown to improve CRFB intake in adolescents. In a randomized controlled trial seeking to evaluate an osteoporosis prevention program, for example, mothers who increased their calcium intakes also reported an increase in their children’s intakes (Winzenberg, Oldenburg, Frendin, De Wit, & Jones, 2006). In the current study, the “Strong families” poster featured parents modeling desirable behaviors, as evidence suggests this practice promotes adolescent CRFB intake. However, in the current study, parents gleaned more general information from this poster, stating that adolescents should perform healthy behaviors. While featuring modeling may promote positive responses, it is evident that fine-tuning is needed to elicit responses related specifically to CRFB.

Parental expectations have also been shown to be important, with findings from Project EAT demonstrating that mothers with high expectations had children with lower BMIs (Berge, Wall, Loth, & Neumark-Sztainer, 2010). Further, setting rules and expectations is positively associated with dairy availability and higher dairy consumption among children (Vollmer & Mobley, 2013). In the current study, posters communicated messages supporting parents in their expectations for adolescents to consume CRFB through making CRFB available. In modifying posters, it will be important to retain the emphasis on all three parenting practices featured, including setting expectations.

A key component of interviews performed in the current study was assessment of message comprehension. Hispanic parents comprehend-

ed that the “Good play” poster advised them to provide CRFB to their children to build strong bones for activity and that the “Strong families” poster conveyed the importance of CRFB for the family. Conversely, several Asian parents had difficulty understanding the messages, and neither group comprehended that foods pictured in “Strong families” contained calcium. Of note, previous studies have revealed a lack of knowledge of calcium food sources across populations. A survey administered to 90 African-American mothers, for example, indicated that 16 percent of women did not correctly identify any calcium food sources (Zablah, Reed, Hegsted, & Keenan, 1999). As parental education is positively associated with calcium intake, interventions should focus on promoting awareness of dietary guidelines, calcium-rich food sources, and risks associated with inadequate calcium intakes (Klohe-Lehman et al., 2006; Parmenter, Waller, & Wardle, 2000; Reicks et al., 2011). Parental knowledge of calcium food sources also relates to positive parenting practices associated with calcium intake in children (Gunther, Rose, Bruhn, Cluskey, Reicks, Richards, Wong, Boushey, Misner, & Olson, 2015). Modifications to posters should emphasize that food images contain calcium and increase awareness of dietary recommendations.

Parents in the current study found both posters culturally relevant. However, both groups desired more ethnic-specific foods featured. Further examination of message surface structure, which encompasses the target population’s observable behaviors such as food choice, is needed (Resnicow, Baranowski, Ahluwalia, & Braithwaite, 1999). Attention to both observable behaviors and the populations’ values is crucial in designing messages (Resnicow, Jackson, Braithwaite, DiIorio, Blisset, Rahotep, & Periasamy, 2002). In further addressing cultural relevance, the diversity of the Asian and Hispanic populations and subgroups targeted must be acknowledged. Preferred vocabulary and food choices may differ depending on country of origin and other factors (Council & Mitchell, 2006; Kaiser, 2008; Maskarinec et al., 2015; Nguyen, 2008; Rahman, Khattak, & Mansor, 2013). The Mexican diet, for example, differs substantially from the Hispanic diet in the Caribbean (Council & Mitchell, 2006; Kaiser, 2008). Differences in food preference demonstrate that accounting for cultural diversity is important, as messages tailored to broad populations may not be relevant to some ethnic minorities.

In addition to generally finding both posters culturally relevant, parents generally found both posters personally relevant. Importance was placed on children’s physical activity, which they encouraged. In addition, parents noted the personal relevance of the theme of “family” in the “Strong families” poster. Previous studies have demonstrated the high importance placed on familial relationships, including those fostered through family meals, in both Asians and Hispanics (Auld et al., 2002; Campos, Ullman, Aguilera, & Dunkel Schetter, 2014; Fulkerson, Neumark-Sztainer, & Story, 2006; Fulkerson, Story, et al., 2006; Larson et al., 2009; Larson et al., 2006; Marquis & Shatenstein, 2005; Melbye, Ogaard, Overby, & Hansen, 2013; Videon & Manning, 2003). Parents in the current study appreciated the family meals pictured, indicating the appropriateness of this content for the target audiences.

While both posters generally performed well, interviews revealed that a number of parents perceived posters to be promoting healthy food generally, rather than CRFB specifically. Messages should further emphasize the connection between foods pictured and calcium through simple phrases, avoiding complicated messages that the audience may misinterpret (Snyder, 2007; Wilson, 2007). In addition, translation of phrases into the language of the target population may further increase relevance (Snyder, 2007; Wilson, 2007). CRFB pictured must also be evaluated for cultural relevance and may include maize-based products (e.g. corn tortillas) for Hispanics and nori (dried seaweed) for Asians.

After modification, final posters may be used to develop an osteoporosis prevention program, and may also be incorporated into programs promoting intake of CRFB. As environmental factors may prevent long-term behavior change, such as the widespread availability of energy-dense foods (French, Story, & Jeffery, 2001), messages should be supplemented with other intervention components. Policies that support opportunities for change, as well as concurrent access to key products and services are crucial to promote behavior change (Wakefield, Loken, & Hornik, 2010).

#### *Strengths/Limitations*

The study has several strengths. First, study participants consisted of Asian and Hispanic parents from various states, two groups that are at risk of inadequate calcium intake. Preliminary testing allowed for evaluation of relevance of the posters

for the two target populations to inform further tailoring. Secondly, several different parenting practices shown to be associated with CRFB intake in adolescents were targeted in the posters, incorporating previous findings. Lastly, parents provided feedback on how to improve posters, which could increase posters' ability to improve CRFB intake.

This study also had various limitations. First, convenience sampling was utilized, and parents were recruited from areas close to the research teams' universities, limiting generalizability. Secondly, comprehensive demographic information was not collected. Although the Asian and Hispanic populations are ethnically and racially diverse, no information was collected regarding identification with more specific segments of the population. This information would allow for further tailoring of messages to meet the needs of these heterogeneous populations. Third, no information on dietary intake of the family was collected, so effectiveness of messages in impacting practices and behaviors of families is unknown. Lastly, a number of parents reported that they already provided and encouraged intake of CRFB and healthy food, indicating that they may already be motivated to perform the behaviors.

## Conclusion

This study evaluated two messages designed to motivate parents to encourage adolescent intake of CRFB. Though parents reported that the posters would motivate them to provide healthy foods and beverages to their families, messages should more clearly indicate the importance of providing CRFB specifically. Modifications are needed to further address both the surface and deep structure of messages and emphasize the connection between messages and calcium intake. Additional testing should be conducted on revised messages. Tailored messages may then be used in development of osteoporosis prevention programs, and may also be incorporated into existing programs promoting intake of CRFB. Such programs will seek to improve feeding practices of parents of early adolescents and promote parental behavior changes to help early adolescents meet their calcium requirements to prevent osteoporosis in later life.

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