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Buenos Hábitos Alimenticios para Una Buena Salud: Evaluation of a Nutrition Education Program to Improve Heart Health and Brain Health in Latinas

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Abstract

Objectives—The goal of this research was to evaluate nutrition education targeting Latinas, a group at particular risk of obesity and diabetes, which predict to later life cardiovascular disease and dementia.

Methods—Culturally tailored, theory-based nutrition education was provided to Mexican origin Latinas aged 48 to 84. The randomized design compared participants in workshops incorporating the connection between dietary fat and brain health, participants in workshops focusing only on dietary fat and heart health, a waitlist control group, and a posttest only control group.

Results—Among those assigned to either intervention, there was statistically significant gain in health literacy, knowledge about dietary fat, and behaviors to reduce dietary fat compared to waitlist control. There was no difference in outcomes between those given the module about diet and brain health and those not provided that module.

Discussion—A program to encourage dietary fat modification in Latinas proved feasible and modestly effective.

Keywords

Latino; outcomes evaluation; community-based participatory research; obesity; diabetes

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Declaration of Conflicting Interests

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Latinos are estimated to comprise more than a quarter of the U.S. population by 2050 (Passel & Cohn, 2008), including 20% of all older adults (Villa, Wallace, Bagdasaryan & Aranda, 2012). Latinos now represent 48% of Los Angeles County, with 78% of Mexican origin (Brown & Lopez, 2013). Of public health concern is the fact that Mexican Americans are over-represented among those with cardiovascular disease, obesity, high blood pressure, and Type II diabetes (e.g., Beard, Ghatrif, Samper-Ternent, Gerst & Markides, 2009; Ostir, Markides, Freeman & Goodwin, 2000). As Mexican origin Baby Boomers move into old age, they will bring these health disadvantages with them, potentially resulting in even greater disparities with respect to chronic and disabling health conditions (Villa et al., 2012).

Dietary fat modification, in particular, decreased consumption of saturated and trans fats and substitution of unsaturated fats, has been a standard approach used to reduce the risk of, delay, or even prevent the onset of cardiovascular disease and other related cardiovascular conditions such as diabetes and hypertension (American Heart Association, 2014; Hooper et al., 2001). Some have begun to target adult Latinos, especially Mexican Americans, with health education aimed at controlling obesity, cholesterol, and blood pressure (Elder et al., 2006; Howard-Pitney, Winkleby, Albright, Bruce & Fortmann, 1997). Other programs have focused on Latino adolescents (Davis, Ventura, Cook, Gyllenhammer, & Gatto, 2011; Gatto, Ventura, Cook, Gyllenhammer & Davis, 2012).

Increasingly, vascular risk factors have also been linked to dementia, both vascular cognitive impairment and Alzheimer's disease. Specifically, midlife obesity, diabetes, and elevated cholesterol have been shown to be risk factors for dementia (e.g., Anstey, Lipnicki & Low, 2008; Whitmer et al., 2008; Xu et al., 2009). Fitten, Ortiz, and Pontón (2001) reported similar findings in a community-based sample of Latinos of Mexican descent in Los Angeles.

An evidence report prepared for a National Institutes of Health Office of Medical Applications of Research State-of-the-Science Conference concluded that there was some evidence that diet, especially a Mediterranean style diet—vegetables, fruits, whole grains and other sources of fiber, fish, little red meat, nuts, olive oil and other unsaturated fats—lowers risk of dementia and cognitive impairment (Williams, Plassman, Burke, Holsinger & Benjamin, 2010). These recommendations converge with advice for reducing risk of heart disease. Health education about brain health in old age has begun to include diet (e.g., Alzheimer's Association, 2014). Unknown is whether telling people about the connection between heart and brain and between diet and dementia contributes to changing behavior.

Consequently, we designed a nutrition education curriculum that has two versions: one included information about the relationship between heart health and brain health, while the other version was identical except for omitting that module and focusing on diet and heart health only. The program was directed toward Latinas in particular due to their prominent role as nutritional gatekeepers in their families, their leadership role in food procurement and preparation, and their potential ability to influence both personal and familial dietary behavior change (Wansink, 2006). Previous research has concluded that Latinas tend to shop at the most convenient stores and to make decisions based on cost and family preference, largely for traditional Mexican foods (Ayala et al. 2001; Evans et al., 2011). Thus it was

important to address food shopping and meal preparation with low-cost and traditional Mexican ingredients (Evans et al., 2011).

The purpose of this study was to evaluate the intervention. Specifically, we compared those who received nutrition education to those who did not. We also evaluated whether teaching participants about the role of diet in brain health as well as heart health increased the effectiveness of the intervention by comparing those who received information about the connection between vascular risk and brain health to those who only received information about the connection between diet and heart disease. Study outcomes included health literacy, knowledge about dietary fat, and behaviors to reduce dietary fat.

Method

Intervention

Buenos Hábitos Alimenticios para una Buena Salud [“Good Eating Habits for Good Health”] was based on a systematic review of existing literature (e.g., Ayala et al., 2001; Brunner, Rees, Ward, Burke & Thorogood, 2007; Horowitz, Tuzzio, Rojas, Monteith & Sisk, 2004); collaboration with a local diabetes and Alzheimer’s disease health educator; and extensive pilot testing with 15 bicultural and bilingual *promotoras de salud*, or lay peer health educators (Otilingam & Gatz, 2008).

Buenos Hábitos Alimenticios consists of two two-hour workshops. Lessons use nutrition education techniques found to be culturally-relevant (see Elder, Ayala, Parra-Medina, & Talavera, 2009) such as cooking demonstrations, *fotonovelas*, experience sharing, and game show formats. Vivid photographs and other visual aids are prominently featured to circumvent potential concerns of low reading literacy. The program incorporates three behavior change principles: reducing dietary fat barriers, building dietary fat self-efficacy, and providing cues to action (Rosenstock, Strecher & Becker, 1988).

Barrier reduction includes both micro-level (perceptual) and macro-level (contextual) barriers to fat-reduction. On a micro-level, personal and familial barriers are shared and discussed. Tools to promote sustained change are introduced in the workshops, including low-cost, easy to adopt fat modification strategies such buying lower fat milk but swapping milk bottle caps to the familiar color, or substituting vegetable oil (unsaturated) for lard (saturated). On a macro-level, a comprehensive list of food stores in a 10 to 20 mile radius is distributed to participants as an alternative to mom-and-pop markets and liquor and convenience stores known to supply processed, high fat products.

Strategies to build self-efficacy include nutrition label reading; cookbooks with fast, healthy, easy, delicious recipes; and a virtual presentation depicting a grocery store tour and strategies to promote healthier, low-fat selections.

Cues to action are provided through teaching skills, with use of props, including how to obtain a healthy portion size; substitute with easily available low fat items; and set incremental goals to sustained health behavior change. An in-class hands-on cooking

demonstration and tasting gives an opportunity for skills modeling and positive reinforcement.

At the end of the first workshop, participants are led in an in-class exercise in which they develop three clear and tangible goals for themselves to target prior to the second workshop. At the start of the second workshop, participants are led in a discussion to share progression of and barriers to these goals.

The workshop outline is shown in Table 1. Lessons incorporate education about food procurement (e.g., shopping on a budget, using the Latin American Food Pyramid, reading food labels); food preparation (e.g., cooking with healthy fats, fat avoidance, substitution of unsaturated fats for saturated and trans fats; and food consumption (e.g., eating a balanced diet, continuing to eat healthy when eating out or during holidays).

The “Brain Connection” module content includes: research findings about the relationship between metabolic syndrome and increased risk for dementia; a visual representation in which a non-pathological brain is compared to a the brain of someone with Alzheimer’s disease; research findings about the relationship between saturated fat consumption and increased risk of cardiovascular as well as cerebrovascular diseases; knowledge about dementia, including the distinction between dementia and normal changes in memory with age.

The intervention is completely manualized. Leader manuals and all handouts and posters are available at <http://dornsife.usc.edu/labs/scrap/usc-alzheimers-disease/>

Research Design, Setting and Procedures

The evaluation design comprised a randomized controlled trial. Data collection occurred at pretest, posttest, and follow-up. The two workshops were conducted one week apart, with the first occurring one week after the pretest. The posttest was administered directly after the second workshop and the follow-up one month later. There were four conditions: heart plus brain; heart only; a waitlist control group; and a posttest only waitlist control group to assess the effect of pretesting on study outcomes (Kazdin, 2003, 2007). At the end of the study, participants in the wait list conditions were offered an invitation to participate in two two-hour workshops based on materials given to participants in the heart plus brain health condition. Workshop facilitators for the heart plus brain condition spent approximately 20 to 30 minutes teaching the “Brain Connection” curriculum during the first workshop. Workshop leaders for the heart only condition devoted extended time to the other topics to maintain an equivalent duration of time.

The setting was a predominantly Mexican American community in Los Angeles County. Workshops were taught at a community clinic with which participants were already familiar. Child care was provided. Workshops were taught in small groups of not more than seven, with 74% of the sessions in Spanish and the others in English. A total of ten bilingual research assistants delivered the workshops following the manualized script. Prior to beginning to teach, workshop facilitators received a series of trainings, including practice

teaching. Fidelity checks after each lesson assured that the scripted components were delivered.

The Institutional Review Board of the University of Southern California, University Park Campus approved this study prior to participant recruitment. All potentially eligible participants were invited by telephone to meet individually with a research assistant at the clinic to complete the informed consent and to be given a sealed envelope with their random assignment to a study condition (so that research assistants were blind to condition until the envelope was opened). At this same meeting, participants in the first three conditions completed the pretest measures; those in the posttest only waitlist control group were simply scheduled for the posttest.

Participants

Inclusion criteria were (a) female, and (b) member of a longitudinal community-wide epidemiological study comprised of a representative sample of Latinos aged 40 and older (Varma et al., 2004). Invitations to participate in the nutrition study were issued to a series of random samples drawn from the parent study until a sufficient number of women agreed to participate. Exclusion criteria included being on a special diet or already participating in another nutrition class or planning to move out of the area prior to the conclusion of the study. Sixteen were excluded; of those invited, 39% agreed to participate in the study. A total of 100 individuals were randomized to the four conditions, with 92% completing all times of measurement for their condition. Two members of the heart plus brain condition and three members of the heart only condition received only a partial intervention and did not complete the posttest, and another one participant from each intervention condition was lost at follow-up. One member of the waitlist control group was lost at follow-up.

Characteristics of participants are shown in Table 2. The age range was 48 to 84.

Measures

Participants were administered IRB-approved materials orally in Spanish or English.

Health literacy was measured by the Newest Vital Sign (NVS; Weiss et al., 2005). Participants were provided a hard copy of the NVS nutrition label and an empty pint-sized ice cream container and asked six questions to assess reading and numeracy skills. The score was the number of items answered correctly.

Dietary fat knowledge was measured with nine questions from the U.S. Department of Agriculture's Diet and Health Knowledge Survey (U.S. Department of Agriculture, 1994–1996). Questions were selected that were covered in the lessons, such as, which has more saturated fat—butter or margarine, which has more fat—hot dogs or ham, which kind of fat is more likely to be a liquid than a solid, in what foods is cholesterol found. The score was how many items were answered correctly.

Behaviors to reduce dietary fat were measured with the Fat-Related Diet Habits Questionnaire (Kristal, Shattuck, & Henry, 1990; Shannon, Kristal, Curry, & Beresford, 1997) as modified by Neuhouser, Thompson, Coronado, and Solomon (2004) for use with

individuals of Mexican descent. The score was the mean on a four point scale (rarely/never, sometimes, often, usually) representing self-reported frequency of behaviors to reduce fat consumption. These behaviors included less frying or cooking with lard or oil; removing fat or skin from meat; using lower fat milk; choosing lower fat foods when eating out; and replacing high-fat snacks with fruits and vegetables.

A copy of the pretest packet is available at <http://dornsife.usc.edu/labs/scrap/usc-alzheimersdisease/>

At posttest, participants, both those in the intervention and those in the waitlist control group who had also been administered the pretest, were asked how effectively they believed that a low fat diet could prevent heart disease, diabetes, Alzheimer's disease, cancer, and stroke. This served as a sort of manipulation check to see how aware the women were of the information that they had been presented.

Statistical Analysis

For the three primary outcomes, we used SAS, version 9.3 (SAS Institute, Cary, NC), PROC MIXED to perform a repeated measures analysis of variance, comparing the two intervention groups and waitlist control groups over three times of measurement, contrasting the combined intervention group with the waitlist controls, and contrasting the two intervention groups with one another (Howell, 2008). The interaction effect tested whether the groups changed differently from one another. PROC MIXED allowed for including all participants, even if they discontinued after providing one or two times of measurement, or if they were in the posttest only waitlist control group. We also conducted a completers-only analysis including only those who participated at all three times of measurement, using PROC GLM. PROC GLM conducts an analysis of variance using a general linear model, using an observation if values are nonmissing for both that outcome variable and relevant classification variables.

Results

On all three primary outcomes, results showed no statistically significant difference in change between the heart plus brain and the heart only interventions. However, as shown in Table 3, there was a statistically significant difference in change between combined intervention groups compared to the control groups, whether including or not including the posttest only waitlist control group.

Tests of contrasts between pretest and posttest and between pretest and follow-up showed that for health literacy and dietary fat knowledge, the combined intervention group showed a statistically significant gain from pretest to posttest that was maintained at follow-up; whereas the waiting list control participants showed no change over time. Tests of contrasts for behaviors to decrease fat consumption showed no statistically significant difference in change for intervention compared to control group between pretest and posttest ($p=.1813$), but statistically significant improvement in the combined intervention group compared to control group at follow-up ($p=.0036$).

At posttest, participants were asked their beliefs about how effectively a low fat diet can prevent each of a list of diseases. As can be seen in Figure 1, those who participated in the workshops generally expressed a stronger belief in the usefulness of a low fat diet. There was a significant difference among groups with respect to whether they believed that a low fat diet could prevent diabetes, $\chi^2(2) = 6.34, p < .05$, and whether a low fat diet could prevent Alzheimer's disease, $\chi^2(2) = 6.70, p < .05$. However, the differences were explained by the control group's lower endorsement. In particular, those who received the Brain Connection module did not have a significantly stronger belief in the connection between dietary fat and brain health than those whose lessons did not include that module.

Participants were asked the three most important things that they had learned in class. The single most frequent response was that they had learned how to read nutrition labels. Also frequently noted were eating more fruits and vegetables, identifying bad fats, better food preparation to reduce bad fats, and healthy substitutions. Other behavioral adjustments were also mentioned although less frequently, e.g., shopping strategies to avoid high fat snack food, and reducing portions. Several noted that they understood the importance of setting goals and of thinking positively, and that they felt more able to make changes. A few mentioned the connection between healthy eating and heart health; no one mentioned the connection between healthy eating and brain health.

Discussion

The study demonstrated that theoretically-based nutrition education tailored to adult Latinas can be feasibly implemented with good retention in the program and a modest positive impact. Participants in the classes showed increased knowledge on the material that was taught and reported behavior changes consistent with the strategies emphasized in the workshops.

Conceptually, the program featured incorporation of behavioral principles: reducing dietary fat barriers, building dietary self-efficacy, and providing cues to action (Rosenstock et al., 1988). In their open-ended responses, women were very responsive to barrier reduction, such as food substitutions to reduce saturated fat and better shopping strategies. With respect to self-efficacy, a key accomplishment was learning to read nutrition labels. A few specifically noted increased confidence in making food selections and preparing healthier meals. Finally, behavioral changes reflected the cues to action embedded in the workshops. Other features included the format of the workshops: The small group context contributed to giving a sense of support. Setting goals between the two sessions made it more likely that behavioral change would occur. The demonstrations made new methods of food preparation seem more achievable and palatable.

The intervention is manualized, such that extensive facilitator training is not required. The manuals are freely available.

However, the inclusion of a module about the connection between healthy diet and healthy brain proved irrelevant. Participants in the heart plus brain workshops improved neither more nor less than participants in the heart only workshops. One implication may be that the

brain health connection was not sufficiently salient to motivate change. Another implication may be that the brain module was not sufficiently developed. Indeed, the women who received the module did not seem more likely to recognize the brain health connection in the posttest interview. At the same time, it is also possible that the manipulation check itself was insensitive. Thus, the results should not yet be taken as arguing conclusively against augmentation of standard health education materials with information about brain health. Rather the question remains open. There may need to be a stronger presentation of the brain material, or a simpler test of whether the brain health message was received. What can safely be concluded is that including the brain health information did not detract from the program. Change was essentially the same with and without the brain connection module.

We would also speculate that for those actively seeking programs to improve long term brain health, being given an explanation about the connection between healthy diet and healthy brain may well have more impact. The women in this evaluation were not seeking a brain health program. Few had relatives with Alzheimer's disease; having affected relatives might have heightened concern with brain health.

Implications for nutrition education can be derived from our experience with this program. Aspects of the program noted as helpful by participants included being taught specific skills and low-cost adjustments that they could readily incorporate into their home lives. Health outcomes measured in the evaluation included improved knowledge; in particular, information to inform good nutritional choices; and self-reported behavior change with respect to dietary fat modification. Our results do not support the added value of teaching the connection between diet and brain health, at least not with the module developed for this program. Nonetheless, the implication of our findings for those seeking to improve long term brain health is that brain-healthy dietary behavior change is possible with the use of a program built on strong health behavior change theory.

Limitations of the study include fairly small sample sizes, reliance on self-report, and no long term follow up of participants. Longer term follow up may have revealed further behavior change, and would have indicated the extent to which knowledge and changes persisted once embedded into daily life (Howard-Pitney et al., 1997). Strengths include the focus on nutritional gatekeepers, the experimental design, theory-based intervention, participant retention, and use of community-based participatory research to develop the program.

The need for public health interventions to address obesity, diabetes, and heart disease in Latinos is driven by demographic and epidemiological data indicating increased numbers of Latinos in the U.S. and high rates of conditions related to obesity and vascular risk (Villa et al., 2012). Significant findings from this study suggest that a culturally-tailored nutrition intervention can offer modest assistance for improving dietary fat outcomes. Ongoing work at multiple systemic levels (e.g., individual, family, neighborhood, community) is warranted to further understand the mechanisms by which nutrition interventions can be initiated and sustained to reduce modifiable vascular risk among Latinos and other high-risk populations.

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Figure 1.

After the workshops, percent endorsing that a low fat diet can very effectively prevent disease.

Table 1*Buenos Hábitos Alimenticios para Una Buena Salud Workshops*

Workshop 1 Lesson	Curriculum	Workshop 2 Lesson	Curriculum
Learning about fats	• Fat versus muscle • Benefits and barriers • The chain game • Types of fats • The colors of milk bottle cap home activity	At the market—Part II	• Food pyramid loteria • Reading food labels
Why do fats matter	• Heart disease discussion • The brain connection	In the kitchen	• Cook with less fat • Cooking class • What to cook
Take small steps	• Achieve your goals by taking small steps	Mealtime—Part I	• Portion size • Serving size • Balanced plate • Eating during holidays and celebrations
At the market—Part I	• Local food directory • Buy healthy foods on a budget • Supermarket map • Buy for taste, not for fat • Buying snacks	Mealtime—Part II	• Eating out

Table 2

Baseline characteristics of participants, mean (SD) or %

	Treatment: Heart plus Brain (n = 32)	Treatment: Heart (n = 33)	Waiting List 1 (n = 17)	Waiting List 2 (n = 18)
Age, in years	57.1 (8.1)	60.1 (8.0)	61.1 (10.0)	58.1 (9.4)
Language preference, Spanish	78.1%	78.8%	82.4%	72.2%
Immigrated to US	78.1%	81.8%	88.2%	72.2%
Years in US	32.6 (8.0)	36.9 (8.4)	31.6 (11.0)	35.2 (10.6)
Highest level of education				
None or elementary	40.6%	45.4%	47.1%	27.8%
High school	31.3%	36.4%	23.5%	50.0%
Community/technical college	15.6%	9.1%	5.9%	5.6%
College	12.5%	9.1%	23.5%	16.7%
Number of family living at home (incl. self)				
1	9.4%	12.5%	5.9%	11.1%
2	12.5%	25.0%	23.5%	0.0%
3	28.1%	15.6%	17.6%	16.7%
4	12.5%	9.4%	5.9%	33.3%
5	15.6%	9.4%	5.9%	33.3%
6 or more	21.9%	28.1%	41.2%	5.6%
Number of children living at home < age 17	1.88 (1.46)	1.88 (1.46)	3.67 (4.62)	1.33 (0.52)
Annual family income \$20K or less	41.7%	39.2%	37.5%	41.2%
Clinical variables				
Obesity	31.2%	18.2%	35.3%	27.8%
Diabetes	46.9%	39.4%	41.2%	44.4%
Hypertension	56.2%	36.4%	52.9%	44.4%
Hypercholesterolemia	43.8%	51.5%	35.3%	50.0%
Family history				
Obesity	31.2%	24.2%	58.8%	11.1%
Diabetes	65.6%	66.7%	47.1%	50.0%
Hypertension	75.0%	75.8%	29.4%	61.1%
Stroke	15.6%	21.2%	17.6%	27.8%
Myocardial infarction	25.0%	24.2%	5.9%	22.2%
Alzheimer's disease	9.4%	9.1%	17.6%	0.0%

Table 3

Primary outcomes at each time of measurement, mean (SD) for completers, and repeated measures analysis of variance results testing the difference between intervention and control groups

Outcome	Condition	N	Pretest (Time 1)	Posttest (Time 2)	Follow-up (Time 3)	Group	Time	Group $\times$ Time Interaction	Contrast Intervention to Control Time 1 vs 2	Time 1 vs 3
Health literacy						F(1,79.1)=5.81, p = .0182	F(91,151)=12.37, p < .0001	F(2,150)=4.72, p = .0103	F(1,149)=8.60, p = .0039	F(1,151)=4.97, p = .0272
	Heart + Brain	29	1.31 (1.71)	2.59 (1.92)	2.59 (1.76)					
	Heart only	29	1.55 (1.60)	2.34 (1.99)	2.55 (1.70)					
	Waiting list control	16	1.25 (1.24)	1.00 (1.63)	1.38 (1.54)					
	Posttest only control	18	1.61 (1.79)							
Knowledge about fat						F(1,77.8)=7.43, p = .0079	F(2,152)=18.08, p < .0001	F(2,150)=3.61, p = .0293	F(1,149)=4.66, p = .0325	F(1,151)=6.02, p = .0153
	Heart + Brain	29	5.48 (1.72)	6.86 (1.27)	6.72 (1.33)					
	Heart only	29	5.97 (1.57)	7.03 (0.91)	6.66 (1.11)					
	Waiting list control	16	5.75 (1.00)	5.94 (1.12)	5.56 (1.71)					
	Posttest only control	18		6.22 (0.94)						
Behaviors to reduce dietary fat						F(1,75.1)=0.62, p = .4321	F(2,141)=6.50, p = .0020	F(2,141)=4.40, p = .0140	F(1,141)=1.83, p = .777	F(1,141)=8.79, p = .0035
	Heart + Brain	29	3.08 (0.46)	3.18 (0.46)	3.43 (0.40)					
	Heart only	29	3.01 (0.44)	3.25 (0.27)	3.38 (0.30)					
	Waiting list control	16	3.18 (0.49)	3.16 (0.39)	3.16 (0.47)					
	Posttest only control	18		3.12 (0.50)						

Note: Analysis of variance results are shown from the analyses with all participants, including those dropped out. The Group effect compares the combined Heart + Brain and Heart Only groups to the Waiting List Control Group. Time compares the three times of measurement. The Group by Time interaction tests the hypothesis that those receiving the intervention show greater gain than the controls. The time 1 vs 2 contrast compares pretest to posttest. The time 2 vs 3 contrast compares pretest to follow-up.