

# Improving Materials for a Technology-Based Childhood Obesity Intervention for Hispanic/Latino Families in Rural Nebraska: A Mixed-Method Usability Test

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# Improving Materials for a Technology-Based Childhood Obesity Intervention for Hispanic/Latino Families in Rural Nebraska: A Mixed-Method Usability Test

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## Abstract

**Background:** Childhood obesity remains a public health concern in the United States, disproportionately affecting Hispanic/Latino (H/L) and rural populations. Despite this disparity, there is a lack of culturally relevant programs specifically designed to reach this population. To address this gap, our team culturally adapted a technology-based childhood obesity intervention, Hispanic Family Connections, targeting H/L families living in rural areas. The intervention comprises two main components: interactive voice response (IVR) calls and a workbook with at-home activities to promote family engagement.

**Objective:** To 1) evaluate the usability of the IVR calls and workbook included in the Hispanic Family Connections intervention; and 2) document and plan adaptations to these components using the Framework for Reporting Adaptations and Modifications-Enhanced (FRAME).

**Methods:** We conducted five mixed-method, task-based usability tests (UT) using the think-aloud procedure. All five participants were women, self-identified as H/L, and were Spanish literate. Each participant completed three think-aloud tasks designed to evaluate the usability of the IVR calls and workbook chapters. Usability was assessed using the After Scenario Questionnaire (ASQ) at the end of each task and the System Usability Scale (SUS) at the end of the UT session. All sessions were recorded, and data were organized into two primary categories: 1) quantitative results (ASQ and SUS), and 2) qualitative data (participants' comments and researchers' observational). Findings were compiled and analyzed following the eight main domains of FRAME.

**Results:** For the workbook, ASQ scores showed a high level of ease in task completion ( $1.1 \pm 0.32$ ), satisfaction with completion time ( $1.0 \pm 0.00$ ), and satisfaction with support information ( $1.5 \pm 0.97$ ). For the IVR calls, participants reported a higher level of ease in task completion ( $1.0 \pm 0.00$ ), satisfaction with completion time ( $1.0 \pm 0.00$ ), and satisfaction with support information ( $1.2 \pm 0.45$ ). SUS results were positive for 80% of participants, with an average usability score above the benchmark ( $75.5 \pm 15.04$ ). Using FRAME, we identified and documented 30 suggestions for adaptations and improvements of the workbook and IVR calls. The majority of suggestions were content-related (86.67%), with most focusing on tailoring/tweaking, or refining existing materials.

**Conclusions:** The usability test results, combined with the systematic documentation using FRAME, allowed us to identify and prioritize the adaptations needed to improve the intervention materials. These refinements will prepare the Hispanic Family Connections intervention for implementation in a subsequent feasibility study. Clinical Trial: Identifier: NCT04731506

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### Abstract

**Background:** Childhood obesity remains a public health concern in the United States, disproportionately affecting Hispanic/Latino (H/L) and rural populations. Despite this disparity, there is a lack of culturally relevant programs specifically designed to reach this population. To address this gap, our team culturally adapted a technology-based childhood obesity intervention, Hispanic Family Connections, targeting H/L families living in rural areas. The intervention comprises two main components: interactive voice response (IVR) calls and a workbook with at-home activities to promote family engagement.

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**Conclusions:** The usability tests results, combined with the systematic documentation using FRAME, allowed us to identify and prioritize the adaptations needed to improve the intervention materials. These refinements will prepare the Hispanic Family Connections intervention for implementation in a subsequent feasibility study.

**Keywords:** Usability testing; User-centered Design; Childhood obesity; Hispanics; Rural communities; FRAME.

### INTRODUCTION

Childhood obesity is a significant public health concern, disproportionately affecting Hispanic/Latino (H/L) populations [1], with greater disparities in rural areas [2]. Reaching underserved H/L communities presents unique challenges due to geographic isolation, cultural differences, and limited access to resources, such as trained bilingual staff, designated spaces, and transportation [3, 4]. While efforts have been made to develop programs addressing childhood obesity, as seen by the 172 studies identified in a 2024 review[5], there remains a shortage of culturally relevant and adapted programs that effectively engage H/L families in rural settings[6, 7].

Leveraging technology can offer a promising strategy to overcome geographical and linguistic barriers and deliver targeted interventions [8] by bringing accurate and culturally appropriate information in the desired language to participants' phones. Use of technology in rural

health is not new and has vastly improved over time [9], as seen with the advancements in telecommunications [10] to more modern medical artificial intelligence interventions [11]. However, to ensure the effectiveness of such interventions, it is crucial to evaluate their usability and make necessary adaptations to optimize their impact.

Usability can be defined as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use” [12, 13]. Usability tests are valuable tools that allow designers and researchers to understand how easy it is to use a product/resource in a specific context, and they should focus on the user’s experience [14]. Results are used to map opportunities for improvement and solving problems related to the design/product/resource being tested [15, 16]. Usability tests can be a crucial method to achieve acceptability and the successful implementation of a technology [17] [18]; therefore, its use could be vital in evaluating materials developed for public health interventions. By conducting usability testing during the program design phase, researchers can identify potential challenges and areas for improvement, thereby enhancing the program's long-term sustainability. This is an especially crucial step for technology-based interventions as they require extensive planning and initial funding [19]. One model that can support researchers in the development of usability tests (UT) is the Framework for Reporting Adaptations and Modifications-Enhanced (FRAME)[20]. The FRAME provides a comprehensive approach for documenting and reporting adaptations made to interventions [21]. This framework is applicable for usability testing, as it offers a structured way to track and plan the necessary changes to improve the intervention's effectiveness.

Our research team developed the Hispanic Family Connections (HFC)[22] intervention to address the unique needs of Latino families residing in rural areas, such as access to culturally and linguistically appropriate health programming. Recognizing the challenges faced by this population in accessing healthcare and partaking in healthy behavior practices that can improve their children’s health, we designed the Hispanic Family Connections tailored to their specific cultural and local circumstances. The primary objective of this study was to evaluate the usability of IVR calls and the workbook, as part of the Hispanic Family Connections intervention. As a secondary aim, we document and plan the adaptations to the IVR calls and the workbook using the Framework for Reporting Adaptations and Modifications-Enhanced (FRAME).

## METHODS

### *Study Design*

This study used a mixed-method, task-based, approach to evaluate the overall usability of IVR calls and a workbook. The materials evaluated are components of an intervention (i.e., HFC), aiming to culturally adapt a technology-delivered, family-based childhood obesity prevention program for rural H/L families. The HFC focuses on parents as agents of change, and includes two parent classes, followed by 10 IVR automated telephone support calls over 6 months. Program materials are provided in a parent Workbook with activities to be completed at home that align with IVR calls to promote increased physical activity and consumption of fruits and vegetables in concert with decreased sugary-drink consumption and screen time[22]. The HFC is an adaptation from the Family Connections program, originally designed for English speakers[23].

This study was approved by the University of Nebraska Medical Center Institutional Review Board (# 0745-20-EP) and is available for consultation in ClinicalTrials.gov (Identifier: NCT04731506). All usability tests were conducted using materials in Spanish, and we have translated some examples of the resources used exclusively to present in this article.

## Usability Testing of Intervention Materials

All intervention materials evaluated are available in Spanish, as part of the cultural adaptation characteristic of this program. The Workbook is divided into nine chapters, guiding parents through understanding the health impact of childhood obesity and providing education and activities to support behavior and environmental changes. Examples of activities include learning how to read a nutrition fact label, planning physical activities as a family, role modeling positive behaviors, and reflecting on current shopping and eating habits (Figure 1). The Workbook also includes extra resources and supplemental materials, such as BMI tables, and a guide on how to use the calls.

**Figure 1.** Example of Workbook content and exercises, in Spanish.

The IVR automated telephone support calls follow the Workbook content logic, and the parents set and track goals for their family's behavioral change using this technology support. During the 6-month period, while receiving the calls, parents can choose what to focus on, share their thoughts on their progress, and set new goals (Textbox 1).

**Table 1.** Examples of IVR call content.

English version	Content tested – Spanish
<p>To set a goal to be consistent in helping your child do some physical activity every day this week press 1.</p> <p>To set a goal to be consistent in offering a number of fruit and vegetable options at every dinner this week press 2.</p> <p>To set a goal to a plan for contingencies for after school snacks that your child can choose from press 3.</p> <p>To set a goal to be consistent in limiting the amount of television your child watches this week to less than 2 hours a day press 4.</p> <p>If you would like me to repeat the goals press Star.</p>	<p>Para establecer el objetivo de ser coherente en ayudar a sus hijos a realizar actividad física todos los días esta semana, presione 1.</p> <p>Para establecer el objetivo de ser coherente en ofrecer una serie de opciones de frutas y verduras en cada cena de esta semana, presione 2.</p> <p>Para establecer el objetivo de un plan de contingencias para refrigerios después de la escuela que sus hijos puedan elegir, presione 3.</p> <p>Para establecer el objetivo de limitar el tiempo que sus hijos ven televisión esta semana a menos de 2 horas al día, presione 4.</p> <p>Si quiere que repita los objetivos, presione Asterisco.</p>
<p>Way to go! It is so great that you were able to use your parenting skills to help your family make some changes. Keep up the great work! If you would like to hear some tips about how to keep on track with your parenting skills press 1 now. If not, press 2 to move on to next week's topic.</p>	<p>¡Muy bien! Es genial que haya podido usar sus habilidades para la crianza de los hijos para ayudar a su familia a realizar algunos cambios. ¡Siga con el buen trabajo que viene haciendo! Si desea escuchar algunos consejos sobre cómo continuar avanzando con sus habilidades de crianza, presione 1 ahora. De lo contrario, presione 2 para pasar al tema de la próxima semana.</p>

## Participants and Setting

Our recruitment goal was 5 to 10 participants, as recommended for this type of study [24]. Community Health Workers (CHW) from three areas in rural Nebraska led the recruitment efforts, contacting potential participants based on their client list, and reviewing the research objectives and the informed consent with those who were interested in participating. Eligibility criteria for participation in this research included: parents/guardians/caregivers of children 6-14 years old, of Hispanic/Latino origin, who are literate in Spanish. We conducted the Usability Tests in a public

library and a meeting room at the health department. The places were selected and reserved by our CHW partners based on our requirements for a quiet location where we could set up the recording materials in their communities.

## **Process**

We conducted usability tests with five participants. Data collection occurred in May 2022, involving participants from two health departments in rural Nebraska. We applied the think-aloud method as a guide for conducting the UT because it allows testing observers to understand and track participants' thought processes while navigating one randomly selected intervention session. To start the Usability Test (process described in Figure 2), the bilingual-trained facilitator explained the activity and asked for the participant's narrative consent. After agreeing to participate, they completed a short questionnaire exploring demographics and health literacy screening information [25]. We explained the think-aloud procedure in their preferred language (English or Spanish) and asked the participants to narrate their actions while they were performing tasks, and to share their perceptions about the materials[14]. The facilitator led each session using a script developed by the research team with the support of an expert in User Experience, while another staff team member acted as a notetaker. In some cases, a community CHW was present to assist in the session facilitation.

Each usability test consisted of: We asked participants to perform three tasks, the first two related to the Workbook, and the third involving an IVR call. Tasks included engaging with the IVR system, accessing the workbook, calculating BMI, and setting exercise goals for the family. The facilitator provided the workbook in Spanish and a smartphone (iOS operating system) for the participants to navigate and test the calls. Additionally, after each attempted task, we used the standardized post-task questionnaire called ASQ (After-Scenario Questionnaire) to address user satisfaction[26] [27]. At the end of the UT, participants answered the System Usability Scale (SUS) [28] [27] to assess overall usability of the materials (Figure 2). Each session was video recorded on Zoom® and transcribed using NVivo software.

**Figure 2.** Usability Test data collection process, per participant.

## **Quantitative measures**

Composed of three items, the After-Scenario Questionnaire (ASQ) [26] was used after every task to evaluate participants' satisfaction regarding the ease of completing the task, the amount of time it took, and the support information to complete it. It contains a Likert scale from 1 (strongly agree) to 7 (strongly disagree). In this way, a lower score indicated a higher level of satisfaction with usability [26]. By the end of the test, participants responded to the ten-item System Usability Scale (SUS) [28], that evaluates usability considering aspects related to effectiveness, efficiency, and satisfaction. The Likert scale goes from 1 (strongly disagree) to 5 (strongly agree). The score for odd questions (Q1, Q3, Q5, Q7, and Q9) is the scale position minus one. For even questions (Q2, Q4, Q6, Q8, and Q10), the score is five minus the scale point. The overall value of SUS was calculated by multiplying 2.5 by the sum of the scores [28] [27] and the classification ranges were: worst (0 - 25), poor (25.01 - 52.00), ok (52.01 - 72.74), good (72.75 - 85.57), and excellent (85.58 or more) [29] [30]. The calculation was scale position minus one. For the even questions, the calculation was five minus the scale position. After that, the overall score was calculated by multiplying 2.5 by the sum of the scores [28]. We chose these two specific scales because they are objective, easy to understand, and reliable [27]. Both questionnaires are widely used by researchers when evaluating user experience [31].

## **Qualitative adaptations report**

We used the Framework for Reporting Adaptations and Modifications-Enhanced (FRAME)

[32] as a base for the data integration in this mixed-method research. We compiled the findings emerged from the UT within the FRAME's eight aspects: 1) when the modification occur; 2) if the modifications were planned (proactive or reactive); 3) who participated in the decision to modify; 4) what is modify; 5) at what level of delivery the modification is made; 6) nature of the content modification; 7) fidelity-consistency of the modification; and 8) reasons for the modification [32]. The FRAME framework has its roots in implementation science, which is why we chose this tool to help translate the research findings into practice, tracking, and planning the necessary adaptations to the HFC materials evaluated.

## Data analysis

To answer the two objectives proposed in this mixed-method study, we organized the data in two categories for integration and analysis: 1) data from the standardized questionnaires (ASQ and SUS), and 2) data from participants' comments (think-aloud procedure) and researchers' (the facilitator and notetaker) notes during the UT. For the descriptive analysis, average and standard deviation for numerical variables, and relative and absolute numbers for categorical variables were used for the demographic questionnaires and scores on the SUS and ASQ.

For more in-depth analysis of the think-aloud data, we transcribed the UT recorded sessions using NVivo software and uploaded the researchers' notes to build a robust data set. The materials were coded based on the FRAME [32] framework, with the primary aim of tracking and planning the necessary adaptations to the IVR calls and workbook. The researchers created an Excel sheet containing the main aspects of the framework, adding the time necessary to complete each task, and the total time spent on the UT. To maintain participants' anonymity during the translation, data analysis and results description, we referred to them in our materials as "Staff", followed by a study identification number. Conducting the UT using a mixed-method approach allows for tracking and planning improvements based not only on the questionnaires' results, but also analyzing their body language, visible comfort or discomfort, and time spent on specific tasks.

## RESULTS

The participants were all women (100%), with a mean age of 41.25 (SD 6.08), and all were born in Latin America. Furthermore, the majority completed Elementary school (60.0%), were married (80.0%), and employed part-time (40.0%). Regarding health literacy, most participants are highly confident in filling out Spanish medical forms by themselves (60.0%) instead of the English version (0.0%) (Table 2).

**Table 2.** Participant's characteristics (n=5).

Variable	Value
<b>Age, average (SD)</b>	41.25 (6.08)
<b>Gender, n (%)</b>	
Female	5 (100)
<b>Country of birth, n (%)</b>	
Mexico	2 (40.0)
Cuba	1 (20.0)
El Salvador	1 (20.0)
Guatemala	1 (20.0)
<b>Education, n (%)</b>	
Elementary	3 (60.0)
High School	1 (20.0)

College	1 (20.0)
<b>Marital status, n (%)</b>	
Married	4 (80.0)
Not married	1 (20.0)
<b>Employment, n (%)</b>	
Employed for wages, part-time	2 (40.0)
Employed for wages, full-time	1 (20.0)
Homemaker	1 (20.0)
No Response	1 (20.0)
<b>Health literacy, n (%)</b>	
How confident are you filling out English medical forms by yourself?	
1 - Extremely	0 (0)
2 - Quite a bit	1 (20.0)
3 - Somewhat	1 (20.0)
4 - A little	0 (0)
5 - Not at all	2 (40.0)
No Response	1 (20.0)
How confident are you filling out Spanish medical forms by yourself?	
1 - Extremely	3 (60.0)
2 - Quite a bit	1 (20.0)
3 - Somewhat	1 (20.0)
4 - A little	0 (0)
5 - Not at all	0 (0)
Since you speak another language besides English at home, we want to know in your opinion, how well you speak English. Would you say, you speak English:	
1 - Well	0 (0)
2 - Very Well	0 (0)
3 - Not well	2 (40.0)
4 - Not at all	3 (60.0)

The SUS provides a subjective assessment of usability, where questions are set as a Likert scale, where 1 (strongly disagree) to 5 (strongly agree). Overall, results were positive for 80% of participants (4 of 5), with usability average above the score ( $75.50 \pm 15.04$ ) (Table 3). When analyzing the System Usability Scale (SUS) items individually, a clear trend was observed in the responses. Positive statements (odd-numbered items) predominantly received ratings between "agree" and "strongly agree." Negative statements (even-numbered items) were mostly rated between "disagree" and "strongly disagree." These results suggest a favorable perception among participants regarding the usability of the evaluated material.

**Table 3.** System Usability Scale (SUS) questionnaire results.

SUS response by question	Participants					Mean (SD)
	01	02	03	04	05	
Q1. I think that I would like to use this system frequently	5	5	1	5	3	3.80 (1.79)
Q2. I found the system unnecessarily complex	1	1	1	1	3	1.40 (0.89)
Q3. I thought the system was easy to use	5	5	5	5	3	4.60 (0.89)

Q4. I think that I would need the support of a technical person to be able to use this system	5	5	NA	5	5	5.00 (0.00)
Q5. I found that the various functions in this system were well integrated	5	4	4	5	5	4.60 (0.55)
Q6. I thought there was too much inconsistency in this system	1	1	1	2	4	1.80 (1.30)
Q7. I would imagine that most people would learn to use this system very quickly	5	5	5	5	4	4.80 (0.45)
Q8. I found the system very cumbersome to use	1	1	1	1	3	1.40 (0.89)
Q9. I felt very confident using the system	5	4	5	5	5	4.80 (0.45)
Q10. I needed to learn a lot of things before I could get going with this system	1	3	1	4	5	2.80 (1.79)
<b>Total SUS Score</b>						75.50 (15.04)

*Odd questions = positively worded items; even questions = negatively worded items; NA - No Response*

Participants were satisfied with the workbook ( $1.2 \pm 0.61$ ) and IVR ( $1.1 \pm 0.26$ ) as seen in the ASQ results in Table 4. For the workbook, participants were satisfied with the ease of task completion ( $1.1 \pm 0.32$ ), completion time ( $1.0 \pm 0.00$ ), and support information ( $1.5 \pm 0.97$ ). Likewise, participants expressed high satisfaction with the IVR system, particularly regarding the ease of task completion ( $1.0 \pm 0.00$ ), the time required to complete tasks ( $1.0 \pm 0.00$ ), and the usefulness of the support information provided ( $1.2 \pm 0.45$ ).

**Table 4.** After-Scenario Questionnaire results by materials.

Variables	Mean score (SD)
<b>Workbook</b>	
Q1. Overall, I am satisfied with the ease of completing the tasks in this scenario.	1.1 (0.32)
Q2. Overall, I am satisfied with the amount of time it took to complete the tasks in this scenario.	1.0 (0)
Q3. Overall, I am satisfied with the support information (online help, messages, documentation) when completing the tasks.	1.5 (0.97)
<b>Total</b>	1.2 (0.61)
<b>IVR<sup>a</sup></b>	
Q1. Overall, I am satisfied with the ease of completing the tasks in this scenario.	1.0 (0)
Q2. Overall, I am satisfied with the amount of time it took to complete the tasks in this scenario.	1.0 (0)
Q3. Overall, I am satisfied with the support information (online help, messages, documentation) when completing the tasks.	1.2 (0.45)
<b>Total</b>	1.1 (0.26)

<sup>a</sup> *IVR = Interactive Voice Response*

After tracking the necessary adaptations, using FRAME elements to organize the workbook and IVR calls adaptations and modifications, we identified a total of 30 suggestions (Table 5). All suggestions were associated with the pre-implementation phase (100%), mostly considered reactive (86.67%), and were made by community health workers (44.33%). Moreover, the suggestions were bound with the “content” (86.67%), focusing especially on “tailoring/tweaking/refining” (44.33%) to

improve the “individual and group levels” (86.67%), and other levels (13.33%). Another point analyzed extracted from FRAME was the different goals of the modifications, such as “addressing cultural factors” (36.67%), “improving fit with recipients” (16.67%), and combining “improving fit with recipients” with “addressing cultural factors” (16.67%).

Analyzing the suggested modifications, 23.33% were not adjusted because there were three changes in the fidelity of materials and intervention (e.g. participants would like to have in-person meetings every three calls or every two months, to understand the family context and evaluate the process; change name to "Conexiones Familiares" of workbook and calls; include a brief explanation about what is self-esteem in page 4 of the workbook), one was already part of the intervention (first visit-in-person), and two individualize the materials and feasibility trial (e.g. insert in the workbook the 'local resources' need to be adapted to what is available in the area; include in Chapter 5 of the workbook a calorie list of foods, most consumed foods or Latinos/Hispanics foods such as tortillas).

**Table 5.** Adaptations tracked for workbook and IVR calls utilizing the FRAME Framework.

Elements of FRAME	Value (%)
<b>1. When</b> did the modification occur?	
Pre-implementation	30 (100)
Implementation	0 (0)
Scale up	0 (0)
Maintenance	0 (0)
<b>2. Were the adaptations planned?</b>	
Proactive	04 (13.33)
Reactive	26 (86.67)
<b>3. Who</b> suggested the modification?	
Community health worker	13 (44.33)
Recipient	02 (06.67)
Researcher	08 (26.67)
Researcher NT	07 (23.33)
<b>4. What</b> is modified?	
Content	27 (86.67)
Contextual	04 (13.33)
Training and Evaluation	0 (0)
Implementation and scale-up activities	0 (0)
<b>5. What was the nature</b> of modifications?	
Adding elements	07 (23.33)
Format	04 (13.33)
Substituting	06 (20.00)
Tailoring/tweaking/refining	13 (44.33)
<b>6. What was the level</b> of delivery?	
Clinic/unit level	01 (03.33)
Individual / target intervention group	26 (86.67)
Target intervention group	04 (10.00)
<b>7. What was the goal?</b>	
Improve effectiveness/outcomes	01 (03.33)
Improve fit with recipients	05 (16.67)
Improve fit with recipients / To address cultural factors	05 (16.67)
Increase reach or engagement / Improve effectiveness/outcomes	02 (06.67)
Increase reach or engagement / Increase retention	02 (06.67)
Increase retention / Improve feasibility / Improve fit with recipients	01 (03.33)
Increase satisfaction	01 (03.33)

To address cultural factors	11 (36.67)
To address cultural factors / Increase satisfaction	02 (06.67)
<b>8. Modifications suggested and adoption status</b>	<b>Modified (Y/N)</b>
<b>Delivery</b>	
✓ First visit in-person (n=1)	N
✓ Participant would like to have in-person meetings every 3 calls or every two months, to understand the family context and evaluate the process (n=1)	N
✓ Slow down voice calls (options), for better understanding (n=1)	Y
✓ Teach participants how to use their cell phone for calls, on the first in-person meeting (n=1)	Y
✓ All calls are in English, need to translate (n=1)	Y
✓ Create magnetic/erasable option for grocery planning (n=1)	Y
<b>Inclusion of Content</b>	
✓ Include calorie list of foods (most consumed foods or Latinos/Hispanics such as tortillas) (n=1)	N
✓ 'Local resources' need to be adapted to what is available in the area (n=1)	N
✓ Replace 'web' by 'redes sociales' (n=1)	Y
✓ To use 'camicata' instead of 'senderismo' (n=1)	Y
✓ To include a brief explanation about what self-esteem is (n=1)	N
✓ Add photo examples of each food group (n=1)	Y
✓ Review entire page, participants struggling to understand and respond (n=1)	Y
✓ Include the option 'don't know', in 'actividad de rutina' (n=1)	N
✓ Questions "cuantos dias a la semana?" and "cuantos minutos?" need to be finalized (n=1)	Y
✓ Workbook - pg 65 - Replace 'hot dogs' with 'Perro caliente' (n=1)	Y
✓ Use 'comidas para llevar' instead of 'comidas al paso' (n=1)	Y
✓ Replace 'Cordon' with 'Luis' (n=1)	Y
✓ Review all figures, some are still in English and need to be translated (n=1)	Y
✓ To create a space at the end of the workbook to add the contact of the CHW and the research team (n=1)	Y
<b>Layout</b>	
✓ Review page layout (n=3)	Y
✓ Review figure (n=2)	Y
✓ Review the content, there is a word missing; and the sentence below the figure is out of context (n=1)	Y
✓ Less color on food planning (n=1)	Y
✓ Center text 'overweight' (n=1)	Y
✓ Change name to " Conexiones Familiares" (n=1)	N
<b>Staff previous training</b>	
✓ Add training with CHW on how to navigate the workbook (n=1)	Y
<b>Overall modifications, n(%)</b>	
No	6 (20)
Yes	24 (80)

NT = Notetaker

## DISCUSSION

This UT mixed-method study's primary objective was to evaluate the usability of IVR calls and a Workbook of HFC, and documented and planned adaptations to these materials. The ASQ results revealed the ease of completing the task, satisfaction with the time required to complete the task, and satisfaction with the support information. The ASQ, a widely used instrument by researchers, has been published in studies to analyze the usability of applications [33-35]; a telerehabilitation system [36], a patient-centered website [37], and others. However, no studies have used ASQ to assess the usability of printed workbook materials and IVR focusing on overweight children by the time of this publication. The SUS showed good usability of the workbook and the IVR calls, primarily when it refers to participants' ability to quickly learn how to use the system (Q7), respondents' confidence in using the system (Q9), and whether the system is simple (Q2) and friendly (Q8). The SUS, like the ASQ, is widely used to evaluate the usability of a product. The SUS has been applied to analyze a social robot-based platform to prevent childhood obesity [38], a mobile app offering techno-healthcare services and assistance with adhering to a Mediterranean diet [39], and a risk estimation tool for obesity prevention [40]. However, the studies are not targeted at H/L children who live in rural areas of the United States.

Advancing to the FRAME coding results, it is clear the nature and stage of the research, considering that all the adaptations are in the pre-implementation phase, and the majority are related to content improvement – wording, figures, layout. When looking at the adaptation's nature and goals, it is explicit that the challenge and importance of working with Hispanics/Latinos from different backgrounds are significant. Our participants included Latinos from 4 different countries living in rural Nebraska, and even within Spanish heritage, there are multiple cultural differences within communication and language preferences that impose a need for a more neutral accent and grammar in the intervention materials.

There are multiple dimensions to consider when working with cultural adaptation for Hs/Ls, especially for public health interventions. Therefore, interventions that include cultural adaptation processes, such as the HFC, must go beyond translation. The materials need to incorporate cultural expressions, using language and images that the recipients can relate to; it must be meaningful, consider the context, reach, and reflect the target population [41, 42]. Therefore, cultural adaptation should be ongoing and regularly refined to address evolving needs and preferences within Hispanic/Latino communities [43].

Another interesting fact we noticed during data analysis and result description is the number of adaptations that emerged from participants (recipients) when compared to the CHW and the researchers. Only 6.67% of the suggestions were made by the participants, and they were all contextual – such as having in-person meetings every two months – showing more concern about the intervention itself than the materials specifications. Based on this, we highlight the importance of choosing the think-aloud procedure [14] for this study, and having the usability tests video recorded, and aggregating the researcher notes to NVivo as part of the dataset and coded based on FRAME [21].

Sometimes in technological studies, the participants may not think something needs to be changed or improved, because it is their first contact with that type of resource. However, for the research team, it is important to draw on all relevant background and experience with the topic and develop the skills to conduct an in-depth analysis of qualitative and quantitative outcomes. Also, it is important to consider that some populations, specifically minorities, could think their opinions are not important or they don't share them freely for other reasons and barriers imposed by different contexts [44-46]. So, when working with studies such as cultural adaptations, inclusive language, or anything related to minorities and health disparities, it could be essential to conduct mixed methods approaches independently of the sample, since the data integration can provide specific, in-depth, essential information for the data analysis [47-49].

Of the 30 adaptations tracked by our team using FRAME, seven were not addressed immediately in this phase of the study. One of them because it was already part of the program – having the first meeting in person – and the others because they could affect fidelity-consistency with the intervention’s core elements. It is important to note that these UTs are part of the HFC. So, any future adaptations needed that involve changes in fidelity will be assessed after the analysis of the HFC feasibility study's results, before planning the intervention scale-up for a broader audience.

### **Strengths**

The methodological innovation proposed by the research team in this study is noteworthy. In technological studies (especially usability and satisfaction assessments), it is new to aggregate standardized questionnaires (such as ASQ and SUS) with frameworks from other disciplines, such as the FRAME framework that we chose for the adaptations report and coding. Our goal with the incorporation of FRAME in the usability tests analysis is to help facilitate translation into practice, since this framework’s roots are in the precepts of Implementation Science, which is essential when working with technology applications for public health interventions, permitting us to have a broader vision of the process of adaptations, improving delivery and effectiveness.

### **Limitations**

This study assessed workbook and IVR usability, but we did not test the intervention materials' effectiveness at this point. Also, the participants are from two different counties of rural Nebraska, all women, and only Spanish-literate individuals were eligible, which does not represent the diversity of Hispanics/Latinos that we intend to reach with the intervention in the future.

### **CONCLUSION**

By testing the usability of Workbook and IVR calls, this study addressed part of the gap related to the development of culturally relevant interventions for Hispanic/Latino families living in rural areas. Our results of the SUS and ASQ show that the usability of Hispanic Family Connections materials, before adaptations, was rated mostly as good. For both resources evaluated (workbook and IVR calls), participants demonstrated higher satisfaction with the level of ease of task completion. Of the 30 adaptations tracked using FRAME, we addressed 23, primarily related to content changes, such as wording, layout, and figure adjustments. By understanding the strengths and limitations of the intervention materials, we aimed to enhance their accessibility and cultural relevance, and possibly their future effectiveness when applied in a feasibility study.

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### **AUTHORS CONTRIBUTIONS**

TFA, FA, TM, FB were involved in the study design and planning. TFA, NS, EDL and CS were involved in manuscript drafting. TFA and NS were responsible for final manuscript formatting with supervision from FB and TM. All authors provided a critical review of the final version of the manuscript.

## CONFLICTS OF INTEREST

None declared.

## ABBREVIATIONS

ASQ: After Scenario Questionnaire

CHW: Community Health Worker

FRAME: Framework for Reporting Adaptations and Modifications-Enhanced

HFC: Hispanic Family Connections

H/L: Hispanic/Latino

IVR: Interactive Voice Response

RCT: Randomized Control Trial

SUS: System Usability Scale

UT: Usability Test

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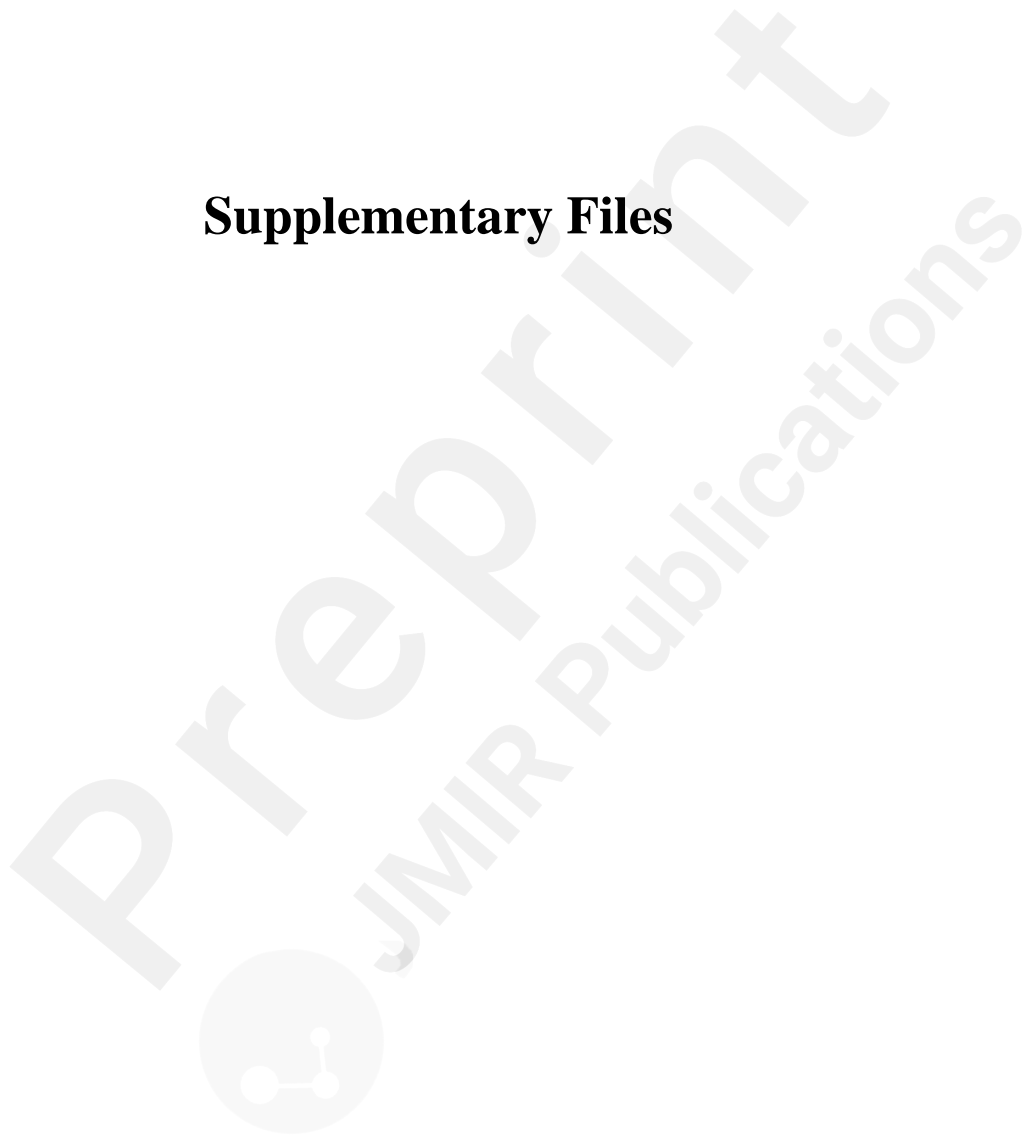
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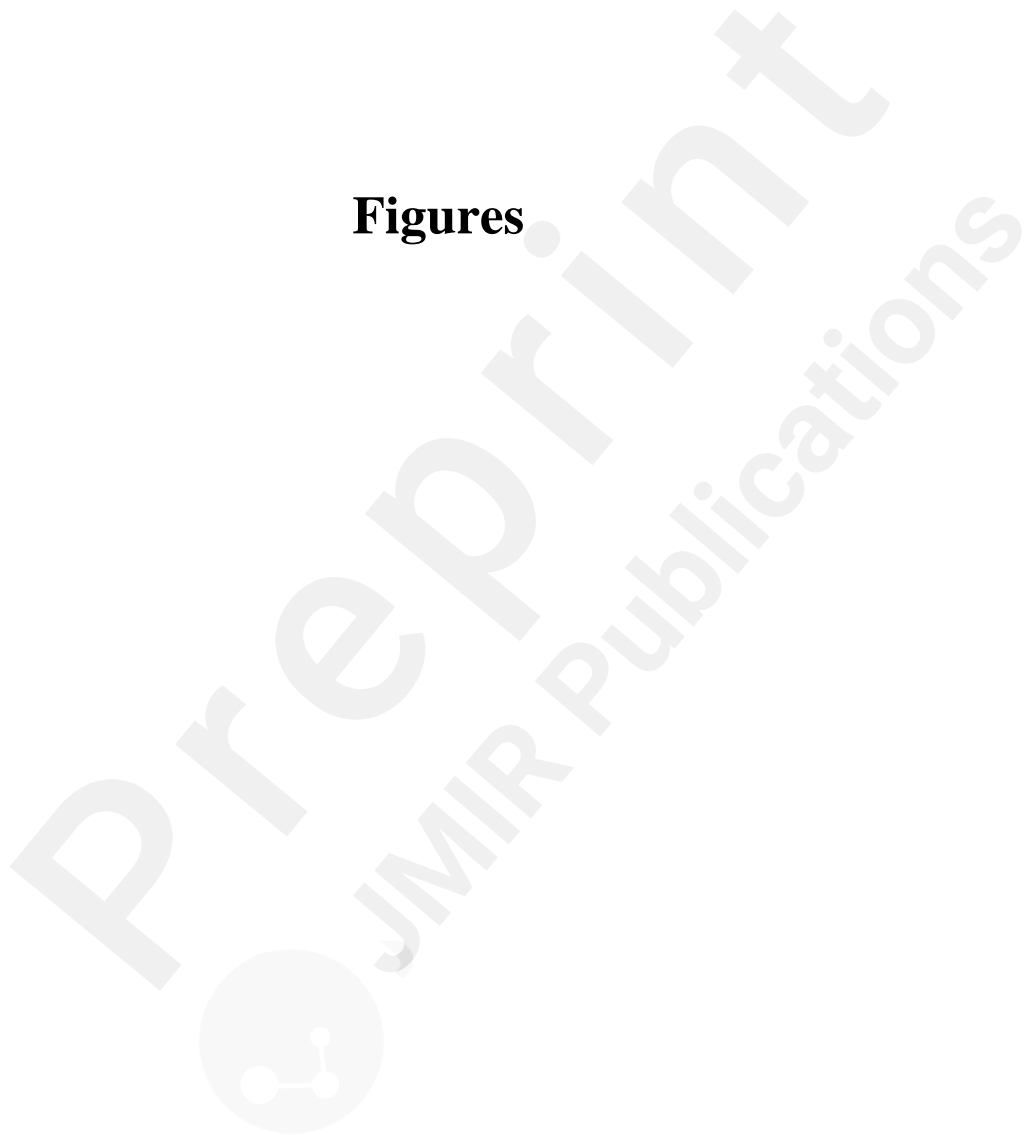
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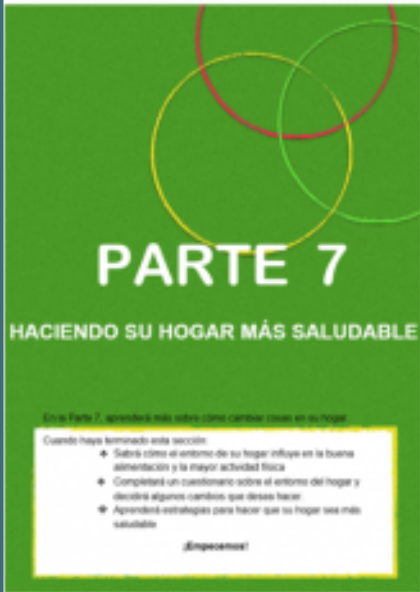
## Supplementary Files



## Figures



Example of Workbook content and exercises, in Spanish.



**PARTE 7**  
HACIENDO SU HOGAR MÁS SALUDABLE

En esta Parte 7, aprenderá más sobre cómo cambiar cosas en su hogar.


Cuando haya terminado esta sección:

- Sabrá cómo el entorno de su hogar influye en la buena alimentación y la mayor actividad física
- Completará un cuestionario sobre el entorno del hogar y decidirá algunos cambios que desea hacer.
- Aprenderá estrategias para hacer que su hogar sea más saludable.

**¡Empiece!**

### En qué forma su hogar apoya su estilo de vida

**¡Felicitades!** Está trabajando muy duro para cambiar las reglas familiares sobre la alimentación saludable y la actividad física. También está practicando nuevas habilidades de crianza para apoyar estos cambios saludables. Como usted va aprendiendo, puede entrar en los comportamientos saludables de su hijo. ¡Su siguiente paso es asegurarse de que su hogar está fomentando a estos de vida saludable que desea para su familia! Para comprender lo importante de hogar en los comportamientos saludables, volvamos a la historia de Corbin...



Una de las cosas que queremos mostrar sobre el entorno de su hogar es que tener opciones saludables disponibles para sus hijos puede no ser suficiente. ¿Recuerda a Corbin? Bueno, al final una excelente decisión. Tanto el tamaño perfecto, se vea más bien y a Corbin le gustaba mucho. Pero un día, Corbin pasó por encima de un clavo y se torció su pie. La pierna se puso que le alegraba, pero su papá no pudo hacerlo de inmediato. En poco tiempo, ambos se olvidaron de la lesión y volvió a sus actividades de patio en el sótano.

**¿Qué le dice esta historia de Corbin?**

Un juguete o equipo deportivo que no está en buenas condiciones de funcionamiento, no se utilizará. Lo mismo ocurre si los artículos no están en un lugar visible o de fácil acceso. En este caso, al niño pierde una oportunidad de actividad física porque no puede usar el juguete o el equipo.

La misma lección se aplica a los alimentos saludables. ¿Recuerda cómo la mamá de Corbin compra frutas y verduras y las coloca en bolsas en el refrigerador? Eso le dio a Corbin un fácil acceso a un refrigerador saludable después de la escuela. Cuando compra alimentos saludables en un lugar donde los niños pueden acceder a ellos rápidamente y fácilmente, es más probable que ellos tomen esa decisión saludable.

**¿Ahora es su turno! ¿Qué mensaje está enviando en su hogar?**  
Responda el Cuestionario sobre el entorno del hogar en la página siguiente.

### Cuestionario sobre el entorno del hogar

**¿Qué alimentos es más probable que coma como refrigerio?**

Biscuitos que están ubicados a la altura de los ojos en la despensa

Biscuitos que están ubicados a la altura de los ojos en el refrigerador

Comida ubicada encima de la mesa en la cocina

Por lo general, ¿qué bocadillos suele comer?

**¿Dónde guarda estos alimentos?**

A la altura de los ojos en la despensa

A la altura de los ojos en el refrigerador

Encima de la mesa de la cocina

Si fuera a comer una fruta o verdura fresca en este momento, tendría que:

Ir a la tienda

Pesar y cortar la pieza de fruta o verdura

**¿Cuáles son sus tamaños de porciones típicos?**

¿Compra alimentos de gran cantidad y/o en paquetes individuales?

Sí

No

¿Qué tipo de alimentos compra de gran cantidad o en paquetes individuales? (Busque el congelador, el refrigerador y la despensa)

A granel o paquetes de tamaño familiar

Pequeños individuales

Usability Test data collection process, per participant.

