

RESPONSIVENESS TO MOTIVATIONAL INTERVIEWING AMONG LATINA OVARIAN CANCER SURVIVORS  
PARTICIPATING IN A LARGE, WELL POWERED RCT: A MIXED METHODS ANALYSIS

by

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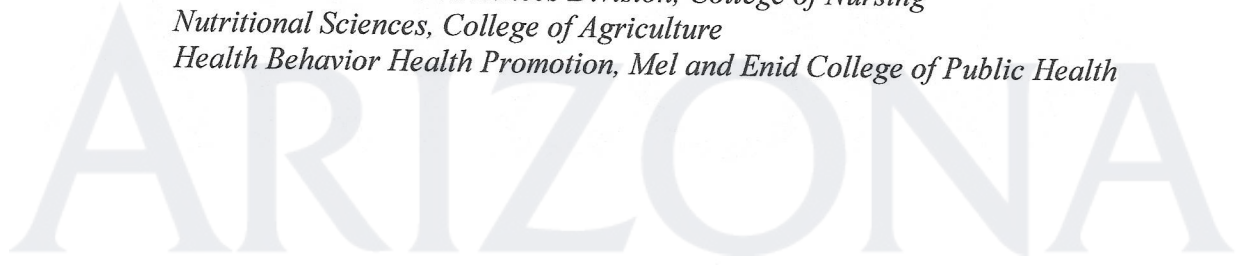
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## Abstract

**Background:** In the United States, cancer is the leading cause of death among Latinas. It is estimated one in four cancer cases could be prevented with modifiable lifestyle behaviors including diet and physical activity. However, approaches for changing these behaviors may be different based on cultural factors, including diet. Motivational Interviewing (MI) is an evidence-based approach for changing lifestyle behaviors composed of 5 constructs: evocation, collaboration, autonomy, direction and empathy. However, previous research, as well as our own anecdotal observations, suggests that Latinas may be less responsive to usual MI behavior change techniques.

**Purpose:** The present study aims to, assess potential differences in MI responsiveness between Latinas and non-Hispanic white women who recently completed treatment for ovarian cancer. These survivors participated in the intervention arm of a large, well-powered RCT, focused on changing dietary intake. Secondly, it aims to qualitatively describe the 5 MI constructs for behavior change, using qualitative descriptive methods, among Spanish-speaking Latinas and English-speaking Latinas.

**Methods:** Women randomized to the intervention arm received a total of 33 lifestyle counseling sessions with health coaches trained in MI. Recorded coaching sessions were randomly selected from a subsample of Spanish-speaking (SPA) Latina group (n=10), English-speaking (ENG) Latina group (n=10), and age-matched non-Hispanic white (NHW) women (n=10). All Coaching sessions (n=123) were scored using Motivational Interviewing Treatment Integrity 3.0 code, a behavioral coding system to assess MI fidelity by the interviewer (coach). Language preference for either English or Spanish was used as a proxy for acculturation. Differences in Individual MITI constructs were also assessed between groups. Adherence to dietary study goals was assessed with the AFFQ tool. Differences in total MITI scores between groups were evaluated using ANOVA, while individual constructs were evaluated using the Kruskal-Wallis test. For the qualitative descriptive analysis, a sub-sample of calls from the MITI scored sample was used (n=12). These calls were transcribed and coded for the 5 MI constructs in both the SPA and ENG Latina groups.

**Results:** Mean MITI scores were 18.3 (SD  $\pm$ 1.1), 20.6 (SD  $\pm$ 1.0) and 21.0 (SD  $\pm$ 0.3) for SPA Latina group, ENG Latina group and NHW group, respectively. Spanish-speaking Latinas' MITI scores were significantly lower ( $p < 0.001$ ), with a  $\beta$ -coefficient value of -2.7 (95%CI: -3.5, 1.8) than NHW, while ENG Latina group MITI scores were not significantly different than NHW. Of the 5 MITI constructs, direction and collaboration were significantly different between groups, with SPA Latina group having significantly lower scores than NHW, with a mean of 3.28 (SD  $\pm$ 0.42) for collaboration and 3.88 (SD  $\pm$ 0.40) for direction. The SPA Latina group also had higher mean behavior counts for giving information, 7.55 (SD  $\pm$ 2.0), and open-ended questions, 8.78 (SD  $\pm$ 4.9) compared to NHW group.

**Conclusion:** Significant differences between MITI scores were observed in Latina cancer survivors based on language preference used as a proxy for acculturation in this analysis. This secondary analysis supports the need for behavioral interventions tailored beyond language for both race and culture; potentially with special attention to direction and collaboration when using MI for these interventions.

**Keywords:** Latinas, Acculturation, Language, Motivational Interviewing, Diet, Ovarian Cancer, Cancer Survivor, Lifestyle

## 1. Introduction

One in three Latinas will be diagnosed with cancer in their lifetime<sup>1</sup>. In the United States, cancer is the leading cause of death in the Latinx<sup>2</sup> community, accounting for 21% of all deaths as compared to 22% in non-Hispanic whites<sup>1</sup>. Latinx is the gender-neutral term used to identify individuals who are Latinos and Latinas. The term Latinx is also based on regional difference, as it includes individuals born in or within Latin America<sup>3,4</sup>. In the US, nearly 50% of all cancer-related deaths and over 40% of newly diagnosed cancers are preventable with modifiable lifestyle behaviors including healthy diet, regular physical activity and avoidance of tobacco products<sup>1</sup>. To date, the majority of lifestyle behavior interventions for cancer prevention and post-treatment cancer survivorship have largely focused on non-Hispanic whites (NHW)<sup>5,6</sup>. There is minimal literature that focuses on cultural beliefs, access and quality of health care and the influence that immigration and acculturation to the United States may impact quality of life and rates of survival in the Latinx community. To better understand these impacts for Latinas, additional research is needed with regard to acculturation and adoption of healthy lifestyle behaviors.

### Lifestyle Behaviors and Cancer

The World Cancer Research Foundation(WCRF), the American Cancer Society (ACS) and the American College of Sports Medicine (ACSP) have issued similar guidelines regarding lifestyle behaviors and cancer prevention<sup>1,7-9</sup> including: limits on the consumption of processed meat and red meat, alcohol, and sedentary behaviors, adequate intake of vegetables and fruits, selection of whole grains over refined grains, and a minimum of 150 minutes of physical activity each week. Mechanisms associated with the effects of healthy lifestyle on underlying tumorigenesis include reduced inflammation, DNA methylation, and normal metabolic indices of insulin, glucose and fatty acids. Despite the consensus around guidelines for cancer prevention across scientific and advocacy organizations, it is estimated only 40% of all cancer survivors meet these recommendations, and less than 20% of Latinx survivors meet the guidelines<sup>10-14</sup>. Given these troublesome statistics and the dearth of research focused on dietary interventions for minority cancer survivors, there is an urgent need for culturally relevant dietary behavioral interventions, tailored specifically for Latinx cancer survivors<sup>15</sup>.

### Behavioral Interventions in Latinx Population

A 2016 systematic review by McNulty et al., evaluated studies conducted within Latinx cancer survivors focused on improving quality of life after treatment<sup>16</sup>. The researchers concluded that the interventions that emphasized psychosocial support<sup>17-21</sup> and education<sup>22-25</sup> (such as nutrition<sup>24,25</sup> and quality of life<sup>22,23</sup>) and had stronger culturally techniques, were better accepted by Latinx and were the most effective. This in contrast to interventions that focused on exercise and nutrition behavior change, which were less culturally adapted. Studies that focused on nutrition and physical activity were noted to be beneficial in this population, however, these interventions lacked cultural tailoring, faced challenges related to intervention adherence, and had high attrition levels in control groups<sup>26-29</sup>. Half of the interventions were conducted with multiethnic samples, and because they were not specific to Latinx, it is challenging to draw conclusions specific to this population. Lastly, acculturation was measured

in only one study<sup>23</sup>, while participant language preference was specified in all but one of the interventions reviewed<sup>29</sup>.

The Latinx population in the United States is composed of individuals from multiple cultural backgrounds and countries of origin, with diverse cultures, beliefs, and norms that can influence health behaviors<sup>3,30</sup>. Associations between acculturation and change in healthy lifestyle behavior may differ between Latinx populations<sup>30</sup>. Thus, studies that assess for acculturation and test for differences between groups are needed and may lead to a better understanding of how to tailor interventions to be culturally sensitive.

### Motivational Interviewing

Motivational Interviewing (MI) is a counseling technique often used to promote lifestyle behavior change for cancer survivors<sup>31</sup>. This counseling method acknowledges that not everyone starts at the same point or stage<sup>32,33</sup> and aids an individual in transitioning from a place of ambivalence to one of action to promote the enactment of healthy behaviors. Specific characteristics of MI include five key elements: collaboration, evocation, autonomy, direction and empathy<sup>34,35</sup>.

Cultural values and beliefs may influence the success of MI for enacting healthy lifestyle behavior change<sup>36</sup>. The techniques the counselor or health coach use may need to be different based on cultural factors. Previous research has found that Latinx individuals are less responsive to classic MI techniques<sup>37,38</sup>, however few studies have evaluated and tested different approaches to MI for the Latinx population. Therefore, the main purpose of this secondary data analysis, using a mixed methods approach, is to determine whether MI differs by acculturation and facilitates behavior change for Latina ovarian cancer survivors compared to non-Latina women participating in the Lifestyle Intervention for oVarian cancer Enhanced Survival (LIVES) study. The findings from this analysis may help describe variations in behavior change techniques related to MI in an effort to identify best practices for helping Latina cancer survivors adopt a healthier diet to prevent new or recurrent cancers.

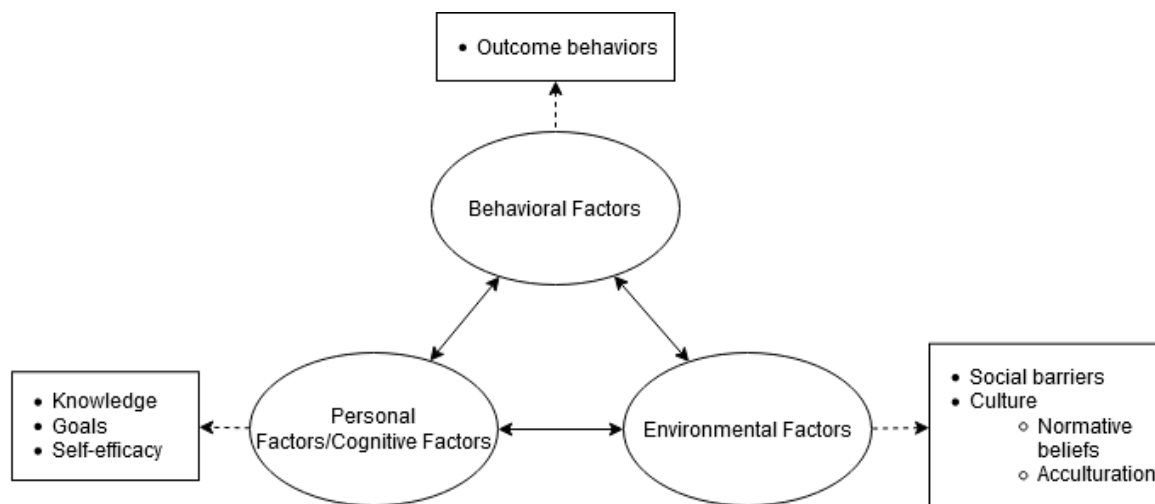
## **2. Methods**

### 2.1. Theoretical Framework: Social Cognitive Theory and MI

The social cognitive theory (SCT) is a basis for understanding and predicting behavior and is useful for grounding behavior change interventions. One key construct of SCT is the concept of reciprocal determinism<sup>39</sup>, which states that an individual's behavior can influence and be influenced by personal and environmental factors, such as self-efficacy and acculturation, respectively<sup>40</sup>. (see Figure 1)

MI fits within SCT by influencing and increasing self-efficacy<sup>41-45</sup>, which is an individual's sense of ability to change, readiness to change, and the perception that he or she can change. Furthermore, an individual's perception of self-efficacy influences the development of new behaviors, and the inhibition of existing behaviors. In this theory, by influencing self-efficacy, MI leads to the promotion of lifestyle behavior change<sup>34,35</sup>.

**Figure 1. Social Cognitive Theory Model**



## 2.2. The Lifestyle Intervention for oVarian Cancer Enhanced Survival (LIVES) Study

The LIVES Study is a nationwide, multi-center randomized controlled trial of 1205 women diagnosed with stage II-IV ovarian cancer, in which 603 which were randomized to the intervention group. The trial protocol was previously published elsewhere<sup>46</sup>. Briefly, the primary outcome of the LIVES study was to determine whether a 24-month, telephone-based diet and physical intervention increased progression-free survival, as compared to an attention control group. The intervention participants receive a total of 33 coaching calls in a decreasing frequency sliding scale by a health coach trained in MI (See Supplemental Figure 1). The intervention was focused on dietary and physical activity goals, which aimed to increase daily servings of vegetable, fruit and fiber and decrease fat intake, and increase physical activity level by 4000 daily steps above baseline levels. Attention control participants receive a total of 22 calls focused on general health education by a different group of health coaches with no training in MI. (See Supplemental Figure 2). For this secondary analysis, only the nutrition goals were analyzed (Table 2). The nutrition goals from the intervention arm included the following: consumption of 6 serving of fruits and vegetables (4 serving of vegetables, 2 servings of fruit), increase in dietary fiber consumption to 30g , >20% of total calories from fat (decrease consumption of fat grams) per day.

### Ethical Considerations

This study was approved by the Institutional Review Board at the University of Arizona. All recorded calls were de-identified and coded with participant identification numbers; linkage data were secured in a password protected computer. Materials were stored securely and only accessible to designated investigators. All study participants provided informed written consent prior to participation in the study.

## 2.3. Quantitative Analysis

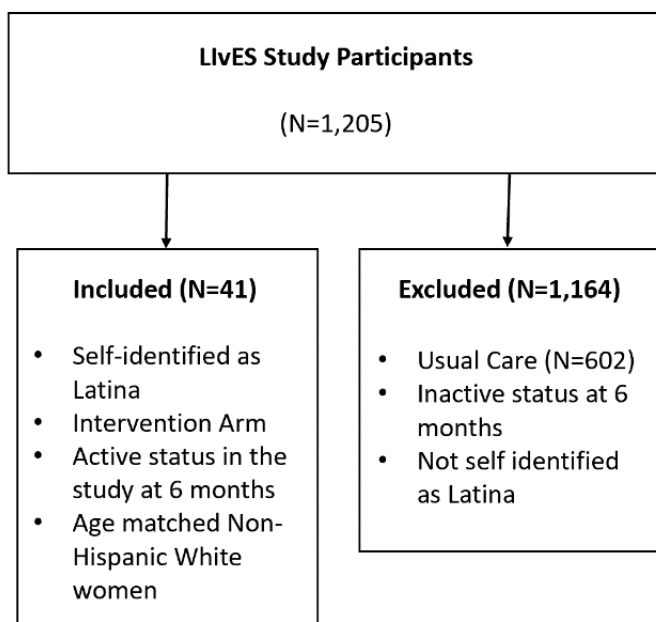
### 2.3.1. Methodological Approach

All LivES study coaching calls were audio recorded using the electronic health and interventions platform (eHIP)<sup>47</sup>. To evaluate the effectiveness of MI among the sub-sample of participants in changing dietary behaviors, three calls per participant (n= 123 total calls) were randomly selected between months one and six of the study (call 4-18). This timeframe was selected to capture calls in which coaches shifted from basic education to active use of MI strategies to promote behavior change<sup>48</sup>. Calls 1-3 were not included in the random selection, as these included introduction to the study by the research coordinator and basic nutrition and physical activity education by the coach. A random number generator between 4 and 18 was used to choose the three recorded for each participant included in this secondary analysis.

### Inclusion and Exclusion Criteria

Only the intervention participants who received behavioral counseling using MI were included. To be included for MITI evaluation, calls needed to be a minimum of 20 minutes long, per MITI 3.0 scoring protocol<sup>49,50</sup>. Eligibility criteria included self-identification as Latina/Hispanic, and active study participation at the six-month mark. Language was used as a proxy for acculturation, as done in previous studies<sup>4</sup>, and was determined by the participant language of preference for coaching sessions and resources (Spanish and English). Participants that self-identified as Latina/Hispanic but did not have an active status at six-months in the study were not included in the analysis (Figure 2). The Non-Hispanic white women group, or NHW was used as the comparison group because the majority of research in cancer (as previously mentioned), has been done in NHW and ovarian cancer is a disease that predominantly affects NHW<sup>51</sup>.

**Figure 2. Inclusion Criteria and Exclusion Criteria**



### 2.3.2. Motivational Interviewing Treatment Integrity (MITI) 3.0 Code and Scoring Guide

All the coaching calls included in this analysis were scored using the Motivational Interviewing Treatment Integrity 3.0 (MITI 3.0)<sup>49,50</sup>. This is a behavioral coding system for MI in which a higher score (on a scale of 5-25) indicates greater MI fidelity. The MITI 3.0 coding is divided into two parts, Global Ratings and Behavior Counts. Trained coders listen for these behavior counts and score per the MITI 3.0 protocol<sup>50</sup>.

Global Ratings: The first part of the MITI 3.0 score is the Global Ratings, where a scale of 1 (low) to 5 (high) for each of the 5 MI constructs<sup>49,50</sup>, with a max possible summed score of 25. High total score indicates good use of MI by the coach, lower total points indicates that MI technique needs improvement. *Collaboration* in MITI is described as the extent in which the coach behaves as if both individuals participating in the intervention calls are equals, and both have valuable knowledge that might be useful for problem solving. The *Evocation* scale measures the coach's understanding and exploring of the participant's reasons for change and her ability to make such change. *Autonomy* is a scale used to convey the coach's efforts to show the participant control and choice, and support in such choices. *Direction* in the Global Rating scale measures the degree in which the coach is able to maintain counseling and exert influence on the session to focus on a target behavior<sup>50</sup>. Lastly, *Empathy* measures the coaches' understanding of the participants' experiences and worldview<sup>50</sup>.

Behavior Counts Codes: The second part of the MITI score are Behavior Counts. Behavior counts are divided into *Giving Information*, *MI Adherent* (Asking permission, affirm, emphasize control, and support), *MI non-adherent* (Advise, confront, direct), *Questions* (subclassified into Closed Questions and Open Questions), *Reflections* (Subclassified as Simple and Complex) (See Supplemental Figure 4). The behavior counts in the MITI 3.0 are used to capture specific coach techniques, without regard as to how these fit into the overall impression of the coach/clinician's use of MI<sup>50</sup>. Higher behavior counts indicate better use of MI, except for closed-questions. *Giving Information* is used when the interviewer educates, gives information or feedback to the participant. *MI Adherent* is used to capture when the interviewer engages in behaviors that are consistent with MI. *MI non-adherent* is used when the coach engages in behaviors that are inconsistent with MI approach. *Closed Question* is a code used when the coach asks "yes" or "no" questions. *Open Question* used when the interviewer asks a question that allows for a broad range of answers. *Reflections* is a category meant to capture the coach's reflective listening statements in response to the participant's statements<sup>50</sup>.

### 2.3.3. MITI 3.0 and the LIVES Study

Per the LIVES protocol, trained intervention coaches were expected to apply MI skills, which included Open-ended questions, Affirmations, Reflections and Summary (OARS) and have a total Global Score of  $\geq 20$  in each coaching session, indicating adequate use of MI skills to promote behavior change<sup>46</sup>. Coaches were also expected to utilize patient-centered behavior change strategies (e.g., asking permission, affirm, emphasize control, and support) and minimize the use of MI non-adherent strategies, such as giving education without asking for permission or telling the participant what to do<sup>46</sup>.

All English-speaking calls (n= 93) were MITI scored by a single trained reviewer, while all the Spanish calls (n=30) were scored by a single bilingual trained reviewer. To ensure interrater reliability, a total of 10 English calls were analyzed by both the English-speaking and bilingual coder to determine-reliability by reviewer. Eighty percent similarity between reviewers was considered acceptable and good reliability.

Differences in individual MITI constructs between groups was assessed by calculating the mean score of each construct.

#### 2.3.4. MITI 3.0 Scored Calls

Following the identification of the 3 groups (n=41) for the analysis, 3 recorded counseling calls were chosen for each participant. This was done to have a better overview of each participant's counseling sessions, since 1 call would not provide enough information about the participants' responsiveness to MI . A total of 123 calls were scored using the MITI 3.0 code and followed protocol from the scoring guide<sup>50</sup>. The calls date from 2013 to 2018 and represent a total 13 coaches.

#### 2.3.5. Health Coach Protocol Fidelity Scoring

Treatment/intervention fidelity to the telephone counseling protocol was also assessed during this research project, separate to the MITI 3.0. The health coach protocol fidelity scores were pertinent and important to demonstrate that the delivery of the intervention was the same across all intervention coaches, as this could impact the internal validity of the research. Protocol fidelity for the LIVES study was developed by researchers to assess the intervention arm fidelity to the treatment delivery and receipt. The protocol adherence fidelity included a fidelity checklist, in which specific behaviors were listed and each call recording was assessed by a trained researcher. Each time a specific behavior was present, the researcher checked it off from the list (see Appendix 6). Each behavior could receive a 0 or 1 on the checklist protocol, a 0 represented that the behavior or instance was not present, while a 1 denoted the coach was engaged in the behavior. In total, there were 14 specific behaviors that were listed in the Health Coach Protocol Fidelity Scoring checklist. A score greater or equal to 11 on the 14-point scale (80%) was considered adherent to as the intervention coaching protocol.

#### 2.3.6. Assessments

Multiple questionnaires were administered at each study-time point, however, only data from the baseline demographic and medical history and the Arizona Food Frequency Questionnaire were utilized for this secondary analysis. At the time of study enrollment, all participants completed questionnaires at clinical sites<sup>46</sup> that included demographic, and other study variables, such weight and weight history, smoking/tobacco use, and medical history.

Arizona Food Frequency Questionnaire (AFFQ): Diet and goal adherence was assessed with the AFFQ. The AFFQ is a validated tool tested in adults and has good reliability and validity with proven feasibility in the setting of chemoprevention and survivorship trials<sup>52</sup>. The dietary instrument is a self-reported, 153-item questionnaire and captures the intake of all LIVES study dietary goals including daily servings of fruits and vegetables and grams of fiber and fat.

### 2.3.7. Statistical Analysis

Summary statistics were used to complete the analysis of the baseline demographic data. For the MITI scoring analysis and fidelity scoring, a sample of 123 calls (with 41 participants) were evaluated, and summary statistics were computed to describe total MITI scores and Protocol Fidelity Scores. Groups were stratified based on language preference, ethnicity, and race. Differences in total MITI scores (Global Rating) between groups were evaluated using a two-way analysis of variance (ANOVA), and regression analysis. Individual MITI construct scores (Evocation, Collaboration, Autonomy/Support, Direction and Empathy), mean and standard deviation were calculated as mean and standard deviation, using the Kruskal-Wallis one-way analysis of variance test, as these were not normally distributed.

Fidelity drift, which is the gradual change during the intervention delivery, was evaluated as the change in fidelity checklist score over time, in which a lower score meant decreased fidelity. A two-way analysis of variance (ANOVA) was used to evaluate fidelity drift. Each call was considered an independent factor without repeated measures due to the random selection of calls. Difference between groups for dietary study goals at six months was evaluated using a Multilevel mixed-effects linear regression analysis, while differences over time (baseline and six months) by group was analyzed using a Student's T-test.). All analyses were completed using STATA 16.1 (StataCorp Inc., College Station, TX, USA).

## **2.4. Qualitative Subset**

### 2.4.1. Design

After the quantitative analysis was conducted, trends and differences were observed between groups on total MITI scores and individual MITI constructs. The purpose of the qualitative portion was to describe the MITI 3.0 constructs from the Global Rating scale (empathy, autonomy, collaboration, direction, evocation) in more detail with qualitative description.

### 2.4.2. Data Collection

A convenience sample of calls data for the qualitative portion of this secondary analysis was chosen based on the ability to reach saturation<sup>53</sup>. A total of 12 calls were identified for this sample; six recordings with the highest MITI scores, 3 in Spanish and 3 in English and six calls with the lowest total MITI scores were chosen for the analysis, 3 in Spanish, and 3 in English. A mix of high and low MITI scored calls were chosen in order to ensure variety and difference between Latina groups. Had this analysis used all high or all low MITI scored calls, the results and may not have been representative of the differences observed between groups.

### 2.4.3. Data Analysis

Each call recording was transcribed using Google Docs voice recognition software (Type with your voice online tool) and corrected by hand as needed. Each call was kept in its original language in order to ensure that no meaning was lost or distorted due to translation. The coding team consisted of 3 researchers, all which were trained in MI. All of the researchers were blinded to the total MITI scores and coach name, and all personal identifiers for both the

coach and participant were removed from the transcripts. 2 of the researchers were bilingual and bicultural. All researchers were previous health coaches and familiar with the LIVES study<sup>46</sup>.

The transcripts were uploaded to the online software program Dedoose<sup>54</sup>, which is used for organizing qualitative data, ease of coding, and allows different coders to use the software at the same time with no disruption while keeping them blind of each other's codes. The MITI constructs were kept in English, which allowed the researchers to use the same codes and discuss them. Each call was first coded independently by two researchers. Once the coding for two calls was completed, the research team met to discuss the coding and come to a consensus before moving to the next calls.

#### 2.4.4. Trustworthiness

In order to establish trustworthiness in the qualitative analysis, the criteria outlined by Lincoln and Guba was followed including credibility, dependability, confirmability and transferability<sup>55</sup>. *Credibility* was established by keeping the transcripts in their original language, so no meaning was lost during translation. The research team met before and after coding the transcripts to discuss the thought process behind each excerpt coded. *Dependability* was ensured by following the recommendations from the literature<sup>53</sup> for secondary analysis of qualitative data, and the process of analyzing data in more than one language<sup>56</sup>. *Confirmability* was met by reaching a consensus within the research team about the codes used in the transcripts, how fitting they were in explaining MITI 3.0 concepts, and by keeping the team blind to the MITI total scores and coach names. *Transferability* was established by providing extended/sufficient detail on the phenomenon observed<sup>55,57</sup> based on language preference and MITI scores.

### **3. Results**

#### 3.1. Sample

A total of 31 participants met the inclusion and exclusion criteria. Twenty-one which were English-speaking (ENG) self-identified Latinas, and 10 Spanish-speaking (SPA) self-identified Latinas. Ten non-Hispanic white (NHW) participants from the LIVES study were added to the sample by age-matching them to the Spanish speaking Latinas. These NHW participants served as the comparison group for the analysis (Figure 2).

#### 3.2. Baseline Demographics

When comparing Latina subgroups to the whole study subsample, these women were younger, with a mean age of 54.5 years (standard deviation (SD)  $\pm 9.08$ ), and 54.1 ( $\pm 9.45$ ) for ENG Latina group and SPA Latina group respectively; these results cannot be directly compared to the subsample of NHW as they were age-matched and not a representative sample for age in this group. For education, 50% (n=5 of the SPA Latina group reported less than high school education), while none of the ENG Latina group and NHW participants reported less than high school education. Furthermore, 40% of NHW and 57.1% ENG Latina group indicated being college graduates, while none of the SPA Latina group reported this. (Table 1)

### 3.2.1. Comorbidities and History of Disease

Smoking status, as well as other comorbidities were asked during the baseline questionnaire. 42.9% (n=9) of ENG Latinas reported to have smoked in the past, while only 20% (n=2) of NWH reported smoking, and none of the SPA Latinas group reported a history of smoking. Only ENG Latinas reported History of Diabetes (n= 4, 19%). For Osteoporosis, 4.8% (n=1) ENG Latinas reported history of the disease, while only 20% (n=2) of NWH participants reported being diagnosed. Finally, 80% (n=8) of SPA Latinas were in the obese BMI category ( $\geq 30$  kg/m<sup>2</sup>), while, 28.6% (n=6) of ENG Latinas fall, and 40% (n=4) of NHW group fall in this category. For the overweight classification (25-29.9 kg/m<sup>2</sup>), 28.6% (n=6) of ENG Latinas, 10% (n=1) of SPA Latinas, and 10% (n=1) of NHW were classified as such. (Table 1)

**Table 1. Baseline Demographics**

	Groups (n=41)		
	NHW English (n = 10)	English- speaking Latinas (n = 21)	Spanish- speaking Latinas (n = 10)
Age (years)	54.5 (9.08)	55.05 (12.61)	54.1 (9.45)
<b>Education</b>			
Less than High School	0	0	5 (50%)
High School Graduate	1 (10.00%)	2 (9.5%)	4 (40%)
Some College	5 (50.0%)	7 (33.3%)	1 (10%)
College Graduate	4 (40.0%)	12 (57.1%)	0 (0.0%)
<b>Marital Status</b>			
Married	7 (70.0%)	13 (61.9%)	7 (70.0%)
Separated	2 (20.0%)	3 (14.3%)	1 (10.0%)
Widowed	0 (0.0%)	2 (9.5%)	1 (10.0%)
Never Married	1 (10.0%)	3 (14.3%)	1 (10.0%)
<b>Ethnicity</b>			
Non-Hispanic	10 (100.0%)	0 (0.0%)	0 (0.0%)
Hispanic	0 (0.0%)	21 (100.0%)	10 (100.0%)
<b>Smoking Status</b>			
Ever Smoked	2 (20.0%)	9 (42.9%)	1 (10.0%)
<b>Chronic Conditions</b>			
Diabetes	0 (0.0%)	4 (19.0%)	0 (0.0%)
Osteoporosis	2 (20.0%)	1 (4.8%)	0 (0.0%)
<b>Body Mass Index Class</b>			
Normal ( $\leq 24.9$ kg/m <sup>2</sup> )	5 (50.0%)	9 (42.9%)	1 (10.0%)
Overweight (25.0- 29.9kg/m <sup>2</sup> )	1 (10.0%)	6 (28.6%)	1 (10.0%)
Obese ( $\geq 30.0$ kg/m <sup>2</sup> )	4 (40.0%)	6 (28.6%)	8 (80.0%)

\*Data are presented as n (%), except for Age, which is presented as mean (Standard Deviation).

NHW= Non-Hispanic white

### 3.3. Quantitative Analysis Results

#### 3.3.1. MITI 3.0 scores

##### Total MITI Scores

After all the calls (N=123) were MITI 3.0 coded, the average scores for the Global Ratings, which have been labeled as Total MITI Scores, were analyzed for each of the 3 groups. Mean total MITI scores for each group were 21 ( $\pm 0.3$ ), 20.6 ( $\pm 1.0$ ), and 18.3 ( $\pm 1.1$ ) for NHW, ENG Latinas, and SPA Latinas, respectively. The SPA Latinas total MITI scores were statistically lower than the NHW group. There was no difference between ENG Latinas and NHW groups (Table 2).

**Table 2. Total MITI Scores: Global Ratings**

Groups	Mean	SD $\pm$	$\beta$ -coef	[95% Conf. Interval]
NHW English (n=10)	21.0	0.3	REF	REF
English-speaking Latinas (n=21)	20.6	1.0	-0.4	-1.1, 0.4
Spanish-speaking Latinas (n=10)	<b>18.3*</b>	1.1	-2.7	-3.5, 1.8
ANOVA test *Statistically significant (P<0.001)				

##### MITI: Individual Constructs

*Collaboration* and *Direction* were the only constructs statistically significant between groups (Table 3). NWH, ENG Latinas, and SPA Latinas had a mean of 4.1 ( $\pm 0.16$ ), 4.06 ( $\pm 0.32$ ), and 3.28 ( $\pm 0.42$ ) for *Collaboration*, respectively. SPA Latinas had a statistically significant lower mean than the NHW and ENG Latinas ( $p < 0.05$ ). There was no difference between NHW and ENG Latinas. The means for the construct of *Direction* were 5.00 ( $\pm 0$ ), 4.73 ( $\pm 0.40$ ), and 3.88 ( $\pm 0.40$ ) for NWH, ENG Latinas, and SPA Latinas, respectively. SPA Latinas had statistically lower *Direction* mean scores, while there was no difference between ENG Latinas and NHW participants. *Evocation and Autonomy* average scores were 4.00 ( $\pm 0$ ) for NWH, 3.95 ( $\pm 0.12$ ) for ENG Latinas, and 3.58 ( $\pm 0.57$ ) for SPA Latinas. NHW group had an average of 3.87 ( $\pm 0.17$ ) in *Empathy*, while ENG Latina group scored on average 3.87 ( $\pm 0.39$ ), and SPA Latinas scored 3.62 ( $\pm 0.73$ ).

**Table 3. MITI 3.0 Individual Constructs: Global Ratings**

	Groups		
	NHW English (n = 10)	English- speaking Latinas (n = 21)	Spanish- speaking Latinas (n = 10)
<b>Constructs</b>			
Evocation	4 (0)	3.95 (.12)	3.58 (.57)
Collaboration	4.1 (.16)	4.06 (.32)	<b>3.28 (.42)*</b>
Autonomy	4 (0)	3.95 (.19)	3.58 (.41)
Direction	5 (0)	4.73 (.40)	<b>3.88 (.40)*</b>
Empathy	3.87 (.17)	3.87 (.39)	3.62 (.43)
Data are presented as mean (Standard Deviation; SD)			
*Indicates Statistically different to NHW (P<0.001)			
Kruskal-Wallis test			

### MITI: Individual Behavior Count Categories

Out of the six behavior count categories, three were statistically different between the groups. They were *Giving Information*, *MI adherent* and *Open Question*.

*Giving Information* was statistically higher in the SPA Latina group, with a mean behavior count of 7.55 ( $\pm 2.0$ ) (as noted before, this is how many times each behavior was observed in each specific call). The second category that was statistically different is *MI adherent*. SPA Latina group showed a statistically lower *MI adherent* mean, 4.96 ( $\pm 1.9$ ), than NHW and ENG Latina group, which had a mean of 9.36 ( $\pm 1.4$ ), and 10.15 ( $\pm 4.5$ ) respectively. *Open-Question* was statistically higher among the Latinas in the SPA group, with a mean of 8.78 ( $\pm 4.9$ ), as compared to NWH and ENG Latina group, who had a mean of 4.83 ( $\pm 2.9$ ) and 3.76 ( $\pm 2.2$ ), respectively. The mean for *MI Non-adherent* behaviors was 0.3 ( $\pm 0.43$ ) for NHW, 0.65 ( $\pm 1.1$ ) for ENG Latina group, and 1.06 ( $\pm 1.1$ ) for SPA Latina group. *Closed Question* behavior means for each group were 14.43 ( $\pm 6.8$ ), 16.62 ( $\pm 5.8$ ), 12.23 ( $\pm 4.8$ ), for NWH, ENG Latina group, and SPA Latina group, respectively. The mean behavior counts for *Reflection* for NHW was 3.80 ( $\pm 1.7$ ), ENG Latina group was 5.02 ( $\pm 3.9$ ), and SPA Latina group was 5.08 ( $\pm 2.75$ ). (Table 4)

**Table 4. MITI 3.0 - Behavior Count Codes**

	Groups		
	NHW English (n = 10)	English- speaking Latinas (n = 21)	Spanish- speaking Latinas (n = 10)
<b>Behavior Counts</b>			
Giving Information	5.16 (2.2)	4.08 (1.9)	<b>7.55 (2.0)*</b>
MI Adherent	9.36 (1.4)	10.15 (4.5)	<b>4.96 (1.9)*</b>
MI Non-adherent	0.3 (.43)	0.65 (1.1)	1.06 (1.1)
Closed Question	14.43 (6.8)	16.62 (5.8)	12.23 (4.8)
Open Question	4.83 (2.9)	3.76 (2.2)	<b>8.78(4.9)*</b>
Total Reflections	3.8 (1.7)	5.02 (3.9)	5.08 (2.75)
Data are presented as mean (Standard Deviation ; SD)			
*Indicates Statistically different to NHW (P<0.05)			
Kruskal-Wallis test			

### 3.3.2. Health Coach Protocol Fidelity Scoring

As shown in Table 5, coaches for the NHW group had a mean Health Coach Protocol Fidelity score of 11.9 ( $\pm 0.88$ ), while coaches for the ENG Latinas had an average score of 11.33 ( $\pm 1.28$ ), and coaches for the SPA Latinas had mean score of 11 ( $\pm 1.15$ ). No statistical difference was observed between any of the groups. (see Table 5)

**Table 5. Health Coach Protocol Fidelity Scores**

Groups	Mean	SD $\pm$	$\beta$ -coef	[95% Conf. Interval]	p-value
NHW English (n=10)	11.9	0.88	REF	REF	REF
English-speaking Latinas (n=21)	11.33	1.28	-0.57	-1.47, 0.34	0.213
Spanish-speaking Latinas (n=10)	11	1.15	-0.90	-1.95, 0.15	0.092
ANOVA test *Statistically different to NHW (P<0.001)					

### 3.3.3. Dietary Behavior Change

#### Study Goals at Baseline (Table 6)

*Fruit and Fiber:* At baseline, the consumption of fruits and fiber among the SPA Latina group was statistically different than the NHW comparison group. The SPA Latina group indicated consuming 7.45 ( $\pm 9.29$ ) servings of fruit, and 47.88 ( $\pm 49.31$ ) grams of fiber per day, while the NHW group reported consuming 1.54 ( $\pm 1.13$ ) servings of fruit, and 18.19 ( $\pm 8.31$ ) grams of fiber per day. Latinas in SPA group on average, were consuming more fruits and fiber at baseline. Latinas in the SPA group were not statistically different than NHW, consuming on average 3.09 ( $\pm 3.03$ ) servings of fruits, and 24.48 ( $\pm 21.63$ ) grams of fiber per day. The consumption of fruits and fiber from the ENG Latina group and the NHW group were below the study goal target, and the ACS Nutrition recommendations for cancer prevention<sup>58</sup> of 1.5 to 2 servings of fruit each day.

*Vegetables:* SPA Latinas reported consuming an average of 6.33 ( $\pm 6.52$ ) servings of vegetables per day, ENG Latinas reported 3.45 ( $\pm 2.43$ ) servings per day, and NHW reported 2.58 ( $\pm 3.36$ ) servings per day, which was statistically significantly higher than the NHW group. All groups, except for the SPA Latina group, were consuming less than the target study goal of vegetables at baseline were not meeting the ACS nutrition recommendations of 2.5 servings per day.

*Total Fat:* SPA Latina group had a mean consumption of 72.16 ( $\pm 54.32$ ) grams of fat per day, ENG Latina group mean consumption of fat was 68.69 ( $\pm 65.96$ ) grams per day, while NHW had a mean of 51.62 ( $\pm 20.53$ ) grams of fat per day, which were not statistically significantly different between groups.

#### Study Goals at six months – Differences between groups

In this small subsample of LIVES participants, those in the SPA Latina group were statistically different than the comparison NWH group, in regard to the consumption of daily total fiber grams at six months. The SPA Latina group on average, consumed 38.85 ( $\pm 28.82$ ) grams of fiber per day, while the NHW group only consumed 27.03 ( $\pm 13.43$ ) grams of fiber per day. The other study goals, such as fruit, vegetable, and fat intake, were not significantly different between groups at the 6-month mark in the study. (see Table 6)

#### Goal Difference from Baseline to six months – Within groups

Change in dietary goals from baseline to six months was analyzed within each group. When comparing baseline to 6-month change, only the ENG Latina group had a statistically significant mean change. ENG Latina group demonstrated a mean consumption of 7.07 ( $\pm 6.76$ ) serving of vegetables per day at six months, which compared to the baseline mean consumption of vegetables, 3.55 ( $\pm 2.46$ ) servings per day, ENG Latinas were consuming 3.52 more serving of vegetables per day than they did at baseline. No other dietary goal was statistically different by group; however, it should be noted that SPA Latina group reported on average, consuming less serving of fruits, vegetable, and grams of fiber per day at 6 months [mean of 6.75 (SD+6.47), mean 4.63 (SD+1.94), mean 38.85 (SD+28.82), respectively]. Finally, although the change was not statistically significant, ENG and SPA Latina groups on average reported meeting the

average daily study fiber goal of 30g a day at 6 months, and SPA Latina group were also consuming, on average, 21.63 less grams of fat per day, than they did at baseline. (Table 6).

**Table 6. Dietary Behavior Change goals from Baseline to 6 Month within Groups**

Study Goals	Groups								
	NHW English			English-speaking Latinas			Spanish-speaking Latinas		
	Baseline Mean (SD)	6 Month Mean (SD)	Change Mean	Baseline Mean (SD)	6 Month Mean (SD)	Change Mean	Baseline Mean (SD)	6 Month Mean (SD)	Change Mean
Total Fruit (servings/day)	1.50 (1.08)	1.79 (1.03)	+0.29	3.05 (3.03)	4.66 (4.42)	+1.61	7.45 (9.29)	6.75 (6.47)	-0.7
Total Vegetable (servings/day)	2.60 (3.41)	5.21 (4.47)	+2.61	3.55 (2.46)	7.07 (6.76)	<b>+3.52*</b>	6.33 (6.52)	4.63 (1.94)	-1.7
Total Fiber (grams/day)	18.20 (8.31)	27.03 (13.43)	+8.83	24.48 (21.63)	38.05 (34.28)	+13.57	47.34 (49.31)	38.85 (28.82)	-8.49
Total Fat (grams/day)	51.62 (20.53)	49.56 (20.49)	-2.06	68.69 (65.96)	60.15 (47.32)	-8.54	72.16 (54.32)	50.53 (17.14)	-21.63
N=10 NHW N=21 Baseline; N=16 at six months-English speaking Latinas N=10 baseline; N=7 at six months-Spanish speaking Latinas *Statistically significant (P<0.05)									

### 3.4. Qualitative Results

Spanish-speaking calls from the SPA Latina group who had high total MITI scores (n=3) showed more collaboration and direction instances than Spanish-speaking calls with low total MITI scores (n=3). English-speaking calls from the ENG Latina group with high MITI scores (n=3) demonstrated the constructs of Collaboration and Empathy more frequently than evocation, autonomy and direction, while the low MITI score English-speaking calls (n=3) were more frequently coded for Autonomy/Support and Direction.

Below are the individual MITI constructs from the Global Rating scale portion of the MITI 3.0 score.

#### 3.4.1. Empathy

Empathy in both language groups for the high-MITI scored calls was the same. Coaches showed an understanding of their participant's world view and gave reflections that went beyond what the participant verbally stated. For example, a participant disclosed to her coach that she was dealing with the aftermath of her abdominal surgery, and how she felt she was complaining most of the time. The coach reflected this sentiment back to the participant, but added a positive point of view, and assured the participant that she was a strong individual, and that she

has gone through a lot. In a Spanish call, a participant told her coach she did not feel comfortable walking, and that she was going through physical therapy. The coach assured the participant that she should do what makes her feel comfortable and did not push her into increasing her physical activity.

English Example:

*“C: ah yeah. Yeah, and and that's okay too, You know what, you've been through a lot and still it's uncomfortable. It's... it's not you know, it's a new normal for you and sounds like you're very strong and you're doing everything you can and just to think about it in that way that 'okay. I've been through a lot but I'm still here and I'm still gonna keep on moving' and you know, I poop a lot more about you know, whatever' you have a really positive attitude about it and that's really important too and not to diminish at all what you've been through or the strength that you have in this too. So...”*

Spanish Example:

Excerpt 1

*“Si no le da confianza y pues si se siente más segura con el walker pues puede um Hacer lo que usted se sienta mejor Haciendo Y-”*

*Translation: “if it doesn't make you feel safe, and you feel safer with the walker, well you can, um, do what makes you feel better doing and-”*

Excerpt 2

*“Bastantes buenas noticias [name] su voz también se oye diferente ya se oye mas como mas contenta y me agrada que que ya está pudiendo caminar y ir a trabajar y cómo le está yendo con el trabajo?”*

*Translation: “Really good news [name], your voice also sounds different, you sound more like happy, and I'm glad that you are able to walk and go to work, how is work doing?”*

Empathy in the low-MITI scored calls is superficial, and the coaches do not try to explore the participants world view. They only repeat what the participant has said, and do not add anything new to the conversation. In the English calls especially, the coaches focus on goal setting, and this leads to missed opportunities to create rapport with the participant.

Example of Empathy in English low-MITI scored call:

Excerpt 1

*“Yeah absolutely that's so important That's really you know you have to advocate for yourself and you yeah so that's really good that you're you know in touch with, with you and your body and what's going on It's important Yeah”*

Excerpt 2

*“Ok that sounds good ok everything seems healthy I might do a little quick check from time to time just to see if there is a certain area that we can work on, It sounds like you are doing very well Utilize a lot more fruit and vegetables for your calories and that way one you will be adding*

*the calories and two will get your metabolism faster and lose the weight So how many hours do you go between each meal Do you usually have just like lunch and dinner maybe one snack? Or is it continuously having little snacks?"*

Example of Empathy in Spanish low-MITI scored call:

Excerpt 1

*"Mhm si este no, pues qué bueno que encontró algo con lo que se pueda tal vez esté distraer Y como dicen tratar de no prestar atención y tratar de sentirse mejor usted internamente"*

*Translation: "Mhm, yeah, well no, well it's good that you found something that you can maybe distract yourself, and just as they say try not to pay attention and try to feel better inside"*

Excerpt 2

*"pues muy bien Entonces está meta si la y la motiva mucho es algo muy importante para usted"*

*Translation: "Well, very good, this goal does motivate you a lot, and is very important to you"*

### 3.4.2. Autonomy

In the high-MITI scored calls both in Spanish and English, autonomy is very similar. The coaches always ask the participant about their opinion, give them a choice and do not push the participant to do something they do not feel ready to do. In one English call, the coach asked the participant if she felt comfortable setting a goal for the next session. This is a clear example of Autonomy, since the coach is allowing the participant to choose whether or not they would like to focus on a new behavior. In a Spanish call, the coach gave the participant the opportunity to choose the topic for their next session, while also letting them know that it was okay if they wanted to continue with the same topic.

English example:

*" Oh good Well, do you, would you be comfortable setting a goal for our next our next call?"*

Spanish Example:

*"Okay muy bien pues umm Esta semana no teníamos un tema de Qué hablar pero Para la otra que hablemos Quisiera escoger un tema O podemos hablar Más sobre la actividad física Ya que está ya que puede caminar más y hacer más movimiento"*

*Translation: "Okay, very Good, well, uhm, this week we didn't have a topic to discuss, but for the next time we talk, would you like to choose a topic? Or we could talk more about physical activity, since you can walk more and move more"*

In the Spanish calls with low-MITI scores, the participant doesn't always have autonomy. The coaches usually create a goal for the participant and ask them if they like the goal. Even though the coach asks for the participant's opinion, the Autonomy aspect was already taken away from the participant. In the English calls with low-MITI scores, the coaches usually guide the participant through the session, which doesn't allow for the participant to choose what they would like to work on or talk about. In one of the calls, the coach pushed the participant a little too much, and the participant showed resistance.

Low-MITI score call in Spanish example:

*“Entonces, cómo le parece que usted calcule por 3 días a Calcula exactamente, cuánta grasa está consumiendo y puede hacer eso como viendo los nutrientes del producto y viendo Cuánta grasa, tiene ese producto y tomando en cuenta la porción que usted consume y también como por ejemplo, la verdura no tiene esos nutrientes ahí anotados entre los puede Buscar en el internet”*

*Translation: “Okay, what do you think if you calculate for 3 days, exactly calculate, how much fat you are consuming, and you can do that by looking at the nutrients in the product and seeing how much fat that product has, and also taking into consideration the portion size you are consuming, and for example, vegetables do not have their nutrient written down, you can look it up online”*

Low-MITI score call in English example:

*“C: ok That's what we are aiming for so what we can do instead is may be work on more of the exercise will you be interested in that?”*

*P: I am still seeing under 30 minutes a day*

*C: ok.. do you- P: because I am tired”*

### 3.4.3. Collaboration

In the high-MITI scored Spanish calls, the participant and coach worked together towards a target goal. For example, in one of the calls, the coach noticed the participant was struggling to understand if she was meeting the study goals. Instead of just telling the participant what she was doing, and what goals she was meeting, the coach asked the participant first if she would like to have the coach’s input. The coach said:

*“Bueno entonces, le parecería bien si le digo cómo, cómo viendo un poquito así nada más a las cosas que está comiendo, mi idea de cosas que pueda hacer diferente, si está bien si le digo?”*  
*Translation: “Well, how do you feel if I tell you how you are doing with the things you are eating, and then an idea of things you could do differently, is it okay if I tell you that?”*

The participant agreed to the coach’s input, and the coach gave her a quick breakdown of how she was meeting the study goals for vegetables and fiber. The coach checked on the participant and asked for her opinion.

Another example of collaboration in high-MITI scored calls, The participant tells the coach that she would like to exercise but cannot do so due to an injury. The coach tells the participant that she can take her time, and to remember that she would be in the study for two years, in which she could work on her goals:

*“Mhm, Okay Sí pues sí Se tiene que tomar su Tiempo usted tomase su tiempo eso Cómo le digo es para los dos años...”*

*Translation: “mhhm, okay, yeah, well, if you need to take your time, you can take your time, like I said before, this is for two years”*

Calls in Spanish with low-MITI scores, collaboration was not as strong, and the coach would guide the participant, and give feedback without asking for permission. It is worth noting that

none of the participants from the low-MITI scored calls seemed to be upset by the feedback, and actually continued with the conversation with the coach.

For example:

*“si se come un cuarto o la mitad de un aguacate eso ya cuenta como una fruta que comió al día y nada más le falta comer su cítrico”*

*Translation: “If you eat a quarter of your avocado, that would count as a fruit that you ate that day, you are only missing eating your citrus”*

Another example of Collaboration in low-MITI scored calls is a coach telling the participant about a handout with information about carbohydrates and sugar. The coach did not ask for permission, nor if the participant wanted the handout. However, the participant did say she wanted the handout, after it was mentioned by the coach.

The English-speaking calls with high MITI scores did not differ much from the high MITI scoring Spanish calls. In the English-speaking calls, most Collaboration was observed as the participant asking questions to the coach, and the coach working with them to answer such questions. In one instance, a participant asked a coach if she could do some research on hot flashes, since the participant was suffering from the condition. This was their conversation:

*“C: yeah. Yeah. I'm glad to hear that, and I'm also glad to hear that your digestion is okay kind of the same and the same thing if anything else kind of happens or it becomes very uncomfortable or intolerable we can work on that. Absolutely and I'm -*

*P: I just, another question [coach name] before you hang up, my last, I remember you telling me that eating like beans is fiber but it slows down my fiber intake for the day. So like for example if I have all my fiber and I have Half cup of beans that will help me too? like that would help. How does that work?*

*C: Yeah. Yeah. Yeah, so there's different, there's two different types of fiber. There's, there's soluble fiber, so things that will slow down your digestive tract kind of expand in the digestive tract. So those are things like oatmeal and beans and [inaudible], that kinda bulks up your stool and it slows it down in a way that isn't going to you know, cause constipation or anything but it's full of down in a good way...”*

The participant and the coach were working together to solve the problem, and after the conversation, the participant seemed interested in the information, and said she would consult with her doctor first. The coach agreed with the participant and did not act as the expert in the situation. She allowed the participant to make her own decisions, since the participant knows herself better than anyone else.

Lastly, in the English calls with low-MITI scores, the coaches asked mostly closed-ended questions, in an effort to elicit more information from the participant about their diet. Instead of rolling with resistance (which is a term used to describe a coach's efforts to confront or push a participant), the coaches would probe for answers, but the participant would only provide short responses.

#### 3.4.4. Direction

Direction in the high-MITI scored calls, both in English and Spanish, show the coach guiding the session, without taking control over the call, or acting as the expert. In the Spanish calls, the coaches guide the participants towards achieving the nutrition study goals, by giving ideas as to how the participant could implement more fruits and vegetables in the recipes they already make. Coaches usually do not guide the participant into exploring new recipes or new vegetables, but rather work with foods the participant is already familiar with, for example, a participant was talking about the vegetable goal, and the coach asked about their thoughts on adding more vegetables to a soup. Another example of *Direction* in the Spanish calls, the coach was asking questions to the participant to help them create goal. However, English calls direct the participants into exploring new foods, or new habits, which they might not have previous experience with. For example, a participant mentioned to their coach they were out of ideas about cruciferous vegetables, and the coach gave examples and ideas of new vegetables and possible recipes the participant might like. In another example, the participant was focusing on everything negative that happened to them on that week, the coach redirected the session by asking the participant to tell her at least one good thing that happened. The coach then followed the conversation by bringing up a topic they both had discussed during the last call.

English examples of *Direction*:

Excerpt 1

*“C: yeah, just salad in general. You could throw it on it, yeah with you other like just a romaine lettuce or something or your other dark green and that is sometimes really, really easy to do especially if you just need that cruciferous and you don't want to do anything special with it. Of course, you know,*

*P: like that's a good idea because I'll have, with my romaine I put spinach in there and I'll throw it. that's perfect, I'll do that. That'll be easy for me, because I'm like oh my gosh, I got to steam this broccoli, and I'm like uhggg, you know?”*

Spanish examples of *Direction*:

Excerpt 1

*“C: Está bien, entonces sí parece que está pensando en la meta de los vegetales y incorporándolos en su dieta Este sí Y cómo se sintiera agregarle más verdura al caldo para que cumpla con una medida entera.”*

*Translation: “That's Good, it looks like you are thinking about the vegetable goal, and you are incorporating them into your diet, well, yeah, how would you feel about adding more vegetables to your soup, so you can reach a whole serving?”*

Excerpt 2

*“C: Entonces siempre con eso es bueno pensar en una cosa pequeña que puede empezar a cambiar, como tal vez se puede nada más enfocar en organizar un día para cortar verduras y todo lo que le quiere echar al licuado o puede organizar como una cosita la vez, cuál cree usted que sea esa cosa?”*

*Translation: "C: yeah, with things like that, it is always good to think about something small that you can start changing, and maybe you can focus on setting up a day to cut vegetable and everything you want to add to your smoothie, or you can organize on thing at a time, what do you think that thing would be?"*

Low-MITI scored calls, in English and Spanish, show strong direction but low Autonomy. During these calls, the coaches tell the participant what to do, or do not allow the participant to think about ideas or topics for future calls on their own. In one English call, the participant is talking about their eating behaviors when eating out, and the coach instead of exploring the topic with the participant, decides that she will send her some resources about eating out. On a Spanish call, the coach asks the participant about what their next goal should be, the participant states that she has no ideas, and asks the participant for ideas. The coach creates specific goals for the participant and doesn't brainstorm with her.

English examples of *Direction* in low-MITI scored calls:

*"P: when I go out I don't order a steak or anything like that*

*C: Okay Well that's great That's a really good start and you're absolutely right It is pretty high in fat So that's you know that's great that you're aware of that So I'll send you some more information maybe something, maybe something will pop out at you to try."*

Spanish examples of *Direction* in low-MITI scored calls:

*"P: qué nos enfocaríamos, hay no se qué decirle Pues usted no tiene idea ahora?*

*C: pues sí tengo algunas ideas, podríamos como que usted calcule exactamente Cuántos gramos de grasa usted consume al día buscando en el internet o buscando también en los como leyendo los nutrientes de los productos por más o menos 3 días a la semana calcular exactamente Cuánta grasa está consumiendo, cómo le parece?"*

*Translation: "P: What should we focus on? I don't know what to tell you, do you have any ideas right now?*

*C: Well, I do have some ideas, we could, like, you could calculate exactly how many grams of fat you are consuming daily, looking online or also looking also, like reading the nutrients in the products for 3 days or so a week, calculate exactly how much fat you are consuming, what do you think?"*

### 3.4.5. Evocation

In the Spanish-speaking calls from the SPA Latina group with high MITI scores, evocation was mostly done by the coach asking the participant how they felt about a behavior change they already made, while in the English calls from the ENG Latina group with high MITI scores, the coaches would ask the participants how they could change a behavior, what could help them, and what is stopping them, while also reflecting on what the participant said. With less reflections, Evocation in high MITI scored calls in Spanish sounded more conversational, rather than a coach and a participant.

For example, in an English call, the coach said this to the participant:

*“you're thinking about it and chicken is definitely you know, it's gonna be less fat grams than that cheeseburger uhm .. so things like that to incorporate into your everyday so... I am glad to hear that from you and it is a hard thing to integrate into the diet right off the bat. Do you think.... I don't know. What do you think would help the most with the with the fat gram goal in terms of trying to make it more of a routine for you?”*

An example of a Spanish call, the coach asked the participant how she felt after walking:

*“Y pues son, son bastantes pasos los que ha dado y pues Se siente como cansada Al final del día cómo se siente?”*

*Translation: “Well, you have taken a lot of steps, and do you feel a little tired at the end of the day? How do you feel?”*

In the Spanish calls with low-MITI scores, evocation is done by the coach by asking the participant to tell them more about their diet, while in the English calls with low-MITI scores, the coaches engage in cheerleading and congratulating the participant for the behavior change.

An example of evocation in an English call with low-MITI score, where the coach is congratulating the participant:

*“The important thing is you have been seeing the changes so that is something that you really should be celebrating and you said you lost one inch of your waist off your weight right?”*

Finally, this is an example of a call in Spanish, with low-MITI score, in which the participant was confused about citrus fruits:

*“P: si y a veces que papaya piña, tomo mucho refresco de piña mucho fresco de piña*

*C: si y cuando habla de cítricos que que otros cítricos come como la naranja”*

*Translation: “P: Yeah, and sometimes there is papaya, pineapple, I drink lots of pineapple juice, lots of pineapple juice.*

*C: yeah, and when you mention citrus, what other citrus do you eat like and orange”*

## 4. Discussion

This secondary mixed-methods analysis of 41 intervention participants from the LiVES Study, 31 of which were Latinas, yielded valuable information about the role of acculturation in motivational interviewing and the potential influence on dietary behavior change outcomes. Language was used as a proxy for acculturation in this analysis, which has been previously done in other studies<sup>3,4</sup>. In this analysis, both of the Latina (SPA and ENG) groups (n=31) were younger, congruent with others reporting younger age of diagnosis for Latina cancer survivors compared to NHW. Latina women tend to be diagnosed at earlier ages, later stages and usually have less access to care<sup>1</sup>. Furthermore, about half of the Latinas in the SPA Latina group reported having less than high school education, and none of the women in this group reported to be college graduates. This trend has been reported by other researchers reporting among Latinas, as they were less likely to pursue further education at a younger age, as a result of family responsibility, financial necessity, or and assuming the role of caregivers<sup>59,60</sup>.

At baseline, the ENG Latina group and the comparison NHW group did not meet the ACS guidelines for Nutrition and Physical activity, nor did they meet the LiVES dietary study goals. Interestingly, the SPA Latina group reported higher than average consumption of fruit, vegetable, fiber and fat, and were meeting both the ACS guidelines and the study goals, which is not a common occurrence, since only about 20% of Latinx cancer survivors<sup>58</sup> meet the ACS recommendations<sup>10-14</sup>. SPA Latina group had a statistically higher daily consumption of fruits and fiber than the comparison NHW group. At baseline, 80% of the SPA Latina group were in the obese BMI category, which is an alarming percentage for such a small sample, as compared to the national BMI data for this group, which indicates that 43.7% of Latinas in 2018, were in the obese category<sup>61</sup>. However, this sample was small and may not be representative of the rest of the US Latina ovarian cancer survivors.

In this study, there was no difference in total MITI scores (all constructs from the Global Rating scale) between the ENG Latina and NHW groups. The SPA Latina group had a statistically lower average total MITI scores than the NHW. This is an important finding, suggesting that language acculturation may have an association with MI, potentially impacting behavior change. The association between language acculturation and behavior change is supported by a 2020 study by Camplain et al.,<sup>4</sup> which described an association between language acculturation and physical activity behavior change. The researchers in this study found out that the Spanish-speaking Latinx participants had higher sedentary rates than Latinx participants who chose English as their primary language for the intervention. The same trend is seen in this secondary analysis; however, the behavior assessed in this study was diet so direct conclusions may not be drawn.

In this analysis, when evaluating the individual MITI constructs, the frequency of *Direction* and *Collaboration* were statistically lower in the SPA Latina group, likely driving the lower total global MITI scores observed between groups. Individual behavior counts were also statistically different between the SPA Latina group and NHW, with *Giving Information* being statistically higher among the SPA Latina group. This suggests that the SPA Latina group was receiving more educational information versus change talk that facilitates behavior change,

from the bilingual LIVES coaches compared to what the ENG Latina and NHW groups received. The heavy focus on nutrition education in the SPA Latina group by the bilingual coaches, which may have led to the behavior change and possibly better understanding of FFQs in this group, is consistent with the literature. An RCT entitled “¡Cocinar Para Su Salud!” by Greenlee et al.<sup>62</sup>, was a dietary intervention that was culturally tailored to Latina breast cancer survivors in both English and Spanish<sup>62</sup>. This trial emphasized the importance of nutrition education in order to improve health literacy, and educate participants regarding the potential benefits of dietary behavior change. The ¡Cocinar Para Su Salud! trial focused on improving self-efficacy after nutrition education was provided<sup>62</sup>. The study reported a short-term increase consumption of fruits and vegetables by the Latina study participants in the intervention arm compared to the control. The focus on education observed in the SPA Latina group coaching in the LIVES study is similar to the approach taken in the culturally tailored ¡Cocinar Para Su Salud! study.

*MI adherent* behavior counts were statistically lower in the SPA Latina group compared to ENG Latina group and the NHW group. However, across groups there was no statistical difference concerning MI non-adherent behaviors. *Open-ended questions* were statistically higher in the SPA Latina group, which is an interesting finding, but may suggest the coaches were asking the Latina participants for their input/opinion after information was provided. Collaboration is described as the interviewer’s behavior during the counseling session, in which he or she sees the participant as an equal. However, bilingual coaches were assuming the role of experts when *Giving Information*, which could explain why *Collaboration* was lower among the SPA Latina group compared to the other 2 groups.

The Health Coach Protocol Fidelity Scoring supported findings that the differences observed in MITI scores between groups were not due to lack of adherence by the intervention study coaches to the study protocol. All 3 groups fell within the total point range identified as adherent to intervention protocol. No statistically significant differences were observed between groups, suggesting participants in all three groups received coaching adherent to the study protocol regardless of who their coach was.

Between baseline and six months, participants in the SPA Latina group reported a decreased consumption of fruits, vegetables, fiber and fat. We hypothesize this may be due to the study intervention and the information received during the counseling sessions. The AFFQ is a validated self-reporting tool, but it could be difficult to fill out and understand if the individual has low health literacy about nutrition<sup>63-65</sup>. A 2016 article by Hooper et al.<sup>66</sup> states that FFQs, although useful for capturing habitual dietary intake, can be challenging for individuals with limited literacy status. FFQs can be cognitively challenging for individuals with low literacy levels, such as the SPA Latina group whom in the present analysis (50% had less than high school education) and may lead to inaccurate estimation of frequency and portion sizes<sup>66</sup>. After several months on study working with their coach, SPA Latina group may have had a better understanding of portion sizes and food groups at the 6-month time point, thus leading to differences in reporting. In this analysis there was a significant difference in the amount of information (education) provided to SPA Latina participants as compared to both ENG Latina and NHW groups. Based on these findings and those reported by Hooper et al., concluding that individuals with lower-health literacy may need additional guidance when completing self-

reported FFQs<sup>66</sup>, when working with Latina cancer survivors additional time and education or alternatives to the FFQ should be considered.

Among the 4 dietary goals for the LIVES study, only fiber consumption was statistically significant between SPA Latina group and NHW at 6 months, potentially signifying that education and language acculturation may have a positive relationship with behavior change and lead to positive dietary changes. The ¡Cocinar Para Su Salud! trial found that their intervention, with a heavy education focus in the Latina population, did lead to short-term increase consumption of fruits and vegetables<sup>62</sup>, which is similar to the increased fiber consumption seen among the SPA Latina group in this secondary analysis.

The qualitative analysis revealed important information about the possible differences between ENG Latina group and SPA Latina group coaching sessions. One of the most interesting findings was how the MITI construct of *Evocation* manifested in slightly different ways in the coaching calls based on language. In the high MITI scored Spanish calls, the coaches showed evocation by asking the participants about their current goals and behavior change, while in the high MITI scored calls from ENG Latina group, the coaches asked about future behaviors, and how the participant could overcome obstacles that were stopping them from making the change. Effective nutrition education requires enhancing motivation and providing resources for taking action<sup>67,68</sup>, which is what is seen in the SPA Latina group. It could explain the temporal difference between the SPA and ENG groups at this time point, since the SPA Latinas were developing new behaviors based on the nutrition education received from the LIVES coaches.

*Direction* was also interesting, since the SPA Latina group with high-MITI scores were counseled and guided towards behavior change based on foods and recipes they were familiar with, while the English-speaking calls from the ENG Latina group with high-MITI scored were guided with the coach exploring new foods and recipes with participants. Low-MITI scored calls in Spanish for *Direction* may explain why SPA Latina group had lower scores for this Global Rating scale. This is because *Direction* in this group was high, to the point that it impacted scores for the Autonomy construct, since the participants were told what to do by the coaches. However, the participants did not seem to be upset by this power dynamic. The temporal differences with regard to time between the two groups could be due to the increased nutrition education the SPA Latina group was receiving. The LIVES coaches were providing the SPA Latina group with resources for taking action<sup>67,68</sup>, in order to increase self-efficacy, which leads to increased *Direction* that did not score high in the MITI 3.0 scale in this group.

#### 4.2. Limitations

This study had several limitations. This project was a secondary analysis of the LIVES study, which focused on ovarian cancer and ovarian cancer is not as prevalent in Latinas, as in other women thus resulting in a small sample size despite the parent trial making concerted efforts to recruit from a diverse group of individuals from across the US. However, the LIVES study offers counseling sessions in both Spanish and English, which allowed for this analysis to investigate potential differences between Latinas, using language as a proxy for acculturation. Missing six-month dietary data was a problem among the SPA Latina group, with one particular

clinic site responsible for several of the missing forms. Bias may have been imposed in the qualitative analysis; however, bias was minimized through blinding of the call transcripts for both coach and participant. Lastly, this secondary analysis only evaluated the interviewer (coach) behaviors for MI. This limited the analysis to just coaches with regard to information gathered during sessions.

#### 4.3. Strengths

This was a secondary analysis of data from the LIVES Study, a large well powered RCT in women with ovarian cancer. These findings may provide additional insights to the main study findings. In addition, this secondary mixed-methods analysis yielded information about the importance of acculturation and how it may influence dietary behavior change outcomes.

#### 4.4. Conclusions

Language preference (Spanish vs English) does have an impact in total and MITI scores, with SPA Latina group having the lower scores. Latinas that choose Spanish as their language of preference had increased instances of receiving education by their individual coaches, which might have also influenced their understanding of the AFFQ. Furthermore, Arizona Food Frequency Questionnaire might not reflect correct food consumption in groups with low literacy, and might need guidance to accurately answer the questionnaire. The qualitative analysis revealed interesting finding as to how MI sessions differed between Latina women based on language of preference, with the SPA Latina group allowing the coach to take control over the session, while the ENG Latina group showed to be more reflective of a typical MI session, where both parties are equal, and each bring to the session their expertise.

#### 4.5. Future Directions

This secondary analysis supports that efforts to tailor behavioral interventions for race and culture are needed. Future studies utilizing MI should assess MI behaviors with MITI for the interviewer (coach) and (Motivational Interviewing Skills Code -MISC) for the interviewee (participant). In addition, specific attention should be paid to direction and collaboration for the intervention. Finally, additional time and education or alternatives to the FFQ should be considered for individuals with low health-literacy and additional time should be spent on educating individuals on information regarding healthy diet.

### **5. Declaration of Conflict of Interest**

The authors have no conflict of interest to report concerning the research, authorship and/or publication of this article.

### **6. Funding**

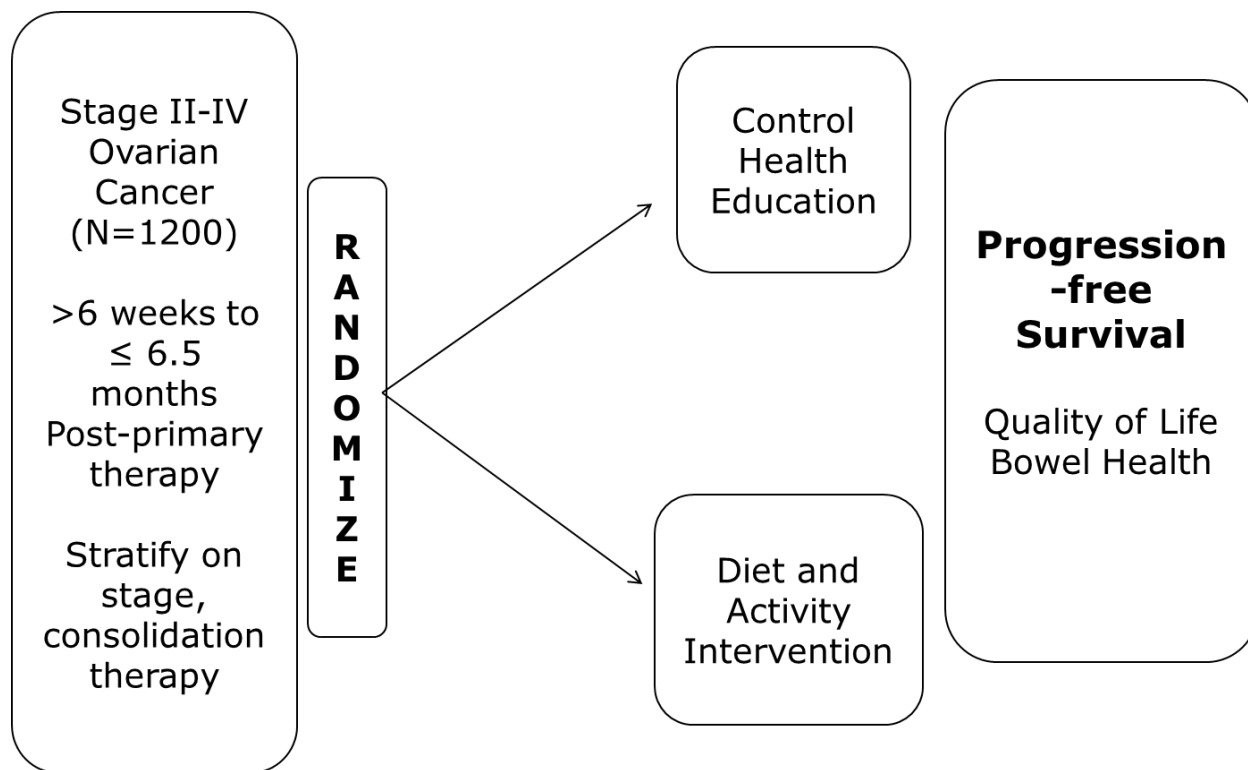
The parent study is funded by the National Institutes of Health, National Cancer Institute 1R01CA186700 and the Behavioral Measurement and Interventions Shared Resource at the University of Arizona Cancer Center Support Grant P30 CA023074.

## **7. Human subjects**

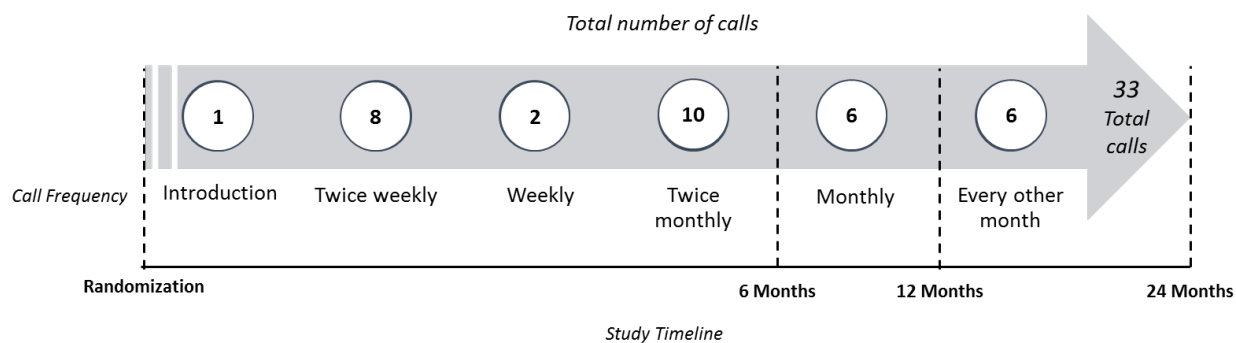
This study is covered under the LIVES Study protocol GOG-0225 IRB# 1200000231. Specifically, under exploratory objective 1.33, approved by IRB for examining participant compliance to healthy lifestyle and assessment of which participants are more likely to be compliant to the healthy lifestyle intervention.

**APPENDIX - SUPPLEMENTAL MATERIALS**

**APPENDIX A - Supplemental Figure 1. LiVES Study Schema**



**APPENDIX B - Supplemental Figure 2. LiVES Study Intervention call Frequency and Schedule**



**APPENDIX C - Supplemental Figure 3. Process Evaluation of Health Coaching Fidelity**

Process Evaluation of Health Coaching Fidelity		
Call Number:	Length of Call:	
Construct	No (0)	Yes (1)
1. Introduce self: name and study		
2. Confirm availability for taking call		
3. Evidence of built/sustained rapport		
4. Review of previous specific goal(s)		
5. Review of goals/change compared to study goal <b>Select which one(s):</b> <input type="checkbox"/> Veg <input type="checkbox"/> Fruit <input type="checkbox"/> Fiber <input type="checkbox"/> Fat <input type="checkbox"/> Step		
6. Numerical recall of: <b>Select which one(s):</b> <input type="checkbox"/> Servings <input type="checkbox"/> Grams <input type="checkbox"/> step count		
7. Identify barriers or enablers to behavior change		
8. Check in with participant ( <i>must have 1, select all that apply</i> ) <input type="checkbox"/> Review of general study progress <input type="checkbox"/> Feedback on performance/goals <input type="checkbox"/> Reference study materials or other resources		
9. Coach characteristics ( <i>must have 1, select all that apply</i> ) <input type="checkbox"/> Encouragement <input type="checkbox"/> Appreciation of participant efforts <input type="checkbox"/> Normalizing <input type="checkbox"/> Empathy <input type="checkbox"/> Tonal Matching		
10. Summarize call		
11. Set next goal		
12. Assessment of self-efficacy		
13. Scheduling next appointment		
14. Close call, thank for time		
<b>Total Score</b>		
Comments		
Participant Characteristics		
Recurrence Call Y/N		
Twilio link		

**APPENDIX D - Supplemental Figure 4. Motivational Interviewing Treatment Integrity Code (MITI) 3.0**

Draft Manuscript: Do Not Quote Without Author's Permission		27				
<b>Motivational Interviewing Treatment Integrity Code (MITI)</b> Coding Sheet      Revised June, 2007						
Tape # _____		Coder: _____ Date: _____				
<b>Global Ratings</b>						
<b>Evocation</b>		1 Low	2	3	4	5 High
<b>Collaboration</b>		1 Low	2	3	4	5 High
<b>Autonomy/ Support</b>		1 Low	2	3	4	5 High
<b>Direction</b>		1 Low	2	3	4	5 High
<b>Empathy</b>		1 Low	2	3	4	5 High
<b>Behavior Counts</b>						
<b>Giving Information</b>						
<i>MI</i> Adherent	Asking permission, affirm, emphasize control, support.					
<i>MI</i> Non-adherent	Advise, confront, direct.					
<b>Question</b> (subclassify)	Closed Question					
	Open Question					
<b>Reflect</b> (subclassify)	Simple					
	Complex					
	<b>TOTAL REFLECTIONS:</b>					
First sentence: _____						
Last sentence: _____						
Revised 25 June 2007						

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