Body Image, Acculturation, Menopause, and Weight-Related Behaviors in Hispanic Women

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Abstract

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Of all U.S. ethnic/racial women groups, Hispanic/Latino women have the second highest rate of obesity; in addition, women aged 40 to 59 are the most affected by this condition. Physical activity and dietary behaviors are usually the target for promoting healthy weight in Hispanic women, yet personal factors, such as body image perception changes as the women acculturate, are less included, particularly when addressing middle-aged and older Hispanic women. Similar to younger populations, middle-aged and older women experience body image (dis)satisfaction. As these women acculturate, their body image discrepancy—the difference between the current and ideal body image—varies, and is associated with an increase of body weight. In addition, the current research neglects the symptoms these women face at menopause, which are known to affect women's physical functioning and quality of life. This dissertation examines the relationship between postmenopausal Hispanic women's acculturative factors, body image discrepancy, physical activity, dietary intake, body mass index (BMI), and waist-hip ratio (WHR) values. It also explores existing literature on the association between menopause

and middle aged Hispanic women's physical activity and dietary behaviors. Manuscript one (Chapter II), assesses the cross-sectional association between acculturation, body image discrepancy, intake of fruit, vegetables, fats, physical activity, BMI and WHR. Results show that high acculturation is positively associated with inactivity and that body image discrepancy increase the odds of being inactive, of having normal weight and low WHR, and of being less likely to consume less than 30% calories from fat/day**.** Manuscript two (Chapter III) examines longitudinally the relationship between body image discrepancy and patterns of BMI and physical activity over 6 years. Results show that physical activity and BMI trajectories are not significantly different, either by Hispanic or body image discrepancy groups. However, women with greater body image discrepancy and those who perceived their figure as heavier or thinner that the ideal figure had lower physical activity scores. In manuscript three (Chapter IV), the review of literature shows that there is a void of studies focusing on dietary behaviors and symptoms at menopause, and a scarcity of studies addressing physical activity or physical functioning and symptoms at menopause. The six studies included in this review show that menopause symptoms play a role in physical mobility and that Hispanic women are more likely to report physical functional impairments and being less physically active. In general, they were mostly overweight or obese as a result. Each of the manuscripts have a different methodology and focus, but are related in that they explore factors associated with body weight in Hispanic women living in the United States. Jointly, these three manuscripts highlight the importance of considering body image perceptions, acculturative factors, and menopause discomforts as well as to embark on studies including both physical activity and dietary behaviors when addressing Hispanic women body weight needs.

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DEDICATION

To the memory of my beloved parents,

Don Julio Huarita Flores and Doña Celia Colque de Huarita. It is your example of courage and resoluteness that I try to follow in all that I do.

And, to my dearest family, my husband Daniel, and my children, Edith and Nicolas, who with their patience and love, have encouraged me to continue this journey to the end.

CHAPTER I: Introduction

Overview

Compared to other racial/ethnic women groups, Hispanic/Latino women are at a high risk of becoming overweight and obese in the United States (MMWR, 2012). Even though research indicates that recent Hispanic women have better health outcomes regardless of the high stress they face while acculturating compared to other ethnic/racial women groups (Caplan, 2007), the odds of becoming obese are higher in these women as they stay longer in the United States (Creighton, Goldman, Pebley, & Chung, 2012). Health strategies, including physical activity and dietary components, have been proven to best support individuals in promoting healthy weight (Seagle, Wyatt, & Hill, 2008). However, much of the published information addressing Hispanic women's body weight needs are centered either on physical activity or dietary behaviors. In addition, few interventions considering cultural and acculturation aspects in promoting Hispanic women's healthy weight were found in the literature (Mier, Ory, & Medina, 2010).

The multidimensional acculturation concept that embraces an immigrant's cultural heritage, values, identifications, and practices from both the receiving and the original country (Schwartz, Unger, Zamboanga, & Szapocznik, 2010) has the potential to identify personal determinants of weight-controlling behaviors in Hispanic women (Mier, et al., 2010). For instance, body image discrepancy (BID)—the difference between Hispanic women's perceived actual body and ideal body image, a change that occurs as they acculturate—has been recently identified as a personal factor influencing Hispanic women's weight-related behaviors (Marshall, Lengyel, & Utioh, 2012; Petti & Cowell, 2011), specifically their physical activity and dietary behaviors.

Most of the research in Hispanic women's body image and weight-related behaviors focusses on younger population samples(L. H. Clarke & Korotchenko, 2011). There is a need in addressing middle-aged and older Hispanic women who have the additional characteristic of facing pre-menopausal or menopausal symptoms/discomforts, which have been suggested to affect physical activity adequacy and quality of life (Lynch et al., 2010), placing Hispanic women at an even higher risk of obesity. Nevertheless, no literature review on the effects of menopause symptoms on middle-aged Hispanic women's weight-related behaviors was found. Such information, may bring greater insights on how to support women in these age group in engaging in healthy weight-related behaviors and preventing body weight gain.

Focusing on the concept of acculturation and BID in middle-aged and older women, this dissertation investigates (1) the cross-sectional association between middle-aged and older Hispanic women's acculturative factors, body image perceptions, weight related behaviors, and BMI and waist-hip ratio (WHR) and (2) the longitudinal association of acculturation, body image, physical activity, and BMI over 6 years. This dissertation also includes a review of literature on the association of symptoms at menopause and weight-related behaviors (physical activity and dietary behaviors) in middle-aged Hispanic women.

Background and Significance

Growing research suggest that women's personal factors, such as acculturative factors, play a role in modeling Hispanic women's perceptions on body image over time, which may result in BID. This body image dissatisfaction is not exclusive to younger women and may be inversely associated with healthy weight-related behaviors predisposing women to gain weight and becoming obese (Marshall, et al., 2012; Petti & Cowell, 2011). The study of patterns of Hispanic women's body image perceptions associated with their level of acculturation, and

understanding how body image perceptions may affect the women's weight-related behaviors can allow identifying key information to tailor healthy weight-promoting interventions in a culture-centered approach to benefit Hispanic women. Moreover, the examination of changes in body mass index (BMI) and waist-hip ratio (WHR) scores, will objectively inform the influence of body image perceptions have on Hispanic women's increase of body weight and adiposity. Because middle-aged and older women have the additional particularity of facing menopausal symptoms, the review of existing literature on the level of association between symptoms at menopause and Hispanic women's weight-related behaviors may also bring valuable insights to the care needed to promote healthy body weight in Hispanic women.

Hispanic Women and Obesity. According to the 2008 Pew Hispanic Center report, in 2007, women represented 48% of all Hispanics in the United States population, where 52% of those were foreign-born (Gonzales, 2008). Hispanic women are younger than non-Hispanic women; their median age is 41 years of age compared with 47 for non-Hispanic. Native-born Hispanic women are even younger, with a median age of 39 compared with 42 in immigrant women (Gonzales, 2008). Earlier data in regards to obesity prevalence among racial/ethnic women did not include Hispanic women who were not Mexican Americans because of their insufficient number (Freedman, 2011). For instance, the National Health and Nutrition Examination Surveys (HANES) from 1988-1994 and 1999-2008 offer information specifying data on "Mexican American" women and not "Hispanic/Latino women" (Friedman, 2011). In those years, of women aged 20 and over, blacks had higher obesity prevalence (51%) than Mexican American (43%) and White women (33%) (Freedman, 2011). Obesity in Hispanic women have a high prevalence, but not as high as Mexican Americans alone. In the last decade

obesity in Hispanic women has increased approximately 12 % and obese Hispanic women now represent 41.1% of all women ethnic groups (MMWR, 2012).

Salient determinants of obesity around Hispanic women's physical activity and dietary behaviors, as well as factors associated with contextualizing body weight gain in Hispanic women, are usually described as *intrapersonal, interpersonal*, and *extra-personal* factors (Keller, Fleury, Gonzalez Castro, Ainsworth, & Perez, 2009). Intrapersonal factors include: lack of awareness about nutrition and physical activity, feelings of alienation, powerlessness, body image perceptions, stress associated with acculturation, variability in the understanding of menopause and sedentary life increase, and unfamiliarity with self-rated tools including body mass index (BMI) (Amesty, 2003; Kepka, Ayala, & Cherrington, 2007; Kohlbry, 2006). These intrapersonal factors are the most cited in the literature as associated with increase of weight and obesity in Hispanic women. Moreover, investigators concerned with acculturation and obesity have reported a positive association between the number of years residing in the United States and frequency of eating at fast food restaurants and buffets related to Hispanic women's easy accessibility to these sites (Murguia, 2009).

Among the interpersonal factors, the most salient include: not having friends to engage in physical activity, language discrepancy within the family (e.g., children mainly speaking English may undermine the adults authority regarding to meal choices), social support, and strong Hispanic traditional family views (Murguia, 2009; Terán, Belkic, & Johnson, 2002). The extra-personal factors include parks and walking areas, physical activity programs focusing on the physical structure and cultural aspects of mobility, and cultural appropriateness of media messages (Amesty, 2003). As Hispanic women are immensely diverse, these multifactorial predisposing factors for obesity in Hispanic women call for a multidimensional approach and

research that includes a heterogeneous group sampling within Hispanic women, so interventions in preventing obesity will correspond with their specific cultural needs.

Body Image and Acculturation. Empirical attention to the relationship between body image and obesity among Hispanic women has grown in the last decade. Body image is a multidimensional concept, which requires the assessment of subjective (dis)satisfaction, cognitive distortions, affective reactions, behavioral avoidance, and perceptual inaccuracy (Sarwer, Thompson, & Cash, 2005). Various assessment tools are available to assess body image from multidimensional questionnaires to schematic figure ratings methodologies such as Figure Rating Scales (see Figure 2.2). Although a disadvantage for using body figure scales with minority groups is that the figures depicted may not represent their valued ethnic body figure, the scales are simple and practical tools to assess body discrepancy. Moreover, they have shown to be correlated with questionnaires that measure body (dis)satisfaction (Sarwer, et al., 2005). BID is the difference between the ideal body figure and the figure participants think they have (Fallon & Rozin, 1985); this may result in body image (dis)satisfaction (the resulting subjective evaluation). Literature reports that BID and body image dissatisfaction is associated with eating disorderly; recently, it has been suggested that BID is a "window of vulnerability" for eating disorders in middle-age women (Mangweth-Matzek et al., 2013).

It has been proposed that body image perceptions are culturally determined and that the acculturation process is associated with increases of body dissatisfaction (L. H. Clarke & Korotchenko, 2011; Marshall, et al., 2012). As a result, research regarding body image paradigms among Hispanic women report contradictory findings. Some investigators suggest that Hispanic women are more accepting of heavy female figures, leading to less body dissatisfaction, whereas others argue that Hispanic women face body dissatisfaction similar to

White women's fear of weight gain (Cachelin, Rebeck, Chung, & Pelayo, 2002; L. H. Clarke & Korotchenko, 2011; Petti & Cowell, 2011; Sánchez-Johnsen et al., 2004). Moreover, it is reported that highly acculturated Hispanic women have greater preference for thinner figures and less tolerance for heavier figures similar to the Anglo orientation of body image (Bhuiyan, Gustat, Srinivasan, & Berenson, 2003; Cachelin, et al., 2002; Dorsey, Eberhardt, & Ogden, 2010). The variability of these findings by scholars lies in the diversity among women with respect to levels of acculturation, education, and socioeconomic status (Guendelman, Ritterman-Weintraub, Fernald, & Kaufer-Horwitz, 2011). In addition, research on body image was largely concerned with adolescent populations. Presently, as the country is facing an obesity epidemic, attention is placed on middle-aged and older women's BID and the resulting (dis)satisfaction (Cachelin, et al., 2002). However, these studies show contradictory findings as well. While some studies report that similar to their younger counterparts, middle-aged and older women tend to be dissatisfied with their body image, other studies find that this age group of women is less invested in their appearance as they age (L. H. Clarke & Korotchenko, 2011; Marshall, et al., 2012). Nevertheless, few of these studies included Hispanic women.

Acculturation and Weight-Related Behaviors. Embracing the diversity of cultural models that exist within groups, acculturation now is conceptualized multidimensionally, where practices, values, and identifications of both the heritage culture and the receiving culture are seen as interrelated and simultaneously occurring (Schwartz, et al., 2010). The process of acculturation—the adoption of values, attitudes, and behaviors prevalent within the American society—is associated with Hispanics' health outcomes and with potentially decreasing health disparities (Schwartz, et al., 2010; Zambrana & Carter-Pokras, 2010). Contrary to the debate among scholars on whether the acculturation concept is impeding methodological scrutiny of

research on Hispanic populations (Hunt, Schneider, & Comer, 2004), studies applying the concept on weight-related behaviors consistently report important information to consider when addressing Hispanic women's body weight. Literature reports that across many immigrant groups, longer stay in the United States and high integration into the American society is positively associated with adequate levels of physical activity and dietary intake (Buenrostro, 2007; Creighton, et al., 2012; Evenson, Sarmiento, & Ayala, 2004). However, for Hispanic women who live within a Hispanic enclave community, the acculturation process is slower; for these women, living longer in the United States may or may not be associated with an improvement in the women's weight-related behaviors (Banna, Kaiser, Drake, & Townsend, 2012; Bettendorf & Fischer, 2009; Evenson, et al., 2004). Higher levels of education, socioeconomic status, and residing in an area with available adequate food and areas of recreation are associated with engaging in healthy body weight behaviors (Martinez, 2010). However, for Hispanic women who are recent immigrants, less acculturated, and have lower socioeconomic status, healthier outcomes were detected compared to their U.S. counterparts (an effect known as the Hispanic/Latino paradox) (Turner, Lloyd, & Taylor, 2006).

Researches have also tested diet and physical activity as moderators between acculturation and BMI. In these studies, strong Hispanic ties showed an increase in engaging in healthful weight-related behaviors other than diet and physical activity (Ayala, Baquero, & Klinger, 2008; Bettendorf & Fischer, 2009; Buenrostro, 2007; Creighton, et al., 2012). Although current reviews of the effects of acculturation on Hispanic women are numerous, few studies are oriented toward understanding the association between acculturation, symptoms at menopause, and weight-related behaviors (Davis et al., 2012) (Avis et al., 2009).

A recent systematic review on acculturation measures suggests that multidimensional acculturation tools are best to measure Hispanic diversity regarding cultural values and beliefs that influence lifestyle behaviors (Wallace, Pomery, Latimer, Martinez, & Salovey, 2010). Although sophisticated measures of acculturation are emerging, proxy indicators such as length of stay, generation, and preferred language are continuously being used to assess the level of acculturation (Aimee Afable-Munsuz, Gregorich, Markides, & Pérez-Stable, 2013) as these proxy measures combined approximate to those measured by a multidimensional parameter.

Weight-related Behaviors, BMI, and WHR. Efforts to decrease the prevalence of weight gain and obesity in Hispanic women are mainly focused on improving Hispanic women's physical activity level and adequacy of dietary intake. The current trend in healthy weight-promoting strategies for Hispanic women is to target both dietary and physical activity; however, the emphasis usually falls on one component, either diet or physical activity.

Literature generally reports insufficient physical activity for the Hispanic female population. Among women aged 20 and over, only one-third reported performing vigorous or moderate activity (Evenson, et al., 2004; Kohlbry, 2006; Nicaise, Marshall, & Ainsworth, 2011; Perez, Fleury, & Keller, 2010). In middle aged and older women Hispanic, vigorous and moderate physical exercise is reported as declining because of age (Avis, et al., 2009; Kohlbry, 2006; Sims et al., 2013). However, some studies advise careful interpretation of physical activity findings as some Hispanic women report housework, care giving, and community responsibilities as physical activity on par with formal exercise (B. E. Ainsworth, 2000; Arredondo, Mendelson, Holub, Espinoza, & Marshall, 2012).

Dietary intake high in saturated fat and low in fiber, fruit, and vegetables has been reported as placing Hispanic women living in the U.S. at risk of gaining weight and suffering

from obesity (Kristal, Shattuck, & Patterson, 1999; White, Cason, Coffee, Mayo, & Kemper, 2010). Yet there is evidence that Hispanic women, particularly those who are newcomers and live in Hispanic enclaves, tend to retain fiber-rich foods as part of their daily intake (Ayala, et al., 2008; Munoz, 2010). Some nutritional studies addressing the increased intake of dietary fiber faced a ceiling effect as the women's dietary fiber intake was estimated to be within dietary recommendations (Elder et al., 2005; Sanchez-Johnsen, Stolley, & Fitzgibbon, 2006); others did not (Paxton et al., 2011). On the contrary, findings of lower intakes of fruit and vegetable by Hispanic women are consistent (Elder, et al., 2005; MMWR, 2007; Sanchez-Johnsen, et al., 2006). Diets high in fruits and vegetables are associated with lower risk of chronic diseases (Kristal, et al., 1999; MMWR, 2007). Thus, exploring the level of association between intake of fruit, vegetable, and fat and body image perceptions in Hispanic women may bring new knowledge to address the women's nutritional needs while working in maintaining the body image they value.

Although BMI does not take into account body mass distribution, lean muscle mass, and ethnic differences or changing body compositions in different age groups, it is the method most widely used in research internationally (WHO, 2013a). The review that preceded this dissertation on Hispanic women's weight-related behavior maintenance revealed that achieved BMI changes of the women were not as significant as predicted by the investigators (Cousins et al., 1992; Hovell et al., 2008). These findings are consistent with the current literature that claims Hispanic women require additional interventions (e.g. greater periods of intervention) to promote weight-related behaviors (Hartman et al., 2011; Lopez & Masse, 1993; Perez, et al., 2010).

WHR is an additional measurement that is used to complement BMI in identifying individuals at increased risk of obesity-related morbidity due to abdominal adiposity (WHO,

2011). There is evidence that the Hispanic female population is predisposed to a higher percentage of fat mass in the central, subscapular, and within the trunk regions (Casas, Schiller, DeSouza, & Seals, 2001; Hartz, He, & Rimm, 2012). Thus, BMI and WHR are a useful combination of adiposity measures.

Menopause and Weight-Related Behaviors. When considering weight-related behaviors in middle-aged an older women, symptoms at menopause such as hot flashes and night sweats, need to be considered as a personal factor that might prevent women from engaging in healthy weight-promoting behaviors. Menopausal symptoms have been associated with a negative effect on quality of life, sleep deprivation (Huang et al., 2008), increased body weight, and chronic diseases such as hypertension and cardiovascular diseases (Avis, et al., 2009; Davis, et al., 2012; Hitchcock et al., 2012). For Hispanic women facing these menopausal symptoms, cultural views of managing and reporting menopausal symptoms are an additional factor to be considered when collecting research data (Avis et al., 2001). Generally, women between the ages of 45 and 55 are at high risk of obesity (Matthews et al., 2001). Women in these age groups are in the in a stage of the perimenopausal period, where menopausal symptoms may be acute. This dissertation includes a literature review on the association on symptoms at menopause and weight-related behaviors in Hispanic women.

Dissertation Theoretical Framework

The Multidimensional Concept of Acculturation (MDCA) and the Socio-cultural Theory (SCT) guide's this dissertation's first and second analyses. The MDCA acknowledges not only individuals' cultural heritage, but also the receiving-culture acquisitions regarding cultural *values*, *practices*, and *identifications* as they acculturate (Dillon et al., 2009; Schwartz, et al., 2010). This concept guides the examination of the extent to which Hispanic women's cultural

identity is associated with their *valued* body image, which in turn may affect their weight-related behavior *practices*. Moreover, in assessing the state of discrepancy of Hispanic women's body image, the impact of acculturative factors (language, generation, country longest lived) may have on Hispanic women's body image perceptions are inferred.

The SCT's main assumption is that the development of an individual is influenced by the culture in which they live (Lantolf & Poehner, 2013). According to this theory, the contributions of a society to the individual as it related to boy image—particularly social media—can result in dissatisfaction with women's own body image and size (Allen, 2012; Morrison, Kalin, & Morrison, 2004). The SCT contends that women's dissatisfaction with their physical appearance is related to the tendency of women to adopt a westernized ideal body type, where they are rewarded for being attractive (e.g., being thin), and face costs of being unattractive (e.g. being fat) (Morrison, et al., 2004). The theory guides the studies to explore the interrelationship of Hispanic women's time exposed to U.S. society, discrepancy of body image, and changes in the women's body weight. The hypothesized relationships among the main variables of the study are illustrated in Figure 1.1.

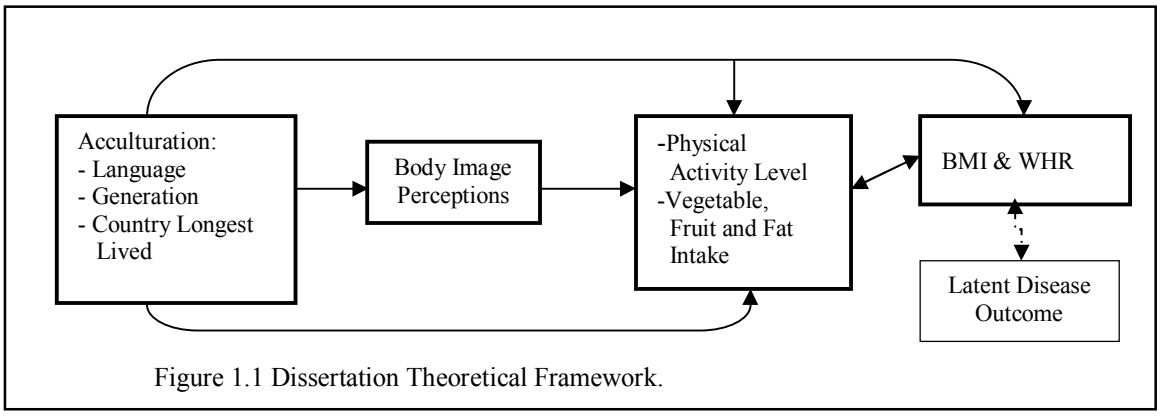

Figure 1.1 Dissertation Theoretical Framework.

It is hypothesized that acculturative factors impact Hispanic women's physical activity levels and their intake of fruits, vegetables, and fats by influencing their body image perceptions.

The framework also depicts the relationship of acculturation with physical activity and intake of fruits, vegetables, and fats as well as with BMI and WHR changes. In turn, BMI and WHR changes have a mutual relationship with physical activity and fruit, vegetable, and fat intake and with a latent disease outcome (e.g. obesity). Solid arrows between variables represent hypothesized associations. In this framework, the dashed arrow indicates a potential end outcome rather than a hypothesized pathway.

Research Purpose

The overall purpose of this dissertation is to better understand the role of acculturation and body image perceptions in Hispanic women's weight-related behaviors and to provide findings from the literature review on the association between menopause and Hispanic women's physical activity and dietary behaviors. Three specific aims guide the development of the three manuscripts that comprise this dissertation.

Manuscripts

Manuscript 1: *Acculturation, Body Image, and Weight-Related Behaviors in Hispanic Women.*

In this first manuscript (Chapter II), the aim is to assess the cross-sectional relationship of Hispanic women's acculturative factors with their body image perceptions, weight-related behaviors, BMI, and WHR. The hypotheses stated in this analysis are that: (1) Hispanic women with higher levels of acculturation have a lower body image discrepancy than women with lower levels of acculturation, (2) there is a relationship between Hispanic women's level of acculturation, weight-related behaviors, and BMI and WHR values, and (3) Hispanic women with higher body image discrepancy are more likely to have unhealthy weight-related behaviors and BMI and WHR values.

The predictor variable for the first hypothesis is acculturation (a composite variable created using participants' proxy demographic indicators, e.g., language, place of birth, country longest lived, and subjects' parents birth place) and the response variable of interest is body image discrepancy. Body image discrepancy was computed subtracting two items of the Stunkard's (1983) Figure Rating Scale (FRS) used to measured participants' body image perceptions: the current body image minus the ideal body image.

For the second hypothesis, the acculturation composite variable is the predictor variable as well, but the response variables of importance are the subjects' weight-related behaviors, BMI, and WHR. The weight-related behaviors comprises, (a) the level of physical activity, for which 4 category levels were created based in the weekly energy expenditure scores calculated in metabolic equivalent tasks (MET) hours per week from participant's reported recreational activity (< 3 MET hrs/week = light, 3 to 8.9 MET hrs/week = moderate, and > 9 MET hrs/week strenuous physical activity) and (b) the daily intake of fruit, vegetables, and fat; up to four daily servings of fruits and vegetables, and less than 30% daily intake of calories from fat are considered adequate (USDA, 2013). BMI was computed using measures of height and weight, and WHR using participants' waist and hip circumference measures.

For the last hypothesis, the predictor variable is body image discrepancy and the response variables of importance include, physical activity levels, fruit, vegetable, and fat intake, BMI, and WHR. Predictor and response variables for this hypothesis were measured in the same manner as for hypothesis 2. For all the models executed to test the hypotheses of this manuscript, the covariates included are age, education, and income.

Manuscript 2: *Hispanic Women's Body Image, Physical Activity, and BMI Trajectories Over 6 Years.*

In the second manuscript (Chapter III), the aim is to assess middle-aged and older Hispanic women's physical activity patterns and BMI values as they relate to their body image discrepancy over a period of six years and to then examine differences in these trajectories among Hispanic ethnicities. The hypotheses for this manuscript were that Hispanic women with body image discrepancy will have less healthy changes in physical activity and BMI scores over time and that the relationship between body image perceptions, physical activity and BMI trajectories will differ over time for women of different Hispanic ethnicities.

The predictor variable of interest is body image discrepancy and the outcomes of importance include, physical activity and BMI scores. Physical activity was measured in MET hrs/week and BMI scores were treated as continuous variables in this analysis. The covariates included were education, income, having insurance, and hormone use.

Manuscript 3. *Menopause and Hispanic Women's Weight-Related Behaviors.*

In the third manuscript, the aim is to review existing literature on the association between menopause and Hispanic women's physical activity and dietary behaviors. The specific questions guiding the literature review are: (a) What are the studies' outcomes on the association between menopause and Hispanic women's weight-related behaviors? (b) What research methods were used to study the review topic? c) What nonphysiologic influential factors for menopause symptoms were considered by the researchers in their studies? The consideration of the influential factors in menopause was guided by the components of the updated Unpleasant Symptoms Theory (UST). These components include, the experienced *symptoms*, the *influencing*

factors (physiologic, psychological, and situational factors), and the effects of these symptoms on an individual's *performance* (Lenz, Pugh, Milligan, Gift, & Suppe, 1997).

Data Source

The data source for manuscript 1 and 2 (the secondary analyses) derive from the Women's Health Initiative Observational Study (WHI OS). The goal of the WHI OS study was to complement the clinical trials that were part of this national study by assessing new risk indicators and biomarkers for diseases, particularly heart disease, cancer, and diabetes. The primary WHI OS data collection of this study that targeted postmenopausal women was between 1993 and 2005. The analyses in this dissertation use exclusively data from this period of women who identified as Hispanic/Latino in the WHI OS cohort. The WHI study design, procedures, and methods are described in detail elsewhere (The WHI Study Group, 1998).

CHAPTER II: Manuscript 1

Title: *Acculturation, Body Image, and Weight-Related Behaviors in Hispanic Women.*

Abstract

Purpose. To examine the associations between acculturation level, body image perceptions, physical activity, food intake, and anthropometric measures in middle-aged and older Hispanic women.

Design. A cross-sectional analysis was conducted of data from 3,032 Hispanic/Latino women in the year-3 follow-up of the Women's Health Initiative Observational Study (WHI OS).

Method. A composite acculturation variable was created from participants' socio-demographic data and their body image discrepancy score (BDS) calculated. Linear, logistic, and multinomial logistic regression models were used to test the associations between acculturation level and BDS; intake of fruits, vegetables, and fats; physical activity; and measured body mass index (BMI) and waist-hip ratio (WHR).

Findings. Hispanic women (mean age = 60.70 yrs) were highly acculturated (81.9%) and nearly half were first-generation immigrants (49.6%). Most of the women (63.1%) perceived themselves as having a heavier figure, 29.6% of the women were overweight (BMI 25 to 29 kg/m^2), 24.6% of the women were obese (BMI $\geq$ 30 kg/m^2). A high BDS was shown to increase the odds of being inactive, of having normal weight and low WHR, and of being less likely to consume < 30% calories from fat/day. High acculturation was positively associated with inactivity. No associations of intake of fruits and vegetables with acculturation or with BDS were observed**.**

Conclusions. Findings suggest that highly acculturated women perceived themselves as having a heavier body figure, that they are less physically active, and that high body image discrepancy

negatively influences their level of activity and dietary fat intake. Further research should aim to longitudinally study weight-related behaviors and the long-term effects of acculturation and body image (dis)satisfaction in middle-aged or older Hispanic women.

Clinical Relevance. This study provides findings on how Hispanic women's acculturation and assessment of their perceptions of body image influences their weight-related behaviors that may have implications on their general health as they age.

Background

Hispanic/Latino women are an increasingly important population of interest in preventive research concerned with promoting healthy weight. Indeed, Hispanic women have the second highest prevalence of obesity (41.4 %) of all female ethnic groups in the United States (MMWR, 2012). Although scholars highlight the inclusion of cultural and acculturation concepts in designing strategies to meet Hispanic women's body weight needs, few strategies are primarily based on these concepts (Mier, et al., 2010). For instance, women's body image and size are less emphasized in the cultural values of Hispanic women. It has been proposed that body image perceptions are culturally determined and that the acculturation process is itself associated with increased body size and body dissatisfaction (L. H. Clarke & Korotchenko, 2011). Moreover, contrary to the belief that body (dis)satisfaction becomes less relevant as women age, it has been shown that (dis)satisfaction continues to affect women throughout their lifespan (Marshall, et al., 2012).

Some researchers suggest that Hispanic women are more accepting of heavy female figures, leading to less body dissatisfaction (Cachelin, et al., 2002). Others argue that Hispanic women and White women face similar feelings of body dissatisfaction and fears of weight gain (Petti & Cowell, 2011). It is also reported that, similar to the Anglo orientation of body image, highly acculturated Hispanic women have greater preference for thinner figures and less tolerance for heavier figures. Scholars attribute these contradictory findings to the diversity among Hispanic women, particularly with respect to levels of acculturation (Guendelman, et al., 2011). Acculturation, conceptualized as a process that emphasizes both an individual's cultural *identification* (e.g., as Hispanic women) and the newly acquired *values* and *practices* (e.g., behaviors) from the receiving culture (Schwartz, et al., 2010), may multidimensionaly influence

Hispanic women's body image paradigms leading to body image (dis)satisfaction. Indeed, the acculturation literature suggests that as Hispanic women acculturate, their body image discrepancy—the difference between their perceived *actual* body image and *ideal* body image—changes as well (Fitzgibbon, Blackman, & Avellone, 2000; Petti & Cowell, 2011). Although, research on Hispanic women's body image has largely focused on younger populations, body image discrepancy has been associated with disordered food intake, larger BMI, low awareness of the health risks that an increase of weight represents, and the neglect of weight-controlling behaviors (Marshall, et al., 2012; Ver Ploeg, Chang, & Lin, 2008).

In addition, few strategies exist that address Hispanic women's body weight concerns while simultaneously emphasizing nutrition, diet, and physical activity (Perez, et al., 2010). The literature on physical activity and body weight among Hispanic women is vast compared to that on dietary behavior interventions which promote healthy weight for Hispanic women. Investigators have reported on insufficient physical activity for Hispanic women (Kohlbry, 2006; Perez, et al., 2010) and caution readers to interpret carefully physical activity findings, as some Hispanic women report housework, care giving, and community responsibilities as physical activity on par with formal exercise (B. E. Ainsworth, 2000; Arredondo, et al., 2012). It is also reported that the intake of food high in saturated fats and low in fiber places Hispanic women at risk of obesity or becoming overweight (Ayala, et al., 2008; Kristal, et al., 1999; White, et al., 2010), that Hispanic women tend to retain their fiber-rich foods as part of their daily intake (Ayala, et al., 2008; Munoz, 2010), and that the intake of fruit and vegetables by Hispanic women is low (Elder, et al., 2005; Sanchez-Johnsen, et al., 2006); whereas diets high in fruits and vegetables are associated with a lower risk of chronic diseases (Kristal, et al., 1999). Thus, in this paper, we explore the relation of acculturation and body image discrepancy to physical activity and the intake

of fruits, vegetables, and fats (the selected weight-related behaviors) in middle-aged and older Hispanic women who participated in the WHI OS. Given that waist circumference and BMI were found to predict an increased risk of disease among Hispanic women from this sample (WHO, 2011), we included both BMI and WHR as our end study outcomes. In this context, we proposed the following hypotheses:

(1) Hispanic women with higher levels of acculturation have a lower body image discrepancy than women with lower levels of acculturation.

(2) There is a relationship between Hispanic women's level of acculturation, weight-related behaviors, and BMI and WHR values.

(3) Hispanic women with higher body image discrepancy are more likely to have unhealthy weight-related behaviors and BMI and WHR values.

Sociocultural Framework for Assessing Body Image and Weight-related Behaviors. Based on a literature review and the compelling reasoning of the Multidimensional Acculturation Concept (MAC) and the Socio-cultural Theory (SCT), we designed a theoretical framework to guide the study with the expectation that acculturation informs how Hispanic women's cultural *identity* is associated with their *valued* body image, which in turn may affect their weight-related behavior *practices* (Dillon, et al., 2009; Schwartz, et al., 2010). SCT aided us in considering how woman's development is influenced by the culture in which she lives; for instance, it is possible that longer periods of exposure to social media in the United States may have contributed to Hispanic women's body image (dis)satisfaction (Lantolf & Poehner, 2013). Figure 2.1. illustrates the important role that acculturation plays, particularly the way it impacts Hispanic women's physical activity levels and intake of fruits, vegetables, and fats by influencing their body image perceptions—the image reported by participants based on their psychosocial body image

experiences (Cash & Green, 1986). By applying a MAC and SCT framework, we aim to examine how acculturation influences Hispanic women's physical activity and intake of fruits, vegetables, and fats, which in turn may affect their BMI and WHR values.

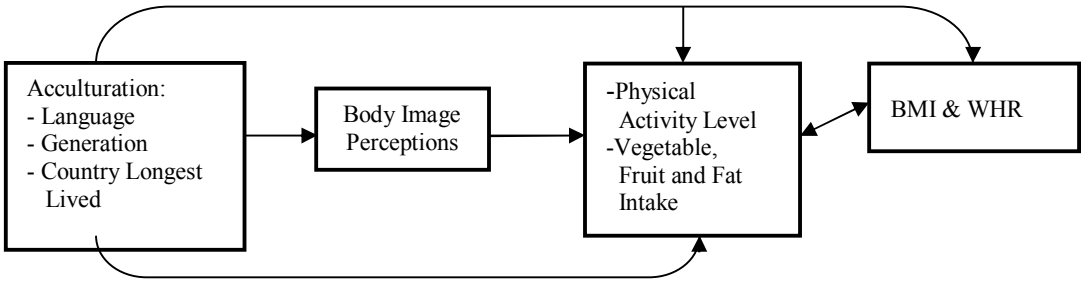

Figure 2.1. Sociocultural Framework for Assessing Body Image and Weigh-related Behaviors.

Materials and Methods

Data Source. This secondary analysis was conducted on data obtained in the WHI OS project, a national study focused on postmenopausal women that was funded by the National Institutes of Health (NIH). Women who were ineligible or unwilling to participate in randomized clinical trials as part of the WHI were invited to join the OS cohort (n = 93,676). Women who identified as Hispanic or Latina in the OS represented 3.9% of the total OS cohort (The WHI Study Group, 1998). The OS was intended to complement the clinical trials by assessing new risk indicators and biomarkers for diseases, particularly heart disease, cancer, and diabetes. The primary WHI OS data collection was conducted between 1993 and 2005, totaling 8 years of follow-up, with women from 40 participating WHI clinical centers nationwide through screening visits, telephone interviews, in-person interviews, and follow-up questionnaires. In our analysis, we used data from the three-year WHI OS follow-up period, during which body perceptions were assessed. Our analysis does not include data from the ongoing extended follow-up

assessments. Note that the WHI OS design has been described in further detail by Langer, et al. (2003) and the WHI Study Group publications (1998).

Study Population. The WHI participant eligibility defined postmenopausal status as the presence of amenorrhea for at least 6 months for women age 55 and over or the presence of amenorrhea for at least 12 months for women age 50 to 54 (The WHI Study Group, 1998). Hispanic women enrolled in the OS cohort were postmenopausal, aged 50 to 79, with or without a uterus or ovaries, likely to reside in the study area for at least three years, and able to provide informed consent to participate in the study. Women were excluded if they had a mental illness, dementia, alcoholism, drug dependency, any condition with predicted survival of less than 3 years, or if they were participating in a randomized intervention study (Hays et al., 2003; The WHI Study Group, 1998). The Hispanic women who participated in the follow-up visit and interviews in year three (n = 3,032) constituted the sample of this study.

Study Variables. To assess Hispanic women's acculturation, we created a composite variable using socio-demographic indicators obtained by the WHI OS. Our intent was to learn about the impact of acculturation—that is, both language and generational information—on middle-aged and older Hispanic women's weight-related behaviors. Specifically, we used collected information on participant language preference in answering the data collection questionnaires, country longest lived (a binary variable: United States versus Latin American countries), and participant and parental birth places (WHI OS questionnaire forms # 41, # 2, and # 147)**.** First, participants were classified by generation: Hispanic women who were foreign-born and had a foreign-born parent or both parents, were classified as being of first generation immigrants. U.S.-born women with at least one foreign parent were considered to be of second generation immigrants. If participants and their parents were born in the United States, these

participants were considered third generation immigrants. Second, two levels of acculturation were designed—high and low (A. Afable-Munsuz, Ponce, Rodriguez, & Perez-Stable, 2010). Women who were of the second or third generation, who answered WHI forms/questionnaires in English, and who had been in the United States the longest time were classified in our high acculturation group, whereas women in the first generation group who answered WHI forms/questionnaires in Spanish and had been in the United States less time were classified in our low acculturation group.

We next sought to measure how discrepant Hispanic women's perception of their current image was with their ideal body image for women similar to them. Thus, we calculated a body image discrepancy score (BDS) based on their results on the figure rating scale (FRS) (Stunkard, Sorensen, & Schulsinger, 1983) that was used in the WHI to assess participants' body image perceptions. The FRS is scaled from 1 to 9, with 1 being the thinnest figure and 9 being the heaviest figure (see Figure 2.2). WHI participants used the FRS to report the body figure that best reflected their ideal figure, their current figure, and the most attractive (to the opposite sex) figure, respectively. This instrument is highly correlated with measured percentage of being overweight ($r = 0.79$) and is a reliable predictor for obesity with or without self-reported height and weight (Stunkard, et al., 1983). The test-reliability for measuring discrepancy with the FRS has also been established by several studies (Thompson & Altabe, 1991). We calculated a BDS by subtracting two items of the FRS: the current body image minus the ideal body image; a simple method established by Fallon and Rozin (1985). A BDS > 0 indicates a perception of being heavier than the ideal body, a BDS < 0 indicates a perception of being thinner than the ideal body, and a BDS 0 indicates an absence of body image discrepancy; the scores ranged from -8 to 8.

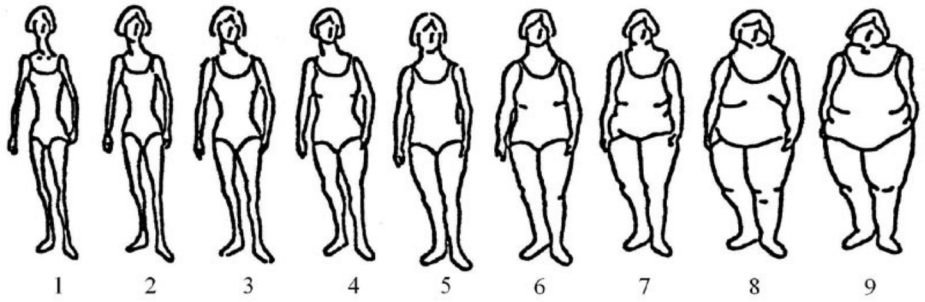

Figure 2.2. Female image for the FRS. Reprinted with permission by T. Wadden in behalf of A. J. Stunkard (1.983).

The weight-related behavior variables were assessed by physical activity intensity and the intake of fruits, vegetables, and fats. Weekly energy expenditure scores were calculated in metabolic equivalents (MET) hours per week that participants spent engaged in recreational activity (e.g., walking or, moderate and strenuous physical activity in Kcal/week/Kg) (Langer, et al., 2003). In our study, we assigned four categories of intensity for physical activity: inactivity for those who reported no physical activity, < 3 MET hrs/week for those who had light physical activity, 3 to 8.9 MET hrs/week for those who were moderately active, and > 9 MET hrs/week for those who engaged in strenuous activity. These cutoff points are consistent with physical activity recommendations for overall health; for example, 9 MET hrs/week would be equivalent to approximately 3 hours per week of moderate physical activity (Hsia et al., 2005; Nguyen et al., 2013). Dietary intake was assessed using the food frequency questionnaire (FFQ) that was administered at the year three follow-up. From this data set, we considered intake of fruits and vegetables (servings/day), and intake of calories from fat (percent intake). Up to four servings of fruits and vegetables and a consumption of less than 30% of calories from fat are considered adequate (Gunn, Weber, Coad, & Kruger, 2013; USDA, 2013). Examples of one serving of vegetables include: one cup of raw leafy vegetables or ½ cup of other cooked or raw vegetable; examples of one serving of fruit include a ½ cup of chopped fruit, ¾ cup of fruit juice or 1

medium apple or orange. The percent of calories from fat intake is calculated based on the total calorie (kcal/g) intake per day (~ 2,000) from carbohydrates, proteins, and fats. By dividing the total calories/day intake by the consumed daily fat, we obtain the percent of calorie intake from fat in a day, which is ideally < 30% (USDA, 2013).

The study's end outcome variables, BMI and WHR, were calculated from year-three data. BMI was calculated by dividing participants' weight in kilograms by the square of their height in meters (kg/m^2). BMI categorization followed the World Health Organization (WHO) recommendations (BMI score < 18 kg/m^2 = underweight, 18 to 24 kg/m^2 = normal weight, 25 to 29 kg/m^2 = overweight, ≥ 30 kg/m^2 = obese). We set the WHR cut-off to >85 cm, which indicates being at risk of weight-related diseases (WHO, 2013a). Anthropometric measurements and WHI questionnaires data were obtained following standardized written protocols and using standardized questionnaires by each of the WHI local sites (The WHI Study Group, 1998; The Women's Health Initiative, 2013). Details of the validity, reliability, and translation into Spanish of the instruments used in the WHI SO study can be found in Anderson et al. (2003), Patterson et al. (1999), Langer et al.(2003), and Meyer et al. (2009).

Finally, we included the following relevant covariates: age, years of education, having health insurance or not, income (assessed in 5 categories, see Table 1), and use of prescribed female hormones (estrogen or progesterone in any form) in the past 2 years. The entry of the covariates varies in each model as the models differ in their main variables.

Statistical Procedures. Post-hoc power calculations to detect changes in body image discrepancy with differences in language and BMI were conducted using G*Power version 3.1.6. A conventional small R^2 (0.1 correlation) between language or BMI, an alpha level of 0.05, and proportions relating language or BMI to body image discrepancy for those who speak Spanish

versus English (Jackson, 2007) were entered, leading to power above 99% for both relationships. Descriptive statistics, multiple linear regression (MLR), logistic regression (LR), and multinomial logistic regression (MNLR) analyses were conducted. The goal of using such regression models was to assess the study outcomes from multiple explanatory variables and to nominally model various study outcomes. Missing data and frequency distributions of the study's variables were examined. A composite acculturation variable was created that included those participants with the necessary proxy acculturation indicators, rendering 1,260 observations. We opted to use the most complete data set available for running the models to test each proposed hypothesis since the models include different variables. These analyses were performed to allow the inclusion of data from all participants with known variable values in the models and to prevent further data reduction, which would negatively affect power. For hypothesis 1, after an acceptable linearity and normality was observed based on residuals and Q-Q plots, multicollinearity was assessed by zero correlation and variance inflation factors (VIFs). Correlations were found to be low ($r < 0.44$) as well as the VIF (< 2) allowing to run a MLR for examining the association between acculturation (binomial variable) and BDS. For hypothesis 2 assuming independence of observations, multicollinearity was checked by VIFs, which in all the models were found to be < 2. MNLRs were computed to explore the effect of acculturation on the number of servings of fruit and vegetable, physical activity levels, and BMI categories. A LR model allowed for the exploration of the association between acculturation and the binary variables, intake of fat and WHR. For hypothesis 3, after observing acceptable VIFs (< 2), similar models to those described for hypothesis 2 were run, but BDS was used as the predictor variable. The models were run in a simultaneous entry fashion. The entry of covariate variables into the models varied from model to model based on prior evidence of their role in the main

variables' relationships. Data analysis was performed using the Statistical Package for the Social and Behavioral Science (SPSS) version 19. Effect estimates are reported with a statistical significance level of 0.05 and 95% confidence intervals (CIs).

Results

Sample Characteristics. The study sample consisted of 3,032 Hispanic women with a mean age of 60.7 ± 7.07 years. Of these women, 38.3% were of Mexican origin, 9% were of Puerto Rican origin, 4.3% were of Cuban origin, and 18.9% were of some other Hispanic origin; for 22.9% participants, ethnicity was unknown. Most of the women spoke English (80.7 %) and lived longer in the United States (85%) than in any other country. Based on the composite acculturation variable, there were more women with a high acculturation status (81.9%) in our analysis than women with a low acculturation status (18.1 %). Furthermore, our results rendered slightly more first-generation participants (49.6%) than second-(34.7%) and third-(15.7%) generation participants. Thirty-six percent of participants had postsecondary education, and the women's annual household income ranged from $10,000 (14.2%) to greater than $50,000 (21.2%). The mean BDS was 1.32 (SD = 1.12); 29.6% of the women were overweight; 24.6% of the women were obese; and the women were more likely to classify themselves as having a larger than ideal body figure (63%) (Table 2.1). Although 14.7% of the women reported being physically inactive, greater than 9 MET hr/week from recreational activity (vigorous activity) was reported by 34% of the women. Most of the women had an intake of less than 2 fruit and vegetable servings per day, 52% and 57.3% respectively, and 50.3% of the women consumed greater than 30% of calories from fat per day (Table 2.2). Table 2.3 provides information on the cross-tabulation of body image discrepancy (categorically) by acculturation level; it shows that

women with both high and low acculturation reported having a body figure larger than the ideal figure (84.6% and 81.3%, respectively).

Table 2.1.
Demographics, Acculturative Factors, and Body Image Characteristics of the Sample[a] (N= 3,032).

	Mean (SD)/*n* (%)
Demographics	
Age (years)	60.70 (SD = 7.07)
< 60	1,455 (48.0)
60 to < 70	1,194 (39.4)
≥ 70	383 (12.6)
Education[a]	
> 8 years	456 (15.0)
Some High School	253 (8.3)
High School Diploma/GED	477 (15.7)
Postsecondary School	1,094 (36.1)
College Degree or Higher	703 (23.2)
Income[b]	
< $10,000	257 (8.5)
$10,000-$19,999	430 (14.2)
$20,000-$34,999	514 (17.0)
$35,000-$49,999	393 (13.0)
>$50, 000	827 (27.3)
Hispanic Ethnicity[c]	
Mexicans	1,162 (38.3)
Puerto Ricans	272 (9.0)
Cubans	131 (4.3)
Other	695 (22.9)
Health Insurance[d]	
Yes	2,118 (69.9)
No	301 (9.9)
Acculturative Factors	
Language Preference	
Spanish	587 (19.3)
English	2,446 (80.7)
Country Longest Lived[e]	
United States	2,577 (85.0)
Other	360 (11.9)
Born in the United States[f]	
Yes	19.11 (63.0)
No	1,062 (35)
Parents birth of place[g]	
Mother:	
U.S./Europe/Mid East/Caribbean/Asia	73 (2.4)
Central/South America	1,240 (40.9)
Other	9 (0.3)
Father:	
U.S./Europe/Mid East/Caribbean/Asia	114 (3.8)
Central/South America	1,264 (41.7)

Table 2.1. (Continued)

	Mean (SD)/*n* (%)
Other	16 (0.5)
Body Image[h]	
BDS	1.32 (SD = 1.12)
Image < ideal	72 (2.4)
Image = Ideal	361 (11.9)
Image > Ideal	1,914 (63.1)

Note. BDS = body image discrepancy score. Subtotal percentages do not sum to 100% in the table due to missing values, including: [a]*n* = 49, [b]*n* = 611, [c]*n* = 772, [d]*n* = 613, [e]*n* = 95, [f]*n* = 59, [g]*n*: mother = 1,710 and father = 1,638, [h]*n* = 685.
†= The data in the table are from baseline, except income, health insurance, and body image, which were collected at year 3.

Table 2.2.
Physical Activity Level, Fruit, Vegetable and Fat Intake, and Anthropometric Characteristics of the Sample (N= 3,032).

	Mean (SD)/*n* (%)[a]
Physical Activity	
No Reported Activity	446 (14.7)
Mild< 3 MET hr/week	388 (12.8)
Moderate 3.1 to 8.9 MET hr/week	597 (19.7)
Strenuous > 9 MET hr/week	1,030 (34)
Fruit intake: Servings/day	
< 2 Servings/day	1,673 (55.2)
2-4 Servings/day	638 (21.0)
>4 Serving/day	179 (5.9)
Vegetables:	
< 2 Servings/day	1,736 (57.3)
2-4 Servings/day	599 (19.8)
> 4 Serving/day	160 (5.3)
Fats (kcal from energy/day)	
<30%	942 (31.1)
≥30%	1,556 (51.3)
BMI (kg/m^2)	
< 18 = underweight	7 (0.2)
18 to 24 = normal weight	646 (21.3)
25 to 29 overweight	896 (29.6)
≥ 30 obese	747 (24.6)
WHR	
<0.85cm	1,589 (52.4)
≥0.85 cm	699 (23.1)

Note. BMI = body mass index, WHR = waist-hip ratio.
a = Subtotal percentages do not sum to 100% in the table due to missing values, including: [a]*n* = 517, [b]*n* = 534, [c]*n* = 534, [d]*n* = 534, [e]*n* = 736, [f]*n* = 744.
†= The data in the table were collected at year 3.

Table 2.3.
Body Image Discrepancy by Acculturation Levels

	BDS by Acculturation			
	Image < Ideal	Image = Ideal	Image > Ideal	Total
High Acculturation	17 (1.9%)	123 (13.5%)	771 (84.6%)	911 (100%)
Low Acculturation	3 (2.4%)	20 (16.3%)	100 (81.3%)	123 (100%)

Note. High Acculturation = second or third generation Hispanic women who answered WHI forms/questionnaires in English, and being in the United States the longest. Low Acculturation = first generation women who answered WHI forms/questionnaires in Spanish and had been in the United States less time.

Acculturation and BDS. Table 2.4 reports the results of the BDS regression model on the composite acculturation variable after adjusting for age, education, and income. Although there was an estimated 0.07 decrease in BDS in women who were more highly acculturated than women who were less acculturated, this association of acculturation and BDS was not significant ($p > 0.05$). Among the covariates, age and income were significantly associated with BDS. There was an estimated mean increase of 0.02 in BDS with each one-year increase in age when adjusting for a constant level of education and income ($b = 0.02$, $SE = 0.01$, $t[930] = 3.92$, $p = 0.001$). This can be interpreted as follows: comparing two women, one being 50 years of age and the other 60, who have similar levels of acculturation, education, and economic status, their average difference in BDS will be 0.2 points, with the older woman having the higher score. Income was another covariate that showed an effect of increasing mean BDS ($b = 0.09$, $SE = 0.03$, $t[930] = 3.05$, $p = 0.002$). This result signifies that after adjusting for all of the covariates in the model there is an increased mean estimate of 0.09 in BDS with each change from one income category to a higher income category (see Table 2.1 for categories).

Table 2.4.
Regression of BDS on Acculturation Adjusted for Covariates

	Standard Regression						
	R^2_{Total}	R^2_{Adj}	F_{Total}	*b*	*(SE)*	*t*	β
BDS	0.15	0.02	5.38**				
Intercept				-2.74	(0.33)	-8.41	
Acculturation				-0.07	(0.12)	-0.56	-0.02
Age				0.02	(0.01)	3.92**	0.13
Education				-0.01	(0.03)	-0.11	-0.01
Income				0.09	(0.03)	3.05 *	0.12

Note. n = 935. Reference category: Low acculturation.
* $p < 0.05$.
** $p < 0.001$

Acculturation, Weight-related Behaviors, BMI, and WHR. Table 2.5 depicts our findings from the MNLR and LR analyses of fruit, vegetable, and fat intake on acculturation, after adjusting for age, income, and education. No significant relationships between acculturation and fruit and vegetable, or fat calorie intake were observed. However, other covariates such as education and income, had a significant effect on the selected food intake in this study. For instance, high income increased the odds of having 2 to 4 servings of fruit intake a day (OR = 1.27, $p = 0.045$); higher education decreased the odds of having less than 2 and between 2 to 4 vegetable servings a day (OR = 1.03 [$p = 0.001$] and 1.17 [$p = 0.02$], respectively); and higher education increased the odds of having an intake of calories from fat (OR = 1.19, $p = 0.01$).

Table 2.6 presents the outcomes of the MNLR analysis of physical activity levels, including a MNLR of BMI categories, and the LR analysis of WHR values on acculturation (ref. = low acculturation), after adjusting for age, education, and income. Our findings suggest that more highly acculturated women have an increase in the odds of being inactive versus being vigorously active (OR = 2.69, $p = 0.01$). Although not significant, more highly acculturated women also showed an increase in the odds of being mildly and moderately active as opposed to

be vigorously active (OR = 1.07 and 1.29 [p values > 0.05], respectively). Similarly, the estimated increase in the odds of being of normal weight and having lower WHR for women with higher acculturation were not statistically significant (OR = 1.12, 0.70, and 1.06 [p values > 0.05], respectively).

In this model, the covariate age, or being older, decreased the odds of being inactive versus being vigorously active for highly acculturated women. Furthermore, age decreased the odds of having a lower WHR (OR = 0.98, $p = 0.05$). However, age increased the odds of being of normal weight or overweight rather than being obese (OR = 1.03 ($p = 0.03$) and 1.04 ($p = 0.001$), respectively). Economic status in highly acculturated women had an effect of increasing the odds of having a lower WHR (OR = 1.14, $p = 0.04$) and decreasing the odds of being inactive, mildly active, and moderately active over being vigorously active (OR = 0.77 ($p = 0.01$), 0.81 ($p = 0.01$), and 0.82 ($p = 0.008$), respectively). Conversely, higher levels of income increased the odds of being normal or overweight compared to being obese (OR = 1.27 ($p = 0.02$) and 1.22 ($p = 0.004$), respectively) and increased the odds of having a lower WHR (OR = 1.14, $p = 0.04$). Lastly, completing a higher level of education decreased the odds of being inactive and mildly active compared to being very active (OR= 0.71 ($p = 0.001$) and 0.72 ($p = 0.01$), respectively). All the models in this section had a significant chi-square test of goodness-of-fit ($p < 0.001$) (Tables 2.5 and 2.6).

Table 2.5.
Regression of Fruits, Vegetables, and Fats Intake on Acculturation, Adjusted for Covariates

		Standard Regression				95% CI for exp (b)	
		χ^2	Pseudo R^2	b	exp(b) OR	Lower Bound	Upper Bound
Fruits[1]		16.38*	0.02				
≤ 2 Servings/day	Intercept			2.54			
	Acculturation			0.31	1.36	0.58	3.52
	Age			-0.01	0.99	0.96	1.03
	Education			-0.14	0.87	0.68	1.13
	Income			0.15	1.16	0.94	1.46
2 to 4 Servings/day	Intercept			-0.29			
	Acculturation			-0.15	0.86	0.35	2.15
	Age			0.01	1.01	0.97	1.06
	Education			0.04	1.04	0.80	1.35
	Income			0.24 *	1.27	1.01	1.61
Vegetables[2]		35.69*	0.05				
≤ 2 Servings/day	Intercept			5.33			
	Acculturation			0.03	1.03	0.38	2.82
	Age			-0.02	0.98	0.95	1.02
	Education			-0.49 **	0.61	0.46	0.82
	Income			-0.05	0.95	0.76	1.19
2 to 4 Servings/day	Intercept			2.35			
	Acculturation			0.15	1.17	0.39	3.49
	Age			0.00	1.00	0.96	1.04
	Education			-0.37 *	0.69	0.51	0.94
	Income			0.15	1.16	0.92	1.48
Fats†		17.39*	0.02				
< 30%	Intercept			-2.32			
(kcal from energy/day)	Acculturation			-0.19	0.83	0.51	1.34
	Age			0.02	1.02	1.00	1.04
	Education			0.18 *	1.19	1.05	1.36
	Income			0.11	1.11	0.99	1.25

Note. Reference category: low acculturation, BDS = body image discrepancy score, BMI = body mass index, WHR = waist-hip ratio.
n = 973
[1] and [2] reference group: > 4 servings/day.
† Logistic regression results, reference category: > 30%.
* $p < .05$, ** $p < .001$.

Table 2.6.

Regression of Physical Activity, BMI, and WHR on Acculturation, Adjusted for Covariates

		Standard Regression			95% CI for exp (b)		
		χ^2	Pseudo R^2	b	exp (b) OR	Lower Bound	Upper Bound
		60.54*	0.70				
Physical Activity[1]							
Inactive	Intercept			2.31			
	Acculturation			**0.99** *	2.69	1.20	5.24
	Age			-0.03 *	0.97	0.95	0.10
	Education			-0.34 **[3]	0.71	0.59	0.84
	Income			-0.26 **[3]	0.77	0.66	0.90
Mild	Intercept			1.40			
< 3 MET-Hr/Wk	Acculturation			0.07	1.07	0.57	2.31
	Age			-0.01	0.99	0.96	1.02
	Education			-0.32 **[3]	0.72	0.59	0.86
	Income			-0.21 *	0.81	0.68	0.97
Moderate	Intercept			1.40			
3.1-9 MET-Hr/Wk	Acculturation			0.26	1.29	0.71	2.33
	Age			-0.02	0.99	0.96	1.01
	Education			-0.15	0.86	0.73	1.01
	Income			-0.19 *	0.82	0.71	0.95
BMI[2]		33.94*	0.04				
Normal	Intercept			-3.32			
18-24 (kg/m^2)	Acculturation			0.12	1.12	0.56	2.35
	Age			0.03 *	1.03	1.00	1.07
	Education			0.12	1.13	0.95	1.37
	Income			0.24 *	1.27	1.10	1.50
Overweight	Intercept			-2.57			
25-29 (kg/m^2)	Acculturation			-0.36	0.70	0.41	2.18
	Age			0.04 **[3]	1.04	1.02	1.06
	Education			0.00	1.00	0.86	1.34
	Income			0.20 *	1.22	1.07	1.48
WHR†		17.82*	0.03				
	Intercept			1.29			
< 0.85 cms	Acculturation			0.05	1.06	0.64	1.74
	Age			-0.02 *	0.98	0.96	1.00
	Education			0.09	1.09	0.95	1.25
	Income			0.13 *	1.14	1.01	1.29

Note. Reference category: low acculturation, MET = metabolic equivalent task, BMI = body mass index, WHR = waist-hip ratio.

[1] n = 975. Reference category: vigorous physical activity.

[2] n = 905. Reference category: obese.

† n = 909. Logistic regression, reference category: > 0.85 cms.

* p < .05, ** p < .001.

Body Image Discrepancy, Weight-related Behaviors, BMI, and WHR. In examining our third hypothesis, we tested whether Hispanic women with higher body image discrepancy were more likely to have unhealthy weight-related behaviors and BMI and WHR values. Table 2.7 depicts the results from our analysis of the association between BDS and fruit, vegetable, and fat intake, after covariate adjustments. It was estimated that women with high BDS have a decrease in the odds of calories from fat comprising lower than 30% of daily intake (OR = 0.85, $p = 0.001$). Other significant associations of BDS with fruit and vegetable intake were not observed, but the model showed a trend that higher education was associated with decreased odds of a daily intake of less than 2 servings of fruit and vegetables (OR = 0.77 [$p = 0.02$] and 0.68 [$p= 0.001$], respectively). Moreover, results shows that higher education levels may lower the odds of an intake of less than 4 servings of vegetables per day (OR = 0.80, $p = 0.03$). Although being older was associated with decreasing the odds of a daily intake of less than 2 servings of fruit and vegetables (OR = 0.97 [$p = 0.008$] and 0.97 [p = 0.03], respectively), it increased the odds of a lower intake of calories from fat (OR = 1.02, $p = 0.004$).

Table 2.8 presents the multinomial model results of the associations between BDS with physical activity intensity, BMI category, and the LR analysis of WHR on BDS, after adjustments for age, education, income, and insurance. Our results show that women with a higher BDS have an increase of 0.23 in the odds of being inactive (OR = 1.25, $p = 001$) compared to being vigorously active. This can be interpreted as follows: if we have two women, one with a BDS of 3 and the other with 2, who are of the same age, level of education, income, and insurance status, the ratio of the odds of being inactive for the woman with a higher BDS versus the woman with a lower BDS is 1.25 (95% CI: 1.12, 1.40). Thus, the woman with the

higher BDS has a higher likelihood of being inactive than being vigorously active. It is also estimated that women with higher BDSs have a higher likelihood of being mildly active (OR = 1.21, $p = 0.001$), but not moderately or vigorously active.

In these models, we found significant association between anthropometrics and BDS. Women with higher BDSs showed a decrease in the odds of being of normal weight (OR = 0.18, $p = 0.001$) or overweight (OR = 0.52, $p = 0.001$) compared to being obese. Moreover, having higher BDS decreases the odds of having low WHR (< 0.85cm) (OR = 0.65, $p = 0.001$). In addition, a trend was observed wherein the odds of women with higher levels of education being inactive, mildly active, or moderately active versus being vigorously active decreased (OR = 0.84 [$p = 0.003$], 0.84 [$p = 0.003$], and 0.87, [$p = 0.01$], respectively). Furthermore, although a higher level of income decreased the odds of being inactive or, mildly or moderately active versus being vigorously active (OR = 0.83 [$p = 0.001$], 0.85 [$p = 0.006$], and 0.86 [$p = 0.002$], respectively), it also increased the odds of being of normal weight and decreased the odds of being overweight versus being obese (OR = 1.40 [$p = 0.001$] and 1.19 [$p = 0.001$], respectively). Having a high income was also associated with increased odds of a low WHR (< 0.85cm) (OR = 1.17, $p = 0.001$), whereas being older decreased the odds of having a low WHR (OR = 0.98, $p = 0.015$). All the models in this section had a significant chi-square test of goodness-of-fit ($p < 0.001$) (Tables 2.7 and 2.8).

Table 2.7.
Regression of Fruits, Vegetables, and Fats Intake on BDS, Adjusted for Covariates

		Standard Regression				95% CI for exp (b)	
		χ^2	Pseudo R^2	b	exp(b) OR	Lower Bound	Upper Bound
Fruits[1]		38.79*	0.02				
≤ 2 Servings/day	Intercept			5.15			
	BDS			0.03	1.04	0.89	1.20
	Age			-0.35 *	0.97	0.94	0.99
	Education			-0.26 *	0.77	0.65	0.91
	Income			0.04	1.05	0.90	1.21
	Insurance			-0.22	0.81	0.44	1.46
2 to 4 Servings/day	Intercept			1.92			
	BDS			0.02	1.03	0.87	1.20
	Age			-0.01	0.99	0.97	1.02
	Education			-0.16	0.85	0.71	1.02
	Income			0.11	1.12	0.96	1.31
	Insurance			-0.33	0.72	0.37	1.40
Vegetables[2]		91.75*	0.06				
≤ 2 Servings/day	Intercept			6.05			
	BDS			-0.01	1.00	0.85	1.18
	Age			-0.03 *	0.97	0.95	1.00
	Education			-0.39 **	0.68	0.56	0.83
	Income			-0.13	0.88	0.75	1.03
	Insurance			0.39	1.48	0.65	3.36
2 to 4 Servings/day	Intercept			2.33			
	BDS			0.10	1.10	0.92	1.31
	Age			-0.01	0.99	0.96	1.02
	Education			-0.23 *	0.80	0.65	0.98
	Income			0.10	1.10	0.93	1.30
	Insurance			0.34	1.40	0.59	3.35
Fats†		46.90*	0.03				
	Intercept			-2.13			
<30%	BDS			**-0.16** *	0.85	0.78	0.92
(kcal from energy/day)	Age			0.02 *	1.02	1.01	1.04
	Education			0.12 *	1.13	1.03	1.23
	Income			0.05	1.05	0.97	1.13
	Insurance			-0.14	0.87	0.62	1.22

Note. BDS = body image discrepancy score, BMI = body mass index, WHR = waist-hip ratio
n = 2,065.
[1] and [2] reference group: > 4 *servings/day.*
† Logistic regression results, the reference category: > 30%.
* p < .05, ** p < 0.001

Table 2.8.
Regression of Physical Activity, BMI, and WHR on BDS, Adjusted for Covariates

		Standard Regression				95% CI for exp (b)	
		χ^2	Pseudo R^2	b	exp (b) OR	Lower Bound	Upper Bound
		86.61*	0.04				
Physical Activity[1]							
Inactive	Intercept			0.92			
	BDS			**0.22** *	1.25	1.12	1.40
	Age			-0.01	0.99	0.97	1.01
	Education			-0.18 *	0.84	0.75	0.94
	Income			-0.19 *	0.83	0.75	0.93
	Insurance			-0.35	0.70	0.45	1.10
Mild	Intercept			0.25			
< 3 MET-Hr/Wk	BDS			**0.19** *	1.21	1.08	1.36
	Age			-0.01	1.00	0.98	1.02
	Education			-0.18 *	0.84	0.74	0.94
	Income			-0.16 *	0.85	0.76	0.95
	Insurance			-0.06	0.94	0.61	1.46
Moderate	Intercept			0.75			
3.1-9 MET-Hr/Wk	BDS			0.09	1.09	0.99	1.21
	Age			-0.01	0.99	0.98	1.01
	Education			-0.14 *	0.87	0.78	0.96
	Income			-0.16 *	0.86	0.78	0.94
	Insurance			-0.07	0.94	0.64	1.38
BMI [2]		606.22*	0.31				
Normal	Intercept			-0.76			
18-24 (kg/m^2)	BDS			**-1.74** *	0.18	0.15	0.21
	Age			0.02 *	1.02	1.00	1.05
	Education			0.10	1.10	0.97	1.26
	Income			0.34 *	1.40	1.24	1.58
	Insurance			-0.12	0.88	0.52	1.49
Overweight	Intercept			-0.91			
25-29 (kg/m^2)	BDS			**-0.66** *	0.52	0.45	0.59
	Age			0.03 *	1.03	1.01	1.05
	Education			-0.04	0.96	0.86	1.06
	Income			0.17 *	1.19	1.08	1.32
	Insurance			0.07	1.07	0.72	1.59
WHR†		107.07*	0.08				
	Intercept			2.02			
< 0.85 cms	BDS			**-0.43** *	0.65	0.59	0.72
	Age			-0.02 *	0.98	0.97	1.00
	Education			0.04	1.04	0.95	1.14
	Income			0.16 *	1.17	1.07	1.28
	Insurance			0.11	1.12	0.78	1.62

Note. BDS = body image discrepancy score, MET= metabolic equivalent task, BMI = body mass index , WHR = waist-hip ratio.
[1] n = 2,077. The reference category is vigorous physical activity.
[2] n = 1,894 The reference category is obese.
† n = 1,896. Logistic regression results, > 0.85 cms is the reference category.
* p < .05, ** p < .001.

Discussion.

This study explored the association of Hispanic women's acculturation level, body image perceptions, weight-related behaviors, and BMI and WHR values. To assess whether our hypothesis that highly acculturated women would demonstrate a decrease in body image discrepancy, we created a composite acculturation variable that includes language and generational information from participants, then we classified the women as having high and low acculturation. The hypothesized relationship direction between acculturation and body image discrepancy was observed, but the finding was not statistically significant. Hispanic women in this study were largely of first-generation immigrants of Mexican descent, who had a good education and economic status and who had lived longer in the United States than in any other country. Although it seems that body image discrepancy decreases in this population as they acculturate, the women classified themselves as heavier than their current figure, with an average BDS of 1.32 ± 1.12. This value is not as high as the average BDS found by the Fitzgibbon, et al. (2000) study of younger Hispanic women (1.4 ± 1.7), yet that study found that the women did not report body image discrepancy until they were overweight. Hispanic women with heavier figures have been reported to choose larger body figures as attractive (Cachelin, et al., 2002). Conversely, with the purpose of establishing the validity of the FRS in middle-aged Mexican women, the Petti and Cowell (2011) study reported the absence of body image discrepancy among Hispanic women; instead, they found that women's perceptions of ideal body image increased with increases in body size. These studies included younger populations who were largely second-generations immigrants and linguistically acculturated (Cachelin, et al., 2002; Fitzgibbon, et al., 2000; Petti & Cowell, 2011), whereas our study population were largely of first-generation immigrants, though they were also highly acculturated. Because of the diversity

among Hispanic women living in the United States, contradictory research study outcomes when investigating acculturation impact on attitudes, beliefs, and behaviors are often reported.

Our study population was also unique from other studies of Hispanic women, acculturation, and body weight in that women in our study were of middle age and beyond, with an average age of 60.7 years. Despite their age, however, they identify themselves as having a heavier figure than their actual figure. Unfortunately, we cannot infer from our results that acculturation has a role in the body image discrepancy in this group. Nevertheless, after controlling for age, education, and income, contrary to what the literature usually suggests—that is, that highly acculturated women are more likely to be physically active (A. Afable-Munsuz, et al., 2010; Evenson, et al., 2004)—our study found that being highly acculturated was associated with decreasing physical activity. This is a concern in this population, as highly acculturated Hispanic women may not only be faced with health conditions as they age, but also with the discomforts of menopause that have been associated with a decrease in physical functioning. Persistent vasomotor symptoms, such as hot flashes and night sweats, and psychological symptoms, including depression and stress have been shown to limit physical functioning and the quality of life in postmenopausal women (Avis et al., 2003; Huang, et al., 2008). These women's decreases in activity could also be related to a lack of understanding about physical activity and sedentary life increases after menopause (Kohlbry, 2006).

Other associations, on whether acculturation influence BMI, WHR values, increases the intake of fruits and vegetables, or decreases the intake of calories from fat were not significant. However, new research continues to inform the role of acculturation on diet and BMI in Hispanic women—some indicate negative nutrition-related health effects in highly acculturated individuals whereas others describe positive effects in less acculturated individuals (Arandia,

Nalty, Sharkey, & Dean, 2012; Munoz, 2010). Research on the relationship between BMI and acculturation usually describes an increase in BMI with longer stays in the United States; indeed, the women who are most affected with increases in BMI tend to be second-generation immigrants (Creighton, et al., 2012; Wolin, Colangelo, Chiu, & Gapstur, 2009).

Body image perceptions had a significant impact in this study's population. After adjusting for age, education, income, and having insurance, we found that having a high BDS was associated with being inactive or, at most, being mildly active, but not vigorously active. Furthermore, a high BDS was correlated with decreasing odds of being of normal weight and of having lower WHR. These findings are consistent with the literature (Cachelin, et al., 2002; Fitzgibbon, et al., 2000; Mama et al., 2011). It is possible that our population of Hispanics perceived a heavier body size as the most acceptable body size, which may correspond to cultural normative ideals of body image that have carried on through the years regardless of interactions with the U.S. society. It is also possible that increase in BMI and inactivity could be due to decreases in their body dissatisfaction as the women age, mature, increase in their sense of self-worth, or learn tolerance of body diversity (L. H. Clarke & Korotchenko, 2011). Marshall, et al. (2012), for example, describe how for some cultures ascribing less importance to a woman's body appearance as she ages is acceptable and at times encouraged.

The only significant association observed in our study regarding BDS and food intake was an inverse association between BDS and calories from fat intake, namely that as BDS increased, the intake of fat from calories lower than 30% decreased. Although we found no other studies with similar body image perceptions in middle-aged Hispanics, a study completed in Mexico with aged thirty and above explored the association of self-perceived body image, BMI, and dietary patterns, and that study reported that a high intake of calories from carbohydrate

origin (e.g., sweet drinks and refined foods) was strongly related to larger body figures and BMI over time, whereas calories from meat and dairy were not related to a larger figure and BMI (Romieu et al., 2012). Additional research is needed to explore how body image perceptions may be associated with patterns of dietary intake and with managing weight-related behaviors in Hispanic women. This is particularly important, considering that some studies suggest that Hispanic women who are aware of their body misperceptions desire a normal body size, yet they tend to not invest energy in modifying their weight-related behaviors (Mama, et al., 2011).

Our study adds to a considerable amount of research literature on body image perceptions and misperceptions, though many of these studies have been conducted in younger populations of Hispanic women (Fitzgibbon, et al., 2000; Guendelman, et al., 2011). The relationship between acculturation levels and body image is being studied (Cachelin, Monreal, & Juarez, 2006; Petti & Cowell, 2011), and lately, initiatives that explore the interrelationships between body image perceptions and satisfaction, attitudes toward nutrition and health, and physical activity or dietary behaviors are also emerging in younger populations (Dissen, Policastro, Quick, & Byrd-Bredbenner, 2011). These emerging studies of interrelationships may offer providers more information to promote healthy weight in women at risk of obesity, even middle-aged and older populations of Hispanic women. Still, although the present study contributes valuable insight on how the body image values of middle-aged and older Hispanic women may influence their weight-controlling behaviors, additional studies of the resulting (dis)satisfaction from body image misperceptions are necessary in older populations. This may allow to better understand how body image (dis)satisfaction affects Hispanic women's self-concept, attitudes, and their affective predisposition toward healthy weight control efforts over time. Such studies may offer providers more opportunities to support these women in a culturally sensitive and agreeable

manner as they tend to their aging body and weight needs. Furthermore, the resulting evaluation of body image perceptions ([dis]satisfaction) should not be overshadowed in Hispanic women as they age. Indeed, it has been reported that some older women tend to be dissatisfied with their body image in a way that is similar to their younger counterparts, and that they seek methods, not always healthy ones (e.g., dieting), to improve their appearance (L. H. Clarke & Korotchenko, 2011; Marshall, et al., 2012). Qualitative research may be a useful supplement to quantitative correlation studies in enhancing our understanding of these complex interrelationships, where acculturation is an important additional variable in studying Hispanic women. The results of this body of work could have significant implications for the design and implementation of more successful weight-related interventions to prevent obesity and promote healthy aging in middle-aged Hispanic women.

As complex as the acculturation variable may appear and as diverse as results which incorporate the variable may be, the inclusion of the acculturation variable is necessary to discriminate acculturative pathways of Hispanic women as they age to thereby offer the best culturally sensitive care preventing obesity-related comorbidities. The constant influx of immigration from Latin American countries, particularly from Mexico, which is the largest contributor of immigrants to the United States (Aimee Afable-Munsuz, et al., 2013), means that the population of Hispanic women in the United States will remain diverse in terms of their levels of acculturation; this can make it difficult when studying body image paradigms and other factors influencing obesity or when intervening in the prevention of obesity. Therefore, it might be best to study this topic under a theoretical model, such as the segmented assimilation theory, that guides researchers in differentiating successful acculturation from unsuccessful or negative acculturation in Hispanics (Portes & Zhou, 1993).

Limitations and Strengths. There are various limitations and strengths to this study. The first limitation is that we have inferred associations using a cross-sectional design. This type of study design allows for assessing associations at a specific point in time, which may produce different results compared to studies that account for longer periods of time. Second, the WHI OS data were collected by self-report, and thus, social desirability might have played a role in how the Hispanic women responded to questions regarding body image and weight-related behaviors. And third, the lack of some socio-demographic indicators, such as the birth place of participants' parents, may have made our composite variable less effective. The findings of this study should be considered in light of these limitations; thus, generalizations cannot be made to other middle-aged and older Hispanic women.

A major strength of this study, however, is that we re-contextualized data by creating a composite variable that leveraged the two strongest proxy measures of acculturation: language and generation. This allowed us to apply a cultural and acculturative perspective to the analysis of data from middle-aged and older Hispanic women who participated in the WHI OS. Furthermore, this study was completed with a large, national representative sample. To our knowledge, the present study is the first to address the intersection of weight-controlling behaviors and body image perceptions and acculturation in middle-aged and older Hispanic women living in the United States.

Conclusions

This study expands important information to our understanding of the influence of body image and the role of acculturation on weight-related health behaviors in middle-aged and older Hispanic women, a population that has received little attention on this critical topic. Our findings indicate that highly acculturated Hispanic women perceived themselves as having heavier body

shapes and that women with higher levels of body image discrepancy were more likely to be inactive and less likely to be of normal weight or low WHR. Additionally, the influence of high body image discrepancy on a lower intake of healthy percentages of calories from fat suggests the need for future studies to evaluate the relationship between (dis)satisfaction resulting from body misperceptions and dietary behavior management. Although acculturation was not associated with body image perception in this study, the fact that body image perceptions influence weight-related behaviors suggests that further research should rigorously explore culturally normative body figure ideals in middle-aged and older Hispanic women and the body (dis)satisfaction that may result from such ideals, preferably using longitudinal designs. Performing such studies may advance research and health promotion efforts that increase the awareness of weight-related behaviors that prevent obesity and improve positive body image in middle-aged and older Hispanic women as they age.

CHAPTER III: Manuscript 2

Title. *Hispanic Women's Body Image, Physical Activity, and BMI Trajectories Over 6 Years.*

Abstract

Purpose. To explore postmenopausal Hispanic women's physical activity (PA) and body mass index (BMI) trajectories as they relate to their body image discrepancy (BID) over a six year follow-up period, and to assess whether these trajectories differ by Hispanic ethnicity.

Method. A secondary analysis was performed on data from Hispanic women ($N = 3032$) who participated in the Women's Health Initiative Observational Study from 2000 to 2005. BID scores were calculated and linear mixed models were used to estimate PA and BMI trajectories in relation to BID scores and to capture differences between subgroups of Hispanic women.

Findings. Throughout the 6-year follow-up period, lower PA rates were observed in women who perceived their figure heavier or thinner than their ideal body image (BID > ideal or BID < ideal, respectively) and BMI was higher in women with BID > ideal. PA or BMI trajectories were not found to significantly differ by BID or Hispanic subgroup.

Conclusions. BID may play a role in the differences in Hispanic women's PA and BMI outcomes over time. No significant PA or BMI trajectory differences were observed among Hispanic subgroups. Further testing that incorporates advanced models allowing Hispanic subgroup-specific-fit is necessary to rigorously explore trajectory differences.

Clinical Relevance. PA and BMI trajectory analysis methods have the potential to identify unhealthy relationships between body figure values and PA and BMI patterns in Hispanic women. Learning more about the intersection of these traits may prevent panethnic views of Hispanic women's body weight needs in health care.

Background

Within the Hispanic/Latino (OMB, 1994) population, Hispanic women are one of the groups most affected by obesity. They represent 44.4% of all women ethnic groups affected by obesity (National Center for Health Statistics, 2012). Lately, increased attention has been placed on the relationship between the body image that Hispanic women value and the potential for obesity (Powell et al., 2010). Some authors have proposed that body image perceptions are culturally determined and that as Hispanic women acquire new behaviors when acculturating to the United States and as their body weight increases, their body image dissatisfaction increases as well (Fitzgibbon, et al., 2000; Guinn, Semper, Jorgensen, & Skaggs, 1997). These relationships between body image perceptions, acculturation, and weight may also influence physical activity (PA), a modifiable risk factor that can prevent obesity.

Most of the research on body image paradigms in Hispanic women have been conducted in younger populations with mixed results. Some studies suggest that Hispanic women are more accepting of heavy body shapes whereas others argue that Hispanic women's body image dissatisfaction is similar to White women's fear of weight gain (Cachelin, et al., 2002). Such dissatisfaction may be the result of body image discrepancy (BID) between women's perceived ideal body image and their current body image (Fallon & Rozin, 1985), and some studies have reported that BID is related to unhealthy weight-controlling behaviors (Fitzgibbon, et al., 2000). Because of the high rates of obesity in the United States, particularly in middle-aged (40 to 59) and older (60+) women (39.5% and 35.4%, respectively) (CDC, 2014), the association between BID and (dis)satisfaction with body image is being studied mostly in middle-aged and older non-Hispanic women (Marshall, et al., 2012). These studies are reporting contradictory findings: some of the studies report that this group of women, like their younger counterparts, tend to be

dissatisfied with their body image, whereas others have found that these older women become less invested in their appearance as they age (L. H. Clarke & Korotchenko, 2011; Marshall, et al., 2012).

Evidence suggests that individuals who engage in PA over time are likely to live longer (Janssen, Carson, Lee, Katzmarzyk, & Blair, 2013). It is recommended that older adults engage in150 minutes of moderately-intense PA and muscle strengthening over 2 or more days a week (CDC, 2013), yet compared to Whites, Hispanic women do not regularly engage in PA (Grubert, Baker, McGeever, & Shaw, 2013). Although age, socioeconomic status, low level of literacy, greater Hispanic cultural orientation, and a lack of understanding concerning the effects of menopause on PA (Amesty, 2003; Keller, et al., 2009; Kohlbry, 2006) are frequently associated with inadequate PA in Hispanic women, few studies appear to have examined Hispanic women's PA and weight gain over time. A study of social disparities and BMI in various ethnic groups found that weight gain was faster for more recent/younger cohorts (P. Clarke, O'Malley, Johnston, & Schulenberg, 2009) , while a more recent study of life span and leisure-time PA among active U.S. women who were active found no clear association between Hispanic women's PA over time and mortality. The authors of the second study speculate that PA in Hispanics is occupational in nature, and that is therefore was not captured by their assessment (Janssen, et al., 2013). Another recent study explored recreational PA over time in a multiethnic postmenopausal sample of women and identified stable PA trajectories across nearly a decade; this study found that income, education, history of vigorous PA, and BMI were all predictive of PA trajectories (Nguyen, et al., 2013). Nevertheless, none of the studies specifically addressed Hispanic women, the body image they value, or the BID they present while interacting with the U.S. culture, all of which may differentially affect their PA and BMI trajectories. The purpose of

this analysis was thus to describe middle-aged and older Hispanic women's PA patterns and BMI values as they relate to their BID over a period of six years and to then examine differences in these trajectories among Hispanic ethnicities. We stated the following hypotheses:

(1) Hispanic women with BIDs will have less healthy changes in PA and BMI values over time.

(2) The relationship between body image perceptions, PA, and BMI trajectories will differ over time for women of different Hispanic ethnicities.

Theoretical Framework. To illustrate the role of body image perception on Hispanic women's PA behaviors, we designed a working framework based on Vygotsky's Socio-cultural Theory (SCT) and the multidimensional acculturation concept. Applying the SCT to the relationship between body image perception and PA suggests that society may contribute body image messages to women (e.g., through social media) that can result in those women feeling dissatisfaction with their body image and size (Allen, 2012; Morrison, et al., 2004). The multidimensional acculturation concept acknowledges that an individual' cultural heritage and interactions with the receiving-culture results in new receiving-culture values acquisitions (Schwartz, et al., 2010), and these new values may contribute to body image (dis)satisfaction as well. Figure 3.1 depicts how body image perceptions may stem from women's cultural heritage and acculturation levels as well as demonstrating how these image perceptions may influence PA behaviors and BMI in a reciprocal fashion, which is likely the result of the dynamic process of adapting to U.S. society over time.

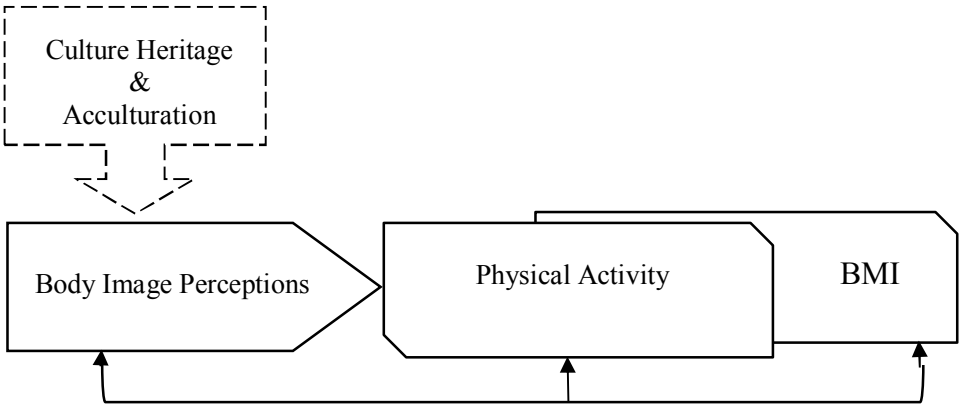

Figure 3.1. Theoretical Framework for Assessing Body Image and Physical Activity Over Time. Solid labeled arrows between variables represent hypothesized paths. Dashed arrow represent alternative pathways, not major hypothesis in this study.

Materials and Methods

Data Source. Data are from the Women's Health Initiative (WHI) study, which is directed by the Office of Disease Prevention and the Office of Research on Women's Health. The WHI is a long-term national health study that focuses on postmenopausal women's health, including the prevention of heart disease, breast and colorectal cancer, and osteoporosis (The Women's Health Initiative, 2013). The observational study (OS) of the WHI was established to complement the project's randomized control trials by assessing new risk indicators and biomarkers for diseases, particularly heart diseases, cancer, and diabetes. The participants of the WHI OS were contacted annually from approximately 1993 to 2005 to obtain updates on their medical histories and selected exposure data. Among other indicators, BMI values and energy expenditures, as measured by metabolic equivalent tasks (METs) resulting from women's PA were obtained. Moreover, body image perceptions of the participants were assessed at year three using Stunkard, Sorensen, and Schulsinger's (1983) Figure Rating Scale (FRS) (Figure 2) (The WHI Study Group, 1998). We used WHI OS data from years three through eight (2000 to 2005)

of women who identified as Hispanic or Latino to longitudinally evaluate the association between Hispanic women's body image perceptions and their PA levels and BMI.

Study Population. Postmenopausal women between the ages 50 and 79 were not eligible or did not join the WHI randomized trials were asked to enroll in the OS cohort (n = 93,676). Hispanic women accounted for 3.9% of the cohort at the time of enrollment, which comprises the sample of this analysis. For women age 50 to 79, postmenopausal status was defined as the presence of amenorrhea for at least 6 months, and for women age 50 to 54, postmenopausal status was defined as the presence of amenorrhea for at least 12 months. Surgically postmenopausal women were also included (The Women's Health Initiative, 2013). Other inclusion criteria stated that women would reside in the study area for a minimum of three years and that they would be able to provide informed consent to participate in the study. Hispanic women excluded from the study were those who had conditions with a predicted survival of less than three years or those who had mental illness, dementia, alcoholism, drug dependency, or were currently were part of another study (The WHI Study Group, 1998).

The WHI OS Hispanic women were asked about the nationality or ethnic group with which they identify. The term "ethnicity" is closely related to a group of individuals' cultural factors, ancestry, language, beliefs, and nationality (Yancey, Ericksen, & Juliani, 1976). The women were classified into four ethnic group categories, which include the three largest Hispanic groups in the United States: Mexican Americans, Puerto Ricans, Cuban Americans, and Other. The "Other" category includes individuals from other Hispanic, Spanish, or Latin American cultures. Because our study aims to explore differences in PA and BMI trends among Hispanic ethnicities, we based our ethnicity categories on the in-force Standards of Classification

on Federal Data on Race and Ethnicity, and we included the category "Other" as "*Other Hispanic Ethnicity*" for the analysis (OMB, 1994).

Study Variables. The explanatory variable in this study is BID, which refers to the difference between the selected ideal body image and the image participants think they have. These body image perceptions, which are based on women's psychosocial body shape experiences (Cash & Green, 1986), were measured by the FRS, a 9-point scale of images in which image 1 represents the thinnest body image and image 9 represents the heaviest body image (Figure 3.2). In completing the FRS, participants select the image that reflects (a) how they think they look, (b) how they feel most of the time (c) what is ideal for them, (d) the ideal figure for women, and (e) what is most preferred by the opposite sex, respectively. The FRS is a reliable predictor of obesity with or without self-reported height and weight and it was found to be highly correlated with measured percentage of overweight ($r = 0.79$) (Stunkard, et al., 1983). BID scores were calculated for each woman as the FRS figure they think they currently have minus their FRS ideal figure. This method was utilized originally as a simple measure of body discrepancy (distortion) and has demonstrated a good validity and reliability in several studies (Fallon & Rozin, 1985; Thompson & Altabe, 1991). Calculated BID scores ranged from -8 to 8, where scores above zero indicated that women perceived their figures as heavier figure than the ideal body image (BID > ideal), scores below zero meant that women perceived their figures as thinner than the ideal body figure (BID < ideal), and scores of zero signified no discrepancy (BID = ideal). In our study, we classified women under these three groups of BID scores.

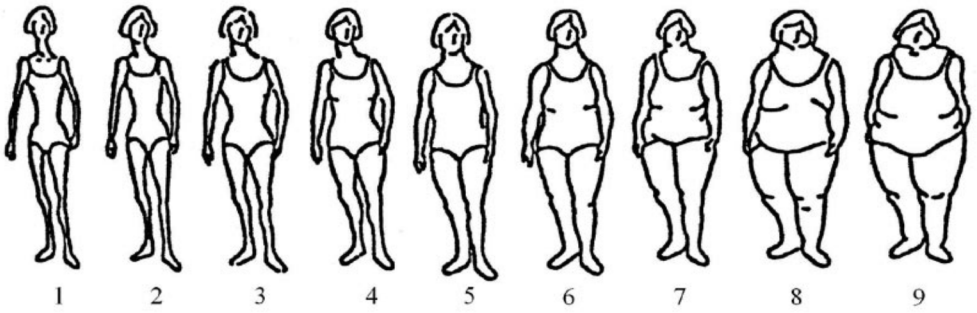

Figure 3.2. Female silhouettes for the FRS. Reprinted with permission by T. Wadden in behalf of A. J. Stunkard (1.983).

PA intensity and BMI are the outcome variables in this study. PA intensity refers to the level of effort or rate of energy expenditure, associated with executing an activity. The universally accepted unit to measure the rate of energy expenditure relative to an individual's body weight is the metabolic expenditure task (MET). One MET is the rate of oxygen consumption in a minute, approximately 3.5 ml per body weight in kilograms (kg) per minute ($3.5ml \cdot kg^{-1} \cdot min^{-1}$), for an average adult sitting quietly. PA intensity usually is categorized as light (<3 METs or < 4 kcal•min), moderate (3-6 METs or 4-7 kcal•min), or vigorous (> 6 METs or >7 kcal•min) (Barbara E. Ainsworth et al., 2011). From the WHI OS participants' recreational activity such as walking, dancing, and from moderate and strenuous physical activity such as swimming or biking outdoors, energy expenditure scores in MET hr/week were calculated (Langer, et al., 2003). The cutoff points for MET vary across studies according to the age and physical characteristics of the target population. For populations similar to the population in this study, 3 hours per week of moderate-intensity physical activity is generally recommended for

overall health, which is approximately equivalent to 9 MET hrs/week (Irwin et al., 2011; Pate et al., 1995). PA intensity was modeled as a continuous variable for the present study's analysis.

In the same manner, the BMI was treated in the statistical analysis as a continuous variable. BMI is defined as weight in kilograms divided by the square of the height in meters (kg/m^2) (WHO, 2013a). The index cutoff points to classify underweight (< 18), normal weight (18 to 24), overweight (25 to 29), and obese (> 30) adults are given in kg/m^2 (WHO, 2013a). BMI values are considered gender- and age-independent; yet because of differences in body proportions, BMI may not correspond to the same degree of fatness in different populations. In Hispanic female populations, for instance, there is evidence of predisposition to higher percentage of fat mass in the central, subscapular, and trunk regions (Casas, et al., 2001), and the globally standardized BMI cutoff points may not capture the risk of unhealthy weight early enough in these women (WHO, 2004).

Our analysis also included variables that previous studies have suggested are related to body image perceptions or that might mediate the association between Hispanic women's PA levels and BMI values and their body image misperceptions as covariates. These variables are, age, education (Fitzgibbon, et al., 2000; Kuchler & Variyam, 2003), income (assessed in 5 categories, see Table 3.1), having health insurance (Ver Ploeg, et al., 2008), and having used postmenopausal hormone therapy (PHT) (Andersen, Crespo, Franckowiak, & Walston, 2003).

Statistical Procedures

Data were analyzed using the Statistical Package for Social Science (SPSS) Version 19. Descriptive statistics were calculated to identify participants' PA levels, BMI values, and body image perceptions, and to describe their sociodemographic information. Under the assumption that women's body image perceptions do not change over time, we use linear using linear mixed

models (LMM) that were adjusted for the covariates to assess the relationships between BID groups, PA, and BMI over 6 years (from the year 3 through 8 follow-up encounters). LMMs provide general and flexible approaches to explicitly model correlated data such as repeated measures (e.g., the yearly BMI of each subject) over time. In addition, LMMs allow us to include subjects with missing data in some of the response variables, thus LMMs use all available observations for a given subject in the analysis (West, Welch, & Galecki, 2007); which benefits the study's power. Thus, we used LMMs to evaluate the relationship of BID groups to PA or BMI trajectories by Hispanic ethnicity over time.

To model repeated measures, these models allow for the specification of the correlation structure of the repeated outcomes to account for the dependence between them over time. In performing these analyses, an autoregressive correlation structure (AR [1]) was specified, which assumes that the outcomes measured closer in time are more correlated than those that are measured farther apart. The trajectories of the outcomes over time were modeled by the inclusion of a main effect of year, and an interaction term of year with BID groups allowed for estimations of the differences in the trajectories among BID groups (to address Hypothesis 1). A three-way interaction of year, BID group, and Hispanic ethnic groups allowed us to determine whether these differences in trajectories over time by BID groups were maintained in each Hispanic ethnic group (to address Hypothesis 2). The fit of the models was checked using Schwartz's Bayesian Information Criterion (BIC)—which in all models were lower compared to other measures of model fitting—and the contribution to the model of each explanatory variable were assessed using the fixed effect overall test. The estimated fixed effects were reported with an alpha level of 0.05 and 95% confidence intervals (CIs) for the estimates.

Results

Sample Characteristics. Table 3.1 presents the study's sample characteristics at the year three follow-up. Among the 3,032 participants, 63.1% self-identified as having a heavier body image than the ideal, 2.4% as being thinner than the ideal image, and 11.9% self-identified with no BID. The average BID score was 1.32 (SD = 1.12). Mexican women were the largest subgroup (38.3%), followed by the Other Ethnicity group (18.9%). The average age of the women was 60.7 (SD = 7.07) years, their yearly income ranged from $10,000 (14.2%) to more than $50.000 (21.2%) and most of the women had more than a high school education (75%) and medical insurance (69%). Women who initiated PHT comprised 43.1%. Overall, participants were mostly overweight (29.6%) or obese (24.6%). The average of PA intensity was 12.9 MET hrs/week and more than half (54%) of the women reported greater than 3.1 MET hrs/week of recreational activity.

Table 3.2 shows BMI categories and physical activity levels by ethnic group across the 6 years from which we have data for this study. It shows a trend over the 6 years of higher rates of moderate and vigorous PA reported by all Hispanic women compared to light PA or inactivity. Reported BMI values by all ethnic groups show higher rates for BMI values > 25 in all years as well. When assessing rates of PA and BMI by ethnic group, similar trends were observed. In addition, there were women in each of the groups who reported being physically inactive, ranging from a low of 10.8% to a higher rate of 23.1%. Cubans were the only subgroup with a lower rate of obese individuals compared to the rest of the groups. This table also depicts the number of observations of the study's outcomes by year.

Table 3.1.
Demographics, Physical Activity, BMI, and Body Image of the Sample [a] (N= 3,032).

		Mean (SD)/*n* (%)[b]
Demographics	Age (years)	60.70 (SD = 7.07)
	Education	
	> 8 years	456 (15.0)
	Some High School	253 (8.3)
	High School Diploma/GED	477 (15.7)
	Postsecondary School	1,094 (36.1)
	College Degree or Higher	703 (23.2)
	(missing values)	49 (1.6)
	Income	
	< $10,000	257 (8.5)
	$10,000-$19,999	430 (14.2)
	$20,000-$34,999	514 (17.0)
	$35,000-$49,999	393 (13.0)
	>$50, 000	643 (21.2)
	(missing values)	611 (20.2)
	Hispanic Ethnicity	
	Mexicans	1,162 (38.3)
	Puerto Ricans	272 (9.0)
	Cubans	131 (4.3)
	Other Ethnicity	695 (22.9)
	(missing values)	772 (25.5)
	Health Insurance	
	Yes	2,118 (69.9)
	No	301 (9.9)
	(missing values)	613 (20.2)
Physical Activity	Average Intensity (METs hrs/week)	12.9 (SD = 15.70)
	No Reported Activity	446 (14.7)
	Mild < 3 METs hr/week	388 (12.8)
	Moderate 3.1 to 8.9 METs hr/week	597 (19.7)
	Strenuous > 9 METs hr/week	1,030 (34)
	(missing values)	517 (18.8)
BMI	Average BMI	28.4 (SD = 5.6)
	< 18 kg/m^2 = underweight	7 (0.2)
	18 to 24 kg/m^2 = normal weight	646 (21.3)
	25 to 29 kg/m^2 = overweight	896 (29.6)
	> 30 kg/m^2 = obese	747 (24.6)
	(missing values)	736 (24.3)
Body Image	BID	1.32 (SD = 1.12)
	Image < ideal	72 (2.4)
	Image = Ideal	361 (11.9)
	Image > Ideal	1,914 (63.1)
	(missing values)	685 (22.6)
PMHT	Yes	1,307 (43.1)
	No	1,108 (36.5)
	Do not know	23 (0.8)
	(missing values)	594 (19.6)

[a] = The data in the table are from year 3 follow-up, except for age, education and ethnicity, which were collected at baseline.
[b] = Subtotals percentages may not sum to 100% due to rounding. BID = body image discrepancy score, PMHT=postmenopausal hormone therapy use.

Table 3.2.
BMI and Physical Activity of Hispanic Groups Combined and by Subgroups Across Time (n / %)

		Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Physical Activity (MET hr/week)							
All Groups Combined		n = 1991	n = 2047	n = 2068	n = 2037	n = 1675	n = 1039
	Inactive	339 (17)	368 (18)	386 (18.7)	354 (17.4)	250 (14.9)	186 (17.9)
	< 3	310 (15.6)	304 (14.9)	288 (14)	297 (14.6)	247 (14.7)	115 (11.1)
	3.1 - 8.9	490 (24.6)	448 (23.8)	477 (23.2)	489 (24)	394 (23.5)	227 (21.8)
	> 9	852 (42.8)	887 (43.3)	908 (44.1)	897 (44)	784 (46.8)	511 (49.2)
Mexicans							
	Inactive	205 (19.8)	216 (20.3)	233 (21.9)	215 (20.4)	153 (18)	100 (20)
	< 3	170 (16.4)	162 (15.2)	140 (13.1)	155 (14.7)	122 (14.3)	57 (11.4)
	3.1 - 8.9	253 (24.5)	248 (23.3)	233 (21.9)	246 (23.3)	201 (23.6)	111 (22.2)
	> 9	406 (39.3)	439 (41.2)	459 (43.1)	439 (41.6)	379 (44.1)	233 (46.5)
Puerto Ricans							
	Inactive	35 (14.7)	40 (17.2)	35 (14.8)	36 (15.3)	27 (14.1)	20 (14.6)
	< 3	35 (14.7)	28 (12)	35 (14.8)	45 (19.1)	28 (14.6)	14 (10.2)
	3.1 - 8.9	68 (28.6)	64 (27.5)	62 (26.3)	51 (21.7)	45 (23.4)	31 (22.6)
	> 9	100 (42)	101 (43.3)	104 (44.1)	103 (43.8)	92 (47.9)	72 (52.6)
Cubans							
	Inactive	12 (12.1)	19 (17.1)	28 (23.1)	16 (13.8)	13 (12.4)	12 (17.1)
	< 3	11 (11.1)	15 (13.5)	13 (10.7)	16 (13.8)	12 (11.4)	5 (7.1)
	3.1 - 8.9	25 (25.3)	20 (18)	25 (20.7)	28 (24.1)	25 (23.8)	14 (20)
	> 9	51 (51.5)	57 (51.4)	55 (45.5)	56 (48.3)	55 (52.4)	39 (55.7)
Other Hispanic Ethnicity							
	Inactive	87 (14)	93 (14.6)	99 (14.1)	87 (13.8)	57 (10.8)	54 (16.3)
	< 3	94 (15.2)	99 (15.5)	100 (15.7)	81 (12.8)	85 (16.2)	39 (11.8)
	3.1 - 8.9	144 (23.2)	156 (24)	157 (24.6)	164 (26)	123 (23.4)	71 (21.5)
	> 9	295 (47.6)	290 (41.7)	290 (45.5)	299(47.4)	261(49.6)	167 (50.5)
BMI (kg/m^2)							
All Groups Combined		n = 1855	n = 1675	n = 1691	n = 1674	n = 1365	n = 848
	< 18	4 (0.2)	8 (0.5)	3 (0.2)	11 (0.7)	7 (0.5)	7 (0.8)
	18 to 24	543 (29.3)	516 (30.8)	526 (31.1)	534 (31.9)	460 (33.7)	297 (35)
	25 to 29	721 (38.9)	679 (40.1)	656 (38.8)	635 (37.9)	511 (37.4)	335 (39.5)
	> 30	586 (31.6)	479 (28.6)	506 (29.9)	494 (29.5)	387 (28.4)	209 (24.6)
Mexicans							
	< 18	1 (0.1)	4 (0.5)	-	3 (0.3)	2 (0.3)	3 (0.7)
	18 to 24	251 (26.3)	243 (27.6)	250 (28.4)	257 (29.2)	202 (28.7)	119 (29)
	25 to 29	385 (40.3)	368 (41.7)	352 (40)	345 (39.2)	289 (41)	171 (41.6)
	> 30	319 (33.4)	267 (30.0)	279 (31.7)	274 (31.2)	212 (30)	118 (28.7)
Puerto Ricans							
	< 18	-	-	-	4 (2.1)	-	-
	18 to 24	62 (27.7)	55 (29.6)	57 (30.2)	59 (30.9)	49 (32.9)	34 (32.4)
	25 to 29	77 (34.4)	69 (37.1)	65 (34.4)	59 (30.9)	48 (32.2)	42 (40)
	> 30	85 (37.9)	62 (33.3)	67 (35.4)	69 (36.1)	52 (34.9)	29 (27.6)
Cubans							
	< 18	-	-	-	-	-	-
	18 to 24	32 (35.2)	27 (34.2)	33 (39.8)	33 (40.7)	33 (46.5)	22 (43.1)
	25 to 29	37 (40.7)	36 (45.6)	32 (38.6)	34 (42)	23 (32.4)	15 (29.4)
	> 30	22 (24.2)	16 (20.3)	18 (21.7)	14 (17.3)	15 (21.1)	14 (27.5)
Other Hispanic Ethnicity							
	< 18	3 (0.5)	4 (0.8)	3 (0.6)	4 (0.8)	5 (1.1)	4 (1.4)
	18 to 24	198 (34)	191 (36.2)	186 (34.6)	185 (35.4)	176 (40)	122 (43.4)
	25 to 29	222 (38.1)	199 (37.7)	207 (38.5)	197 (37.7)	151 (34.3)	107 (38.1)
	> 30	160 (27.4)	134 (25.4)	142(26.4)	137 (26.2)	108 (24.5)	48 (17.1)

Note: Percents are calculated after excluding missing values. Column percentages may not sum to 100% due to rounding.
BMI = body mass index, MET = metabolic expenditure task.

Body Image and Changes in Physical Activity and BMI over Time. Table 3.3 shows the linear mixed effects regression estimates that address our hypothesis that women with body image discrepancy would have unhealthy PA and BMI changes over the 6 years of follow-up. Our results show that, adjusting for covariates, mean PA levels change significantly over time. Specifically, we observed an estimated average increase of 0.32 PA intensity or of MET hrs/week (p = 0.002, 95% CI: 0.12, 0.53) with each passing year. In addition, for women who self-identify as having a thinner figure than the ideal body image (BID < ideal), we noted an estimated mean decrease of 5.32 in PA intensity (p = 0.001, 95% CI: 0.66, 12.00) compared to women with no body image discrepancy. In women who self-identified as being heavier than the ideal image (BID > ideal), we observed an estimated average decrease of 4.51 decrease of PA intensity (p = 0.001, 95% CI: -8.49, -2.14) compared to women with no body image discrepancy.

Moreover, we also observed that high education and income were positively associated with PA intensity (e.g., as education increased, physical activity did as well) (b = 0.80, p = 0.001, 95% CI: 0.34, 1.27 and b =1.09, p = 0.001, 95% CI: 0.65, 1.54, respectively). Being older and having insurance were also positively associated with increasing PA intensity, but these estimated values were not statistically significant (p values > 0.05). Conversely, PHT was negatively associated with PA intensity; that is, women on PHT had an estimated mean decrease of 1.61 PA intensity (p = 0.003, 95% CI: -2.65, -0.56).

The estimates of the interaction term for PA intensity times BID groups showed a difference in slopes or PA trajectories over the 6 years of follow-up by BID groups. Women with BID < ideal had an estimated 0.02 (95% CI: -1.29, 1.33) higher mean MET hrs/week over time than women with no BID. Women with BID > ideal had an estimated 0.29 (95% CI: -0.31, 0.88) higher mean MET hrs/week over time than women with no BID. These differences in the

trajectories of PA intensity over time were not significant (simultaneous test of interaction, $F = 0.52$, $p = 0.60$).

In summary, according the main fixed effect models that compare average change in PA at any point in time, both groups of women (BID < ideal and BID > ideal) showed a PA decrease or a slower PA compared to women with no BID, though PA was the slowest in women who self-identified as thinner than the ideal figure. As the years passed, when comparing slopes by BID group, the trajectories illustrate a trend of increasing PA (positive slope) in both groups of women, though women with BID > ideal had the higher PA score; in contrast, women without BID had a stable trend of PA (The slope differences in PA by BID groups are graphically illustrated in Figure 3.3 A).

Adjusting for covariates, mean BMI also changed significantly with an estimated average decrease of 0.13 units of BMI (P = 0.001, 95% CI: -0.16, -0.09) with each passing year. Women who self-identified as having BID > ideal had an estimated average of 4.66 increase of BMI units ($p = 0.001$, 95% CI: 4.02, 5.29) compared to women with no BID, whereas women who self-classified as having BID < ideal had an estimated mean decrease of 1.31 of BMI units (p = 0.06) compared to women with no BID, although this latter finding was nor statistically significant.

Additionally, our model shows that over time BMI decreases for women who are older, have a high education and have a high income (all p values < 0.05). PHT and health insurance were also positively associated with BMI ($p = 0.001$), though the association between insurance and BMI did not reach significance ($p = > 0.05$). In our analysis of BMI trajectories by BID groups, the interaction term parameters show a difference across the years. Participants who self-classified as having BID < ideal had an average of 0.05 (95% CI:-0.30, 0.21) lower BMI over time compared to women with no BID, and women who self-identified as BID > ideal had an

average of 0.10 (95% CI: -0.21, 0.02) lower BMI compared to women with no BID (see Table 3.3). However, the estimated differences in slopes of BMI over time by BID group were not statistically significant at 5% alpha level (simultaneous test of interaction, $F = 1.36$, $p = 0.26$). In short, women with BID > ideal, at any point in time, had higher average BMI that was over four times that of women with no BID. For women with BID < ideal, at any given year, on average, BMI was lower than for women with no BID. As the years passed, BMI decreased (negative slope) in all three, though it decreased at a slower rate in women with no BID (Figure 3.3B).

Physical Activity and BMI Associated with Body Image Trajectories by Hispanic Ethnicity. We hypothesized that the relationship of women's body image perceptions to trajectories of PA level and BMI would differ according to ethnicity (see the interaction model in Table 3.3). Although there were differences in the relationship between PA intensity or BMI and BID groups by Hispanic ethnicity (results not shown), these differences were not statistically significant (simultaneous test of interaction, $F = 0.885$ $p = 0.56$ and $F = 0.50$, $p = 0.90$, respectively).

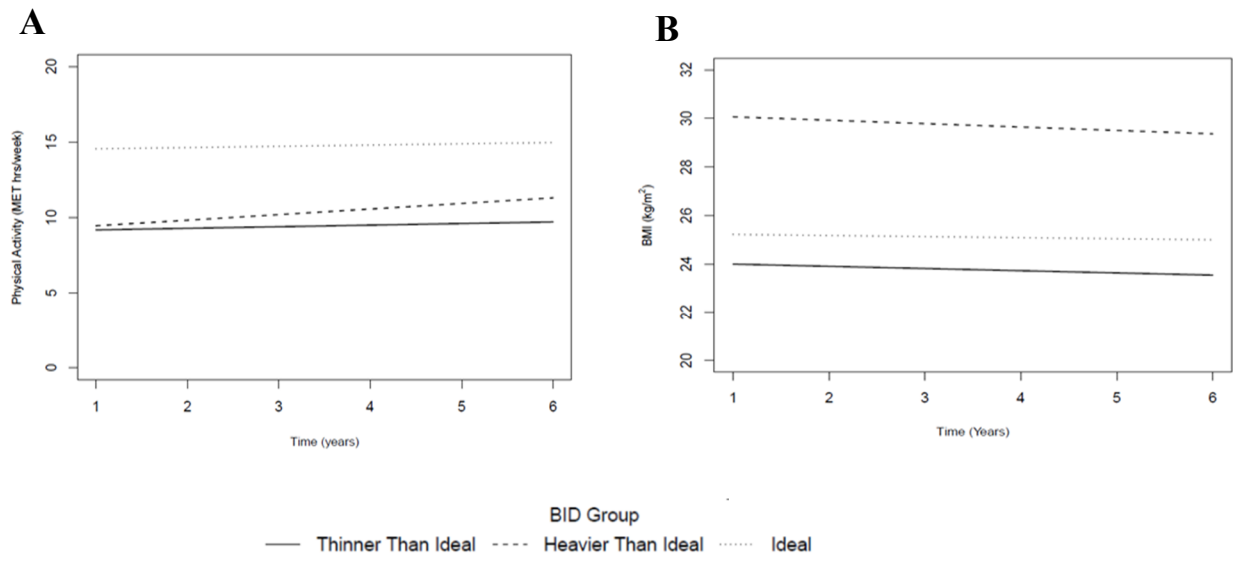

Figure 3.3. Hispanic women Physical Activity and BMI Trajectories by BID Group.

Table 3.3.
Mixed Effect Regression of Physical Activity and BMI on BID and Trajectories by BID Across Time

	Physical Activity (n = 2,044)		**BMI** (n = 1,869)	
	b	95%CI	*b*	95%CI
Intercept	6.33	(0.66, 12.00)	33.01	(30.59, 35.42)
BID < Ideal†	**-5.32** *	(-8.49, -2.14)	-1.31	(-2.71, 0.09)
BID > Ideal	**-4.51** **	(-5.96, -3.06)	**4.66** *	(4.02, 5.29)
Year	**0.32** *	(0.12, 0.53)	**-0.13** **	(-0.16, -0.09)
Age	0.06	(-0.02, 0.13)	-0.10 **	(-0.41, -0.01)
Education	0.80 *	(0.34, 1.27)	-0.21 *	(-0.41, -0.01)
Income	1.09 *	(0.65, 1.54)	-0.54 **	(-0.73, -0.35)
Insurance	0.23	(-1.59, 2.04)	0.32	(-0.46, 1.10)
Hormone use	-1.61 *	(-2.65, -0.56)	0.97 **	(0.53, 1.42)
BID and Year Interaction Model‡				
BID < Ideal X Year	0.02	(-1.29, 1.33)	-0.05	(-0.30, 0.21)
BID > Ideal X Year	0.29	(-0.31, 0.88)	-0.10	(-0.21, 0.02)

Note. BID = body image discrepancy. BID < ideal = thinner than ideal; BID > ideal = larger than ideal.
†Main effect model. Baseline: BID = Ideal.
‡Interaction model of physical activity and BMI by BID group. Baseline: BID = Ideal x Year. Overall test: Physical Activity: F = 0.51, p = 0.60; BMI: F =1.36 , p = 0.26.
* < 0.05, ** p < 0.001

Discussion

This study aimed to explore PA and BMI trajectories associated with Hispanic women's body image perceptions over six years of follow-up. Our first hypothesis, that women with BID would experience unhealthy changes over time, was only supported in that the study variables' outcomes differed by BID group over time; that is, the slopes or trajectories differed slightly, but these changes were not statistically significant. We observed significantly decreased PA intensity in any given year, regardless of whether women self-identified as having larger or thinner body image. For women who self-identified as BID > ideal, there are two important caveats to this finding. First, the majority of the women in this study self-identified as having a heavier figure than the ideal (63.1%), and second, more than a half of the women in this study were overweight

or obese. Thus, a considerable number of the women identified body image ratings that approximated their current body size, indicating that they recognized that they have a larger figure. Only one study, which aimed to establish the validity and reliability of the FRS in Mexican women, reported similar findings (Petti & Cowell, 2011). Generally, BID is reported as emerging in Hispanic women when they are already overweight (Fitzgibbon, et al., 2000; Potti, Milli, Jeronis, Gaughan, & Rose, 2009), and decrease in PA or increases in sedentary behavior are frequently reported in such women (Dorsey, et al., 2010; Kuchler & Variyam, 2003). Because BID is closely related to a person's self-concept and self-esteem, it has been identified as a barrier to healthy weight loss behaviors such as engaging in PA and the utilization of health care systems (Powell, et al., 2010).The recognition among the women in our study that they possess a larger body size may signify an acceptance of larger body figures by Hispanic women; however, further study is needed to discern whether this might be because of cultural views of body figures as they age or related to unknown factors that are yet to be discovered in middle-aged and older women.

Women who self-identified as thinner than the ideal image, were the smallest group (2.4%) in our analysis, are their rates of PA have also been less studied in other studies. Lower PA intensity and overestimation of body size in this BDI group of women may have deleterious health effects. A recent literature review on middle-aged and older women suggests that women who are of normal weight frequently report body image dissatisfaction, leading them to think that they should be of a lighter weight than what they are. Many engage in measures of being thinner, such as dieting, which may risk their physical functioning related to nutritional status and to lack of energy (Marshall, et al., 2012).

Despite this findings, over the 6 years of follow-up, our mixed adjusted model showed a slight increase in PA among both women with BID < ideal and BID < ideal compared to women who had no BID who maintained a stable level of PA with ~ 14 METs hr/week. Although the slopes by BID were not significant, women with BID present with a level of PA intensity that is closer to the PA levels recommended for overall health. In a multiethnic WHI OS trajectory analysis by Nguyen, et al. (2013) that encompassed 8 years of follow-up, high PA intensity in Hispanic women was also reported, but our results offer specific differentiation in the levels of PA by BID, which adds a potential target to help prevent weight gain in Hispanic women, as body image dissatisfaction has been found to be an additional predictor of healthy weight (L. A. Anderson, Eyler, Galuska, Brown, & Brownson, 2002). Our findings and the findings of Nguyen's et al. (2013) are different from those of Shaw, et al.(2010) as far as PA intensity is concerned in that Shaw et al. found decreases in Hispanic women's PA with age; they hypothesized that such decreases might occur as individuals lose independence and are less socially connected.

Similarly, we found that despite BMI increases in women with BID > ideal and decreases in women with BID < ideal at any point in time (similar to the PA slopes), over time BMI trajectories level out and demonstrated a trend of slightly decreasing; these rates of BMI decline were minimal and did not reach significance. Of note, however, at year three BMI trajectories for women with no BID were approximately 25 and BMI trajectories for women with BID > ideal were approximately 30 Kg/m^2. According the WHO (2013) classification of BMI, women over 25 are overweight and above 30 obese. Several cross-sectional descriptive studies have reported high BMI rates in Hispanic women (Dorsey, et al., 2010; Fitzgibbon, et al., 2000; Mama, et al., 2011; Potti, et al., 2009). The few longitudinal studies that have addressed BMI in Hispanic

women have also found increases in BMI over time. For example, in a 19-year, longitudinal study that examined social disparities and BMI trajectories through adulthood (age 18-45), Hispanic women spent more of the study period overweight than women from other ethnic group (Janssen, et al., 2013).

In determining why the findings related to our hypothesis about the trajectories of PA and BMI were not significant, several additional factors may be worthy of consideration. We believe that the inclusion of physical or psychological impairments, comprehensive and consecutive body image measurement, and additional cultural and acculturative factors may help future studies of PA and BMI in Hispanic women to significantly differentiate these trajectories. That said, our observation of high BMI scores that declined slightly over the years also deserves additional consideration. One possible explanation for this trend may be that despite the fact that Hispanic women in our studies continue to be physically active through the years, the aging process in Hispanic women may somehow be related to high but declining BMI. An explanation volunteered by Casas, et al. (2001) is that the body structure of Hispanic women allows for a greater accumulation of fat mass in the trunk regions which increases their BMI values over time. Other contributing factors could be the women's understanding of what constitutes PA intensity (Kohlbry, 2006), the accuracy of self-reports of physical activity (Tortolero, Masse, Fulton, Torres, & Kohl, 1999), and ultimately, the question of whether Hispanic women are bounded by their cultural beliefs on body image, as it is documented that in many Latin American cultures, large and full-bodied women are considered healthy and of high status (Gil-Kashiwabara, 2002), which may or may not be a current value for Hispanic women living in the United States.

Our second hypothesis aimed to learn whether the relationship between body image perceptions and PA levels and BMI trajectories over time differed among women of various Hispanic ethnicities. In examining these relationships, we found no significant differences between the trajectories. Overall, there is a dearth of literature on body image, particularly among Hispanic ethnicities and on the association of BID with weight-related behaviors. Body image researchers generally include Hispanic populations that are mostly of Mexican origin, but because weight gain and obesity are a U.S. public health epidemic (U.S. DHHS, 2010), contributing factors to obesity, such as the ways that (dis)satisfaction with body image may lead women to unhealthy weight-controlling behaviors, it should be studied, within particular Hispanic ethnicities. Moreover, because of the rapid exchange of information among countries and the transition to unhealthy diets and PA, obesity is increasing globally. For example, BMI data for Latin American countries indicate that the largest recent increase in female obesity has occurred in Central America (8.5 percentage points per decade) and Southern Latin America (Perez Rodrigo, 2013). And in looking at the obesity of Hispanic women in a U.S. context, the impact of pre-immigration circumstances may further affect recent immigrant women's physical and mental health. For instance, high rates of unhelpful behaviors (e.g., disordered eating) and depression have been reported in Cuban and Puerto Rican women who immigrated because of political or personal circumstances (e.g., because they "had to") compared to Mexican women who immigrated because they "wanted to immigrate" (Torres & Wallace, 2013). This finding implies that the influx of immigrants to the United States from these regions may mean a corresponding influx in the number of women who struggle with body weight increases; it also suggests that immigration trends may mean that reducing obesity in Hispanic women will pose an even greater public heath challenge in the coming years.

Limitations and Strengths. Our modest findings should be interpreted in light of our study limitations. Although the WHI OS offers a considerable sample size, some of the Hispanic subgroups were small, especially as the years passed, and because we adjusted the interaction models, our results may not have captured true significant differences. In addition, in our analytic method, we assumed a random effect in the slopes; such random effects could vary with time in unspecified ways. More advanced and specialized models and statistical techniques should be utilized in future studies. Unmeasured covariates that were not included in this study, such as physical and psychological impairments, are another limitation. The unmeasured complexity of body image and our assumption that a woman's body image remains intact over the years may have also influenced our results. Lastly, because Hispanic women are a diverse population and because we have included women who did not identify with a specific subgroup, our results cannot be considered representative of Hispanic women as a whole.

Despite these limitations, our study provides valuable insights into the role of body image perceptions on PA and BMI changes over time. Although further testing is warranted to explore true trajectory differences, this study, according to our literature review, is the first to longitudinally explore U.S. Hispanic middle-aged and older women's body image perceptions as they relate to PA and BMI changes. Replication studies should be prospectively designed to better uncover true patterns of PA and consequent BMI in these important understudied populations of middle-aged and older Hispanic women. And most importantly, future studies should aim to inform nursing practice in the assessment of body image (mis)perceptions in middle-aged and older Hispanic women as an alternative method for addressing weight gain and obesity in this population.

Conclusions

The exploration of the influence of Hispanic women's body image perceptions on their PA patterns and BMI scores over time contributes to our growing understanding of how Hispanic women's values of body image may serve as a potential factor in explaining their obesity increases. Although we did not find significant changes in women's PA and BMI over the years or significant differences in the trajectories by BID and by Hispanic women ethnicities, our trajectory analysis method brought to light important differences in PA and BMI patterns by BID. Generalizations of body image findings based on studies which include mostly individuals of Mexican heritage will not reach women of other Hispanic backgrounds that may be at a highest risk of obesity (Thrower, Danawi, & Lockett, 2013). The women in this study were overweight and obese, and they self-classified as having a heavier figure compared to their ideal body choice. Indeed our work demonstrates that trajectory methods offer a strong basis in nursing research of health behaviors for determining true associations among study variables. Such analyses, though, should include cultural and acculturative assessments so that the findings and promotional strategies from those studies culturally fit their intended clientele group and, in our case, appropriately respond to Hispanic women's body weight needs.

CHAPTER IV: Manuscript 3

Title. *Menopause and Hispanic Women's Weight-Related Behaviors.*

Abstract

As women's life expectancy increases, they may face menopausal symptoms for more years, which may negatively impact their health. Given that Hispanic/Latino women in the United States are currently, on average, younger than non-Hispanic women, such health trends are particularly important to study in this underserved population. This review assesses the existing literature on menopause and Hispanic women's physical activity and dietary behaviors. Searches of major online bibliographic databases were conducted and six relevant articles were evaluated that analyzed existing data on physical activity and functioning, among other health variables. No published studies that focused on dietary behaviors were located. In line with the Unpleasant Symptoms Theory perspective, the physiological and environmental factors of symptoms at menopause were explored more in these studies than psychological factors. Compared to women in other ethnic/racial women groups, Hispanic women were less physically active, more likely to report functional impairments, and more likely to be overweight or obese. Menopause symptoms also played an important role in their body weight status. However, a formal systematic review could not be completed because so few articles addressed the relationship between menopause and physical activity or functioning and because no articles explored dietary behaviors. There is an urgent need for studies that focus on both physical activity and dietary behaviors in Hispanic women; such studies should incorporate the neglected psychological influential factor of symptoms and should consider participant-centered and mixed-methods research methodologies that may allow the integration of Hispanic women's cultural and acculturation factors so that their body weight needs may be better served.

Introduction

Increases in body weight and obesity are a concern for the majority of Americans, but Hispanic women are disparately affected. Obesity affects 42.5% of Hispanic women in the United States (CDC, 2014). Although lifestyle behaviors associated with culture, socioeconomic factors, education, and access to health care can contribute to the onset of obesity in Hispanic women, symptoms at menopause may represent an additional contributing factor of weight accumulation, particularly between the ages of 45 to 55 when women's risk of obesity is at its highest (Matthews, et al., 2001). This age range includes the estimated average age at natural menopause in women of Hispanic descent (41 to 47) (Ortiz, Harlow, Sowers, Nan, & Romaguera, 2006), which is a younger age range compared to all women in the United States (49 to 52) (Coffman, 2008).

Menopause is not a disease, but the symptoms that some women experience, including vasomotor symptoms (VMS), such as hot flashes and night sweats; psychological symptoms, such as tiredness and anxiety; and psychosomatic symptoms, including palpitations and dizziness, may negatively affect women's quality of life and their overall health (Avis, et al., 2001). There is also evidence that menopausal symptoms are associated with increased body weight, metabolic syndrome, diabetes, hypertension, and cardiovascular diseases (Davis, et al., 2012). Recently, researchers have given international attention to the relationship between menopause symptoms, physical activity, and dietary behaviors in weight gain and obesity (Mangweth-Matzek, et al., 2013; Mirzaiinjmabadi, Anderson, & Barnes, 2006).

Although there is considerable information regarding managing menopausal symptoms (NIH, 2005); the effects of certain foods to ameliorate VMS (Barnabei et al., 2005); the ways that menopause relates to specific diseases, such as hypertension or cardiovascular diseases

(Hitchcock, et al., 2012; Matthews et al., 2009) and osteoporosis (Yarbrough, Williams, & Allen, 2004); the ways that menopause symptoms differ by ethnicity (Green et al., 2010; Green & Santoro, 2009); the cultural signifiers of menopause for Hispanic women (Longworth, 2003); and the means Hispanic women use to alleviate their menopause symptoms (Bair et al., 2008; Villarruel, Harlow, Lopez, & Sowers, 2002), no literature review regarding the effects of menopause symptoms on Hispanic women's weight-related behaviors—that is, their physical activity and dietary behaviors—was found.

Generally, clinical advice on menopause tends to emphasize dissemination of information regarding menopause care as a normal and healthy phase of a woman's life (NIH, 2005). This is valuable, but information on menopause should also be emphasized in its potential health risks associated with weight gain and obesity. Evidence on the extent to which menopause affects Hispanic women's weight-controlling behaviors may aid not only in redefining our approach to studying menopause and body weight, but also in supporting middle-aged Hispanic women in the prevention of obesity later in their lives. To that end, this review explores existing literature on the association between menopause and Hispanic women's physical activity and dietary behaviors.

Literature Search Approach

Databases (PubMed, Academic Search Complete, CINAHL, Web of Science, ProQuest, Psych-Quest e-Journals, and the Cochrane Library) were searched using the following key words: "physical activity" or "fitness," "body weight" or "BMI," "nutrition" or "diet" or "food intake," "Hispanic Americans" or "Latina*" or "Hispanic*," and "climacteric" or "menopause* symptom*." The aim was to identify peer-reviewed articles from studies of Hispanic women living in the United States that focused on menopause or menopausal symptoms and the women's physical activity

and nutritional and/or dietary behaviors but, not on the development of diseases associated with menopause (e.g., cardiac diseases or eating disorders). No limitations were established for the date of publishing or type of study design. The query rendered few articles (n = 8) across databases. The literature search was then refined by adding related words (physical functioning, quality of life, physical limitations, dietary patterns, education/change of diet) that were found in these 8 articles and in relevant papers on menopause and weight gain (Keller et al., 2010), and another 4 articles were located, excluding duplicates. Two study reports that were conducted out of the United States were discarded after reviewing the abstracts and four articles that emphasized menopausal symptomology differentiation, physical conditions (e.g., diabetes), or the effects of hormone therapy and physical activity were discarded after careful review. Thus, 6 articles that focused on physical activity and physical functioning were analyzed.

Analysis of Articles. The following questions guided the analysis of these articles: (a) what are the studies' outcomes on the association between menopause and Hispanic women's weight-related behaviors? (b) What research methods were used to study the review topic? And c) what nonphysiologic influential factors for menopause symptoms were considered by the researchers in their studies? The consideration of these questions, particularly the consideration of influential factors in menopause symptoms and weight-related behaviors, was guided by the main components of the updated Unpleasant Symptoms Theory (UST). These components include the following: the experienced *symptoms*, described by timing, quality, intensity, and distress (the theory's dimensions); the *influencing factors* (physiologic, psychological, and situational factors) for the unpleasant symptoms to occur (e.g., menopause symptoms); and the effects of these symptoms on an individual's *performance* (e.g., physical activity level) (Lenz, et al., 1997) (Figure 4.1). The UST, proposed by Lenz et al. (1997), assumes that there are

commonalities among the symptoms experienced by individuals in varied situations and contexts and that similar factors may influence the experience of symptoms. Therefore, similar care or interventions may alleviate the symptoms and lead to improvements in an individual's performance. Furthermore, the UST suggests that just as symptoms can affect the individual's role performance, cognitive functioning, physical functioning, and quality of life, the affected performance can affect the symptoms and the influencing factors of symptoms (Myers, 2009).

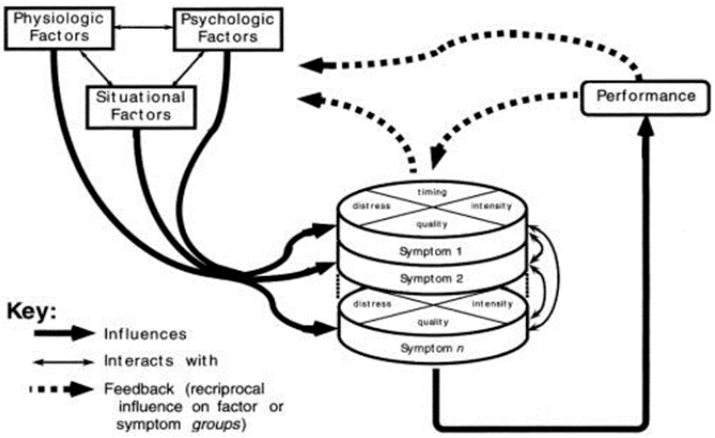

Figure 4.1. Updated Version of the Middle-Range Theory of Unpleasant Symptoms

Note. From "The Middle-Range Theory of Unpleasant Symptoms: An Update," by E.R. Lenz, L.C. Pugh, R.A. Milligan, A. Gift, & F. Suppe, 1997, *Advances in Nursing Science, 19*(3), pp. 14–27. Copyright 1997 by Lippincott Williams and Wilkins. Reprinted with permission.

Menopause and Reproductive Aging. Menopause is the transition period from women's reproductive years to their post-reproductive years or post-menopause; this period, usually range from 40 to 55 years of age (Greendale & Sowers, 1997). During this time, the decrease of estrogen—a hormone responsible for maintaining the integrity of various vital bodily functions, such as the regulation of body fluids (sodium and water retention) (Stachenfeld, 2014), the regulation of the ovarian-menstrual cycle, and glucose/energy metabolism (Lizcano & Guzman, 2014)—is an influential factor in several unpleasant menopause symptoms/discomforts. In addition to temporal physiologic changes in health status, women also

experience longer-term menopausal changes in health outcomes such as urogenital symptoms and a decrease of bone density (Coffman, 2008; Herron et al., 2002; Huang, Luft, Grady, & Kuppermann, 2010).

The latest report from Stages of Reproductive Aging Workshop + 10 (STRAW) (2012) describes reproductive aging in three stages: the reproductive stage, the menopausal transition, and the post-menopausal period (Figure 4.2). These stages are defined by examining (a) the characteristics of menstrual cycles; (b) ovarian function, by assessing biomarkers such as the follicle-stimulating hormone (FSH), anti-mullerian hormone (AMH), inhibin B, and the antral foliculle counts (AFC); and (c) symptoms reported by women (Harlow, Crawford, Sommer, & Greendale, 2000). Starting in the late reproductive stage, fecundability begins to decline, which is manifested by changes in the flow and length of menstrual cycles. As women progress into the early stage of menopausal transition period, FHS increases; the variability of menses length increases, persisting for more than 7 days of consecutive cycles; AMH and AFC decrease. In the late menopausal transition stage, which may last up to 3 years, amenorrhea of more than 60 days may occur—serum FSH can be greater than 25IU/L, and the most notable symptoms are VMS. The early post-menopausal stage (substages **a** and **b)** may last 2 years, during which VMS continue to be notable. In substage **c**, the FSH and estradiol levels start to stabilize and women progress to post-menopausal status. The perimenopausal period, which may last up to 10 years, spans from the early menopausal transition substage to the early postmenopausal substage. (Harlow et al., 2012). This perimenopausal transition period, which often includes unpredictable and variable symptoms, is increasingly been targeted by scholars as they aim to promote healthy behaviors among women (Lange-Collett, 2002). This research trend is demonstrated by the fact that searching the PubMed database for perimenopause and health behaviors rendered 55 items.

Aside from VMS, a variety of symptoms are reported as defining the menopause transition that are not bounded to physiologic symptoms. Physiologic symptoms that are frequently reported include breast tenderness, vaginal dryness, headaches or migraines, joint pain or stiffness, general aches or pains, lower back pain, neck pain, bloating or gas, and swelling of the hands or feet (Barnabei, et al., 2005). Although, these symptoms are largely based on reports from Caucasian women in the Western nations, they are common to Hispanic women. However, compared to other racial/ethnic group, apparently Hispanic women are more likely to report psychosomatic and psychologic symptoms at a greater frequency than physiologic symptoms. For instance, Avis, et al., (2001) found that 2 of the most frequently reported symptoms by Hispanics (out of 3) were feelings of tension and depression; the least reported of the three symptoms were headache. Later, in a study of menopause and socioeconomics, heart pounding and forgetfulness were 2 of the most frequently reported symptoms (out of 5) by Hispanic women who were of low socioeconomic status. In that study, the reported physiologic symptoms were frequent urine leakage, vaginal dryness, and VMS (Gold et al., 2000). In a more recent study with a predominantly Hispanic population (63.8%), 5 out of the 6 most frequently reported symptoms were mood swings, decreases in energy, palpitations, sleep problems, and memory problems. The sixth prevalent symptom was VMS (Schnatz, Banever, Greene, & O'Sullivan, 2005; Schnatz, Serra, O'Sullivan, & Sorosky, 2006).

Review Findings

An important finding of this review was that there is a lack of studies focusing on the association between menopausal discomforts and dietary behaviors (e.g., disordered eating or changes in dietary patterns). Instead, existing research concentrates on physical function, which refers to assessments of impairment in strength or capacity that could influence physical

functions—not only skeletal muscles but other organ body systems as well (Brach, Simonsick, Kritchevsky, Yaffe, & Newman, 2004)— and physical activity, which is defined as any bodily movement, planned (e.g., physical fitness) or spontaneous, produced by the skeletal muscles that results in increases of energy expenditure (WHO, 2013b). In any case, the two terms are very much related to increasing the risk of an unhealthy body weight.

Menopause and Hispanic Women's Physical Activity/Functioning. Most of the information in this review regarding the effect of menopausal discomforts on Hispanic women's physical activity, functioning, and quality of life is drawn from 5 manuscripts that used data sets (n = 5) from the 7-site community-based Study of Women's Health Across the Nation (SWAN), particularly data from its cross-sectional telephone and in-person survey that the SWAN investigators conducted in 1996 and 1997 to determine the eligibility of multiethnic women for longitudinal studies of their health during middle age (Avis, et al., 2003). The cross-sectional analyses of these 5 multiethnic data sets each included an average of 11,382 female participants, including sub-samples of, on average, 1,404 (12.3%) Hispanic women. SWAN participant ages ranged from 40 to 52 and the most representative groups were premenopausal (ranging from 32.20% to 35.11% of the women) and perimenopausal (from 30% to 46% of the women). Postmenopausal women were the least represented group (from 12.07% to 14.14% of the women) in the studies, and among the postmenopausal women, those who were surgically postmenopausal were the most represented (from 13% to 20% of all women). All of the SWAN-related studies (Avis, et al., 2003; Gold, et al., 2000; Kravitz et al., 2003; Matthews, et al., 2001; Sowers, Pope, Welch, Sternfeld, & Albrecht, 2001) classified women in groups according to the STRAW criteria that were proposed in 2001(Soules et al., 2001). The main difference this initial criteria and the latest STRAW criteria, described previously, is that the most recent criteria

provide more comprehensive basis for classifying and assessing the reproductive aging stages (see Harlow et al., 2012).

The SWAN participants in these studies primarily provided information on their physical activity level, body mass index (BMI), lifestyle behaviors, sociodemographic factors, and difficulty "paying for basics" such as for food, shelter, clothing, and heat, which was used as a proxy measure of income in these studies. For four of the manuscript analyses, information on physical activity was collected by a single question about the women's activity level relative to other women of their age (Gold, et al., 2000; Kravitz, et al., 2003; Matthews, et al., 2001; Sowers, et al., 2001). The fifth author to use the SWAN data used the Kaiser Physical Activity scale (Avis, et al., 2003), an instrument designed specifically for measuring physical activity in women, to collect information on the frequency, intensity, and duration of physical activity (B. E. Ainsworth, 2000). Other instruments utilized by the researchers to measure the particular study variables that correspond to their research hypotheses are noted in our discussion of the outcome findings of each study in the next section.

Studies suggest that there is a trend of decreasing physical activity as symptoms at menopause increase. In an early SWAN study completed by Gold et al. (2000) the association of sociodemographic and lifestyle factors, including physical activity, to a number of menopausal symptoms were investigated. A specific research goal of this study was to determine whether VMS decreased with physical activity. The results showed that VMS were prevalent in late perimenopausal women and, surgically, or naturally postmenopausal women. Concordant with emerging findings that counter to the theory that women with higher adiposity should have higher estrogen and thus a lower likelihood of presenting with VMS (Thurston et al., 2008), this study found that women with higher BMI showed increased VMS. In addition, women who

reported less activity were more likely to report menopausal symptoms, particularly soreness, heart pounding or racing, forgetfulness, and difficulty sleeping. It was also observed that all symptoms were increased in women who reported being unable to pay for basics. In this study, Hispanic women were more likely than non-Hispanic women to be postmenopausal, experience higher parity, attain lower education levels, and report having difficulty paying for basics. Examining the symptoms in relation to health and lifestyle characteristics showed that Hispanic women were more likely to report frequent urine leakage, vaginal dryness, heart pounding or racing, forgetfulness, and VMS. Of these symptoms, forgetfulness was the most common (46%), followed by VMS (35.4%). In this study, no association between VMS and physical activity was found (data on the association magnitude was not shown, p. 469). However, Hispanic women showed lower physical activity performance compared to the rest of the women in the study. Although this finding was not statistically significant (Gold, et al., 2000), decreased physical activity and difficulty paying for basics are potential factors that may affect the frequency that Hispanic women report symptoms.

Decreases in physical activity, consequent increases in BMI and menopausal status were explored by Matthews et al. (2001). In a sample with greater percentage of postmenopausal women, including surgically postmenopausal women (36%), compared to premenopausal (33%), and perimenopausal (19%) women, found that surgical (OR = 0.032, 95% CI: 0.022, 0.042) and perimenopausal status (data not shown, p.868) as well as not using hormones were predictors of elevated BMI. Overall menopausal status was found to be the least successful predictor of BMI while physical activity the best predictor of BMI in each ethnic group of the sample. The study participants were mostly overweight (54%) and obese (26%). Furthermore, it was observed an inverse association between education and obesity. In this study, Hispanic women were less

educated (having less than high school education) and more likely to report less physical activity than the rest of the women. Among all the ethnic groups examined in this sample, the prevalence of obesity was the second highest for Hispanics (22.85%), the highest prevalence was for African Americans (42.68%). Despite these differences, 48.7% of Hispanic women reported about the same level of physical activity as other women their age (Matthews, et al., 2001).

Although menopausal discomforts were not directly associated with increases in body weight, such discomforts were found to influence postmenopausal women's physical functioning (PF). In an investigation by Sowers et al., (2001) a conceptual model of natural history of PF was used to analyzed the association between PF and menopause. PF was evaluated using the Medical Outcome Study—Short Form 36 (MOS-SF-36) PF scale. This instrument asks participants about their difficulty in performing physical activities, relative to mobility, ranging from vigorous athletic to more sedentary activities, like bathing and dressing. In this study, 10% of women were found to have some PF limitation (e.g., walking a city block) and 9.2% were found to have substantial limitation (e.g., climbing stairs). The women with some PF limitation had 1.5 greater odds of having surgical menopause and 1.6 greater odds of using postmenopausal hormones than the women with no PF limitation, and participants reporting difficulty in paying basics were 5 times more likely to be classified as having substantial PF limitations. Among Hispanic women, substantial limitation were reported more frequently in women from the Caribbean (11.1%) than non-Caribbean (5.8%). In addition, Hispanic women from Mexico and Central America more frequently reported difficulty paying the basics (Sowers, et al., 2001). This study suggests the importance of further research on the menopausal characteristics that influence the progression of functional limitations, particularly in postmenopausal Hispanic women with varying fiscal resources.

The effects of menopausal discomforts on physical functioning were not only studied at the late menopausal stages, but also at premenopause and early perimenopause stages. Avis et al. (2003) sought to explore the association between premenopause and perimenopause discomforts and health-related quality of life (HRQOL) domains. HRQOL was assessed using 5 sub-scales of the MOS-SF-36 questionnaire: bodily pain, physical role-limitation, emotional role-limitation, social functioning, and vitality. For all HRQOL domains, early perimenopausal women were more likely than premenopausal women to report impaired functioning. Among ethnic/racial groups, Hispanic women were significantly more likely than White women to demonstrate impaired functioning in all domains (role-physical: OR = 1.58, 95% CI: 1.20, 2.09, bodily pain: OR = 3.87, 95% CI: 2.95, 5.08, vitality: OR = 1.81, 95% CI:1.38, 2, 37, social function: OR = 2.87,95% CI: 2.19, 3.78, p values for all domains < 0.001), except for the role-emotional domain (OR = 0.81, 95% CI: 0.61, 1.08, p = 0.01). Among all women, the sociodemographic variables did not explain differences in impaired functioning, whereas the health variables, such as difficulty sleeping, arthritis, and VMS, did explain some of the differences in impaired functioning. Particularly in the role-physical, role-vitality, and role-emotional domains. In Hispanic women, the bodily pain and the social functioning domains were the most affected (OR = 4.34, 95% CI: 2.56, 7.29, and 2.62, 95%CI: 1.61, 4.35, respectively) by the health variables. (Avis, et al., 2003). Although Hispanic women were not as affected as other ethnic/racial groups in the role-emotional domain, their scores in social functioning impairment may be due to physical problems, as they were also affected in the bodily pain domain.

Sleep problems during menopause, a frequent menopausal discomfort reported by Hispanic women, was studied by Kravitz, et al. (2003) to discern its association with physical activity, physical health factors, BMI, VMS, and socio-demographic factors. In this study, the

sleeping status of women was evaluated using the question: "Over the past 2 years, have you experienced difficulty sleeping?" Using this measure, it was found that self-reported sleep difficulty was prevalent in 37.7% of the participants and that 65% of surgical postmenopausal women and 50% to 56% of women from other menopausal-status group reported sleep difficulty. In terms of ethnicity, 38% of Hispanics and 40% of Caucasians reported sleep difficulty, which was higher than for other ethnic groups, and 50.3% of natural post-menopausal Hispanic women reported sleep difficulty, which was the highest rate when factoring in both ethnicity and menopause status. For women of all races and ethnicities, the authors noted a trend of increasing sleep difficulty among those women who transitioned through menopause naturally as well as that sleep difficulty was significantly associated with higher levels of education, psychological symptoms, poor self-perceived health, lower quality of life, less physical activity, arthritis, and smoking. An analysis of the subgroup of women who did not present with vasomotor symptoms, the most prevalent symptoms among the women, was also completed to ascertain whether menopause status was truly related to difficulty sleeping. When this analysis was included, the magnitude of the association changed minimally, showing that only premenopausal women reported less difficulty sleeping (26%) as compared to other menopausal status groups, which ranged from 30% to 32%. Furthermore, the study results showed that women who did not present with VMS had lower odds of performing less activity compared to women who reported having VMS (OR = 1.26, 95% CI: 0.90, 1.17, and 1.35, 95% CI: 1.20, 1.53, respectively) (Kravitz, et al., 2003). Unfortunately, this study did not present BMI and menopause outcome results, nor did it specify all its main findings by ethnic group.

Finally, the association between self-reported depressive symptoms, physical activity, BMI, and waist-hip-ratio (WHR) was explored by Juarbe, et al.(2006) using data from a study

completed from 1996 to 2002 in the state of California. This study performed a longitudinal secondary analysis over a 12-month period on a sample of 81 Latina and 151 White women who were aged 40 to 50 and in late premenopause. The participants' physical activity level were evaluated using the Paffenbarger Activity Questionnaire (PAQ), which provides information on activity frequency, intensity, and duration. Participants were categorized as in the late stage of premenopause using the STRAW criteria and the assessment of urine with FHS lower than 2.5 IU/DL. Depressive symptoms were evaluated using the CES-D. Although the Latinas were of lower economic status and had attended fewer years of education than the White women in the study, the investigators included a higher percentage of Latinas who completed high school (58%) or had graduate degrees (39%), and had high household incomes ($31,000/year) that is not generally found in studies with Hispanic populations (Gonzales, 2008).

The most frequently reported type of work by Latinas in the study was in the service and agricultural industries, occupations that require moderate to vigorous physical activity. They reported greater weekly expenditures of energy (MET/week) than Whites at baseline (413 versus 381 MET/week), 6 months (426 versus 382 MET/week) and 12 months (421 versus 378 METs/week), as well as higher mean increases in weekly self-reported physical activity from baseline to the end point of the study (from 413 ± 88 to 431 ± 80) compared to White women (381 ± 70 to 378± 60).Yet, Latinas had higher BMI and WHR values at baseline (BMI: average of 28.3 versus 25.9; WHR: 0.88 versus 0.76) and at 12 months (BMI: average of 29 versus 26.2; WHR: 0.88 versus 0.77) compared with Whites. Although Latinas were more likely than women of other race/ethnicity to self-report their perceived health as fair or poor rather than very good or excellent, they experience increases in their frequency of depressive symptoms that were similar to White women (at baseline for both groups of women, a frequency average of 11.1, and at the

end of the 12 months, 13.0 frequency for Latinas versus 13.7, for white women). In addition, a significant average increase of 2.0 points ($p = 0.04$) was observed at 12 months for both groups. Overall for all women, a positive association was found at baseline ($r = 0.20$, $p < 0.01$) and 3 months ($r = 0.18$, $p < 0.01$) between depressive symptoms and increased BMI. Self-reported physical activity at 12 months ($r = 0.13$, $p < 0.01$) was also positively associated with depressive symptoms, but it was not significant (Juarbe, et al., 2006). Although the correlations in the study between depression and BMI were not high, the statistical significance of these values suggests that BMI might be predictive of depression over time as women transition to menopause.

Studies' Methodological Venue. In Table 4.1, the summaries of the six relevant menopause articles organized by the UST components are presented. Five of the studies had the same data source and all six studies included similar study variables; however, their analyses assessed very different ways in that menopause may be related to women's physical activity and functioning. All of the analyzed studies were observational studies (5 cross-sectionally designed and 1 longitudinally), and only one of these studies explicitly described the theoretical framework that guided the study (Sowers, et al., 2001). According to the U.S. Preventive Service Task Force (USPSTF) (2012), the studies included in this review, offer sufficient evidence to determine the associations of symptoms on physical activity and functioning (grade: B), but the findings are inconsistent across studies' subjects which may limit the generalizability of their findings.

Selected Influential Factors in the Studies. Changes in physiology, like menopause, for instance, have long been appraised and diagnosed according to their symptoms, but when individuals present with symptoms, they often vary in how they experience those symptoms. Psychological and situational factors are now recognized as responsible for such variability in

symptoms manifestation (Lenz, et al., 1997). For example, in menopausal women, psychological factors like anxiety may exacerbate sleeplessness that is related to VMS, and then a situational factor, such as absence of social support, may then increase anxiety, or, if a situational factor, such as social support, is present, it may serve as a stress-buffering factor. This review presents in Table 4.2 the influential factors each of the studies examined in their investigations. As this table demonstrates, the neglected influential factor in these studies of menopause and physical activity or functioning is the *psychological* factor.

Table 4.2. Influential Factors Examined in the Included Studies

Author(s)	Influencing Factors			Symptoms	Performance/ Outcome
	Physiologic	*Psychologic*	*Situational*		
Gold, E. B., et al. (2000)	x		x	VMS	PA
Matthews, K. A., et al. (2001)	x			MS	PA, BMI
Sowers, M., et al. (2001)	x		x	MS	PF
Avis, N. E., et al. (2003)	x		x	MS	QOL, FP
Kravitz, H.M., et al. (2003)	x	x	x	MS	QOL, PA, Sleep
Juarbe, T. C. et al., (2006)	x	x	x	MS	PA, BMI

Note: VMS = vasomotor symptoms, MS= menopausal symptoms, PA = physical activity, BMI = body mass index, PF = physical functioning, QOL = quality of life.

Discussion

This review aimed to examine the existing literature on the association between menopausal discomforts and Hispanic women's physical activity and dietary behaviors. There were no study reports on the association between dietary behaviors in Hispanic women and menopause, and few articles that addressed menopause and physical activity in Hispanics applied a variety of disparate approaches of measuring physical mobility. Therefore, the scarcity of articles on dietary behaviors and the lack of unity in the reported outcomes specific to physical activity prevented a more formal systematic review. Initiatives that champion the discussion of

dietary behaviors when addressing menopause are emerging. A study in Southern rural Taiwan, for example, examined the association between physical activity, dietary behaviors, and menopause in middle-aged women. In this study, the nutrition-related behavior variable was a significant negative predictor of BMI. The authors suggested that women have limited information and access to menopausal health care and that the relevant media reports which reach these women allocate more attention to hormone therapy and less attention to consumption of quality food for their age group (Pai, Chen, & Tsao, 2010). Although this study was conducted outside United States, it suggest possible similarities to our own culture in that Hispanic women in the United States, namely recent immigrants, who are highly exposed to the media and have less access to conventional health services and who may therefore be less informed about menopause-related nutrition (Geller, Moran, Cox, Goldstein, & Studee, 2003).

Other risks associated with dietary behaviors and menopause are also being studied. For instance, a recent Austrian study explored menopause and eating disorders, discovering that perimenopause, like puberty, may represent a window for vulnerability to dietary pathologies such as being diagnosed with "subthreshold eating disorders," which are defined as (a) recurrent binge eating associated with a loss of control over eating and (b) purging behaviors such as the use of laxatives while overweight (Mangweth-Matzek, et al., 2013). Moreover, nutritional or dietary interventions to help decrease body weight in menopausal women are frequently described in the literature. An example is the intervention study of Barone Gibbs, Kunzel, Pettee Gabriel, Chang, and Kuller (2012), which examined the modification of eating behaviors (e.g., the frequency of eating meals, easting at restaurants, and eating fried foods during a month) rather than energy intake as a way of decreasing body weight. Nonetheless, this study was

addressed to postmenopausal multiethnic samples, where body weight starts to decrease with age.

Despite their lack of attention to dietary behaviors, the studies included in this review provide substantial information on the association between menopause and physical activity and functioning. Without exception, all the studies reported a decrease in physical activity and functioning in Hispanic women, regardless of whether they were in an early stage of perimenopause or postmenopause. Likewise, these studies also found high rate increases in body weight and BMI values for Hispanic women. However, contradictory findings were also reported. For instance, Gold et al. (2000) found no association between VMS and physical activity whereas Kravitz et al. (2003) found a positive correlation not only between VMS and physical activity, but also between VMS and sleep difficulty. Findings on the symptoms reported at menopause varied as well. An example discussed earlier in this review is the prevalence of psychologic and psychosomatic menopause-related symptoms in Hispanic women, a prevalence that appears to differ from study report to study report. The differences in these SWAN study findings may be related to re-contextualization that occurs when the same data are manipulated by different statistical methods under the specific research aims pursued by the authors.

The large-scale studies of middle-aged women included in this review, as well as others from the SWAN, have reiteratively found that varying degrees of VMS and psychological and psychosomatic symptoms are part of the menopausal symptomatology (Avis, et al., 2001). However, the SWAN studies are not composed of true probability samples; participants voluntarily joined these studies. Moreover, because of the observational designs of these studies, scholars have found that is often problematic to generalize their findings, particularly in Hispanic women or other ethnic subpopulations (Huang, et al., 2010). As a response to this concern,

smaller-scale studies that include greater participation of Hispanic women are emerging. One example is the cross-sectional study completed by Schnatz et al. (2005), which only includes Hispanic and White women and lists the most commonly experienced symptoms by Hispanic women besides VMS, mood swings, decreased energy, sleepiness, depression, and forgetfulness. These findings are different from those cited in the studies included in this review. Perhaps collecting information from Hispanic women in a manner that it can be differentiated by components, e.g., using the UST components (physiologic, psychologic, and situational), may aid in differentiating with certainty the most frequent symptoms Hispanic women present. Another finding among the six articles studies in this review is related to the inequalities between Hispanic and non-Hispanic women level of education and income. These studies demonstrate that education and income inequalities may serve as situational factors that either influence symptoms or the level of physical activity and functioning. However, it is important to consider trends in the changing demographics of Hispanic female population in the United States. For instance, in the Juarbe et al. (2006) study, the most recent study included in this review, Hispanic women were found to be of a lower education and economic status than White women; however, they had an average annual income that was greater than what is usually reported in the Hispanic literature, as well as a considerable number of women with a graduate level of education. Likewise, a recent study completed with a multiethnic sample not only reported that 58.4% of Hispanic women participating in the study had a college education, but also that Hispanic women were the highest employed group (78%) (Lee & Im, 2010). This study was completed via the Internet, with 25.6% of the sample being Hispanic, which is a greater participation rate than in all studies included in this review.

The studies included in this review did not include the acculturation variable; however, in their discussion sections, these studies often suggested the need to discern ethnic differences in the results. This is a valuable recommendation, given that cultural heritage and the acculturation process play an important influential role in how women situate and interact with the receiving culture to meet their health needs. The SWAN team of researchers, interested in learning whether acculturation plays a role in symptoms at menopause manifestation, completed a study, which found that symptoms differ by country of origin and not by acculturation among Hispanic women. However, there were only three symptoms investigated in this study—VMS, vaginal dryness, and difficulty sleeping (Green, et al., 2010). Moreover, that study only assessed acculturation according to language usage, whereas acculturation is a complex concept with a variety of measurements that do not only include language, but also new acquisitions in the receiving country regarding values and practices (Schwartz, et al., 2010). In addition, the diversity among Hispanic women causes further complexity in assessing acculturation associated with specific symptomatology such as those manifested at menopause. It would be much more fruitful to approach menopause and health behaviors in Hispanic women through mixed methods where acculturation can be evaluated and Hispanic women's voiced concerns can be part of the research process.

The few studies that addressed the psychologic influential factors of menopause suggest that menopause is a potential predictor of depressive symptoms and that such symptoms, for instance, may be associated with increase in body weight (Juarbe, et al., 2006). The acculturation literature states that Hispanic women face high stress, often resulting from the demands of adjusting to a new culture, for example, cognitive dissonance, that affect their daily decision-making, which can lead to unhealthy behaviors (Nesdale & Mak, 2003). Hispanic women who

are transitioning to menopause and in the process of adjusting to their new place of residence may experience and additive effect that makes them more likely to of develop psychologic or psychosomatic symptoms. Further research is needed to establish the type of effect that psychological factors will have during menopause in Hispanic women's physical activity and dietary behaviors. It may help, for instance, to explain why it is that despite Hispanics reporting the same level of activity as other women and performing work requiring moderate to vigorous physical activity, most studies conclude that Hispanic women have the highest BMI among all ethnic groups.

Conclusions

Despite the scarcity of studies on menopause and weight-related behaviors in Hispanic women, the groups of studies included in this review offer substantial evidence of a positive association between menopause and physical activity and functioning in Hispanic women. The lack of studies that examine both physical activity and dietary behaviors during menopause is a critical gap, as leading authors strongly recommend that weight gain and obesity are best addressed by both behaviors (Foster-Schubert et al., 2012; Seagle, et al., 2008). By pursuing large-scale initiatives and/or mixed-methods studies that address cultural and acculturation factors in Hispanic women to gain knowledge, for instance, on which frequently reported symptoms at menopause may influence their health behaviors while assimilating into United States society, we will better situated to address Hispanic women's health needs. Although symptoms at menopause are just one of many factors associated with obesity, they are among the most personal of health issues for women and should not be overshadowed by other contributing factors to obesity, nor should such studies only consider the physiologic factors influencing symptoms.

Table 4.1. Design, Sampling, and Findings of Included Studies

Authors	Study Design and Aims	Sample	Findings*		
			Influencing Factors	***Symptoms***	***Performance (Outcomes)***
Gold, E. B., et al. (2000)	Cross-sectional survey study. Explores menopause symptoms and physiologic and socioeconomic factors.	Multiethnic sample (N = 12,425), including Hispanic women (*n* = 1.712) obtained from the Study of Women's Health Across the Nation (SWAN). Age: 40-55.	• Physiologic: menstruation characteristics. • Psychologic, cognitive: forgetfulness. • Situational: age, low education and economic level, parity, and employment.	Frequent urine leakage, vaginal dryness, heart pounding, hot flushes, stiffness, and sleepiness.	Less physical activity for women who reported stiffness, heart pounding, forgetfulness, and difficult sleeping.
Matthews, K. A., et al. (2001).	Cross-sectional, survey study. Examines menopausal status, hormone use, and BMI.	Pre-and postmenopausal women (N= 14,155), including Hispanic women (*n* = 1660), obtained from multiethnic SWAN sample. Age: 40-55.	• Physiologic: menstruation characteristics. • Psychologic, cognitive: less than high school education. • Situational. not assessed.	N/A	Hispanic women were more likely to report less physical activity. Obesity was high in women with surgical menopause. The measured mean BMI was 30.26 ± 7.83. Menopausal status was the least effective predictor of BMI.
Sowers, M., et al. (2001).	Cross-sectional, survey study. Assesses menopausal transition and physical functioning.	Multiethnic sample (N = 14,427). Hispanic women (12%) were recruited from the Newark location of the SWAN. Age: 40-55.	• Physiologic. menstrual characteristics, hormone use, and surgical menopause. • Psychologic, cognitive: not assessed. • Situational: difficulty in paying for basics.	N/A	Limitations in physical functioning (PF) were significantly less for Hispanic women from Mexico or Central America (OR = 0.49, $p <$ 0.05).

Table 4.1. (Continued)

Authors	Study Design and Aims	Sample	Findings*		
			Influencing Factors	***Symptoms***	***Performance (Outcomes)***
Avis, N. E., et al. (2003)	Cross-sectional, survey study. Explores the association between menopause and symptoms at menopause with impaired HRQOL.	Multiethnic pre-or early perimenopausal women (N = 3,302), including Hispanic women (*n* = 259) from the SWAN. Age: 42-52.	• Physiologic. bleeding patterns and other health conditions (arthritis). • Psychologic: • Situational. unable to pay for basics.	• Feeling tense, headaches, and feeling depressed.	Hispanic women were more likely to report physical functioning impairment and had lower HRQOL scores. Menopausal symptoms explained impaired functioning in the role-physical, pain, vitality, and social functioning domains.
Kravitz, H.M., et al. (2003)	Cross-sectional survey study. Examines psychological, physical, and socio-demographic factors and sleep difficulty in menopausal women.	Multiethnic sample (N= 12, 603) of mainly pre- and post-menopausal women, including Hispanic women (*n* = 1,656) obtained from the SWAN. Age: 40-55.	• Physiologic: menstrual bleeding, arthritis and smoking history. • Psychologic: stress and poor self- perceived health. • Situational: marital status, parity, education, able to pay for basics.	VMS and difficulty sleeping.	The highest rates of sleeping difficulty were reported by naturally postmenopausal Hispanic women. Difficulty sleeping was more prevalent in post- (47.6%0 and premenopausal (31.4%) women. Less physical activity and a lower quality of life were associated with difficulty sleeping (OR = 0.9, 95% CI: 0.94-0.99).
Juarbe, T. C. et al., (2006).	Longitudinal study (12 months) Explores late menopausal status, depression, physical activity, BMI, and perceived health.	Population-based community sample of a longitudinal study completed in the state of California from 1996 to 2002. Latina (*n* = 81) and White (*n* =151) women. Age: 40-50.	• Physiologic. FSH < 2.5 IU/DL to ascertain menopausal status. • Psycho logic, cognitive: depressive symptoms, lower education level. • Situational: having more than a job, low income status.	Depressive symptoms.	Significantly lower periods of moderate and vigorous physical activity were evident during weekdays and weekends ($p < 0.05$). Engagement in physical activity decreased toward the end of the study. BMI was significantly associated with self-reported physical activity level.

Note. * = Findings are specific for Hispanic women, BMI = body mass index, HRQOL= health related quality of life measured by the SF-36, Short form Health Survey, FSH = follicle stimulating hormone levels in IU/DL (international units/deciliter), PF = physical functioning measured by the Medical Outcome Scale over 10 activities ranging from vigorous to ability to bathe and dress, VMS = vasomotor symptoms (hot flushes and night sweats).

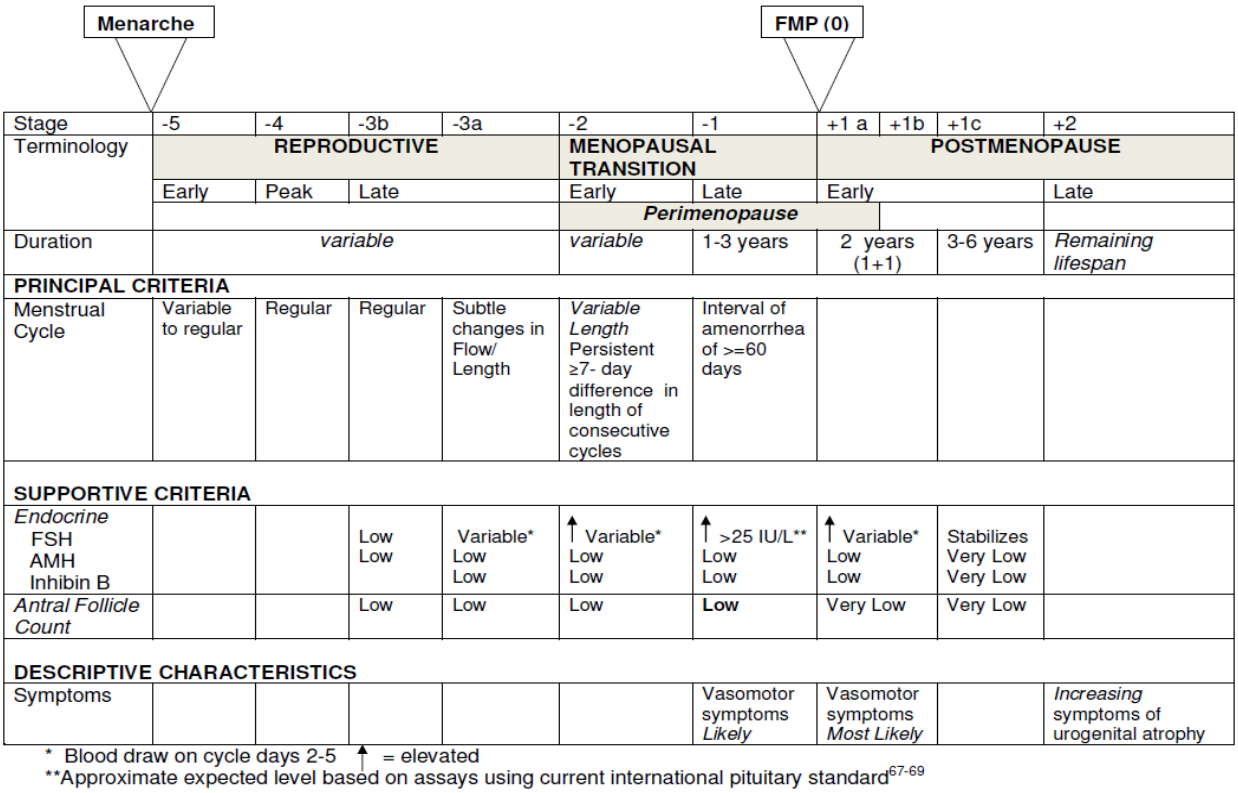

Figure 4.2. The stages of Reproductive Aging Workshop + 10 Staging System for Reproductive Aging in Women. From: "Executive Summary of the Stages of Reproductive Aging Workshop + 10: Addressing the Unfinished Agenda of Staging Reproductive Aging," by S.D. Harlow, G. Margery, J.E. Hall, R. Lobo, P. Maki, R.W. Rebar, S. Sherman, P.M. Sluss, 2012, *Fertility and Sterility,* 7 (4), pp. 846 Copyright 2012 American Society for Reproductive Medicine, Published by Elsevier Inc. Reprinted with permission.

CHAPTER V: Conclusions

Body image perceptions are culturally determined and as Hispanic women acculturate the perception of their body image becomes discrepant, affecting women's behaviors associated with maintaining a healthy body weight. In this dissertation, manuscripts 1 and 2 focus on how BID influences middle-aged and older Hispanic women's weigh-related behaviors resulting in increases of women's BMI and WHR scores. Manuscript 3 focuses on exploring the published studies on the association between menopause discomforts and weight-controlling behaviors in middle-aged Hispanic women.

In the first Manuscript of this dissertation, engendering a composite variable of acculturation from the sociodemographic indicators of Hispanic women who participated in the WHI OS, we hypothesized that acculturation influences Hispanic women's body image perceptions, which affect their physical activity levels, daily intake of fruit, vegetable and fats, and their BMI and WHR scores. The analysis suggest that women with higher levels of BID were more likely to be inactive, less likely to be of normal weight or having a low WHR, and less likely to consume less than 30% of calories from fat/day. Although no significant association between acculturation and BID was found, a cross-tabulation between BID and acculturation suggests that highly acculturated women perceived themselves as having a heavier body figure compared to low acculturated women. While these results are found within other research on body image research, the analysis differs in that it targets middle-aged and older Hispanic women.

In manuscript 2, we hypothesized that Hispanic women with BID would have less healthy changes in physical activity and BMI scores over time and that these changes will differ by Hispanic ethnicities. No significant differences in the trajectories by BID and by Hispanic

women ethnicities were observed in the analysis. However, our trajectory analysis method brought to light important differences in physical activity and BMI patterns among participants. At any point in time women with BID showed a decrease in physical activity compared to women with no discrepancy. As the years passed the physical activity trajectories showed a trend of increase of physical activity intensity for women who self-classified as having BID > ideal and BID < ideal. For these women, BMI trajectories also show a decreased trend. Among Hispanic subgroups, Cuban women who self-identified as having BID < ideal present pronounced decreased trend of physical activity, and Puerto Rican women who also self-classified as having a BID < ideal, show increasing BMI trajectories over the years. Although these results were not statistically significant and may not be clinically relevant, these changes may have an unhealthy accumulative effect over the years.

In manuscript 3, the review of existing literature showcases that there is a void of studies addressing dietary behaviors and symptoms at menopause as well as a paucity in published articles on physical activity's association with menopause. Thus, the review focuses on physical activity or physical functioning and menopause. Much of what is known about Hispanic women's physical activity and menopause in the United States comes from the SWAN study. Five of the six study reports selected for the review were SWAN studies, which had multiethnic samples. The findings show that there is a decrease in physical activity and functioning associated with symptoms at menopause in Hispanic women, regardless of whether they were in an early stage of perimenopause or postmenopause. The studies also report high rates of increase of body weight and BMI for Hispanic women compared to other racial/ethnic women groups. Apparently Hispanic women are more likely to report psychosomatic and psychological

menopausal-related symptoms. Yet the neglected influential factor associated to symptoms at menopause in these studies was the psychological factor.

Limitations and Strengths

The identified limitations for the cross-sectional and the longitudinal analyses (Manuscripts 1 and 2) presented in this dissertation are: (1) the inference of results on the association between acculturation and body image perceptions using a cross-sectional design. Longitudinal studies may produce different results as acculturation is a process lasting varying years among Hispanic women; (2) the creation of the composite acculturation variable based on participants' proxy measures (for many participants these indicators were missing), which may have not been effective in assessing the women's acculturation level in the cross-sectional; (3) the multinomial regression and the mixed linear models used in the analyses required large sample sizes and although the WHI OS offers a considerable sample size of Hispanic women, some of the subsamples for the analyses were still small; (4) the social desirability factor might have played a role in how the Hispanic women self-reported information regarding body image and physical activity behaviors based on the WHI OS questionnaire; and (5) the unmeasured complexity of body image and our assumption that a woman's body image remains intact over the years in the longitudinal study may have also influenced the results.

The major strengths of the secondary analyses are: (1) the creation and use of the composite variable that allow the application of an acculturative perspective to the cross-sectional analysis and (2) the trajectory analysis method used in the longitudinal study that provides valuable insights into the role of body image perceptions on physical activity and BMI changes over time in Hispanic women. In addition, these studies are the first in assessing middle-aged and older women's body image perceptions associated with weight-controlling behaviors.

Moreover, despite the modest findings in the analyses, it has valuable clinical implications: first, to prevent panethnic views of Hispanic women's body weight needs based on the body image they value, and second to aid in the decrease of obesity through taking into account Hispanic women's acculturation and body image perceptions when designing weight-controlling strategies.

Future Research

Future research in studying body image perceptions and weight-related behaviors should aim to rigorously explore culturally normative body image ideals and the (dis) satisfaction that may result from such ideals in middle-aged and older Hispanic women; preferably, these studies should be conducted longitudinally and with the use of standard acculturation instruments. Body image perceptions and the discrepancy of body image should also be assessed with culturally validated instruments. Physical activity level of Hispanic women will be better measured with an additional objective instrument (e.g., pedometer-determined steps/day) and not only by self-reported questionnaires. Studies differentiating age groups in adult Hispanic women, may aid to distinguish age groups that are most affected by BID, which in turn may affect the women's weight-related behavior. In addition, behaviors such as eating disorderly, daily or weekly frequency of eating at fast food restaurants, and the choices Hispanic women make while eating in restaurants should be included as part of assessing dietary behaviors.

The longitudinal study in this dissertation was limited to assess BID with physical activity and BMI. Future studies should incorporate dietary behaviors as this will bring much more information as to address Hispanic women's body weight needs. Moreover, the assessment of body image should also follow a prospective fashion. More complex and specialized methods for trajectory analysis should prospectively be designed to better uncover true patterns of

physical activity and consequent BMI increases in middle-aged and older Hispanic women. Finally, collaborative research (engaging university researchers and community-based organizations) and perhaps large-scale studies are needed to identify the frequent menopause discomforts that Hispanic women report and how these discomforts are associated with decreases of physical activity and dietary behavior adequacy in Hispanic women.

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Appendix A

Permission Request Note to Reprint the Figure Rating Scale (FRS)

Daisy S Garcia< daisyg2@uw.edu> Mon, Mar 3, 2014 at 2:56 PM
To: stunkard@mail.med.upenn.edu

Dr. Stunkard,

I am a doctorate student at University of Washington School of Nursing. I would like to ask permission to reprint the Figure Rating Scale you authored to include it on the report of a secondary analysis I am completing using data from the Women's health Initiative. This secondary analysis is part of my dissertation and once it is approved it will be published though ProQuest Thesis and Dissertations database.

Please let me know if I have to follow other required steps to obtain the permission.

Thank you very much for your attention.

Daisy S. Huarita de Garcia, MSN, RN
Doctoral Student
UWSON

Dr. Stunkard< stunkard@mail.med.upenn.edu> Mon, Mar 3, 2014 at 2:56 PM
To: daisyg2@uw.edu

Hello,
Thank you for your inquiry. Dr. Stunkard is no longer receiving email. Please contact Dr. Kelly Allison for topics related to Night Eating Syndrome at kca@mail.med.upenn.edu.
For all other issues you may contact the Director of the Center for Weight and Eating Disorders, Dr. Thomas A. Wadden, at wadden@mail.med.upenn.edu.

Daisy S Garcia< daisyg2@uw.edu> Mon, Mar 3, 2014 at 3:17 PM
To: wadden@mail.med.upenn.edu

Dr. Wadden,

I have been redirected to contact you regarding the reprint permission I am requesting-see below may initial note I sent.

I'd appreciate much your help.

Thomas Wadden< wadden@mail.med.upenn.edu> Mon, Mar 3, 2014 at 8:23 PM
To: Daisy S Garcia <daisyg2@uw.edu>

That's fine Daisy. I'm happy to provide permission on behalf of Dr. Stunkard.

Tom Wadden

----- Original Message -----
From: "Daisy S Garcia" <daisyg2@uw.edu>
[Quoted text hidden]

Permission Request Letter to Reprint the Middle-Range Theory of Unpleasant Symptoms Figure

April 28, 2014

Elizabeth Lenz, Ph.D., R.N., FAAN
Dean and Professor College of Nursing
Ohio State University

Dear Dr. Lenz,

I am in the process of writing my doctoral dissertation in which one the manuscripts is a literature review on "Menopause and Hispanic Women's Health-related Behaviors." The consideration of influential factors of menopause and its association with health behaviors in this review is guided by the Theory of Unpleasant Symptoms. Once the manuscript is finalized and approved by my supervisory committee, it is to be published by "ProQuest Dissertations and Thesis" data base.

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Sincerely,

D. García

Daisy Garcia, MSN, RN
Doctoral Student
School of Nursing
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April 28, 2014

Sioban D. Harlow, Ph. D.
Professor, Epidemiology
Director, Center for Integrated Approaches to Complex Diseases (CIACD)
1855 SPH I
1415 Washington Heights
Ann Arbor, Michigan 49109-2029

Dear Dr. Harlow,

I am in the process of writing my doctoral dissertation in which one the manuscripts is a literature review on "Menopause and Hispanic Women's Health-related Behaviors." The review of influential factors of menopause and its association with health behaviors required to discuss The Stages of Reproductive Aging Workshop in this review. Once the manuscripts is finalized and approved by my supervisory committee, it is to be published by "ProQuest Dissertations and Thesis" data base.

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Sincerely,

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