

Exploring the Relationship Between Body Dissatisfaction, Disordered Eating Behaviors  
and BMI, Measured by The Kids Eating Disorder Survey (KEDS) In Hispanic  
Adolescents

by  
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A dissertation submitted to the Faculty of the Department  
of Health and Human Performance,  
University of Houston  
in partial fulfillment of the requirements for the degree of  
Doctor of Philosophy  
in Kinesiology

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August 2020

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## **DEDICATION**

This dissertation is dedicated to my husband, my mother, and father-in-law, and my parents, who have always encouraged me to pursue my dreams.

## ACKNOWLEDGMENTS

It is my pleasure to acknowledge the many people who have assisted me throughout my graduate career and with my dissertation.

I would like to express my deepest gratitude to Dr. Tracey Ledoux for the continuous support of my undergraduate and Ph.D. studies. Over the last ten years, she has been a consistent source of support and guidance. I often say I started my Ph.D. because of her, and I know I would not have finished it without her. She was a role model and a source of inspiration not only for my academics but for my future career. I am very grateful for her guidance, patience, and motivation. Her support and guidance throughout these years helped me in the time of research and writing of this dissertation. I could not have done this without her as my mentor for my Ph.D. study.

Also, I would like to thank the rest of my thesis committee: Dr. Margit Wiesner, Dr. Craig Johnston, and Dr. Kevin Haubrick. Dr. Margit Wiesner has helped me to improve my knowledge in statistical analysis, and her excellent teaching and mentorship will always be remembered. Dr. Johnston has supported me throughout my Ph.D. career to improve my skills as a researcher, and his valuable comments and guidance for this dissertation will always be appreciated. I would also like to thank Dr. Haubrick for his insightful comments, and also for the insightful questions which encouraged me to focus my research questions.

Last but not least, I would like to thank my family: my husband, my mother and father-in-law, and my parents for supporting me throughout writing this dissertation and my academic career. I am blessed to have their incredible support that has carried me through hard times. Most importantly, I would like to thank my husband, Randy, for providing me with unfailing support and motivation. I could not have done it without his love, support, and encouragement. We have shared the long road that culminated in this dissertation.

## ABSTRACT

Diagnosed eating disorders are present in 3% of adolescents, with Hispanic adolescents having the highest prevalence. Disordered eating behaviors and weight dissatisfaction are risk factors for the development of diagnosed eating disorders. It is essential to understand the relationship between BMI, body dissatisfaction, and disordered eating behaviors in Hispanic adolescents. Therefore the objectives of the current study are to 1) determine validity of the Kids Eating Disorder survey (KEDS), a self-report screener for purging/restriction behaviors and weight dissatisfaction in Hispanic adolescents, 2) examine the prevalence of purging/restriction behaviors and weight dissatisfaction in Hispanic adolescents, and 3) examine the mediating role of weight dissatisfaction and the moderating role of gender between standardized body mass index (zBMI), and purging/restriction behaviors in Hispanic adolescents. This study was conducted as a secondary data analysis using the FLOW intervention, an intervention of middle school students who attend an urban charter school in the city of Houston, TX. The sample included 690 male and female Hispanic adolescents. Height, weight, and the KEDS (Kids Eating Disorder Survey) data were extracted from baseline data. Confirmatory factor analysis in Mplus was applied to validate the KEDS in Hispanic adolescents. Standard parametric, non-parametric methods, and Chi-square tests were used to compare weight dissatisfaction and disordered eating behavior items by gender and weight class (under/normal weight verse overweight/obesity). Finally, mediation and moderation were assessed with Hayes' PROCESS macros in SPSS to test the indirect effect of X (zBMI) on Y (purging/restrict behaviors) through M (weight dissatisfaction). Moderation was assessed by the interaction of W (gender) on each of the variables. Findings from this study showed Modified –KEDS (M-KEDS) is a valid screening instrument for purging/restriction behaviors and weight dissatisfaction in Hispanic male and

female adolescents. Among Hispanic adolescents, those with overweight/obesity are most likely to have high levels of weight dissatisfaction and purging/restriction behaviors. Also, the indirect effect of weight dissatisfaction on the relationship between body size (zBMI) and purging/restriction behaviors was identified in this sample. The findings of this study have implications for future research, suggesting the need to address both body dissatisfaction and disordered eating behaviors together in Hispanic adolescents.

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## CHAPTER 1:

### INTRODUCTION

#### 1.1 Background and rationale

Diagnosed eating disorders are present in almost 3% of adolescents, with Hispanic adolescents having the highest prevalence (8%).<sup>1</sup> Diagnosed eating disorders are characterized by disordered eating behaviors and a preoccupation with shape and weight. Adolescents who develop diagnosed eating disorders are at high risk for developing severe health consequences such as cardiovascular problems, gastrointestinal problems, anemia, dehydration, metabolic disorders, neurological disorders, and death.<sup>2</sup> Precursors to diagnosed eating disorders are disordered eating behaviors and body dissatisfaction. These behaviors are present in approximately 16% of adolescents, with Hispanic females reporting the highest prevalence (30%).<sup>3</sup> Disordered eating refers to a myriad of abnormal eating behaviors. The difference between disordered eating behaviors and a diagnosed eating disorder is the frequency and the level of the severity of the behaviors.<sup>4</sup> These behaviors exist on a continuum ranging from unhealthy behaviors (i.e., frequent dieting, anxiety with specific foods) to extreme behaviors (i.e., self-induced vomiting, loss of control around food).<sup>5</sup> Disordered eating behaviors are harmful to the individual's mental and physical health. The lack of understanding of the detrimental effects of these behaviors can lead to obesity, gastrointestinal disturbances, fluid imbalances, depression, anxiety, and diagnosed eating disorders.<sup>6</sup>

Disordered eating behaviors frequently begin during adolescence. According to the National Health and Nutrition Examination Survey (NHANES) from 2013–2016, 38% of adolescents reported trying to lose weight, with females (45%) reporting a higher prevalence than males (30%).<sup>7</sup> This sample found Hispanic adolescents had the highest prevalence of trying

to lose weight (51%), compared to non-Hispanic whites (33%), non-Hispanic blacks (31.8%), and non-Hispanic Asian (28.4%) adolescents.<sup>7</sup> Hispanic adolescents also reported the highest use of unhealthy weight control behaviors such as binge eating and chronic dieting compared to other racial/ethnic groups.<sup>8</sup>

In ethnically diverse samples of adolescents, a significant number who reported engaging in disordered eating behaviors were overweight or obese.<sup>6</sup> Among adolescents with obesity, 76% of females and 55% of males use unhealthy weight control behaviors and 18% of females and 6% of males use extreme weight control behaviors.<sup>9</sup> Adolescents with overweight or obesity are twice as likely to use unhealthy or extreme behaviors such as binge eating or loss of control episodes than adolescents without overweight/obesity.<sup>10,11</sup> Hispanic female and male adolescents affected by overweight frequently report, dieting (70%, 50%), unhealthy weight control behaviors (66%, 56%) and overeating (17%, 15%) respectively.<sup>12</sup> Adolescents with disordered eating behaviors and overweight/obesity are more likely to be affected by obesity as adults and at a higher risk for developing heart disease, type 2 diabetes, metabolic syndrome, and specific types of cancer.<sup>13</sup>

Social Cognitive Theory (SCT) posits human behaviors are a complex interplay between personal, behavioral, and environmental factors.<sup>14,15</sup> SCT focuses on the individuals' ability to change, build, and interact within their environment. Some of the key concepts of SCT include outcome expectations, self-efficacy, observational learning, incentive motivation, and self-regulation.<sup>14,15</sup> Outcome expectations are the belief in an outcome from a specific behavior, for example, the belief that using diet pills, laxatives or fasting will result in weight loss.<sup>14</sup> Additionally, the outcome expectations can lead to increased disordered eating behaviors. Observational learning can be attributed to mass media, societal pressures to be thin, and

messages from family and peers, which can lead to body dissatisfaction.<sup>14, 16</sup> Body dissatisfaction can include preoccupation with weight, body shape, size, and weight dissatisfaction.<sup>6, 10, 16, 17</sup> The aforementioned personal factors (i.e., weight and attitudes about weight) and behaviors (i.e., fasting and frequent dieting) often lead to an increase in weight dissatisfaction and disordered eating behaviors.<sup>16</sup> Individuals with high body dissatisfaction frequently have diet behaviors, disordered eating behaviors, low self-esteem, and depressive symptoms.<sup>18</sup>

Adolescence is a critical period for the development of body dissatisfaction due to puberty and identity formation. A recent study found almost 50% of adolescents with overweight/obesity were dissatisfied with their bodies, and 9.5% of the sample met the criteria for frequent binge eating.<sup>19</sup> More recent studies noted Hispanic adolescents reported more body dissatisfaction than other ethnicities—62% of females and 52% of males.<sup>8, 16, 20</sup>

The prevalence of disordered eating behaviors and body dissatisfaction in adolescents with overweight/obesity is increasing in Hispanic adolescents. However, there are no screening tools for weight dissatisfaction and disordered eating behaviors validated for this population. This study will examine the validity of the Kids Eating Disorder Survey (KEDS) in Hispanic adolescents. The original KEDS is a 14-item self-report screening tool to assess weight dissatisfaction and purging/restricting behaviors, valid in white adolescents (Appendix 1).<sup>21, 22</sup> The KEDS is based on the DSM-III criteria and a modified version of the Eating Symptoms Inventory (ESI).<sup>22</sup>

The relationship between weight status, body dissatisfaction, and disordered eating behaviors has been well established among predominantly white female adolescent samples<sup>19, 23-</sup><sup>27</sup> and few have included male adolescents.<sup>3, 5, 8, 11, 28-31</sup> However, few studies have examined the

relationships between weight status, body dissatisfaction, and disordered eating behaviors among male and female Hispanic adolescents.<sup>20, 32-34</sup> Ethnic minorities are at a higher risk for obesity and disordered eating behaviors.<sup>8, 12, 35, 36</sup> This study provides health care professionals and educators a validated screening tool for early detection of eating disorder pathology in Hispanic adolescents. Additionally, the study will inform researchers as to the mechanisms behind these behaviors in a Hispanic adolescent population and provide a foundation for further research in this growing population.

## 1.2 Problem Statement and Research Aims

Further research is needed to understand the relationships between disordered eating behaviors, body dissatisfaction, and weight status in Hispanic adolescents. Few studies have examined these behaviors in this population, and even fewer have utilized valid measures.<sup>1, 8, 20, 32-34</sup> Validation of the KEDS as a screening tool for disordered eating behaviors and weight dissatisfaction in Hispanic adolescents will allow an improved understanding of the relationships between these attitudes and behaviors. Identifying the KEDS factorial structure for Hispanic adolescence will provide an appropriate screening tool for this population. Exploring the mechanism relating these attitudes and behaviors will provide a foundation for future research within this population. Evaluating the aforementioned topics within the context of a Hispanic population has yet to be established.

The aims this dissertation addressed are: 1) Determine the validity of the Kids Eating Disorder Survey (KEDS) in a Hispanic adolescent population 2) Examined the prevalence of weight dissatisfaction and purging/restriction behaviors by gender and weight status in Hispanic adolescents 3) Examined the mediating effect of weight dissatisfaction and the moderating effect



of gender, on the relationship between standardized body mass index (zBMI) and disordered eating behaviors in Hispanic adolescents.

The specific research aims and the hypothesis that this study was built upon are described below.

**Study aim 1: Determine the validity of the Kids Eating Disorder survey (KEDS), a self-report screener for purging/restriction behaviors and weight dissatisfaction in Hispanic male and female adolescents.**

Disordered eating behaviors and weight dissatisfaction is a growing problem in Hispanic adolescents. These attitudes and behaviors are linked to obesity, depression, anxiety, and diagnosed eating disorders. There is a lack of validated screeners for disordered eating behaviors and weight dissatisfaction for Hispanic adolescents. This aim was evaluated through the following hypothesis;

*Hypothesis: The KEDS original two-factor structure will be valid in Hispanic adolescents.*

**Study aim 2: Examine the prevalence of weight dissatisfaction and disordered eating behaviors by gender and weight status (under/normal versus overweight/obese).**

Disordered eating behaviors and weight dissatisfaction is a growing problem in Hispanic adolescents. However, there is a lack of research examining the prevalence of these behaviors in male and female Hispanic adolescents with overweight/obesity. This aim was evaluated through the following hypothesis;

*Hypothesis: Hispanic adolescents with overweight/obesity will report higher levels of weight dissatisfaction and disordered eating behaviors than normal-weight peers.*

**Study aim 3: Investigate the mediating role of body dissatisfaction on weight status (zBMI) and purging/restriction behaviors in Hispanic male and female adolescents.**

**Study aim 4: Investigate the moderating role of gender on weight status (zBMI) and purging/restriction behaviors in Hispanic male and female adolescents.**

The growing problem of obesity in minority populations may be contributing to the increase in weight dissatisfaction and disordered eating behaviors in Hispanic adolescents. However, there is a lack of research understanding the relationship between weight status, attitudes, and behaviors in Hispanic adolescents. This aim was evaluated through the following hypotheses;

*Hypothesis 1: Weight dissatisfaction will mediate the relationship between weight status (zBMI) and purging/restriction behaviors in Hispanic adolescents.*

*Hypothesis 2: Gender will moderate the relationship between weight status (zBMI) and purging/restriction behaviors, and the relationship will be stronger in females.*

### 1.3 Outline

An overview of the details provided within this dissertation proposal is as follows.

Chapter 1, the Introduction, presents the topic for this dissertation. It serves as a guide for the chapters that follow.

Chapter 2, the Literature Review, explains the current research available on the topic and identifies limitations in the current knowledge. It further establishes the lack of knowledge on body dissatisfaction and disordered eating behaviors in Hispanic adolescents. After reading this chapter, the reader should understand the purpose of the investigation topic.

Chapter 3, the Methodology, will fully describe the methodology for executing the research necessary to fulfill Research Aims 1, 2, and 3.

## 1.4 Definitions of important terms and abbreviations

BMI- body mass index

zBMI – standardized body mass index

CFA - Confirmatory Factor Analysis

KEDS - Kids Eating Disorder Survey

M-KEDS- Modified – Kids Eating Disorder Survey

SCT - Social Cognitive Theory

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

This literature review intends to provide the reader with an overview of the current research related to the purpose of this dissertation. The current literature review will include the following topics: 1) Disordered Eating Behaviors, 2) Theory, 3) Body Dissatisfaction, 4) BMI, Disordered Eating Behaviors, and Body Dissatisfaction, 5) Significance.

This chapter provides the reader with an understanding of the rationale for this study and will demonstrate the importance of this work to the literature. Overall, this chapter explains why disordered eating behaviors and body dissatisfaction are critical topics and how these terms are defined, and identify current gaps in our knowledge regarding the role of these attitudes, and behaviors in Hispanic adolescents.

#### 2.2 Disordered Eating Behaviors

Diagnosed eating disorders are present in almost 3% of adolescents, with Hispanic adolescents having the highest prevalence (8%) among all racial and ethnic groups in the US.<sup>1</sup> Eating disorders are characterized by the “fear of fatness and pathological preoccupation with weight and shape.”<sup>2</sup> The behaviors reach their peak during ages 14-19, but often last throughout life. Adolescents who develop eating disorders are at a higher risk for developing serious health consequences such as cardiovascular problems, gastrointestinal problems, anemia, dehydration, metabolic disorders, neurological disorders, and death.<sup>2</sup> Often the precursor to diagnosed eating disorders is disordered eating behaviors, including restricting food, fasting, binge eating, purging, use of diuretics, and medications to achieve weight loss.

Disordered eating refers to a myriad of abnormal eating behaviors. The frequency and level of severity of the behaviors are often the difference between a diagnosed eating disorder and disordered eating behaviors. Disordered eating behaviors exist on a continuum ranging from unhealthy behaviors (i.e., chronic dieting) to extreme behaviors (i.e., self-induced vomiting, loss of control around food). Disordered eating behaviors are present in approximately 16% of adolescents, with Hispanic females reporting the highest prevalence (30%).<sup>3</sup> The behaviors are deleterious and can lead to obesity, depression, anxiety, and diagnosed eating disorders.<sup>6, 10</sup> Young adults who attempt unhealthy or extreme weight control behaviors are at a higher risk for becoming involved with tobacco/alcohol use, suicide attempts and unprotected sexual activity.<sup>8, 23, 37</sup> According to Social Cognitive Theory, the development of disordered eating behaviors is multifactorial, including self-efficacy, personal factors, external influences, and behavior.<sup>38, 39</sup>

Disordered eating behaviors frequently begin during adolescence and continue through young adulthood.<sup>40</sup> The behaviors are most prevalent in Hispanic female (55%) and male (47%) adolescents, compared to non-Hispanic white, non-Hispanic black, and non-Hispanic Asian male and female adolescents.<sup>7</sup> Hispanic adolescents report the highest use of unhealthy weight control behaviors, diet pills, diuretics, binge eating, and chronic dieting compared to other racial groups.<sup>8</sup> The majority of the research on this topic is from Project EAT (Eating and Activity over Time), a population study conducted in Minnesota from 1998-2010. The sample included mostly (48%) white male and female adolescents and 6% Hispanic adolescents; a sample size of 273 male and female Hispanic adolescents.<sup>8</sup> Of Hispanic adolescents, 70% of females and 46% of males reported attempting to lose weight.<sup>8</sup> Of those Hispanic adolescents, 64% of females and 40% of males reported using unhealthy weight control behaviors, including fasting, restriction, and cigarette smoking, to achieve weight loss.<sup>8</sup> This study also reported a high prevalence of

extreme weight control behaviors in 11% of female and 3.4% of male Hispanic adolescents.<sup>8</sup> Behaviors such as purging/restricting behaviors included the use of diet pills, diuretics, laxatives, vomiting, and fasting.<sup>21</sup> The use of diet pills during early adolescence is shown to more than triple into young adulthood in males and females.<sup>40</sup> The specific behaviors, unhealthy and extreme weight control behaviors, are higher in Hispanic adolescents<sup>3, 8, 28</sup>. The aforementioned study provided a strong foundation for the need for more research regarding male and female Hispanic adolescents' disordered eating behaviors.

Disordered eating behaviors are even more common in adolescents affected by overweight/obesity.<sup>6, 8, 10, 11</sup> Adolescents who experience both childhood obesity and disordered eating behaviors are at a higher risk for development of health issues such as diagnosed binge eating disorder, depression, anxiety, peer problems and teasing.<sup>41, 42</sup> In a majority-white adolescent sample, 76% of females and 55% of males with obesity reported using unhealthy weight control behaviors (i.e., fasting, binge eating), and 18% of females and 6% of males with obesity reported using extreme weight control behaviors (i.e., purging/restricting).<sup>8</sup> An ethnically diverse adolescent population found at least 18% of both females and males with overweight/obesity reported using unhealthy weight control behaviors.<sup>11</sup> Of Hispanic adolescent females with overweight, 70% reported dieting, 66% reported unhealthy weight control behaviors, and 17% reported overeating.<sup>12</sup> Hispanic adolescent males with overweight also reported high prevalence, 50% reported dieting, 56% reported unhealthy weight control behaviors, and 15% reported overeating.<sup>12</sup> The behaviors are more likely to track into adulthood, increasing the risks for psychological and social problems, including diagnosed eating disorders, depression, and anxiety.<sup>6, 10</sup> Adolescents with disordered eating behaviors and overweight are

also more likely to be affected by obesity as adults and at a higher risk for developing heart disease, type 2 diabetes, metabolic syndrome, and specific types of cancer.<sup>13, 43</sup>

Hispanic male and female adolescents are 1.5 times more likely than their white peers to engage in disordered eating behaviors.<sup>28</sup> Among Hispanic adolescents, 35-43% of males and 45-63% of females reported disordered eating behaviors.<sup>8, 12, 18, 28</sup> A plethora of research has documented that disordered eating behaviors are common in Hispanics during adolescence.<sup>1, 3, 5, 8, 9, 25, 28, 40, 41, 44-48</sup> The majority of these studies have utilized data from Project EAT. The studies include small Hispanic samples suggesting disordered eating behaviors occur in higher frequency among Hispanic youth. Hispanic youth also have higher rates of obesity, and this is a risk factor for developing disordered eating behaviors.<sup>49, 50</sup> Preliminary evidence suggests that disordered eating behaviors are a prevalent problem among Hispanic youth, but more research is needed. The current study provides a foundation in the understanding of disordered eating behaviors and body dissatisfaction in Hispanic adolescents.

### 2.3 Theory

One lens through which to view the development of disordered eating behaviors is Social Cognitive Theory (SCT), a widely-used theory of adolescent behaviors. SCT specifies a “reciprocal determinism,” the dynamic interaction between behavioral, personal, and environmental factors.<sup>14,38</sup> The theory focuses on the individuals’ ability to change, build, and interact within their environment. Some of the key concepts of SCT include outcome expectations, self-efficacy, observational learning, incentive motivation, and self-regulation.<sup>14, 15</sup> This theory proposes individuals go through a cognitive process which is influenced by external

events (i.e., media, peers) and personal factors (i.e., race, gender, weight), which impact their behavior (i.e., weight control behaviors).<sup>15, 38</sup>

SCT has been used in previous work to examine adolescents' eating behaviors and body dissatisfaction specifically. Story, Neumark-Sztainer and French<sup>51</sup> discuss factors influencing eating behaviors of adolescents: the individual, social environment, physical environment, and macro system. Adolescents' attitudes, beliefs, knowledge, and taste preferences influence weight control behaviors (i.e., dieting).<sup>51</sup> The social environment, including friends, family, and peers, influence body image and eating behaviors through observational learning, modeling, reinforcement, social support, and perceived norms.<sup>51</sup> The macrosystem influences adolescents through food advertising and the media. The media conveys social norms through body ideals, diet imagery, and advertising.<sup>52, 53</sup>

Based on SCT, consistent cultural and societal messages portrayed in the media on diet, fashion, fitness, and pharmaceutical industries to achieve the ideal body size has increased the prevalence of disordered eating behaviors.<sup>17, 48, 53, 54</sup> Social networking sites (SNS) have increased our exposure to the media's beauty ideals, increasing internalization, body comparisons, and self-objectification.<sup>17</sup> Based on a systematic review with diverse samples, young adults who have a high use of SNS are at increased risk for developing weight dissatisfaction, drive for thinness, thin-ideal internalization, self-worth based on appearance, self-objectification, and diet behaviors.<sup>17</sup>

The influence of these cultural and societal messages conveyed by the media are not well understood in Hispanic adolescents due to the under-representation of relatable characters in media. The Comprehensive Annenberg Report on Diversity in Entertainment reports only 6% of speaking/named characters in film and television were Hispanic.<sup>55</sup> However, there have been



increases in the representation of young Hispanics in media; these characters are conforming to the thin white ideal.<sup>52</sup> Granatino<sup>52</sup> suggests this is influencing young Hispanic youth to also conform. There is very little research on the influence of parents, peers, and the media in Hispanic adolescents. One study found that social media use increased peer competition, body dissatisfaction, and disordered eating behaviors in Hispanic female adolescents.<sup>56</sup> Others report Hispanic female adolescents were more impacted than white and African American female adolescents by the media.<sup>52</sup> This study will utilize SCT and reciprocal determinism suggested by Bandura, to examine influences on disordered eating behaviors. We theorize observational learning of external body image norms established through the media, peers, and parents influence personal factors (BMI, body dissatisfaction,) which in turn influence behaviors (disordered eating behaviors).<sup>15, 38, 57</sup>

## 2.4 Body Dissatisfaction

Body dissatisfaction refers to a negative assessment of one's shape or weight. This can be a changing perception based on recent changes in weight, shape, eating behaviors, and mood, often linked to an over-evaluation of one's shape and weight.<sup>6, 10, 46</sup> Negative body perceptions are formed as early as childhood, with exposure to unrealistic body ideals for males and females. Females are frequently pressured with a drive for thinness while males are often pressured with a drive for muscularity, both genders suffer from body dissatisfaction due to these unrealistic ideals.

Adolescents with high levels of body dissatisfaction frequently have chronic diet behaviors, disordered eating behaviors, low self-esteem, and depressive symptoms.<sup>18</sup> This attitude can lead to long term deleterious behaviors such as diagnosed eating disorders.<sup>9, 25, 26</sup>

Adolescents are at an increased risk of developing body dissatisfaction during critical periods of puberty and identity formation. They are more likely to engage in disordered eating behaviors (i.e., dieting and binge eating) to control weight and body shape and unlikely to engage in healthy behaviors (i.e., regular exercise and fruit/vegetable intake).<sup>9</sup> In adolescents as body mass index (BMI) increases, so does the level of body dissatisfaction, increasing engagement in disordered eating behaviors and risk for diagnosed eating disorders.<sup>19, 58</sup> Diverse samples of male and female adolescents have found that 60% of females and 28% of males with overweight were dissatisfied with their bodies, those numbers are even higher in adolescents with obesity.<sup>5, 19</sup>

The prevalence of body dissatisfaction in males has increased significantly in the last decade.<sup>47, 52</sup> In male adolescents' body dissatisfaction is often a focus on muscularity.<sup>47, 52, 53</sup> A recent study found that 17% of male adolescents were extremely concerned about their weight and shape, and among young adults, 7.6% were actively using unhealthy means to achieve their ideal muscularity.<sup>59</sup> Males focus on building muscle and losing body fat, excessive behaviors (i.e., bulk and cut, cheat meals, excessive caloric intake) to achieve these goals, can lead to disordered eating behaviors.<sup>30, 59</sup> Male and female adolescents with higher weight status and body dissatisfaction are more likely to experience body dissatisfaction during young adulthood.<sup>60, 61</sup>

A large amount of research has documented body dissatisfaction in adolescents. However, fewer studies have examined this relationship in ethnic minorities, particularly Hispanic adolescents.<sup>5, 18, 20, 33</sup> In diverse samples of adolescents, Hispanic youth consistently report higher than average body dissatisfaction.<sup>18, 33</sup> In Hispanic populations, 62% of female and 52% of male adolescents reported body dissatisfaction, almost all of those adolescents reported trying to lose weight by restricting calories.<sup>20</sup> The majority of the research in this area has

utilized the diverse data from Project EAT, which is not representative of the Hispanic adolescent population. Reina, Monsma, Dumas and Gay<sup>20</sup> examined body dissatisfaction in an all Hispanic population by sport type. Adolescents who participated in sports were more dissatisfied with their body image and more likely to exercise to lose weight than those who did not participate in sports. The aforementioned studies provide a strong foundation for the high prevalence of body dissatisfaction in male and female adolescents.

Body dissatisfaction developed during childhood can lead to diet behaviors, disordered eating behaviors, low self-esteem, and depressive symptoms. Previous research has identified high levels of body dissatisfaction in Hispanic males and females. This research will examine the influence of body dissatisfaction on disordered eating behaviors in Hispanic adolescents.

## 2.5 BMI, Disordered Eating Behaviors and Body Dissatisfaction

Three studies have examined the mediating role of body dissatisfaction between depressive symptoms and disordered eating behaviors as well as BMI and disordered eating behaviors in adolescents.<sup>5, 62, 63</sup> Neumark-Sztainer, Wall, Story and Perry<sup>48</sup>, examined weight concerns as part of a larger model of correlates for unhealthy weight control behaviors in adolescents from Project EAT. The researchers found that the weight-body concerns component mediated the relationship between BMI and unhealthy weight control behaviors, and BMI did not directly influence unhealthy weight control behaviors. A longitudinal study of white Spanish adolescents found body dissatisfaction mediated the relationship between depressive symptoms and disordered eating behaviors, moderated by gender, a stronger effect was found among females than males.<sup>63</sup> However, this study did not include BMI or weight status in its analysis. The third study, Buckingham-Howes, Armstrong, Pejsa-Reitz, Wang, Witherspoon, Hager and

Black<sup>62</sup> found body dissatisfaction mediated the relationship between zBMI and dieting behaviors; however, it did not mediate the relationship between zBMI and purging/restriction behaviors in a sample of African American adolescent females. Previous research has established a mediating relationship of body dissatisfaction on BMI and disordered eating behaviors in other adolescent populations. Besides the previously discussed studies, the research establishing the relationships between BMI, disordered eating behaviors, and body dissatisfaction is noted in ethnically diverse adolescent samples; however, does not focus specifically on Hispanic adolescents. The prevalence of disordered eating behaviors and body dissatisfaction is well documented in diverse samples. Bucchianeri, Fernandes, Loth, Hannan, Eisenberg and Neumark-Sztainer<sup>18</sup> found a positive association between body dissatisfaction, unhealthy, extreme, and binge eating weight control behaviors across the sample, which included Hispanic youth. A recent study conducted in Spain examined the relationship between BMI, disordered eating, and body dissatisfaction in late adolescents. The researchers reported BMI as a significant predictor of disordered eating behaviors in females but not males.<sup>64</sup> This study and others have found body dissatisfaction predicts disordered eating behaviors in males and females.<sup>58, 64</sup> The relationship between BMI, body dissatisfaction, and disordered eating behaviors has been established in ethnically diverse and African American samples of adolescents.<sup>8, 62, 63</sup> However, this relationship in Hispanic adolescents is unclear and even less so in males in this population.

## 2.6 Significance

According to the 2017 US Census, the most substantial minority group and most rapidly growing percentage of adolescents is Hispanics.<sup>36, 49</sup> By 2050, the number of Hispanic adolescents is expected to double.<sup>49</sup> Of these, 26% have obesity, the most of any other ethnic

group.<sup>36</sup> Hispanic adolescents are more likely to have body dissatisfaction and unhealthy weight control behaviors than other racial groups. As the rates of obesity increase, the rates of body dissatisfaction and disordered eating behaviors may also increase, increasing health complications, mental disorders, and diagnosed eating disorders. This study aims to examine this important relationship in a growing population of Hispanic adolescents. This study contributes to the growing body of research examining the critical role of BMI and body dissatisfaction on disordered eating behaviors. This study provides practitioners and clinicians a focus area to identify and intervene with adolescents to prevent further negative health consequences, including diagnosed eating disorders.

## 2.7 Summary

This literature review is intended to provide the reader with a detailed summary of the current knowledge on disorder eating behaviors as a critical topic of health and health consequences. All sections and literature were included in order for the reader to comprehend the background, significance, and underlying mechanisms for the proposed methodology of this research. The next chapter (Chapter 3, Methodology) will explain the procedures and methods of the research, which fulfilled the following three aims to: 1) To determine the validity of the Kids Eating Disorder survey (KEDS), a self-report screener for purging/restriction behaviors and weight dissatisfaction in Hispanic males and females, 2) Examine the prevalence of weight dissatisfaction and disordered eating behaviors by gender and weight status (under/normal versus overweight/obese), and 3) Investigate the mediating role of weight dissatisfaction and the moderating role of gender on weight status (zBMI) and purging/restriction behaviors in Hispanic male and female adolescents.

## CHAPTER 3

### METHODOLOGY

The purpose of this study was to conduct confirmatory factor analysis on the Kids Eating Disorder Survey (KEDS) and mediation/ moderation analysis to determine if weight dissatisfaction influences the relationship between BMI and disordered eating behaviors (binging, purging/restrictive). This chapter will define the research design, sample, measurement tool, and procedures used for the study. The present study was based on data collected from the FLOW Intervention from 2004-2009.

#### 3.1 Dataset

Baseline data from FLOW Intervention, an intervention study of middle school students who attend an urban charter school in the city of Houston, TX, was used for this study. Consent forms were provided to all 6<sup>th</sup> and 7<sup>th</sup>-grade students enrolled in the fall of 2004 and the summer of 2005. All children, regardless of weight, were enrolled in the study with parental consent and child assent. For more details on the original study, see Johnston, Tyler, McFarlin, Poston, Haddock, Reeves and Foreyt<sup>65</sup>. Briefly, the purpose of the study was to test an intensive intervention for weight loss in overweight Mexican American middle school children. Subjects were recruited in five cohorts over five years (2004-2009).<sup>65-68</sup> Participants volunteered for participation with parental consent, followed by child assent. Participants (N=1551) had an average age of 12, were in the 6<sup>th</sup> or 7<sup>th</sup> grade, 54% female, and had an average BMI for age of the 74<sup>th</sup> percentile. Ninety-five percent of the adolescents self-identified as Mexican American. Participants were randomly assigned to one of two groups, intervention (N=755) or self-help (N=639) group. Both groups were focused on increasing healthy eating and physical activity

using behavioral changes. Assessments were collected at baseline, three months, six months, twelve months, 18 months, 24 months, and 60 months. For this study, height, weight, gender, and KEDS variables will be examined from baseline.

## 3.2 Measures

### 3.2.1 Anthropometrics

Participants' height and weight were measured at baseline, 3-months, 6-months, 12 months, 18-months, 24-months, and 60 months. Weights were measured using a digital scale with participants wearing light clothing and no footwear. Height was measured using a stadiometer, with no footwear.

### 3.2.2 Weight Status

Weight Status was directly assessed with Body Mass Index (BMI) for age, weight status categories and the corresponding percentiles were based on the prevention guidelines established by the Centers for Disease Control (CDC).<sup>69</sup> Growth chart percentiles established by the CDC were used to classify participants as underweight (less than the 5<sup>th</sup> percentile), normal weight (5<sup>th</sup> percentile to less than the 85<sup>th</sup> percentile), overweight (85<sup>th</sup> to less than 95<sup>th</sup> percentile), and obese (95<sup>th</sup> percentile or greater).<sup>69, 70</sup> Participants were classified as having under/normal weight or overweight/obesity. Standardized BMI (zBMI) was calculated using age and gender-normative data from the Centers for Disease Control and Prevention.<sup>70</sup>

### 3.2.3 Kids Eating Disorder Survey (KEDS)

The Kids Eating Disorder Survey (KEDS) is a 14-item self-report screening tool to assess weight dissatisfaction and purging/restricting behaviors.<sup>21, 22</sup> (Appendix 1). KEDS was developed in the early 1990s to assess these behaviors in children and adolescents. Previous measures were designed for adults and focused on restricting behaviors; however, they did not assess the use of diet pills, laxatives, diuretics, and fasting behaviors. Based on the DSM-III, KEDS is a modified version of the Eating Symptoms Inventory (ESI) developed by Whitaker, Davies, Shaffer, Johnson, Abrams, Walsh and Kalikow<sup>71</sup>. The KEDS items were developed to measure two dimensions—weight dissatisfaction and purging/restriction behaviors.<sup>21, 22</sup> Weight dissatisfaction includes questions regarding wants to lose weight, felt looked fat to others, dieted to lose weight, exercised a lot to lose weight, afraid to eat due to weight gain, frequent binge eating, and body dissatisfaction. The purging/restricting scale includes the use of diet pills, diuretics, laxatives, vomiting, and fasting to lose weight (Table 1). Scoring was described by Marx<sup>72</sup>, for items 1-10, score yes = 2, ?= 1, and no=0. Frequent binge eating is the sum of items 11 and 12; if the sum  $\leq 5$  the score is zero, if the sum = 6 than score is one, and a sum  $\geq 7$  the score is two.<sup>72</sup> Item 12 assesses body dissatisfaction with two sets of eight child figure drawings adapted from Stunkard, Sorensen and Schulsinger<sup>73</sup> The use of these child figures has been validated in adolescent populations.<sup>74, 75</sup> Adolescents are instructed to circle the image most like them and underline their desired body image. The body dissatisfaction score is obtained by subtracting the underlined drawing from the circled drawing. A difference less than or equal to two yields a body dissatisfaction score of 0; if the difference is three, then the body dissatisfaction score is one, and if the difference is greater than or equal to four, the body dissatisfaction score is two.<sup>72</sup> The original KEDs validation study found, the Cronbach's Alpha



was 0.73.<sup>22</sup> The total score test-retest correlation was 0.83.<sup>22</sup> The principal component analysis revealed two components, weight dissatisfaction, and purging/restricting behaviors.<sup>21, 22</sup>

Although two items, frequency of binge eating and body dissatisfaction, loaded less than 0.40 on any component.<sup>21, 22</sup>

**Table 1: Kids Eating Disorder Survey items by construct**<sup>22</sup>

<b>Component 1: Weight Dissatisfaction</b>	<b>Component 2: Purging/Restricting</b>
1. Wants to lose weight now	8. Used diet Pills
2. Felt looked fat to others	9. Used diuretics
4. Dieted to lose weight	10. Use laxatives
7. Exercised a lot to lose weight	6. Vomited to lose weight
3. Afraid to eat because of weight gain	5. Fasted to lose weight
11. & 12. Frequent binge eating	
13. & 14. Body dissatisfaction	

### 3.3 Methodology for Manuscript 1

The KEDS is a widely used self-report screening tool for adolescents measuring weight dissatisfaction and purging/restricting behaviors. Based on Childress, Jarrell and Brewerton<sup>22</sup>, the KEDS was developed with two components identified. Interviews and test-retest procedures were used to validate the original KEDS.<sup>21, 22, 76</sup> In a cross-sectional study of White, African American, and other male and female adolescents.<sup>21, 22</sup> The original validation study found two components with twelve items, two items (frequent binge eating and body dissatisfaction) loaded less than 0.40 on any component.<sup>22</sup> Childress, Brewerton, Hodges and Jarrell<sup>21</sup> reported a significant difference between males and females on fasting (females) and binge eating (males),

no other significant difference between gender were found <sup>21</sup>. Regarding race, significant differences were found in females across; “wants to lose weight now,” “felt looked fat to others,” “afraid to eat because of weight gain,” and “dieted,” with the highest prevalence in white and other ethnicities.<sup>21</sup> In males, a significant difference by race was found in, "wants to lose weight now" and "exercised to lose weight." <sup>21</sup> For females, the weight dissatisfaction component and the total score were significantly different by race.<sup>21</sup> Based on this, it appears essential to continue to evaluate the components of the KEDS and to examine the factor structure in a Hispanic adolescent population.

### 3.3.1 Sample Selection for Manuscript 1

The initial sample of 1551 adolescents was reduced to only include those who completed the KEDS in full at baseline (N= 690). Participants were eliminated from analyses due to missing baseline data on gender (n=2), and incomplete KEDS (n=861). The final analytical sample included 690 adolescents. One way univariate analyses of variance tests (ANOVA) were utilized to compare excluded individuals from those included in the analytical sample.

### 3.3.2 Data Analysis for Manuscript 1

Descriptive Statistics (means, frequencies, and standard errors) and Pearson’s correlations were conducted using SPSS version 25 statistical software.<sup>77</sup> One-way ANOVAs and chi-squares analyses will be used to identify differences by gender. All analysis was performed using Mplus.<sup>78</sup> The confirmatory factor analysis (CFA) models with dichotomous items were estimated using robust weighted least squares (WLSMV) estimation, this accommodates for dichotomous data and provides robust standard errors and adjusted test statistics.<sup>79</sup> Recommendations for

sample size are varied, but a critical sample size of 200 participants in each group is required.<sup>80</sup> Data was screened for violations of the normality assumption and outliers. Participants with missing data were excluded. Various factorial solutions, including the original KEDs two-factor, one-factor, and M-KEDs modified two-factor models, were tested. In the two factor models, the factors (weight dissatisfaction, and purging/restriction) were highly correlated (the correlation factors range from 0.58 to 0.74 in our sample).

Evaluation of global model fit was based on the model chi-square statistic, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA)<sup>81</sup>. Hu and Bentler<sup>82</sup> suggested the following acceptable cutoff criteria: TLI > .95, CFI > .95, and RMSEA < .06. The model Chi-Square statistic tests how closely the model-based covariance matrix reproduces the observed sample covariance matrix (i.e., the tested model is rejected if the p-value is significant).<sup>81</sup> Because the model chi-square test can be sensitive to sample size,<sup>81</sup> less weight was given to its significance during model fit evaluation relative to the other global model fit criteria.<sup>81, 83, 84</sup> CFI compares the fit of the tested model to that of an independence (null) model, as does the TLI which is a non-normed fit index that additionally imposes a greater relative penalty for model complexity.<sup>81</sup> RMSEA is a closeness or “error of approximation” index (values very close to 0 represent a good fit) and provides a confidence interval around its point-estimate.<sup>81</sup> The RMSEA “close-fit test” is also reported; if its p-value is greater than 0.05, then we cannot reject the null hypothesis (i.e.,  $H_0: RMSEA \leq .05$ ) and the specified model has a “close fit.”<sup>81</sup> All results were screened for Heywood cases (i.e., negative variance estimates, out-of-range standardized loadings) and high rates of significant standardized residuals (i.e., a ratio of covariance residuals over the standard error) to assess local model misfit. The models tested include the original two-factor KEDs by Childress, Jarrell and

Brewerton <sup>22</sup>, a one-factor solution, and following modifications of the modified two-factor model (M-KEDs).

### 3.4 Methodology for Manuscript 2

#### 3.4.1 Sample Selection for Manuscript 2

The initial sample from Manuscript 1 will be retained in Manuscript 2. Therefore, sample demographics and missing data will remain the same.

#### 3.4.2 Data Analysis for Manuscript 2

Data was analyzed using SPSS (Version 25, IBM) with standard parametric and non-parametric methods. Chi-square tests were used to compare by gender and weight class (under/normal weight verse overweight/obesity) on the eight items of the M-KEDS. Component scores and total scores were analyzed using the Mann-Whitney U test.

### 3.5 Methodology for Manuscript 3

#### 3.5.1 Sample Selection for Manuscript 3

The initial sample from Aim 1 will be retained in Aim 3. Therefore, sample demographics and missing data will remain the same.

#### 3.5.2 Data Analysis for Manuscript 3

All analysis was performed using SPSS (Version 25). Descriptive statistics for the sample characteristics were conducted. Data was screened for errors and outliers before analysis. Means and standard deviations were completed by gender. Bivariate correlations between the outcome variable and associated factors were tested using Pearson correlation analysis. Mediation and moderation were evaluated by the PROCESS macro of SPSS developed by Hayes <sup>85</sup>. In this

method, effects are assessed with bias-corrected bootstrap confidence intervals that are significant when the upper and lower bound of the bias-corrected 95% confidence interval (CI) do not contain zeros.<sup>85</sup> Mediation is assessed by the indirect effect of X (zBMI) on Y (Purging/restrict behaviors) through M (weight dissatisfaction). Moderation is assessed by the interaction of W (gender) on each of the variables. Bootstrapping with 5000 samples was utilized for analysis, the assumption of normality is not required for this method.<sup>85</sup> Criteria established by Hayes<sup>85</sup> was used to determine the significance of mediation and moderation using bootstrapping procedures.

## Chapter 4 Manuscript 1

### Development of the modified Kids Eating Disorder Survey (M-KEDs): A Validation Study with Hispanic Adolescents

#### 4.1 Introduction

Diagnosed eating disorders are present in almost 3% of adolescents in the U.S., with Hispanic adolescents having the highest prevalence (8%).<sup>1</sup> Diagnosed eating disorders are characterized by disordered eating behaviors and a preoccupation with shape and weight.<sup>2</sup> Adolescents who develop diagnosed eating disorders are at high risk for developing severe health consequences such as cardiovascular problems, gastrointestinal problems, anemia, dehydration, metabolic disorders, neurological disorders, and death.<sup>2</sup> Precursors to diagnosed eating disorders are body dissatisfaction and disordered eating behaviors, such as frequent dieting, caloric restriction, fasting, binge eating, purging, and the use of diuretics. Which are present in approximately 16% of adolescents, with Hispanic females reporting the highest prevalence (30%).<sup>3</sup> The behaviors are deleterious and can lead to obesity, depression, anxiety, and diagnosed eating disorders.<sup>6, 10</sup> Project EAT (Eating and Activity over Time), a research study on adolescents eating behavior, found that 70% of female and 46% of male Hispanic adolescents reported attempting to lose weight.<sup>8</sup> Of those, 64% of females and 40% of males reported using unhealthy weight control behaviors, including fasting, restriction, and cigarette smoking, to achieve weight loss.<sup>8</sup> The detrimental weight behaviors are likely to track into adulthood, increasing risks for obesity, psychological and social problems, diagnosed eating disorders, depression, and anxiety.<sup>6, 10, 86</sup>

Hispanic adolescents also report higher than average body dissatisfaction compared to their non-Hispanic peers.<sup>18, 33</sup> Reina, Monsma, Dumas and Gay<sup>20</sup> reported 62% of female and

52% of male Hispanic adolescents reported body dissatisfaction. Hispanic adolescents are the most substantial minority group and most rapidly growing proportion of adolescents, according to the 2017 US census.<sup>36, 49</sup> Importantly, much of the previous research has been conducted with ethnically diverse populations, including only small samples of Hispanic adolescents. Thus, there is a need for an improved understanding of disordered eating behaviors and body dissatisfaction in Hispanic adolescents.

Researchers and clinicians rely on validated measures to identify adolescents at risk for these behaviors, such as the Children's Eating Attitudes Test (ChEAT) and the Eating Symptoms Inventory (ESI).<sup>71, 87</sup> Compared to these other tools, the Kids Eating Disorder Survey (KEDS) is a short (14-item) self-report screener, assessing the perception of appearance and disordered eating behaviors. KEDS was validated on a sample of 5-8<sup>th</sup> grade white male and female adolescents.<sup>21, 22</sup> While the KEDS is used widely to screen for these behaviors in the U.S., its validation for non-White adolescent populations is lacking.<sup>21, 22</sup>

#### *Kids Eating Disordered survey (KEDS)*

The Kids Eating Disordered survey (KEDS) assesses weight dissatisfaction and disordered eating behaviors in non-clinical adolescent populations.<sup>21, 22, 88-91</sup> The KEDS is a short screening tool based on the Eating Symptoms Inventory (ESI), a comprehensive self-report instrument with 24 sets of questions addressing the cardinal features of anorexia and bulimia.<sup>71</sup> The ESI is a valid questionnaire with high sensitivity and specificity for high school students.<sup>71</sup> Therefore, an abbreviated version, the KEDS, was developed for middle school adolescents.<sup>22</sup> The initial development of the KEDS was tested on clinical and non-clinical 5-8<sup>th</sup> grade males and females. The validity and reliability of the KEDS is limited to the initial study sample.<sup>21, 22</sup>

The KEDS includes two components: weight dissatisfaction and purging/restricting behaviors.<sup>22</sup> The weight dissatisfaction component includes questions regarding want to lose weight, felt looked fat to others, afraid to eat because of weight gain, tried to lose weight by dieting, frequent binge eating, and body dissatisfaction. The purging/restricting component includes the use of diet pills, diuretics, laxatives, vomiting, and fasting to lose weight. Although the KEDS has high internal consistency and test-retest reliability, two items (frequent binge eating and body dissatisfaction) loaded less than 0.40 on either component.<sup>22</sup> Childress, Jarrell and Brewerton<sup>22</sup> noted in their validation study the adolescents frequently asked for clarification on the binge eating items due to a lack of understanding of the specific amounts and frequency of the foods. The body dissatisfaction item was assessed with body image silhouettes. The body image silhouettes have been utilized separately from the KEDs in several studies and have been validated in girls.<sup>62, 76, 92-94</sup> Due to the issues with the frequency of binge eating and body dissatisfaction items, researchers handle these two items differently during statistical analysis. Some included the items, and others have excluded them from total and subscale scores<sup>71, 91</sup>. Another study utilized interviews and food models to address these issues<sup>89</sup>. The lack of consistent methods when using the KEDS has made comparing the results very challenging. There is a need to clarify these issues with the KEDS, and develop it as a valid screener for weight dissatisfaction and purging/restriction behaviors in Hispanic adolescents.

### *Current Study*

To further understand weight dissatisfaction and purging/restricting behaviors in young adolescents, the present cross-sectional study will investigate the properties of the KEDS in a U.S. Hispanic adolescent population. Specifically, we examined the factorial structure of this screener to evaluate the extent to which the KEDS provides a precise and robust measure of



weight dissatisfaction and purging/restriction behaviors in Hispanic male and female adolescents. Testing the measure within this population allowed us to assess the validity of the KEDS within this rapidly growing population.

## 4.2 Methods

### *Study Population*

The overall study population consists of 1551 adolescents from the FLOW Intervention, a longitudinal intervention study of middle school students who attended an urban charter school in the city of Houston, TX. Subjects were recruited in five cohorts over five years (2004-2009)<sup>65-68</sup> For more details on the original study, see Johnston, Tyler, McFarlin, Poston, Haddock, Reeves and Foreyt<sup>65</sup>. Briefly, the purpose of the study was to test an intensive intervention for weight loss in overweight Mexican American middle school children. Participants (N=1551) had an average age of 12 (SD  $\pm$  0.7), were in the 6<sup>th</sup> or 7<sup>th</sup> grade, 54% female, and had an average weight in the 74<sup>th</sup> percentile (SD  $\pm$  28.0). Ninety-five percent of the adolescents self-identified as Mexican American. Participants were randomly assigned to one of two groups, intervention (N=755) or self-help (N=639) group. Both were focused on increasing healthy eating and physical activity using behavioral changes. Assessments were collected at baseline, three months, six months, 12 months, 18 months, 24 months, and 60 months.

Data for the present study were drawn from the baseline of the FLOW intervention. The initial sample of 1551 adolescents was reduced to only include those who completed the KEDs in full at baseline (N= 690). Participants were eliminated from analyses due to missing baseline data on gender (n=2) and an incomplete KEDs questionnaire (n=861). The final analytical sample included 690 adolescents. One way univariate analyses of variance tests (ANOVA) were utilized to compare excluded individuals from those included in the analytical sample; there were

no significant differences between the sample and excluded participants on all measures included in this study ( $p > .05$ ).

### *Kids Eating Disorder Survey (KEDS)*

The KEDS items were developed to measure two dimensions—weight dissatisfaction and purging/restriction behaviors.<sup>21, 22</sup> Weight dissatisfaction includes questions regarding wants to lose weight, felt looked fat to others, dieted to lose weight, exercised a lot to lose weight, afraid to eat due to weight gain, frequent binge eating, and body dissatisfaction. The purging/restricting scale includes the use of diet pills, diuretics, laxatives, vomiting, and fasting to lose weight. Scoring was described by Marx<sup>72</sup>, for items 1-10, score yes = 2, ? = 1, and no=0. Frequent binge eating is the sum of items 11 and 12; if the sum  $\leq 5$  the score is zero, if the sum = 6, the score is one, and for a sum  $\geq 7$  the score is two.<sup>72</sup> Item 12 assesses body dissatisfaction with two sets of eight child figure drawings adapted from Stunkard, Sorensen and Schulsinger<sup>73</sup> The use of the child figures has been validated in adolescent populations.<sup>74, 75</sup> Adolescents are instructed to circle the image most like them and underline their desired body image. The body dissatisfaction score was obtained by subtracting the underlined drawing from the circled drawing. A difference less than or equal to two, yields a body dissatisfaction score of 0; if the difference is three, then the body dissatisfaction score is one, and if the difference is greater than or equal to four, the body dissatisfaction score is two.<sup>72</sup>

### 4.3 Analysis

All analysis were performed using Mplus (Version 8).<sup>78</sup> All final Confirmatory Factor Analysis (CFA) models with dichotomous items were estimated using robust weighted least

squares (WLSMV) estimation, which accommodates for dichotomous data and provides robust standard errors and adjusted test statistics.<sup>79</sup> Recommendations for sample size are varied, but a critical sample size of 200 participants in each group was required.<sup>80</sup> Various factorial solutions, including the original KEDs two-factor, one-factor, and M-KEDs modified two-factor models, were tested.

Evaluation of global model fit was based on the model chi-square statistic, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA)<sup>81</sup>. Hu and Bentler<sup>82</sup> suggested the following acceptable cutoff criteria: TLI > .95, CFI > .95, and RMSEA < .06. The model Chi-Square statistic tests how closely the model-based covariance matrix reproduces the observed covariance matrix (i.e., the tested model is rejected if the p-value is significant).<sup>81</sup> Because the model chi-square test can be sensitive to sample size, less weight was given to its significance during model fit evaluation relative to the other global model fit criteria.<sup>81, 83, 84</sup> CFI compares the fit of the tested model to that of an independence (null) model, as does the TLI which is a non-normed fit index that additionally imposes a greater relative penalty for model complexity.<sup>81</sup> RMSEA is a closeness or “error of approximation” index (values very close to 0 represent a good fit) and provides a confidence interval around its point-estimate.<sup>81</sup> The RMSEA “close-fit test” is also reported; if its p-value is greater than 0.05, then we cannot reject the null hypothesis (i.e.,  $H_0: RMSEA \leq .05$ ) and the specified model has a “close fit.”<sup>81</sup> All results were screened for Heywood cases (i.e., negative variance estimates, out-of-range standardized loadings) and high rates of significant standardized residuals (i.e., a ratio of covariance residuals over the standard error) to assess local model misfit. The models tested include the original two-factor KEDs by Childress, Jarrell and Brewerton<sup>22</sup>, a one-factor solution, and following modifications the modified two-factor model (M-KEDs).

## 4.4 Results

### *Participants*

Demographic characteristics are shown in Table 2. Ninety-five percent of the adolescents self-identified as Mexican American. The sample had a mean age of 12 years, and most were female (53%) and had a mean BMI for age in the 73<sup>rd</sup> percentile.

Table 2: Demographic data for participants (N=690)

Demographic variable	Mean $\pm$ SD
Age	12.1 $\pm$ 0.7
BMI percentile	73 <sup>rd</sup> $\pm$ 28.0
zBMI	0.92 $\pm$ 1.1

### *Models Tested*

#### 1. Original two-factor KEDS model

In preliminary analyses, the original two-factor KEDs model was tested, consistent with Childress, Jarrell and Brewerton<sup>22</sup>, specifying the KEDs items as continuous indicators. Because results revealed a Heywood case, item distributions were examined in more detail. The observed frequency of the “?” response option for items 1-10 was very low (i.e., ranging from 0.3 to 3.5 %). Therefore, items 1-10 were recoded as dichotomous indicators for this study and all results reported hereafter are based on CFA models with dichotomous KEDs items. Specifically, item responses coded as “yes” were coded as a value of “1”, all other responses (“no,” “?”) were coded as a value of “0”. After recoding the KEDS items as dichotomous measures, the Kuder-Richardson Formula 20 (KR-20), non-parametric equivalent to Cronbach’s alpha, was used to evaluate internal consistency.<sup>95</sup> A KR-20 coefficient  $\geq 0.70$  is considered to indicate that the measure is internally consistent.<sup>96</sup> This model was internally consistent (KR-20 = 0.67). However, the dichotomous model was also not supported due to Heywood cases (Table 5).

## 2. One-factor KEDS model

Due to reasonably strong floor effects (i.e., 90% to 99% of the cell counts were “no”) found in the first model, five items were collapsed into one item (new Item 5). Floor effects were observed in items 5, 6, 8, 9, and 10. These items asked about extreme eating behaviors such as; fasting, vomiting, diet pills, diuretics, and laxatives. These five items were collapsed into a single measure, yes =1 if any of these behaviors are present or no=0 if none of these behaviors are present, to avoid model estimation problems due to sparse data. Given the content and age of participants, it is not surprising to receive strong floor effects for these items.<sup>40</sup> After combining items, this model was internally consistent (KR-20 = 0.69) but did not improve the model fit of the two-factor original KEDS model.

## 3. Modified two-factor KEDS – M-KEDS

Two items, frequency of binge eating and body dissatisfaction items were explored further due to failure to load significantly and low factor loadings in previous models, consistent with the original validation study.<sup>22</sup> The original two-factor KEDS by Childress, Jarrell and Brewerton<sup>22</sup> was validated with principal component analysis. However, the same two items failed to load; frequency of binge eating and body dissatisfaction. For the frequency of binge eating items (sum of items 11 & 12), the authors cited young participants had difficulty understanding the examples of specific foods and frequencies.<sup>22</sup> The current study also found the frequency of binge eating did not significantly correlated to any other items ( $p=0.40$ ). Attempts were made to recode and separate the items. However, all attempts showed no improvement. Therefore, this item was dropped from the M-KEDS.

Body dissatisfaction also failed to load on any factor in the Childress, Jarrell and Brewerton<sup>22</sup> study. However, in the current study, it did load significantly ( $p=0.001$ ). The original KEDS scoring of this item only identifies adolescents who wish to be three body sizes smaller than their current size. Body dissatisfaction is a perceived discrepancy between actual and desired appearance. Therefore, a difference of one body size up or down would be body dissatisfaction. Other studies have used this method to calculate body dissatisfaction.<sup>92-94</sup> Therefore, this item was recoded into “0” equals no desired change in body size, and “1” equals a positive or negative desired to change body size.

The original KEDS discusses assessing a “reliable method for screening for eating disordered behaviors and attitudes,” however, the subscales are not clearly separated by behaviors and attitudes.<sup>21, 22, 72</sup> Therefore, dieting and exercising to lose weight are behaviors and were moved to the purging/restriction subscale. This is consistent with other research in this area; Project EAT assesses dieting and disordered eating behaviors together.<sup>5, 18, 25, 40, 41</sup>

In the two factor models, the factors (weight dissatisfaction, and purging/restriction) were highly correlated (the correlation factors range from 0.58 to 0.74 in our sample). The number and the percentage of adolescents who endorsed each item of the M-KEDS are shown in Table 3. The correlation matrix used for the dichotomous M-KEDS items is shown in Table 4. The fit statistics for each of the three models (original KEDS two-factor, one-factor, and M-KEDS modified two-factor) are presented in Table 5.

Table 3: Descriptive statistics of dichotomous items of the M-KEDs 12 items in Hispanic adolescents (N=690)

ITEM	ITEM #	N (%)
<b>WEIGHT DISSATISFACTION</b>		
Do you want to lose weight now?	1	415 (60)
Have you ever thought that you looked fat to other people?	2	301 (44)
Have you ever been afraid to eat because you thought you would gain weight?	3	200 (29)
Body Dissatisfaction	11/12	505 (73)
<b>PURGING / RESTRICTION</b>		
Have you ever tried to lose weight by dieting? (dieting means eating at least some food, but less than you usually eat.)	4	250 (36)
Have you ever exercised to lose a lot of weight? (a lot means more than one hour every day.)	7	265 (38)
Have you ever tried to lose weight by fasting?	5	88 (13)
Have you ever made yourself throw up (vomit) to lose weight?		
Have you ever taken diet pills, diuretics, water pills, or laxatives to lose weight?		
<b>M-KEDS</b>	<b>1-12</b>	<b>(KR-20=0.77)</b>

Note. KR-20: The Kuder Richardson Coefficient of reliability, which is a non-parametric equivalent to Cronbach's alpha.

Table 4: Correlation Matrix used for M-KEDs CFA in Hispanic adolescents (N=690)

ITEM #	1	2	3	11/12	4	7
1						
2	.51*					
3	.32*	.39*				
11/12	.45*	.33*	.26*			
4	.48*	.40*	.37*	.26*		
7	.42*	.28*	.15*	.20*	.38*	
5	.24*	.22*	.33*	.15*	.32*	.25*

\*p≤.05

### Final Model

Of the three models tested, the first two had floor effects and contained Heywood cases, therefore the model estimates could not be interpreted. Modifications were made, and the M-KEDS was tested. The M-KEDS showed good fit to the data. Although the M-KEDs two factor model chi-square test was statistically significant ( $p = 0.000$ ), its other model fit indices (e.g., CFI = 0.99, TLI = 0.98, RMSEA = 0.06 (90% C.I.: 0.04, 0.08), indicate the model fit is acceptable. The M-KEDS parameter estimates are all statistically meaningful (see Table 6).<sup>97</sup>

The internal consistency for M-KEDs measured by KR-20 was 0.77, demonstrating good internal

consistency.<sup>95, 96</sup> Internal consistency was also examined by gender; males' KR-20 was 0.78, and females' KR-20 was 0.77, validating the internal consistency of the M-KEDs in both male and female Hispanic adolescents.<sup>95, 96</sup> The M-KEDs showed the best model fit for this sample of Hispanic adolescents.

Table 5: Goodness of fit statistics for tested models for the KEDS in Hispanic adolescents (N=690)

MODEL	X <sup>2</sup>	DF	NFParm	CFI	TLI	RMSEA [90% CI]	RMSEA CLOSE-FIT P
Original KEDS Two-Factor CFA	86.617	53	27	.98	.98	.031 [.019, .042]	0.998
One-Factor CFA	73.853	20	18	.97	.96	.062 [.048, .078]	0.013
M-KEDS Two –Factor CFA	46.992	13	15	.99	.98	.062 [.043, .081]	0.142

All CFA models reported in this table were tested using dichotomous KEDS items. CFI =comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean squared error of approximation; NFParm = number of free parameters; CFA = confirmatory factor analysis;

Table 6: Results of M-KEDs CFA model in Hispanic adolescents (N=690)

ITEMS	Proportion of explained variance (SE)	Standardized (SE)	Unstandardized (SE)
<b>Weight dissatisfaction</b>			
1. Do you want to lose weight now?	0.92 (0.06) *	0.96 (0.03)	1.00
2. Have you ever thought that you looked fat to other people?	0.62 (0.05) *	0.79 (0.03)	0.82 (0.05)
3. Have you ever been afraid to eat because you thought you would gain weight?	0.48 (0.06) *	0.70 (0.04)	0.72 (0.05)
7 & 8 Body dissatisfaction	0.47 (0.05) *	0.69 (0.04)	0.72 (0.05)
<b>Purging/restriction</b>			
4. Have you ever tried to lose weight by dieting? (dieting means eating at least some food, but less than you usually eat.)	0.73 (0.06) *	0.86 (0.03)	1.00
7. Have you ever exercised to lose a lot of weight? (a lot means more than one hour every day.)	0.43 (0.05) *	0.66 (0.04)	0.77 (0.05)
5. Have you ever tried to lose weight by fasting? Have you ever made yourself throw up (vomit) to lose weight? Have you ever taken diet pills, diuretics, water pills, or laxatives to lose weight?	0.50 (0.07) *	0.70 (0.05)	0.82 (0.06)

The first item of each factor was treated as the marker indicator by default in Mplus. Switching marker indicators did not change the results.  
\*p≤.001, two-tailed



## 4.5 Discussion

Hispanic adolescents are the most rapidly growing group of adolescents. They also have the highest prevalence of disordered eating behaviors and body dissatisfaction of any other group.<sup>8, 18, 36</sup> However, presently, there was a gap in the literature of a validated screening tool for detrimental disordered eating behaviors in Hispanic adolescents. The purpose of this study was to validate the original factor structure of the KEDS in Hispanic adolescents.<sup>21, 22</sup> Not surprisingly, the original two factor KEDS was a poor fit, given the previous miss fit of two items, frequent binge eating and body dissatisfaction in the original validation.<sup>22</sup> Confirmatory factor analysis found the modified 12 item, two-factor structure M-KEDS was an acceptable fit to the data in our sample.

Importantly, our study recommended a useful alternative approach for evaluating the factorial structure of the KEDS, the M-KEDS. The development of the M-KEDS focused on several issues within the original KEDS. The first issue was the failure to statistically load two items, frequent binge eating and body image. Researchers have lacked consensus on how to deal with these items. Some researchers have utilized interviews and food models in addition to the KEDS. This allowed researchers to provide adolescents with examples of the amount and frequency of binge eating episodes. Interviews provided access to the research team for an explanation of the frequency of binge eating and body dissatisfaction items.<sup>89</sup> Dalton, Johnston, Foreyt and Tyler<sup>91</sup> chose to remove these items when calculating the scale in a sample of Hispanic adolescents.<sup>71, 91</sup> Others have chosen to use the scale with the items included.<sup>89</sup> In this study, several attempts were made to recode frequent binge eating items using the foundation of the KEDS, the original EAT measure, none of these were significantly related to the other items in the KEDS and created local misfit.<sup>87</sup> Therefore it was decided to remove these items. The

implications for removing the aforementioned items are the screening tool is no longer assesses binge eating behaviors. Future research is needed to develop more specific questions to assess this behavior in adolescents.

The other item that failed to load in the original KEDS is body dissatisfaction, which is utilized to assess body image. The original KEDS only accounted for adolescents who wished to be three body sizes smaller than their current size. Body dissatisfaction is a perceived discrepancy between actual and desired appearance.<sup>98</sup> Therefore, a difference of one body size up or down would potentially be classified as body dissatisfaction. Other studies have used this method to calculate body dissatisfaction.<sup>92-94</sup> In the M-KEDS, body dissatisfaction was recoded to include all levels of body dissatisfaction. Clinically it is essential to identify adolescents with positive or negative body dissatisfaction.

Other issues with the original KEDS included the “?” option choice and low response rates of items. The “?” option was selected less than 4.5% of the time, our findings demonstrated the need for dichotomous answer choices. As well as the low response rate of items 5, 6, 8, 9, 10, therefore were combined due to the low prevalence of fasting, vomiting, diet pills, diuretics, and laxatives behaviors. This was expected in this population. Project EAT found only 5% of all Hispanic males and females and 10% of Hispanic males and females with overweight, reported these specific behaviors.<sup>40</sup> This is consistent with the results from this study; 13% of participants report these behaviors.

The final modification was made to examine behaviors and attitudes separately, as proposed by the original KEDS.<sup>21, 22, 72</sup> Items 4 and 7 addressed dieting and exercising behaviors to lose weight and were therefore moved to the purging/restriction subscale. This was consistent with other research in this area. EAT 2010 assesses dieting and disordered eating behaviors

together in adolescents.<sup>5, 18, 25, 40, 41</sup> These modifications were necessary to address issues of the original KEDS and provide a foundation for future research, as well as a consensus among researchers in this field. The modifications made to the original KEDS led to the development of the M-KEDS. An improved and validated screener for weight dissatisfaction and purging/restriction behaviors in Hispanic adolescents.

Although our findings demonstrate the M-KEDs potential utilization as a screening tool for weight dissatisfaction and purging/restriction behaviors in male and female Hispanic adolescents, we must consider some limitations. First, the data utilized in the study was self-reported by the adolescent; therefore, may contain potential bias. Second, the items were recoded as dichotomous due to floor effects of the “?” answer choice. The items appeared to be confusing to the participants and were selected very few times. Due to this, the items were conservatively recoded as “no.” Third, this sample was based on one sample of Hispanic adolescents from one school district. More samples from different populations are needed to cross-validate our findings and gain a better understanding of the factorial structure. Finally, the proposed screening tool does not include binge eating behaviors, that was necessary to remove the frequent binge eating item due to failure to load from the original KEDs internal reliability and the confirmatory factor analysis. The results of this study agree with Childress.<sup>21, 22</sup> The examples and wording of these questions were confusing to the adolescents.<sup>22</sup> Therefore, for clarity of this study and future research, frequent binge eating questions needed to be removed.

#### 4.6 Conclusion

Our analysis presents several intriguing findings concerning the KEDS with Hispanic male and female adolescents. First, this study recommended using an alternative approach for

evaluating the factorial structure of the KEDS, with dichotomous item measures. Second, although the original KEDS has a valid factor structure, modifications were required due to local misfit. The new M-KEDS proposed in this study improved model fit and was valid with male and female Hispanic adolescents. Cross-validation of the M-KEDS factor structure with independent Hispanic samples is indicated.

## **Chapter 5**

### **Manuscript 2**

#### **The Modified Kids Eating Disorder Survey (M-KEDS): A study of Hispanic adolescents**

##### 5.1 Introduction

Diagnosed Eating disorders, as defined in the Diagnostic and Statistical Manual of Mental Disorders (DSM), are characterized by severe and frequent levels of disordered eating behaviors, excessive exercise, and an unhealthy preoccupation with one's weight or shape.<sup>4</sup> Eating disorders take on many different forms; anorexia nervosa, bulimia nervosa, and binge eating disorder are the most common. A variety of factors determine the risk for developing eating disorders, including; neurobiology, personality, family, peer group, and social environment.<sup>2</sup> The health consequences related to eating disorders, such as muscle wasting, heart failure, cardiovascular complications, gastroparesis, constipation, pancreatitis, bone loss, and kidney failure, are severe and detrimental.<sup>2</sup> Eating disorders affect both genders and ethnicities, with serious physical and mental consequences.

In adolescent populations, diagnosed eating disorders are present in almost 3%, with Hispanic adolescents reporting the highest prevalence among all racial and ethnic groups (8%) in the US.<sup>1</sup> "Fear of fatness and pathological preoccupation with weight and shape" characterize most eating disorders in adolescents.<sup>2</sup> The precursors to eating disorders are disordered eating behaviors and body dissatisfaction. The attitudes and behaviors reach their peak around age 12, but usually, last throughout life.<sup>1, 10, 99</sup> The precursors are major public health concerns in adolescents due to adverse health consequences and high prevalence.<sup>8</sup>

Among adolescents, disordered eating behaviors are symptoms of diagnosed eating disorders. The disordered eating behaviors exist on a continuum ranging from unhealthy

behaviors (i.e., frequent dieting, anxiety with specific foods) to extreme behaviors (i.e., self-induced vomiting, loss of control around food).<sup>5</sup> The behaviors have serious consequences such as depression, anxiety, diagnosed eating disorders, and obesity.<sup>6, 10</sup> Disordered eating behaviors are present across both genders and ethnicities with approximately 42% of adolescents in the US engaging in these behaviors.<sup>8, 40</sup> Disordered eating behaviors are slightly more common among females (54%) than male adolescents (30%).<sup>8, 40</sup> Hispanic females in the US report the highest prevalence of frequent dieting, restriction, and binge eating behaviors, compared to other racial groups.<sup>8</sup> Among Hispanic adolescents in the US, 11% of females and 3% of males reported at least one extreme behavior in the last year.<sup>8</sup> Both male and female Hispanic adolescents report a higher prevalence of unhealthy and extreme weight control behaviors.<sup>21</sup>

Disordered eating behaviors may be more prevalent in Hispanic adolescents with overweight/obesity, compared to normal-weight adolescents.<sup>12</sup> Rodgers, Watts, Austin, Haines and Neumark-Sztainer<sup>12</sup> reported higher frequency of dieting, unhealthy weight control behaviors, and overeating among Hispanic females and males in the US with overweight compared to those with normal weight.<sup>12</sup> There was a need to confirm and illuminate these patterns in larger samples of Hispanic adolescents.

Body dissatisfaction is a leading risk factor for diagnosed eating disorders in adolescents. Body dissatisfaction refers to a negative assessment of one's shape or weight.<sup>52</sup> Adolescents with high levels of body dissatisfaction are at a greater risk for disordered eating behaviors, low self-esteem, and depressive symptoms.<sup>9, 18</sup> In Hispanic populations in the US, 62% of female and 52% of male adolescents reported body dissatisfaction.<sup>20</sup> Body dissatisfaction is even more prevalent in adolescents with overweight/obesity.<sup>27, 60</sup> Adolescents with disordered eating

behaviors and body dissatisfaction are at an increased risk for the development of eating disorders.

Previous research in this area has been guided by Social Cognitive Theory (SCT), to gain an improved understanding of how personal factors (i.e., weight and body dissatisfaction) influence behavioral factors (i.e., disordered eating behaviors). This study aims to examine body dissatisfaction attitudes and purging/restriction behaviors across a large male and female Hispanic adolescent sample. This research expands on the growing body of research examining ethnic differences in these attitudes and behaviors and compares Hispanic adolescents with under/normal weight to those with overweight/obesity, males and females, to assess associations across weight status and gender.

## 5.2 Method

### *Sample*

This study utilized baseline data from the FLOW Intervention, a longitudinal intervention study of middle school students who attend an urban charter school in the city of Houston, TX. For more details on the original research, see Johnston, Tyler, McFarlin, Poston, Haddock, Reeves and Foreyt<sup>65</sup> Briefly, the purpose of the study was to test an intensive intervention for weight loss in overweight Mexican American middle school children. Subjects were recruited in five cohorts over five years (2004-2009).<sup>65-68</sup> The initial sample of 1551 adolescents was reduced to only include those who completed the KEDs in full at baseline (N= 690). Participants were eliminated from analyses due to missing baseline data on gender (n=2), and incomplete KEDs (n=861). The final analytical sample will include 690 adolescents. One way univariate analyses of variance tests (ANOVA) were utilized to compare excluded individuals from those included in the analytical sample. For this study, the KEDS survey variables were examined at baseline.

### *Modified Kids Eating Disorder Survey*

The M-KEDS is an 8-items self-report screening tool to assess for weight dissatisfaction and purging/restriction behaviors in Hispanic adolescents. Questions are presented in a “yes” or “no” format. The screening tool also includes a set of eight child figure drawings for each gender to assess body dissatisfaction graphically. Adolescents are instructed to circle the image most like them and underline their desired body image.<sup>22</sup> A discrepancy between the images is coded as body dissatisfaction. The M-KEDS includes two subscales; weight dissatisfaction and purging/restricting behaviors. The weight dissatisfaction subscale contains, wants to lose weight, thought you looked fat to others, afraid of gaining weight, and body dissatisfaction. The purging/restriction subscale includes dieting, exercising, and extreme eating behaviors (i.e., diet pills, diuretics, fasting and laxative use). The items are summed (yes=1, no=0), for each respective subscale score. The subscale scores are summed for a total score. The screening tool has been validated by confirmatory factor analysis and internal consistency by Lopez, Wiesner, Johnston, Haubrick and Ledoux<sup>100</sup>

### 5.3 Analysis

Data was analyzed using SPSS (Version 25, IBM) with standard parametric and non-parametric methods. Chi-square tests were used to compare by gender and weight class (under/normal weight verse overweight/obesity) on the eight items of the M-KEDS. Component scores and total scores were analyzed using the Mann-Whitney U test.



## 5.4 Results

### *Demographics*

The demographics for the sample by total group and gender are shown in Table 7. Of the sample, 53% were female (N=363), and 47% were male (N=327). The age range of the participants was nine to 15, with a mean of 12 years old, and 95% self-reported as Mexican-American. Of the sample, 45% of the females had overweight/obesity (N=162), and 53% of the males had overweight/obesity (N=172).

Table 7: Demographics of female and male Hispanic students (N=690)

	Females (N=363)	Males (N=327)
Age (Mean $\pm$ SD)	12.0 $\pm$ 0.6	12.1 $\pm$ 0.7
BMI percentile	72 <sup>nd</sup> $\pm$ 28.2	74 <sup>th</sup> $\pm$ 28.0
ZBMI	0.86 $\pm$ 1.1	0.98 $\pm$ 1.1

### *Individual Items*

A Chi-Squared test was performed for each of the eight items on the M-KEDS, comparing the “yes” verse “no” responses by gender and weight (underweight/normal verse overweight/obese). The percentage of adolescents who endorsed individual items of the M-KEDS by gender and weight status is listed in Table 8. More than 70% of the adolescents reported “body dissatisfaction,” 60% reported “wanted to lose weight,” and 40% reported, “felt looked fat to others.”

Significant differences ( $p < .001$ ) were found between females with under/normal weight and females with overweight/obesity in each of the 8 items (see Table 8). The same was true for males; significant differences were found between males with under/normal weight and males with overweight/obesity in each of the 8 items. In this sample, females endorsed all the behaviors more frequently than the males except for “exercised” and “Fasted, vomited diet pills, diuretics,

or laxative use.” There were significant differences by gender, females reported more “felt looked fat” ( $\chi^2=7.36$ ,  $df=1$ ,  $p<0.05$ ), and “afraid of weight gain” ( $\chi^2=9.96$ ,  $df=1$ ,  $p<0.05$ ), while males reported “exercised to lose weight” ( $\chi^2=11.27$ ,  $df=1$ ,  $p<0.05$ ) more frequently.

#### *Components and total score*

The ranges and means  $\pm$  SD of component and total scores are presented in Table 9. Females component scores were significantly higher than males for the weight dissatisfaction component (Mann Whitney U=52,694,  $p<.05$ ). The purging/restriction component (Mann Whitney U=55,131,  $p=0.08$ ) and the total score (Mann Whitney U=57,019,  $p=0.37$ ) was not significantly different by gender. However, the component scores were significantly different between females with under/normal weight and females with overweight/obesity in weight dissatisfaction, purging restriction, and total score. The same results were seen in males. Significant differences were found between males with under/normal weight and males with overweight/obesity in weight dissatisfaction, purging restriction, and total score.

Table 8: Percentage of adolescences who endorsed individual items of the M-KEDS by gender and weight status in Hispanic adolescents.

Items	Total sample Percent Endorsed (N=690)	Females			Males		
		Under/normal weight (N=201), %	Overweight/obesity (N=162), %	X <sup>2</sup> (df=1)	Underweight/normal (N=155), %	Overweight/obesity (N=172), %	X <sup>2</sup> (df=1)
Wanted to lose weight now	60	21	40	97.3*	13	45	111.8*
Felt looked fat to others	44	17	32	59.3*	6	32	75.9*
Afraid to eat because of weight gain	29	12	22	27.7*	6	17	17.7*
Dieted to lose weight	36	10	26	61.0*	7	29	59.8*
Exercised a lot to lose weight	38	13	19	15.3*	11	34	52.9*
Fasted to lose weight, vomited to lose weight, used diet pills, used diuretics, or used laxatives	13	4	8	10.3*	4	10	8.9*
Body dissatisfaction	73	33	42	56.8*	24	47	61.4*

\*p<.001

Table 9: Mean Total and Component Scores on the M-KEDS in Hispanic Adolescents

Component	TOTAL SAMPLE			FEMALES		MALES	
	Min.	Max	Mean±SD	Mean±SD		Mean±SD	
				Underweight/ Normal	Overweight/ Obese	Underweight/ Normal	Overweight/ Obese
Weight dissatisfaction	0	4	2.1 ± 1.4	1.5 ± 1.3	3.0 ± 1.0*	1.1 ± 1.0	2.7 ± 1.0*
Purging/restriction	0	3	0.9 ± 1.0	0.5 ± 0.8	1.2 ± 1.0*	0.5 ± 0.8	1.4 ± 0.9*
Total score	0	7	2.9 ± 2.1	2.0 ± 1.9	4.2 ± 1.6*	1.5 ± 1.6	4.1 ± 1.7*

\*p<.001

## 5.5 Discussion

The findings of this study provide evidence of the relationship between weight dissatisfaction, disordered eating behaviors, gender, and weight status in Hispanic adolescents. Specifically, disordered eating behaviors and body dissatisfaction were highly prevalent among Hispanic adolescents. More than 70% of the total sample reported body dissatisfaction, 60% reported “wanting to lose weight now,” and 44% “felt they looked fat to others.” Females endorsed all behaviors except, “exercised to lose weight” and “fasted, vomited diet pills, diuretics, or laxative use” more frequently than males. As in the original Childress, Brewerton, Hodges and Jarrell<sup>21</sup> survey, “wanted to lose weight,” “felt fat to others,” and “exercised to lose weight” were the most frequently reported behaviors and attitudes. The original authors also reported significant differences between male and female adolescents on “felt looked fat,” “afraid of weight gain,” and “exercised to lose weight.”<sup>21</sup> The current study also demonstrated that both male and female Hispanic adolescents with overweight/obesity reported a significantly higher prevalence of weight dissatisfaction and purging/restriction behaviors than adolescents with under/normal weight. These personal factors (weight status, weight dissatisfaction) are related to unhealthy weight control behaviors and increase the risk of developing an eating disorder.<sup>25</sup>

This study is consistent with previous research; approximately 29% of the total sample reported some purging/restricting behaviors.<sup>8, 40</sup> Also consistent with previous work, adolescents with overweight/obesity report more disordered eating behaviors than peers with under/normal weight.<sup>12</sup> Unlike previous research, males with overweight/obesity reported more disordered eating behaviors than females with overweight/obesity.<sup>8, 12, 40</sup> Hispanic males with overweight reported the highest prevalence of “dieting to lose weight,” “exercised a lot to lose weight” and

extreme weight control behaviors. Hispanic females reported a higher prevalence of all disordered eating behaviors compared to males. The prevalence of extreme weight control behaviors were consistent with previous research; 11% of female and 3% of male Hispanic adolescents reported at least one extreme weight control behavior.<sup>8</sup> Both male and female Hispanic adolescents report a high prevalence of unhealthy and extreme weight control behaviors; the prevalence is considerably higher in those with overweight/obesity.<sup>21</sup>

This study found a high prevalence of weight dissatisfaction, especially in adolescents with overweight/obesity. This is consistent with previous research demonstrating that increases in weight are associated with increases in body dissatisfaction in Hispanic adolescents.<sup>91</sup> Hispanic females reported a higher prevalence of all weight dissatisfaction items more frequently than males. In another study, Hispanic female adolescents reported higher levels of body dissatisfaction than males.<sup>8</sup> In another study of Hispanic adolescents who engaged in sports, females (62%) had greater body dissatisfaction than males (52%).<sup>20</sup> However, in the current study, males with overweight/obesity reported more “wanting to lose weight now” and “body dissatisfaction” than females with overweight/obesity. Body dissatisfaction is prevalent in Hispanic adolescents, but it may be different for males compared to females.<sup>18, 47</sup>

Among females, with overweight/obesity, significant differences emerged between all weight dissatisfaction attitudes and purging restriction behaviors compared to females with under/normal weight. Males with overweight/obesity were also significantly different than their under/normal-weight peers on weight dissatisfaction attitudes and purging restriction behaviors compared to males with under/normal weight. However, a large percentage of adolescents with under/normal weight reported “wanting to lose weight” and body dissatisfaction. The findings of this study are consistent with previous research, adolescent females with overweight/obesity

reported significantly more unhealthy weight control behaviors, extreme weight control behaviors, and body dissatisfaction than their average-weight peers.<sup>5</sup> The associations were similar among males with overweight/obesity except laxatives, diuretics and diet pills were not significantly different compared to their average-weight peers.<sup>5</sup> The results are from a longitudinal study, Project EAT (Eating and Activity over Time) designed as a comprehensive study of adolescent health to examine weight-related attitudes and behaviors across males and females, over ten years.<sup>5, 8, 9, 25, 40, 41, 47</sup> The Project EAT sample is ethnically diverse and includes a 6% Hispanic sample and has contributed to the majority of the research in this area. Project EAT has found that Hispanic females have the highest percentage of overweight, body dissatisfaction, weight loss attempts, and chronic dieting of any other female ethnic group.<sup>8</sup> Neumark-Sztainer, Croll, Story, Hannan, French and Perry<sup>8</sup> also reported high levels of unhealthy weight control behaviors and extreme weight control behaviors.<sup>8</sup> Project EAT has found similar results for males, high levels of overweight, body dissatisfaction, unhealthy and extreme weight control behaviors.<sup>8</sup> This is the first study, to knowledge of the researchers, to show body dissatisfaction differed by weight status and gender among Hispanic adolescents.

Overall, the results have several important implications for work with Hispanic adolescents. First, this study adds to the growing body of literature on the high prevalence of disordered eating behaviors and body dissatisfaction in Hispanic adolescents, especially males. Disordered eating prevention programs for Hispanic adolescents are needed to address these attitudes and behaviors. Interventions that focus on obesity alone or obesity with eating disorders prevention have failed to impact BMI.<sup>101</sup> Innovative interventions are needed to develop successful programs.<sup>101</sup> Second, the study emphasizes the importance of screening and identifying eating disorder symptoms in Hispanic adolescents. Previous research suggests that

ethnic minorities are less likely to seek help for their eating disorder symptoms.<sup>102</sup> As well as less likely to ask by their doctor about eating disorder symptoms, delaying diagnosis and treatment.<sup>12, 102</sup>

This study had several strengths which enhance the findings. The large sample of Hispanic adolescents allowed for several comparisons of males and females by weight status as well as the study methods, which included researcher measured height and weight. The limitations of this study should also be considered. Disordered eating behaviors and body dissatisfaction were assessed with a brief self-reported measurement tool. In addition, the frequency of the behaviors was not assessed on the self-reported measurement tool. This study focused on the Hispanic adolescent sample and may not generalize to other ethnicities or age groups, although disordered eating behaviors and body dissatisfaction have been shown in other ethnicities.<sup>1, 3, 8, 18</sup>

## 5.6 Conclusion

The prevalence of disordered eating behaviors among Hispanic adolescents in this study was striking, particularly among those with overweight/obesity compared to those with under/normal weight, and this is consistent with previous research.<sup>6, 8, 10, 11</sup> Interventions need to be developed, and healthy weight control strategies need to be promoted. Interventions that address both personal factors and disordered eating behaviors may protect against diagnosed eating disorders and adult obesity.<sup>10</sup>

## Chapter 6

### Manuscript 3

# Weight Status and Disordered Eating in Hispanic Adolescents: The Mediating Role of Body Dissatisfaction

## 6.1 Introduction

Diagnosed eating disorders are an important health concern in adolescents and currently impact 3% in the US, with Hispanic adolescents having the highest prevalence (8%).<sup>1</sup> Disordered eating behaviors and body dissatisfaction often characterize these disorders. The behaviors and attitudes are prevalent among adolescents. Disordered eating behaviors are present in approximately 50% of all adolescents.<sup>5, 8, 40</sup> Additionally, these detrimental behaviors are most common in female (64%), and male (61%) Hispanic adolescents with overweight/obesity.<sup>6, 8, 10, 11</sup> Hispanic adolescents with overweight/obesity report a higher prevalence of dieting, unhealthy weight control behaviors, and overeating, compared to other ethnicities.<sup>12</sup> The adolescents are then at a higher risk for developing diagnosed eating disorders, depression, anxiety, peer problems, and teasing.<sup>41, 42</sup> These behaviors are likely to track into adulthood, increasing risks for obesity, heart disease, type 2 diabetes, metabolic syndrome, and specific types of cancer.<sup>13, 43</sup> Disordered eating behaviors are common in adolescents and have serious physical and mental consequences.

The negative attitude towards one's shape or weight is body dissatisfaction. This can be a changing perception based on recent changes in weight, shape, and eating behaviors, often linked to an over-evaluation of one's shape and weight.<sup>6, 10, 46</sup> Negative body perceptions are formed as early as childhood, with exposure to unrealistic body ideals for both males and females. Ayala, Mickens, Galindo and Elder<sup>92</sup> reported that 76% of female and 61% of male Hispanic



adolescents reported wanting to be thinner. Of the entire sample of adolescents, only 4% of females and 10% of males desired to be their current weight.<sup>92</sup> Other studies, with ethnically diverse populations, have reported similar results for adolescents with overweight or obesity.<sup>5, 19, 36, 49 18</sup> This attitude can lead to long term deleterious behaviors such as frequent dieting, disordered eating behaviors, extreme weight control behaviors, and diagnosed eating disorders.<sup>9, 25, 26</sup> Body dissatisfaction is prevalent in adolescents, especially among those with overweight/obesity. This negative attitude can have deleterious long term impacts.

The research on disordered eating behaviors and body dissatisfaction in the US is limited. Project EAT (Eating and Activity over Time), a population study with an ethnically diverse sample, included a small sample of Hispanic adolescents (6%).<sup>5, 12, 18, 40, 41</sup> The authors noted Hispanic females had the highest percentage of overweight, body dissatisfaction, weight loss attempts, and chronic dieting than any other female ethnic group.<sup>8</sup> Research from Project EAT has also consistently reported high levels of unhealthy (64%) and extreme (11%) weight control behaviors.<sup>5</sup> Hispanic male adolescents have high rates of overweight/obesity and body dissatisfaction, as well as unhealthy (40%) and extreme (3%) weight control behaviors.<sup>8</sup> However, there is still little research focusing on Hispanic adolescents. This is very concerning considering the high prevalence of these behaviors and attitudes in Hispanic adolescents, who are the largest minority group and the most rapidly growing percentage of adolescents, according to the 2017 US census.<sup>36, 49</sup>

Three studies have examined the mediating effect of body dissatisfaction on depressive symptoms and disordered eating behaviors as well as BMI and disordered eating behaviors in adolescents.<sup>48, 62, 63</sup> Neumark-Sztainer, Wall, Story and Perry<sup>48</sup> found that the weight-body concerns mediated the relationship between BMI and unhealthy weight control behaviors, and

BMI did not directly influence unhealthy weight control behaviors. A longitudinal study of white Spanish adolescents found body dissatisfaction mediated the relationship between depressive symptoms and disordered eating behaviors, moderated by gender, a stronger effect was found among females than males.<sup>63</sup> However, this study did not include BMI or weight status in the analysis. The third study, Buckingham-Howes, Armstrong, Pejsa-Reitz, Wang, Witherspoon, Hager and Black<sup>62</sup> found body dissatisfaction mediated the relationship between standardized BMI and dieting behaviors; however, body dissatisfaction did not mediate the relationship between standardized BMI and purging/restriction behaviors in a sample of African American adolescent females. Body dissatisfaction appears to mediate the relationship between BMI and disordered eating behaviors in mostly white and African American adolescent populations, but little is known about this relationship in Hispanic adolescents. Due to the high prevalence of disordered eating behaviors and body dissatisfaction in Hispanic Adolescents, we hypothesize this will be a strong relationship. This study will add to the previous research to improve the understanding of the factors that contribute to disordered eating behaviors in Hispanic adolescents.

Previous research has established associations between BMI, body dissatisfaction, and disordered eating behaviors.<sup>2, 16, 48</sup> These attitudes and behaviors are prevalent in the growing Hispanic adolescent population in the US, especially those with overweight/obesity.<sup>1, 3, 8</sup> Studies examining the mechanism linking weight, body dissatisfaction, and disordered eating behaviors are needed among Hispanic adolescent males and females. This study aims to examine body dissatisfaction attitudes and purging/restriction behaviors across a large sample of male and female Hispanic adolescents. The research expands on the growing body of research examining ethnic differences in these attitudes and behaviors.

### *Current Study*

The current study utilizes Social Cognitive Theory (SCT) to gain an improved understanding of how personal factors (i.e., weight status and body dissatisfaction) influence behavioral factors (i.e., disordered eating behaviors). The purpose of this study was to examine the interrelationships between weight, body dissatisfaction, and disordered eating behaviors. This study focusses on Hispanic adolescents because this represents a growing population with a high prevalence of these attitudes and behaviors. Specifically, we hypothesize the relationship between zBMI and purging/restriction behaviors will be mediated by weight dissatisfaction in Hispanic adolescents. Second, we hypothesize gender will moderate this mediation model. Examining these relationships in this population allows us to gain an improved understanding of these attitudes and behaviors in this at-risk population.

## 6.2 Method

### *Study Population*

Data for the present study were drawn from the baseline of the FLOW intervention, a longitudinal intervention study of middle school students who attended an urban charter school in the city of Houston, TX. For more details on the original study, see Johnston, Tyler, McFarlin, Poston, Haddock, Reeves and Foreyt<sup>65</sup>. The initial sample of 1551 adolescents was reduced to only include those who completed the Kids Eating Disorder Survey (KEDS)<sup>22</sup> in full at baseline (N= 690). Participants were eliminated from analyses due to missing baseline data on gender (n=2), and incomplete KEDS (n=861). The final analytical sample included 690 adolescents. One way univariate analyses of variance tests were utilized to compare excluded individuals

from those included in the analytical sample; there were no significant differences between the sample and excluded participants.

### *Modified Kids Eating Disorder Survey (M-KEDS)*

The M-KEDS is an 8-items self-report in which questions are presented in a "yes" or "no" format. The questionnaire also includes a set of eight child figure drawings for each gender to assess body dissatisfaction graphically (Item 7 males and 8 females). The body dissatisfaction item utilizes body image silhouettes. Adolescents are instructed to circle the image most like them and underline their desired body image. The body dissatisfaction score is obtained by subtracting the underlined drawing from the circled drawing. A discrepancy between the images is coded as body dissatisfaction. The weight dissatisfaction subscale contains, wants to lose weight, thought you looked fat to others, afraid of gaining weight, and body dissatisfaction. Kuder-Richardson Formula 20 (KR-20), non-parametric equivalent to Cronbach's alpha, was used to evaluate internal consistency.<sup>95, 96</sup> The KR-20 for this subscale in the current study is 0.71, demonstrating good reliability. The purging/restriction subscale includes dieting, fasting, exercising, diet pills, diuretics, and laxative use. The KR-20 for this subscale in the current sample is 0.60, demonstrating good reliability. The M-KEDS has been validated by confirmatory factor analysis and internal consistency by Lopez, Wiesner, Johnston, Haubrick and Ledoux<sup>100</sup>. The KR-20 for the M-KEDS in the current study is 0.77, demonstrating good reliability.

### 6.3 Analysis

All analysis were performed using SPSS (Version 25). Descriptive statistics for the sample characteristics were conducted (Table 10). Data was screened for errors and outliers before analysis. Means and standard deviations were examined by gender (Table 11). Bivariate

correlations between the outcome variable and associated factors were tested using Pearson correlation analysis (Table 12). Mediation and moderation effects were evaluated using the PROCESS macro of SPSS developed by Hayes<sup>85</sup>. In this approach, effects are assessed with bias-corrected bootstrap confidence intervals that are significant when the upper and lower bound of the bias-corrected 95% confidence interval (CI) do not contain zeros, also the assumption of normality is not required.<sup>85</sup> Mediation is assessed by the indirect effect of X (zBMI) on Y (Purging/restrict behaviors) through M (weight dissatisfaction). Moderation is assessed by the interaction of W (gender) on each of the variables. Bootstrapping with 5000 samples was utilized for analysis.<sup>85</sup> Criteria established by Hayes<sup>85</sup> was used to determine the significance of mediation and moderation using bootstrapping procedures.

#### 6.4 Results

Descriptive statistics revealed ninety-five percent of the adolescents self-identified as Mexican American, with a mean age of 12. Additionally, the majority were female (53%) and a mean BMI for age in the 73<sup>rd</sup> percentile (Table 10). The percentage of subjects who endorsed each item is listed in Table 11. Means and standard deviations for the two components, and total scores are shown in Table 12, by gender. An examination of the interrelationships between primary study variables for the entire sample reveal trends consistent with our hypothesis: zBMI (M=0.88, SD=±1.2), weight dissatisfaction (M=2.06, SD=±1.40), purging/restriction behaviors (M=0.87, SD=±0.97). The correlation matrix for items, subscale scores, and standardized BMI (zBMI) by gender are shown in Table 13. A significant positive relationship emerged between primary study variables for both genders ( $p \leq .01$ ).

Table 10: Demographic data for Hispanic adolescents (N=690)

Demographic variable	MEAN $\pm$ SD
Age	12.1 $\pm$ 0.7
BMI percentile	73 <sup>rd</sup> $\pm$ 28.0
zBMI	0.88 $\pm$ 1.2

Table 11: Descriptive statistics of the M-KEDs items by gender in Hispanic adolescents (N=690)

Items	TOTAL	FEMALES	MALES
	SAMPLE (N=690), %	(N=363), %	(N=327), %
Wanted to lose weight now	60	61	59
Felt looked fat to others	44	49	38
Afraid to eat because of weight gain	29	34	23
Dieted to lose weight	36	37	36
Exercised a lot to lose weight	38	33	45
Fasted to lose weight, vomited to lose weight, used diet pills, used diuretics, or used laxatives	13	12	14
Body dissatisfaction	73	75	72

Table 12: Means and standard deviations for the M-KEDs weight dissatisfaction component and purging/restriction component scores and total score by gender (N=690)

Item	Item #	Females (N=363) M (SD)	Males (N=327) M (SD)
Weight Dissatisfaction Score		2.19 (1.42)	1.92 (1.32)
Purging / Restriction Score		0.81 (0.94)	0.94 (1.00)
M-KEDS Total Score	1-8	3.00 (2.06)	2.86 (2.10)

Table 13: Correlation Matrix for M-KEDs weight dissatisfaction component and purging/restriction component scores, and zBMI (N=690)

	Weight Dissatisfaction	Purging/ Restriction
<b>Females</b>		
PR	.52*	
ZBMI	.56*	.42*
<b>Males</b>		
PR	.62*	
ZBMI	.62*	.50*

\* $p \leq .01$ , PR=purging/restriction behaviors, ZBMI=standardized BMI

### *Mediation Model*

The mediation model examined weight dissatisfaction as a mediator between zBMI and purging/restriction behaviors (Figure 1). Pathway a, the relationship between zBMI and weight dissatisfaction was statistically significant ( $\beta = 0.58, p < 0.001$ ), as was pathway c, the standardized direct effect between zBMI and purging/restriction behaviors ( $\beta = 0.46, p < 0.001$ ). The standardized regression coefficient between weight dissatisfaction and purging restriction behaviors, pathway b, was also significant ( $\beta = 0.43, p < 0.001$ ). When weight dissatisfaction is included in the model, pathway c', the association of zBMI and purging/restriction behaviors remained significant ( $\beta = 0.22, p < 0.001$ ). However, the strength of the relationship decreased. The bias-corrected bootstrap 95% CI indicated the indirect effect through weight dissatisfaction was significant ( $\beta = 0.21$  (SE=0.02), 95%CI [0.17, 0.26]). Weight dissatisfaction is a partial mediator between zBMI and purging/restriction behaviors. The indirect effect through weight dissatisfaction accounts for 54% of the total effect of zBMI on purging/restriction behaviors among Hispanic adolescents.

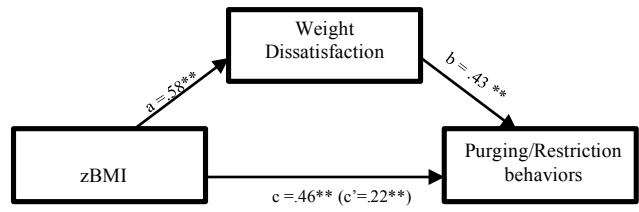


Figure 1: Simple mediation model for the entire sample. The relationship between standardized BMI (zBMI) and purging/restriction eating behaviors, as mediated by weight dissatisfaction (N=690). Standardized coefficients are shown in each path.  $p \leq .001$

### *Mediation Moderation Model*

The moderation analysis investigated gender as a moderator of the association between zBMI, weight dissatisfaction, and purging/restriction behaviors. Using the mediation model (Figure 1), gender was tested as a moderator of each pathway using the approach from Hayes.<sup>85</sup> The interactions were not significant. The conditional indirect effect of gender on purging/restriction behaviors through weight dissatisfaction were significant in both females ( $\beta = 0.19$  (SE=0.03), 95%CI [0.14-0.25]) and males ( $\beta = 0.28$  (SE=0.04), 95%CI [0.21-0.35]). In this sample, gender was not a moderator. The index of moderated mediation was not significant for gender (Index = -0.08 (SE=0.05), 95%CI [-0.18-0.004]).<sup>85</sup>

### 6.5 Discussion

The present study examined weight dissatisfaction as a mechanism linking body size (zBMI) to disordered eating behaviors (purging/restriction) in male and female Hispanic adolescents. The indirect effect of zBMI through weight dissatisfaction was significant on purging/restriction behaviors. This effect did not differ between males and females. This study also found elevated weight predicted elevated weight dissatisfaction. In addition, weight dissatisfaction predicted purging/restriction behaviors. These relationships were consistent across



gender, in this sample of Hispanic adolescents. The mediation moderation model posits that personal factors (weight status and weight dissatisfaction) affect disordered eating behaviors.

These findings are consistent with previous research in adolescents. Project EAT identified weight-body concerns as a mediator for the relationship between BMI and unhealthy weight control behaviors in a diverse sample of adolescents.<sup>48</sup> Project EAT also found this relationship was consistent across gender.<sup>48</sup> Contrary to Neumark-Sztainer, Wall, Story and Perry<sup>48</sup>, the current study found standardized BMI directly influenced disordered eating behaviors in Hispanic adolescents. Whereas Project EAT did not find a direct relationship between BMI and unhealthy weight control behaviors.<sup>48</sup>

The current study and the Project EAT found similar results; however, the methods did differ slightly. Project EAT study utilized different measurements for the variables of interest than the current study. Weight-body concerns component contained weight concerns, weight importance, and body dissatisfaction were measured on a Likert scale. The unhealthy weight control behavior component used in Project EAT was similar to the current study. The researchers asked about dieting frequency, fasting, restriction, diet pills, vomiting, and laxative use. This study also utilized a SCT lens to examine the relationship between these personal factors (weight status, weight dissatisfaction) and behavioral factors (disordered eating behaviors). The results from the current study are very similar to Project EAT and reveal the important role of body dissatisfaction on disordered eating behaviors. Another longitudinal study by Buckingham-Howes, Armstrong, Pejsa-Reitz, Wang, Witherspoon, Hager and Black<sup>62</sup> examined the mediating role of body dissatisfaction on BMI and disordered eating behaviors. The researchers separated disordered eating behaviors into dieting and purging/restriction behaviors and found body dissatisfaction mediated the relationship between zBMI and dieting

behaviors; however, body dissatisfaction did not mediate the relationship between zBMI and purging/restriction behaviors in a sample of African American adolescent females.<sup>62</sup> Other longitudinal research has examined body dissatisfaction as a mediator in the relationship of depressive symptoms and disordered eating behaviors in white Spanish adolescents.<sup>63</sup> Similar to the other studies; body dissatisfaction mediated the relationship between depressive symptoms and disordered eating behaviors, moderated by gender, a stronger effect was found among females than males.<sup>63</sup> This study did not account for BMI or weight status in any of its analysis. Therefore, it is unknown what role BMI may play in the relationship with depressive symptoms and disordered eating behaviors. The current study adds to the research by combining frequent dieting and purging/restriction behaviors, including males and identifying body dissatisfaction as a mediator in the relationship between weight and disordered eating behaviors.

The findings from this study demonstrate that Hispanic adolescents with overweight/obesity are at a higher risk of having body dissatisfaction and disordered eating behaviors. Other research suggests that adolescents with overweight/obesity are 36% more likely to require treatment for a restrictive eating disorder.<sup>103</sup> However, of Hispanic adolescents who reported an eating disorder, only 13% were receiving treatment, and only 2% were males.<sup>104</sup> These adolescents can take approximately ten months longer than healthy weight adolescents to be diagnosed with an eating disorder and also experience extreme weight loss.<sup>103</sup> Adolescents with overweight or obesity are at a particularly high risk of being untreated and encouraged to engage in unhealthy behaviors to achieve weight loss.<sup>45</sup>

While the results of the present study suggest increased body size leads to purging/restriction behaviors through increased weight dissatisfaction, only partial mediation was found. This indicates other factors are contributing to this relationship. An important future

direction would include identification of the other factors that account for this relationship.<sup>105</sup> Potential mechanisms could include ethnic-specific social norms/influences, availability of healthy foods, physical activity, and acculturation.<sup>8</sup> Studying all of the possible mechanisms was beyond the scope of this study. However, collectively the other possible mediators have implications for future research.

Implications of this study may be the need for adolescents with overweight/obesity and weight dissatisfaction be identified and provide support early. Adolescents with the co-occurrence of obesity and disordered eating behaviors are often not being identified by health care professionals, leading to delayed treatment.<sup>106</sup> Healthcare professionals should work to identify these deleterious attitudes and behaviors and encourage healthy eating behaviors and body image among these adolescents. There is a need for effective interventions for Hispanic adolescents that have been rigorously tested to address the issues in this population.<sup>107</sup> Only a few interventions have been tested addressing issues of body dissatisfaction and disordered eating behaviors together in early adolescent samples. Interventions that have used cognitive-behavioral therapy (CBT) have shown improvements in body dissatisfaction and disordered eating behaviors in adolescents with overweight.<sup>106,105, 107-110</sup> The results from this study will aid in the design and development of novel interventions that address both personal factors and behaviors.

This study has several strengths including a large sample size of males and females, and objectively measure heights and weights. Nevertheless, there are some limitations worth noting. First, the cross-sectional nature of the data does not provide the opportunity to assess whether the relationship persists over time, contributing to increased weight dissatisfaction or disordered eating behaviors. Conducting a longitudinal study may assist in better understanding the health

consequences of this mechanism in male and female Hispanic adolescents. Second, the findings from this sample of Hispanic adolescents limits the generalizability to other groups.

## 6.6 Conclusion

This study demonstrates the detrimental effects of body dissatisfaction. Specifically, adolescents with overweight/obesity may be at a higher risk of experiencing increased weight dissatisfaction and, subsequently, increased purging/restriction behaviors. Increasing the likelihood of developing diagnosed eating disorders. This is the first study, to knowledge of the researchers, to show body dissatisfaction mediated the relationship between weight status and disordered eating behaviors among Hispanic adolescents. These results provide a better understanding of the relationships between body size and disordered eating behaviors. This study also examined how this relationship is moderated by gender. Our mediation moderation model did not support gender moderating this mediation relationship. Therefore, we found weight dissatisfaction mediates the relationship between zBMI and purging/restriction behaviors similarly for both males and females. The findings provided an improved understanding of a significant population, male and female Hispanic adolescents, to target interventions to prevent the development of disordered eating behaviors and later the development of diagnosed eating disorders.

## Chapter 7

### Summary, Future Directions, and Limitations

#### 7.1 Summary

Hispanic adolescents are the most substantial minority group and most rapidly growing percentage of adolescents, according to the 2017 US census.<sup>36,49</sup> Hispanic adolescents also have the highest prevalence of obesity compared to other ethnicities.<sup>36</sup> Adolescents, in general, who are overweight/obesity are more than three times more likely to have type II diabetes and five times more likely to have coronary artery disease as adults.<sup>111</sup> Adolescents with overweight/obesity report higher prevalence of body dissatisfaction, a leading risk factor for disordered eating behaviors.<sup>16,60,16</sup> Research has also established that body dissatisfaction and disordered eating behaviors are predictors for diagnosed eating disorders.<sup>16</sup> Hispanic adolescents report the highest prevalence of eating disorders compared to other ethnic/racial groups.<sup>1,8</sup> The problem is the relationship between BMI, body dissatisfaction and disordered eating behaviors has been well established among predominantly white female adolescent samples<sup>19,23-27</sup> and few including male adolescents<sup>3,5,8,11,28-31</sup>. Only a few studies have examined the relationships between weight status, body dissatisfaction and disordered eating behaviors among this growing Hispanic population of male and female adolescents.<sup>20,32-34</sup> This study is the first to focus on developing screening tools, revealing the prevalence, and understanding the mechanism behind these personal factors (weight status and body dissatisfaction) and disordered eating behaviors in Hispanic adolescents.

This study used confirmatory factor analysis to identify the M-KEDS, an 8-item, a two-factor screening tool for weight dissatisfaction and purging/restriction behaviors in Hispanic adolescents. The new M-KEDS proposed in this study is a valid screener for male and female

Hispanic adolescents. This screener will allow for early identification of adolescents at risk for these deleterious behaviors.

This study also examined the prevalence of disordered eating behaviors in a Hispanic adolescent population. The prevalence of the disordered eating behaviors among Hispanic adolescents was striking, particularly among those with overweight/obesity compared to those with under/normal weight, and this is consistent with previous research.<sup>6, 8, 10, 11</sup> In both male and female Hispanic adolescents with overweight/obesity reported a significantly higher prevalence of weight dissatisfaction and purging/restriction behaviors than adolescents with under/normal weight. Specifically, disordered eating behaviors and body dissatisfaction were highly prevalent among Hispanic adolescents. More than 70% of the total sample reported body dissatisfaction, 60% reported “wanting to lose weight now,” and 44% “felt they looked fat to others.” Females endorsed all behaviors except, “exercised to lose weight” and “fasted, vomited diet pills, diuretics, or laxative use” more frequently than males. These personal factors are related to unhealthy weight control behaviors and increase the risk of developing an eating disorder.<sup>25</sup> Interventions need to be developed, and healthy weight control strategies need to be promoted, given the prevalence of disordered eating behaviors and obesity in Hispanic adolescents. Interventions that address both personal factors and disordered eating behaviors may protect against diagnosed eating disorders and adult obesity.<sup>10</sup>

Finally, this study examined weight dissatisfaction as a mechanism linking body size (zBMI) to disordered eating behaviors (purging/restriction) in male and female Hispanic adolescents. The indirect effect of zBMI through weight dissatisfaction was significant on purging/restriction behaviors. This effect did not differ between males and females. This study also found that elevated BMI predicted elevated weight dissatisfaction. As well as high weight

dissatisfaction predicted high purging/restriction behaviors. These relationships were consistent across gender, in this sample of Hispanic adolescents. The mediation model emphasizes the impact of personal factors (weight status and weight dissatisfaction) have on behaviors.

Overall, the results of this study have several important implications for work with Hispanic adolescents. First, this study adds to the growing body of literature on the high prevalence of disordered eating behaviors and body dissatisfaction in Hispanic adolescents, especially males. Disordered eating behavior prevention programs for Hispanic adolescents are needed to address these attitudes and behaviors. Second, the study emphasizes the importance of early screening and identification of body dissatisfaction and disordered eating behaviors in Hispanic adolescents. Research suggests that adolescents with overweight/obesity are 36% more likely to require treatment for a restrictive eating disorder.<sup>103</sup> Other research suggests that ethnic minorities are less likely to seek help for their eating disorder symptoms.<sup>104</sup> As well as less likely to be asked by their doctor about eating disorder symptoms, delaying diagnosis and treatment.<sup>12,</sup><sup>102</sup> Of Hispanic adolescents who reported an eating disorder only 13% were receiving treatment, and only 2% were males.<sup>104</sup> Adolescents can take approximately ten months longer than healthy weight adolescents to be diagnosed with an eating disorder and also experience extreme weight loss.<sup>103</sup> Adolescents with overweight or obesity are at a particularly high risk of being untreated and encouraged to engage in unhealthy behaviors to achieve weight loss.<sup>45</sup> The finding emphasizes the need to further investigate, intervene and understand the personal factors and eating behaviors in Hispanic adolescents.

## 7.2 Future Directions

There are several areas of future research for this line of work. The further development of the M-KEDS, precursors to body dissatisfaction, improved understanding of these behaviors

in males, and intervention development. Future research can improve upon the validated M-KEDS by cross validating it in other samples of Hispanic adolescents and other ethnic groups, to improve its generalizability. Also, the M-KEDS could be improved with a validated measure of binge eating symptoms. Currently, it does not screen for binge eating due to the adolescents not understanding the questions. Future research should work to develop a valid item for binge eating behaviors for the M-KEDS.

Another area of focus is prospective and experimental studies in the examination of precursors and effects of body dissatisfaction in Hispanic adolescents. This is not well understood in Hispanic adolescents. Much of the past research expresses the cultural desire for larger body size. This is not true in this sample of Hispanic adolescents. Several factors should be further explored, such as acculturation, family influence, peer influence, and media/social media influence.

This study revealed a remarkably high prevalence of weight dissatisfaction attitudes and disordered eating behaviors in male Hispanic adolescents. This has not been reported before. Researchers need to work to gain an improved understanding of these behaviors in this population.

This study also demonstrated the importance of future interventions to address both body dissatisfaction and disordered eating behaviors together during the intervention.<sup>109</sup> This study has focused on known predictors of diagnosed eating disorders. However, future research should also explore the opposite, protective factors. Protective factors are essential for informing the development of novel interventions.

Although the relationship between weight status, body dissatisfaction and disordered eating behaviors is well established, it is not thoroughly explored in Hispanic adolescents. While



many studies have found higher rates of disordered eating behaviors in Hispanic male and female adolescents, these are small subsamples of a population.<sup>3</sup> Current research defines clear risks of the development of eating disorders in Hispanic adolescents. This study exclusively examined the precursors in Hispanic male and female adolescents. It provides a foundation for future studies to examine these attitudes and behaviors further and identify areas to intervene. A greater understanding of the gender and ethnic pathways related to the development of eating disorders is needed.

### 7.3 Strengths and Limitations

This study had several strengths and limitations. The data for the study was taken from a larger study longitudinal data set, which allowed for a large sample size of Hispanic adolescents.<sup>65, 66, 88</sup> Due to the nature of secondary data analysis, other factors such as acculturation, family influence, peer influence, and media/social media influence related to body dissatisfaction and disordered eating behaviors were not explored in this study. However, this study was conducted in a relatively new population. Nine to fourteen-year-old Hispanic adolescents; however, the results may not generalize to other ethnicities or age groups. The validation of the M-KEDS for Hispanic adolescents will allow improved screening; however, it is a brief self-report measure, and the frequency of behaviors was not assessed. Additionally, the binge eating measure had to be removed due to the unclear nature of the questions. However, the weight and height measures for this study were objectively measured. In conclusion, this study contributes to the sparse literature in Hispanic adolescents regarding risk factors for eating disorders, weight status, body dissatisfaction and disordered eating behaviors. Among Hispanic adolescents with overweight/obesity, rates of body dissatisfaction and disordered eating

behaviors are disconcertingly high, in both males and females. Increased attention in how we can work toward prevention and increase treatments in this vulnerable population is needed.

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Appendix 2: Body Image Figures

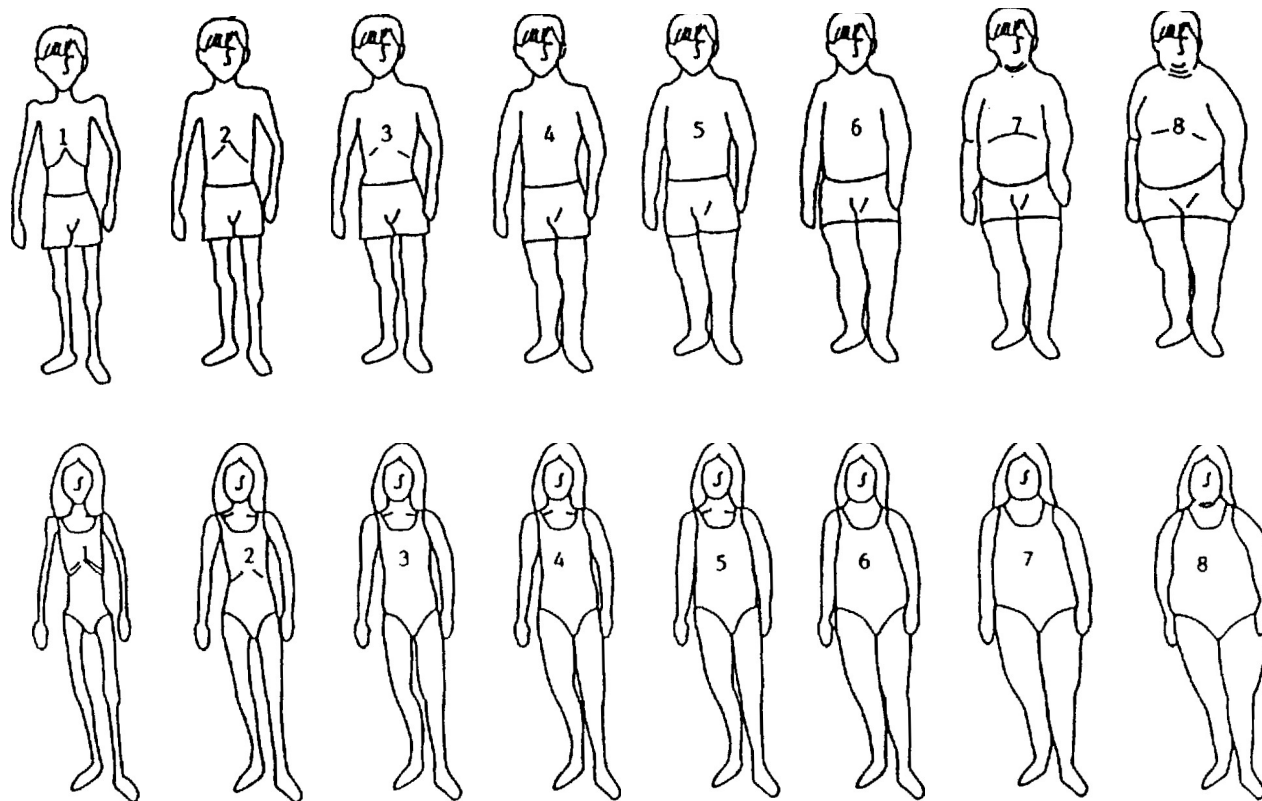


Figure A-1. Instructions: "Circle the drawing that most looks like you, then underline the drawing you would most like to look like."