OBESE ADOLESCENT FEMALES AND ACTUAL BEHAVIORAL RESPONSES TO A MINDFUL EATING INTERVENTION

by

Patricia Daly

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SIGNED: Patricia Daly
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ABSTRACT

Background: Adolescent obesity has tripled over the last three decades and is associated with an 80 percent risk of adult obesity, hypertension, diabetes, hypercholesterolemia, and decreased life expectancy. Current adolescent obesity medical recommendations include bariatric surgery and appetite suppressants which lower BMI, but present serious health risks. Nutrition and exercise interventions promote health, however, meta-analysis reveal do not lower BMI. Mindful eating, a behavioral skill, reconnecting eating to satiety cues, and has potential as an anti-obesity intervention which lowers BMI, while promoting health.

Study Aims:

Aim 1: To determine the effect of a mindful eating intervention compared to usual diet and exercise information on BMI of obese female adolescents.

Aim 2: To determine if the effect of a mindful eating intervention on BMI of obese female adolescents is sustained over time.

Aim 3: To determine the feasibility of conducting a group mindful eating intervention over six weeks for obese adolescent girls in their school setting.

Methods: Obesity was measured by Body Mass Index (BMI) = Weight in Pounds / Height in inches x Height in inches x 703. The sample included adolescent females aged 14-17 years with BMI >90th%. Participants were randomized to an intervention group receiving a 6 week mindful eating intervention and a comparison group receiving the usual care of nutrition and physical activity handouts. Participants’ BMI was measured at baseline, immediately post intervention and at 4 week follow up assessing intervention effectiveness.
Results: ANOVA results demonstrate a statistically significant difference in BMI between the experimental and comparison groups $F(1,2)=22.24, p<.001$. On average, the experimental group’s BMI decreased 0.71, whereas the comparison group’s BMI increased by 1.1 over the 6 week intervention. The experimental group’s BMI continued to decline at the 4 week follow up. Attrition from the study was 38%, below the 45% set feasibility threshold. A group mindful eating intervention over six weeks for obese adolescent girls was effective in lowering BMI sustained over time is feasible. Teaching the behavioral skill of mindful eating holds great promise for combatting obesity in adolescents. Future study should include a school based intervention with a larger more diverse sample.
CHAPTER 1: BACKGROUND AND SIGNIFICANCE

Introduction

Pediatric obesity in the United States has doubled over the last three decades (Centers for Disease Control and Prevention (CDC), 2011). The most affected subset of this population are adolescents, obesity has tripled in 12-17 year olds; thus over 8 million U.S. adolescents are obese (United States, Child Statistics, 2012). In 2010, more than one third of children and adolescents were overweight or obese (CDC, 2013). Left unchecked, it is predicted this epidemic will, for the first time since its recording, decrease the life expectancy in the United States (Wang, Beyoun, Liang, Caballero, & Kumanyika, 2008).

Cultural forces such as ballooning portion size, the increase of fat and sugar content of foods, and the escalating trend of dining out are noted to be the leading cause of obesity; these forces are argued to be the most plausible explanation for such a rapid rise in adolescent obesity (Wasink, 2007; Ogden, Carroll, Kit & Flegal; Brandon & Proctor, 2008; Peterson & Fox, 2007). The burgeoning challenge of escalating adolescent obesity plagues industrialized nations (Care, 2012). American society has become obesogenic; defined as a culture that promotes increased food intake, non-healthful foods consumption and inactivity (Minihan, Must, Anderson, Popper & Dworetzky, 2011). Culture drives food preferences and acceptable body phenotypes (Cornette, 2008). Female adolescents are noted to be the most sedentary subset of the pediatric population. (August, Caprio, Fennoy, Freemark, Kaufman, Lustig, & Montori, 2008). Female adolescents are especially vulnerable to these cultural forces, just as they were the subset most affected by anorexia nervosa in the 1980s and 1990s (Neumark-Sztainer, Story, Hannan, & Rex, 2003).
Though seemingly opposite, anorexia and obesity have striking similarities. Both of these culturally driven phenomena devastate adolescents with disordered eating unrelated to hunger and disconnected from satiety resulting in horrendous health consequences (Daly, 2010). Cultural expectations, body image, depression and social interactions place female adolescents at the greatest risk for physiological and psychological threats stemming from adolescent obesity (Boutelle, Hannan, Fulkerson, Crow, & Stice, 2010).

The empirics of obesity are simple: caloric intake exceeds caloric expenditure resulting in fat storage. Of note, rigorous exercise only expends 300 calories per hour and this expenditure of calories cannot negate the consumption of a fast food meal which can exceed 2,000 calories (Bleich, Ku & Wang, 2010). Thus addressing eating is the crux in an effective anti-obesity intervention.

Given that adolescent females are increasingly affected by the obesity epidemic, and that effective interventions must target eating, the purpose of this study was to test the effectiveness of teaching the cognitive behavioral skill of mindful eating on Body Mass Index (BMI) in obese adolescent females compared to the usual care of receiving only diet and exercise information.

**Definition of Terms**

Understanding the purpose of this study requires knowing common terminology. The following includes a list of definitions used throughout the proposal:

1. *Body Mass Index (BMI)*: Determination of BMI percentile was calculated by dividing weight in kilograms by height in square meters (kg/m²) using study protocol.

2. *Obesogenic culture*: A culture that promotes increased food intake, non-healthful foods and inactivity.
3. **Adolescent**: For clarity the NHANES 12-17 year, age definition of adolescents is utilized in this paper.

4. **Adolescent overweight/oobesity**: defined as a BMI >90\textsuperscript{th} percentile (CDC, 2011).

5. **Mindful eating**: defined as intentional eating with a sustained, nonjudgmental awareness of emotional and physiological states occurring during eating (Kristeller, Baer, & Quillian-Wolever, 2006).

**Background**

**Incidence and Economic Impact**

Obesity occurs in 30\% 12-17 year olds; thus over 8 million United States (U.S.) adolescents are obese (United States, Child Statistics, 2012). Obese children have an 80\% risk of adult obesity; as well as an increased incidence of hypertension, hypercholesterolemia and Type 2 diabetes (Freedman, Mei, Srinivasan, Berenson & Dietz, 2007), (Ogden, Carroll, Curtin, McDowell, Tabak & Flegal, 2006). The escalating pediatric obesity rates cross all socioeconomic and racial barriers with the prevalence increasing among all income and education levels (National Health and Nutrition Examination Survey (NHANES), 2010). The most affected subset is adolescents.

Tragically, for the first time since its recording, it is predicted that pediatric obesity will result in a decline in life expectancy of citizens in the United States (Olshansky, Passaro, Hershow, Layden, Carnes, Brody, & Ludwig, 2005). Adolescent obesity has resulted in a decline in eligibility of young military recruits and predictions there will be inadequate numbers of personnel fit for military and emergency services (Cawley & Maclean, 2010). Health care
costs attributable to obesity double each decade, and are estimated at $956 billion, one in every six dollars spent on health care (Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008).

Our culture had become obesogenic, promoting consumption of large quantities of high calorie foods and a sedentary lifestyle (Fisher & Kral, 2008). Adolescent susceptibility to cultural norms is evidenced by this subset of the population having the highest incidence of obesity, which has tripled over the past 30 years (CDC, 2010). Cultural expectations, body image, depression and social interactions place female adolescents at the greatest risk for physiological and psychological threats stemming from adolescent obesity (Minihan, Must, Anderson, Popper & Dworetzky, 2011). Consequently, women who remain obese since adolescence are more likely to have no further education beyond high school and, by the age of 40 years, to have two chronic health problems, and higher odds of receiving welfare or unemployment compensation (Clarke, O'Malley, Schulenberg & Johnston, 2010).

**Current Interventional Studies Meta-analysis**

This dramatic rise in adolescent obesity has generated a vast body of anti-obesity intervention research. Lifestyle interventions, including exercise and nutrition education, promote adolescent health, but do not significantly impact the BMI of obese adolescents (August et al, 2008). Two recent meta-analysis of these lifestyle pediatric obesity intervention studies found that these studies do not demonstrate efficacy as measured by lowering the BMI of participants (Gonzalez-Suarez, Worley, Grimmer-Somers, & Dones, 2009; McGovern, Johnson, Paulo, Hettinger, Singhal, Kamath & Montori, 2008; Kamath, Vickers, Ehrlich, McGovern, Johnson, Singhal, Montori, 2008).
Medical interventions of pharmacotherapy and bariatric surgery, now recommended for obese adolescents by the Endocrine Society’s Expert Opinion Clinical Practice Guidelines, do lower BMI (August, et al., 2008). However, these medical approaches pose serious health risks. Gastric bypass surgery complications can be life threatening and include pulmonary embolism, shock, intestinal obstruction and severe malnutrition. Appetite suppressing pharmaceuticals risk side effects of dependence, hypertension, arrhythmia and serotonin syndrome (Freemark, 2010).

The effectiveness of appetite suppressant and bypass surgery is their ability to induce satiety, thereby altering calorie consumption. As previously reviewed, increasing calorie expenditure promotes health, but cannot equalize our obesogenic culture’s new norm of excessive calorie consumption. An important omission from extant literature is an anti-obesity intervention that induces satiety and promotes health.

**Mindful Eating Intervention**

Mindful eating cognitive behavioral therapy has advanced during the past decade, and is currently used by psychotherapists and registered dieticians in the treatment of eating disorders. A recent mindful eating pilot study in obese adults demonstrated significant weight loss using the Mindful Eating And Living (MEAL) curriculum, taught in six 2-hour weekly sessions. Mindfulness, as a cognitive behavioral approach, is developmentally appropriate approach for adolescents due to their acquisition of abstract thinking (Dummy, Kirk Penney, Dodds & Parker, 2012) and findings that behavioral interventions are both appropriate and effective for adolescents. (Alberga, Sigal, Goldfield, Prud'Homme, & Kenny, 2012; Stok, Vet, Ridder, & de Wit, 2012). Additionally, an analysis of mindfulness interventions in pediatric populations
demonstrates such interventions are successful, and recommends future mindful intervention research in this young population (Burke, 2009).

**Problem Statement and Purpose of the Study**

The purpose of this study was to test the feasibility and effects of a mindful eating intervention and diet and exercise information on outcomes of healthy eating behavior as measured by lowering BMI in obese adolescent females aged 14-17 years. Guided by the Information, Motivation, Behavioral Skill Theory (IMB), the behavioral skill of mindful eating was taught and practiced to measure changes in eating behavior as measured by BMI. The overall goal of this program of research is to improve the health of obese adolescents by promoting healthy eating behaviors, thereby reducing BMI.

**Study Aims**

The specific aims of this study were:

Aim 1: To determine the effect of a mindful eating intervention (Mindful Eating and Living (MEAL) compared to usual diet and exercise information on BMI of obese female adolescents.

Aim 2: To determine if the effect of a mindful eating intervention (MEAL) on BMI of obese female adolescents is sustained over time.

Aim 3: To determine the feasibility of conducting a group mindful eating intervention over six weeks for obese adolescent girls in their school setting. Feasibility was determined as less than 45% attrition across the study.
Study Significance to Nursing and Society

Mindful eating holds great promise for impacting adolescent obesity. As previously reviewed, the cognitive behavioral intervention of mindful eating is developmentally appropriate for adolescents due to their ability think abstractly. This self-regulation technique addresses three key components identified as threats to healthy adolescent eating behavior: self-regulation, unanticipated situations and internal locus (Stoke et al). Mindful eating is easily employed in unanticipated health risk situations, focusing on bodily cues thus employing self-monitoring. Lastly, since mindful eating is a behavioral skill with an internal locus of control, it can be readily employed at the spur of the moment and is therefore compatible with the hectic schedule of adolescents. As a holistic, self-regulating intervention, mindful eating respects individual choice and self-determination, crucial elements in intervention studies for adolescents (Sonntag, Esch, von Hagen, Renneberg, Braun, & Heintze, 2010). Mindful eating aligns with this client-centered nursing approach, respecting the impact of culture, personal choice, and developmental appropriateness in fostering health.

The escalation of pediatric obesity had led to a multitude of intervention research studies. Current lifestyle interventions of nutritional and exercise education promote health, but have not impacted BMI. Medical approaches of gastric bypass surgery and appetite suppressants, now recommended by the medical establishment, lower BMI, but pose serious health risks, with little data on the future health risks such interventions raise for this young population. The effectiveness of these medical interventions to lower BMI is likely due to their ability to induce satiety. An important omission from extant literature is the identification of anti-obesity intervention which lowers BMI, while simultaneously promoting health and inducing satiety.
Obese adolescents have an 80% risk of adult obesity, with associated chronic health challenges of diabetes, hypertension and depression. Effective anti-obesity interventions impact quality of life, as well as financial consequences to individuals, families, and our nation (Clarke, O'Malley, Schulenberg, & Johnston, 2010).

Mindful eating is easily employed in unanticipated high risk eating situations, focusing on bodily cues thus employing self-monitoring. Nurses and advanced practice nurses, with background in patient teaching and nutrition are uniquely qualified as teachers of this eating approach. Mindful eating is consistent with nursing’s health model and addresses individuals interacting in a complex environment to achieve health. One unique aspect of this study was a focus upon teaching a behavioral skill to impact eating behavior. To date, few experimental studies have examined the role of mindful eating in obesity. Results from this study may suggest the teaching of this behavioral skill to extend beyond adolescents and potentially to school aged children.

**Summary**

Chapter One identified the interplay between obesity and culture. A key term, obesogenic culture is defined as a culture promoting increased intake of non-healthful foods and inactivity. Our obesogenic culture not only places the obese individual at risk, but plays an important role on the health of our society. Adolescent obesity threatens society with its associated soaring health care costs, lowered life expectancy and decreasing numbers of fit personnel for military and emergency services. Adolescents and particularly female adolescents are presented as the most affected subset of the population. High caloric intake is identified as the crux issue the obesity challenge. The chapter introduces the concept of mindful eating as a
learned behavioral skill which is the focus of this study. The purpose of the study and related research aims were stated. This study’s contribution to nursing research and uncovering effective anti-obesity interventions concludes the chapter. Chapter two presents a review of the literature supporting this study’s aims.
CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Introduction

This chapter presents a critical analysis of adolescent obesity focusing on cultural forces which have contributed to adolescent obesity’s rapid rise, the behavioral characteristics of adolescents placing them at risk, as well as current interventions designed to combat this health care epidemic. The specific challenges obesity poses for adolescent females are reviewed. The important role of satiety in the effectiveness of current interventions and gaps in the literature are identified. Key themes synthesized include the impact of culture upon adolescents, the special risks of female adolescents and the gap in the literature identified as the role satiety plays in the efficacy of current interventions. Mindful eating research is presented as filling this identified gap in the literature. This literature search was limited to studies published between 2002 and 2012. The databases searched were PubMed, CINAHL and Google Scholar. Key search terms included adolescent development, culture, pediatric obesity, interventional studies and mindful eating.

Overview of Obesity Interventions Concept Map

Figure 1 depicts a concept map of the literature review. This analysis focused upon adolescent obesity interventional research and its impact upon healthy eating behavior. Synthesis of the literature revealed 3 broad categories of interventions: lifestyle interventions, medical interventions including gastric bypass procedures and appetite suppressant pharmaceuticals, and mindful eating, a behavioral skills intervention. The literature review also revealed 4 major forces that drive healthy eating behavior: nutrition knowledge, cultural influences, motivation and satiety. Unequivocally, interventions that increase satiety were the most efficacious,
resulting in a significant impact on eating behavior and lowering BMI, compared to other anti-obesity interventions.

Figure 1: Obesity Review of the Literature Concept Map
Adolescent Obesity and Culture

Culture has been defined as the totality of socially transmitted behavioral patterns characteristic of a population of people, guiding their worldview and decision making (Im, 2008). Nursing recognizes culture as integral to health care (Reed, 2009). Culture is identified as integral to nursing, with Webber defining culture as “law worthy” in her defense of proposing laws of nursing (Webber, 2008). Interestingly, there is a reciprocal relationship between obese adolescents and their culture, each impacts the other. This discussion of the literature includes both studies of the cultural forces driving adolescent obesity as well studies that describe the impact adolescent obesity has on our society.

Adolescent Obesity’s Impact Upon Society

The young age of the affected adolescent population, coupled with the rapid rise of obesity and its consequential health threats, pose serious potential societal problems. Predictive studies speak to the urgency of remedying the burgeoning challenge of adolescent obesity (Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008, Cawley & Maclean, 2010, Olshansky, Passaro, Hershow, Layden, Carnes, Brody, & Ludwig, 2005). This coupling of young age and rapid rise obesity has led to multitude of literature generating predictions regarding the societal costs of this health epidemic. These predictive interaction studies utilize substantive theory to generate a highly differentiated causal hypothesis (Shadish, Cook & Campbell, 2008). Left unchecked adolescent obesity devastates not only the lives of the affected individuals, but will bankrupt our health care system, decrease the life expectancy of the United States and result in inadequate numbers of fit personnel for emergency and military service. These studies speak to
the magnitude of the burgeoning problem of adolescent obesity, as well as the urgent need to reverse this tragic trend.

A statistical analysis of data from the Social Security Administration calculated the effect of obesity on longevity. Tragically, for the first time since its recording, this study concludes that pediatric obesity will result in a decline in life expectancy of U.S. citizens (Olshansky, Passaro, Hershow, Layden, Carnes, Brody, & Ludwig, 2005). Cawley and Maclean’s 2010 data analysis of the full series of the National Health and Nutrition Examination Surveys (1959-2008) found a marked decline in eligibility of young military recruits and projects that obesity in young people will result inadequate numbers of personnel fit for military and emergency services (Cawley & Maclean, 2010). A collaboration of biostatisticians estimates health care costs attributable to obesity double each decade, and are estimated at $956 billion, one in every six dollars spent on health care. This study based its projection on census population data and national estimates of per capita health care costs of obesity (Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008). Each of these studies utilizes predictive statistics (Shadish, Cook & Campbell) to forecast the consequences of pediatric obesity, emphasizing the urgency of squelching this burgeoning epidemic.

**Cultural Forces Driving Adolescent Obesity**

Cultural forces including increased portion size, increased fat and sugar content of food, fast food consumption and sedentary lifestyle are noted to be the leading cause of obesity; These forces are argued to be the most plausible explanation for such a rapid rise in adolescent obesity (Wasink, 2007; Ogden, Carroll, Kit & Flegal; Brandon & Proctor, 2008; Peterson & Fox, 2007). American society has become *obesogenic* defined as a culture that promotes increased
food intake, non-healthful foods and inactivity (Minihan, Must, Anderson, Popper & Dworetzky, 2011). This obesogenic culture is further evidenced in Brandon’s development of a theoretical framework for children with metabolic system (Brandon & Proctor, 2008).

There are a multitude of studies citing the increase of portion size with its resultant intake of calories. Mechanisms by which portion size exerts its effects on intake in both children and adults are yet poorly understood. Visual cues are believed to play an important role. Visual cues are thought to act as possible modifiers of eating behavior (Scheibehenne, Todd & Wasink, 2010). An analysis of dishware demonstrated the average dinner size plate has increased 36% since 1960 (Wansink & Van Ittersum, 2007), similar conclusions regarding the growing diameter of plate sizes have been drawn from analysis artwork (Wansink & Wansink, 2010). Colapinto and Nielsen, in their respective portion and beverage studies noted this recurring trend of markedly increased beverage and food portions over the last two decades (Colapinto, Fitzgerald, Taper & Veugelers, 2007; Nielsen & Popkin, 2004). Wasink and Van Ittersum synthesized 12 studies on portion size and its influence on consumption, ranging from varying ice cream scoop sizes to bottomless soup bowls. Results were universally consistent, finding that given larger portions, individuals of all backgrounds consume an additional 24-36%. This increased quantity of food consumed, hovering around 1/3 is also found in analysis of recipes over the past 25 years (Wasink, 2009). The importance of visual cues is further evidenced in studies revealing blind folded participants consume 24% fewer calories (Scheibehenne, Todd & Wasink, 2010).

Fast food intake has been well documented as a major contributor to obesity (Fisher & Kral, 2008, Rosenheck, 2008). Rosenheck’s rigorous systematic review of fast food studies concluded there is sufficient evidence for public health recommendations to limit child and
adolescent fast food consumption (Rosenheck, 2008). Nielsen and Popkin note that current day fast food meals often exceed 2,000 calories...600 more calories than fast food meals in 1977 (Nielsen & Popkin, 2004). Of note, are the empirics of calorie intake and expenditure. Rigorous exercise only expends 300 calories per hour. It is therefore physically impossible for calorie expenditure to negate a fast food meal (Bleich, Ku & Wang, 2010).

Sedentary lifestyle is also noted in the literature as a factor contributing to adolescent obesity (Puhl, 2010; Nelson, Neumark-Stzainer, Hannan, Sirard & Story, 2006). A systematic review of 26 cross-sectional and longitudinal studies of calorie intake and expenditure focusing on sedentary activity level’s impact upon pediatric obesity was inconclusive; citing wide variation in data quality. These authors recommended further causal research with improved methodologies (Bleich, Ku & Wang, 2010).

Eating preferences impact pediatric obesity. Learned in families during childhood, eating preferences are often culturally acquired (Freedman, & Alvarez, 2007). Food is both an expression of cultural identity and affection, thus parents’ food choices impact their children’s relationship with food. Current nutritional education interventions often lack cultural sensitivity and have not decreased the incidence of pediatric obesity (Whitaker, Gooze, Hughes, & Finkelstein, 2009). Increased family restaurant dining further contributes to obesity (Devine, Jastran, Jabs, Wethington, Farell, & Bisogni, 2006).

**Adolescent Behavior and Culture**

Adolescents are more susceptible to the cultural forces that drive obesity (Viner, Ozer, Denny, Marmot, Resnick, Fatusi, & Currie 2012; Stice, 2002; Puhl, & Heuer, 2009). Viner et al., (2012) reviewed existing data on the effects of social determinants on adolescent health in a
country-wide ecological analysis and found the health of adolescents is strongly affected by social factors. Developmentally, adolescents are more responsive to peer pressure and demonstrate more susceptibility to socio-cultural norms than their adult counterparts (Viner, et al, 2012; Puhl, & Latner, 2007). This may explain why 12-17 year olds have the greatest increase in obesity of all age groups (CDC, 2010). Well documented throughout the adolescent literature is their pivotal cognitive development from concrete of abstract thinking (Huang, Esposito, Fisher Mennella & Hoelscher, 2009), as well as influence of pubertal hormones (Styne, 2004, Coviello, Legro, & Dunaif, 2006). Further compounding their risk for obesity are the lifestyle changes which accompany adolescence and the struggle with irregular schedules, peer pressure, impulsivity and time management (Hassink, 2007; Puhl & Latner, 2007). The Endocrine Society’ expert panel noted important adolescent obesity risk factors including sedentary behavior, body esteem issues and risk for depression. It was also noted that these risk factors increase, while simultaneously sport participation declines during late adolescence; most especially in teenage girls (Haines& Neumark-Sztainer, 2006, August, et al., 2008).

Strauss’ (2003) analysis of friendship nominations in teens revealed significantly fewer nominations for adolescents with body mass indexes exceeding the 95th percentile. The relationship of depression and obesity has been identified as escalating health threats to adolescent (Reeves, 2008). The literature reveals the emotional impact of obesity’s stigma is more devastating to adolescents than older adults (Cornette, 2008).

**Social Stigma**

The impact of the stigma of obesity extends beyond social interaction, individuals who experience weight stigmatization have higher rates of depression, anxiety, social isolation, and
poorer psychological adjustment (Puhl & Heuer, 2009). Individuals may react to weight stigma by internalizing and accepting negative attitudes against them, increasing vulnerability to low self-esteem. These deleterious psychological effects may impact treatment; lowering the desire to seek treatment and increasing attrition from weight loss program (Gill, Karmali, Hadi, Al-Adra, Xinzhe, Shi, & Birch, 2012).

**Female Adolescents an At Risk Population**

A variety of factors place female adolescents at increased risk of physiological and psychological health threats; including activity level, cultural expectations, body image, depression and social interactions. The impact of these factors likely explains why obese adolescent females complete less schooling than those who are not obese. Women who remained obese since adolescence are more likely to have chronic health problems by the age 40 years, to have no further education beyond high school, and to have higher odds of receiving welfare or unemployment compensation at age 40 years than their normal weight counterparts (Clarke, O'Malley, Schulenberg, & Johnston, 2010).

Sedentary lifestyle contributes to the energy imbalance of obesity, and although at all ages, girls are less physically active than boys (Kimm, Glynn, Kriska, Barton, Kronsberg, Daniels, & Liu, 2004), this difference escalates during adolescence. (Ferreira, Vander Horst, Wendel-Vos, Kremers, Van Lenthe, & Brug, 2007). A ten year longitudinal study of 2379 of 9-10yr and 16-17 yr females found a dramatic 75% decrease in leisure time physical activity (Ward, Dowda, Trost, Felton, Dishman, & Pate, 2012). Culturally, obesity poses specific challenges for female adolescents with strong social pressures for thinness in females (Neumark-Sztainer, Story, Hannan, & Rex, 2003). Although there are numerous studies finding obesity...
threatens the psychological health with both genders, female adolescents report higher levels of body dissatisfaction and depression than obese male adolescents (Boutelle, Hannan, Fulkerson, Crow, & Stice, 2010). Additionally, female obese adolescents date less frequently and report victimization in close relationships, findings not reported by their male obese counterparts (Pearce, Boergers, & Prinstein, 2012).

**Current Anti-obesity Intervention Studies**

In this section current lifestyle and medical model intervention studies are reviewed. Mindful eating is then presented as a developmentally appropriate alternate intervention. This section analyzes current interventional studies combining adolescent obesity. The efficacy and health risks of lifestyle interventions and medical approaches are reviewed.

**Current Anti-obesity Lifestyle Intervention Studies**

Lifestyle interventions promote adolescent health, but do not significantly impact the BMI of obese adolescents (August et al, 2008). Recent meta-analysis of pediatric obesity interventional studies do not demonstrate efficacy as measured by lowering the BMI of participants (Gonzalez-Suarez, Worley, Grimmer-Somers, & Dones, 2009; McGovern, Johnson, Paulo, Hettinger, Singhal, Kamath & Montori, 2008; Kamath, Vickers, Ehrlich, McGovern, Johnson, Singhal, Montori, 2008). In 2006, Doak Rendes & Siedell performed an extensive review of pediatric obesity intervention studies. Only 4 of the 25 school-based interventional studies reviewed were found effective in lowering BMI. In 2009, Gonzalez-Suarez, Worley, Grimmer-Somers and Dones performed a comprehensive literature search and identified 41 studies of clinically controlled school-based interventions. Their meta-analysis included only studies with odd ratios or standardized mean differences and 95% CIs which were either reported
or could be calculated from available data. In this meta-analysis, examining 41 school-based nutrition and exercise intervention studies only 19 studies met the meta-analysis criteria. Results revealed these nutrition and activity focused interventional studies were not effective in decreasing BMI. The meta-analysis of these studies did, however, find that BMI did not, at least, increase in the interventional groups of these studies (Gonzalez-Suarez, et al., 2009). A third meta-analysis of 1162 random controlled lifestyle interventional studies to combat pediatric obesity was commissioned by the Endocrine Society’s Guidelines Task Force. This extensive librarian–designed search assessed 64 studies that met criteria aimed at increasing physical activity (PA) decreasing sedentary activity (SA) increasing healthy dietary habits (HD) and decreasing unhealthy dietary habits (HU). The interventions of these studies caused small changes to their respective target behaviors. Unfortunately, again there was no significant effect of these interventions on BMI when compared to control (Kamath et al, 2008). Similarly, Stice, Shaw and Marti’s meta-analytic review of obesity prevention programs for adolescents and children revealed 79% did not produce statistically reliable weight gain prevention effects (Stice, Shaw & Marti, 2006). In contrast, one systematic review of 76 randomized control trials of nonsurgical pediatric obesity interventions reported both pharmaceutical and lifestyle interventions did produce small to moderate effects on BMI (McGovern, et al., 2008).

**Attrition Rates in Anti-obesity lifestyle interventions**

Attrition is a major obstacle to anti-obesity lifestyle interventions. Anti-obesity lifestyle interventions are dominated by commercial weight loss programs. Studies cite attrition rates for such programs exceed 50 percent. Data from this private industry is not readily available from independent sources. One study by the American Society for Clinical Nutrition found 50% of the
participants dropped out in six weeks and 70% in 12 weeks (Volkmar, Stunkard, Woolston & Bailey, 2001) The Canadian Journal of Surgery reports drop-out rates of 54% in anti-obesity lifestyle interventions, noting female and younger patients had even higher rates of attrition. (Gill et al., 2012). This finding aligns with the impulsivity of normal adolescent development. Additionally, this vulnerable population is at high risk for attrition due to their lack of autonomy including challenges with transportation and family responsibilities. Offering lifestyle interventions afterschool addresses some of these challenges, however, studies cite an overall attrition rate >50% from most after school programs (Weisman & Gottfredson, 2001). Of note is these afterschool programs do not carry the stigma of obesity.

**Current Anti-obesity Medical Intervention Studies**

Addressing obesity as a disease, the medical model advocates the use of pharmaceutical agents and gastric bypass surgery in obese adolescents (August, et al., 2008). Although these medical interventions impact satiety and lower BMI, they pose significant health risks as well as costs.

A meta-analysis of 8 adolescent by-pass surgery studies included 352 patients aged 9-21 years. This meta-analysis noted severe complications including pulmonary embolism, shock, intestinal obstruction and severe malnutrition. This review concluded that bariatric surgery in pediatric patients results in sustained and clinically significant weight loss, but has potential for serious side effects (Treadwell, 2008).

Remarkably, the Endocrine Society’s Expert Opinion Clinical Practice Guidelines, now recommend appetite suppressants and bariatric surgery for adolescents who fail lifestyle modifications (August, et al., 2008). This all medical doctor expert panel justifies this
recommendation citing that only 25% of obese pediatric patients respond to intensive lifestyle modification programs, additionally noting the financial disincentive of poor reimbursement for such programs.

Bypass surgery primarily impacts satiety and thereby decreases caloric intake, which is the crux issue underlying obesity. What these studies fail to consider is the devastating long term effects of bypass surgery and long-term efficacy and safety of these pediatric obesity treatments remains unclear (McGovern, et al., 2008, Treadwell, 2008). Along with the risk of relapse, bypass poses life threatening complications including pulmonary embolism, shock, intestinal obstruction and severe malnutrition.

The Endocrine Society’s current medical guidelines for the treatment of adolescent obesity also now recommend the use of appetite suppressants. Similar to bypass surgery, these appetite suppressants impact satiety and lower BMI, but risk side effects of dependence, hypertension, arrhythmia and serotonin syndrome (Freemark, 2010).

The effectiveness of gastric bypass and pharmaceutical agents lies in the ability to reduce hunger and promote a sensation of satiety. Unfortunately, there are serious health threats posed by these medical approaches. Additionally, there is no long term safety or relapse data for either pharmaceutical agents or gastric bypass surgery in adolescents.

**Mindful Eating**

**Mindful Eating Origins**

Mindfulness is routed in eastern spiritual traditions, and entered the world of western psychology in the 1990’s. It was utilized primarily by psychologists as a cognitive behavioral technique to treat various psychological and physical disorders. The most widely utilized
technique Mindfulness-Based Stress Reduction (MBSR), is considered a type of cognitive behavioral therapy first utilized to treat anxiety, depression, and later eating disorders (Miller, Fletcher, & Kabat-Zinn, 1995; Teasdale, Segal, Williams, Ridgeway, Soulsby, & Lau, 2000). A meta-analysis of 64 studies using mindfulness–based stress reduction, found mindfulness to be an effective intervention for both psychological and physiological ailments with calculated effect sizes of 0.5 (Grossman, Niemann, Schmidt & Wallach, 2004).

Treatment of eating disorders with mindful eating is a growing area of research. More recently, registered dieticians have embraced this approach. Dieticians are currently applying mindful eating techniques during obesity consultations emphasizing pausing between bites and attention to satiety cues. Most importantly, a mindfulness approach teaches a behavioral skill, which may be employed in a multitude of situations. This behavioral skill does not require following a prescribed regimen, but instead emphasizes self-empowerment.

**Mindful Eating Pilot Study**

A recent pilot study in adults supports the hypothesis that mindful eating is an effective intervention in lowering BMI (Dalen, 2010). Dalen’s pilot study of 10 obese adults implementing a 6 week mindful eating instruction yielded a significant change in BMI, as well as marked improvement in disordered eating psychometrics (Dalen, 2010). The Mindful Eating and Living (MEAL) curriculum utilized in this study was taught in weekly 2 hour sessions. This MEAL curriculum developed by Brian Shelley MD focuses upon awareness of hunger cues drawing from both the MB-EAT curriculum of Jean Kristeller PhD and Quillian-Wover which was developed to address bulimic disorders; as well as the MSBR curriculum of Jon Kabat-Zinn PhD developed to foster stress coping mechanisms.
In addition to the didactic sessions, a 10 minute daily meditation exercise emphasizing self-awareness including bodily sensations experienced while eating is promoted in this curriculum. This study measured BMI prior to the MEAL curriculum intervention, immediately following the intervention and at a 3 month follow-up. The adults enrolled in this study initially had a mean BMI of 36.9, and all had significant weight loss with a mean weight loss of 4 kg over a 12 week period.

**Mindful Eating/Satiety Concept**

Figure 2 depicts the key concept that differentiates interventions that lower BMI from interventions that promote health: satiety. Diet and exercise interventions promote health but do not address this crucial concept. Diet and exercise rely on an individuals’ self-discipline, and, as revealed in multiple meta-analyses do not result in long term healthy eating, and therefore do not lower BMI. Satiety, is the sensation of gastric fullness after consuming a satisfying meal. It can also be induced surgically by resecting the stomach or by suppressing hunger with pharmaceutical appetite suppressants. Mindful eating is defined as the sustained nonjudgmental awareness of emotional and physiological states as they are occurring during eating (Kristeller, Baer, & Quillian-Wolever, 2006). Mindful eating, a behavioral skill that can be taught and practiced, cues individuals to the sensation of satiety. Mindful eating, as a learned healthy behavior skill promotes health and induces satiety, thereby lowering BMI.
Adolescent Obesity and Anorexia Parallels

Though seemingly opposite, anorexia and obesity have much in common. Both are culturally driven eating disorders devastating adolescents, with horrendous health consequences, in which eating is unrelated to hunger and disconnected from satiety (Daly, 2010). Additionally, investigating treatment similarities reveals nutrition knowledge and support, though important in the treatment of anorexia and obesity, did not effectively resolve the underlying problem: eating behavior. An additional similarity is the ineffectiveness of medical interventions controlling
intake; nasogastric tube feedings were not effective in treating anorexia. Mindful eating was
developed to address the dire need for an effective intervention to reconnect eating and satiety in
these eating disturbed adolescents.

**Mindful Eating Intervention**

Mindful eating is defined as intentional eating with a sustained, nonjudgmental awareness
of emotional and physiological states occurring during eating (Kristeller, Baer, & Quillian-
Wolever, 2006). It is considered a cognitive based therapy with its roots in eastern philosophy
(Albers, 2010). Mindful eating was developed as a psychological approach to treat anorexia
nervosa which devastated the health of adolescent females in the 1980s (Kristeller, Baer, &
Quillian-Wolever, 2006). Health professionals trained in this technique, taught this mindful
eating in both individual and group sessions, with good outcomes. The MEAL curriculum was
developed specifically to address obesity and is taught in 6 weekly group sessions.

**Mindful Eating as an Anti-obesity Intervention**

Mindful eating is a cognitive behavior therapy designed to effectively treat disordered
eating (Kristeller, Baer & Quillen, 2006; Burke, 2010). Mindful eating reconnects eating
behaviors to the normal human response of hunger and satiety (Daly, 2010). A review of
empirical studies utilizing mindful eating in the treatment of binge eating and anorexia reveals a
60-70% success rate (Kristeller, Baer, & Quillian-Wolever, 2006). The technique of mindful
eating had been utilized effectively in treating the aversion to eating of anorexics and bulimics.
Mindful eating reconnected these affected individuals to the basic, natural drive to eat when
hungry. It seems logical this approach could be effective in combatting obesity. A recent pilot
study in adults supports this hypothesis (Dalen, 2010). Dalen’s pilot study of 10 obese adults
implementing a 6 week mindful eating instruction yielded a significant decrease in BMI, as well as marked improvement in disordered eating psychometrics (Dalen, 2010).

**The Literature Gap: Satiety and Mindful Eating Intervention**

This review of the literature presents the state of the science in adolescent obesity. The dire outcomes of predictive studies emphasize the urgent need for efficacious interventions for this culturally driven phenomenon impacting the especially susceptible population of adolescents. Current meta-analysis of anti-obesity adolescent interventional studies reveal lifestyle interventions promote health, but do not induce satiety and are not efficacious in lowering BMI. Medical approaches of gastric bypass and appetite suppressants directly impact satiety and are therefore efficacious in lowering BMI, but pose serious health and relapse risks. Dalen’s recent effective pilot study implementing mindful eating in obese adults holds great promise for adolescent obesity.

Satiety therefore must be a key consideration in developing efficacious interventions to combat this complex health care problem. Successful interventions need to combat the disordered eating that underlies adolescent obesity and must induce satiety and reconnect eating behavior to normal responses of hunger and satiety. Therefore the knowledge gap is the need to explore the role of satiety role in healthy eating behavior. This may be achieved with the mindful eating intervention study in obese adolescents proposed below.

**Mindful Eating Effectiveness**

Mindful eating is defined as the sustained nonjudgmental awareness of emotional and physiological states as they are occurring during eating (Kristeller, Baer, & Quillian-Wolever,
In a review of empirical studies utilizing mindful eating in the treatment of binge eating and anorexia reveals a 60-70% success rate (Kristeller, Baer, & Quillian-Wolever, 2006). Cognitive therapy is developmentally appropriate for adolescents due to their acquisition of abstract thinking (Dummy, Kirk Penney, Dodds & Parker, 2012) and behavioral interventions have been found to be appropriate and effective for adolescents (Alberga, Sigal, Goldfield, Prud'Homme, & Kenny, 2012; Stok, Vet, Ridder, & de Wit, 2012).

In a review of mindfulness approaches in children and adolescents, Burke states current research supports the feasibility of mindfulness-based interventions for this young population, but also notes there is no generalized empiric evidence of the efficacy of these interventions. This review identifies the need for more well-controlled studies of mindfulness in the pediatric population to establish a strong research evidence base.

**Developmental Appropriateness of Mindful Eating in Adolescent Females**

The developmental appropriateness of mindful eating in adolescent females is evidenced by their increased risk for disordered eating, prior success of mindful eating interventions in this population, and this intervention’s ability to address self-regulation challenges of this specific population. An analysis of mindfulness interventions in pediatric populations has proven such interventions to be successful, recommending mindful interventions in this young population (Burke, 2009).

Further support of the benefits of a mindful eating approach in female adolescents is this group’s increased risk for depression and body esteem issues during adolescence (Alberga, et al,
2012). In their paper exploring adolescence as a critical period for obesity intervention, Alberga et al note this stage of development is critical in the both the onset and prevention of obesity continuing throughout the life span. Also of note, is that historically a majority of mindful eating participants have been female. This is due to mindful eating’s origin in treating disordered eating (anorexia and binge eating) which disproportionately affects females (Kristeller, Baer, & Quillian-Wolever, 2006).

Consistent with previous research, Stok et al found adolescents demonstrate knowledge of both healthy eating and self-regulation strategies (Brandon & Proctor, 2008; Minihan et al, 2011). This finding seems contrary to the escalating incidence of adolescent obesity. In this study, an ANOVA of 357 adolescents generated statements regarding self-regulation of healthy eating and identified 3 trends. The three self-regulation risks identified were inability to anticipate health risk situations, spur of the moment wavering, and lack of employing self-regulation strategies. An important positive outcome of this study was self-monitoring, when combined with self-regulation strategies resulted in successful healthy eating outcomes. These trends offer some insight into the contradictory evidence of obesity rising despite adolescents’ nutrition knowledge.

Meeting these recommendations, mindful eating holds great promise for impacting adolescent obesity. As reviewed the cognitive intervention of mindful eating is developmentally appropriate for adolescents due to their ability for abstract thinking. This self-regulation technique addresses the key threats to adolescent eating behavior self-regulation (Stok et al). Mindful eating is easily employed in unanticipated health risk situations, focusing on bodily cues thus employing self-monitoring. Since mindful eating is a behavioral skill with an internal locus
of control, it can be readily employed at the spur of the moment. As a holistic, self-regulating intervention, mindful eating respects individual choice and self-determination, crucial elements in interventional studies for adolescents. Mindful eating aligns with a nursing’s client-centered approach, respecting the impact of culture, personal choice, and developmental appropriateness in fostering health.

**Information Motivation Behavioral Skills (IMB) Theory**

**IMB Theory as a Framework for a Mindful Eating Intervention**

The Information Motivation Behavioral Skills (IMB) theory focuses on developing special behavioral skills to promote an individual health behavior change, in addition to motivation and information (Fischer, Fisher, Williams & Malloy, 1994). This model is depicted in Figure 3 below. Although widely used to explain AIDS preventative behavior, the IMB has been extended to explain other individual health behavior changes (Osborne & Egede, 2010). In the IMB theory, the constructs of information and motivation are antecedents or moderators and have a positive relationship to both of the outcome variables of health behavior change, as well as behavior skills. This focus on behavioral skills as a “precursor” to behavior change is the unique feature of this theory, differentiating it from other individual health care theories. Information and motivation also directly impact the desired health behavior change. The key concepts as defined by Fischer and Fischer and Malloy are:

- **Information**: Knowledge of health problem and prevention practices
- **Motivation**: Self efficacy, personal attitudes, intention and perceived normative support for the health behavior
- **Behavioral Skills**: Skills integral in performing the desired outcome health behavior.
• **Health Behavior**: Behavior which promotes health.

**Relationships of Constructs**

Figure 3 depicts the IMB theory constructs and demonstrates their relationships.

The **blue boxes** indicate the major constructs of the theory, Information, Motivation, Behavioral Skills and Behavior Change.

The **gray arrows** demonstrate the relationships proposed by the original authors. Specifically, Information, Motivation and Behavioral Skills have a positive, unidirectional relationship with the desired health behavior. Information and Motivation have a bidirectional positive relationship with each other. Thus, as Information increases, so does Motivation. As Information, Motivation and Behavioral Skill increase, so does the desired outcome of the health behavior.

**Yellow arrows** indicate an additional cyclical relationship proposed by the researcher. As the positive outcome Behavior Change increases, Motivation and Information increase.
Figure 3: Information Motivation Behavioral Skills Model (IMB)

**IMB Theory: Relevance to Adolescent Obesity**

The IMB theory is uniquely relevant to this substantive area. Parallels between HIV, (the health behavior challenge the IMB was created to explain), and adolescent obesity are numerous. Both these health care challenges arose suddenly with grave consequences for the relatively young affected population. Logically, it would seem the dire health consequences of HIV and obesity would motivate behavior change. However, the initial health care interventions of disseminating information and education alone were not effective in stemming these epidemics. Fisher and Fisher (1994) found an additional behavioral skill set was crucial in effecting the
needed health behavior change: using a condom during sex. These researchers found that role playing and practicing the social skillset, in combination with motivation and information greatly enhanced the desired outcome health behavior. Similarly, in reviewing the adolescent obesity literature, multiple meta-analysis reveal that informational lifestyle interventions are not effective at lowering BMI (Gonzalez-Suarez, Worley, Grimmer-Somers, & Dones, 2009; McGovern, Johnson, Paulo, Hettinger, Singhal, Kamath & Montori, 2008; Kamath, Vickers, Ehrlich, McGovern, Johnson, Singhal, Montori, 2008). Like the desired healthy outcome of condom use, a behavioral skill may enhance the desired outcome of healthy eating, currently not achieved with information and motivation alone.

Both the HIV and adolescent obesity epidemics necessitate a change in social behavior. Furthermore, the underlying behavior changes are related to innate human drives, sexuality and hunger. Additionally, the affected population may share characteristics; it is likely that HIV prone individuals shared threats to self-regulation, a risk factor well-documented in adolescents (Stok, Vet, Ridder, & de Wit, 2012). Practicing behavior skills, the unique component of the IMB theory, is likely to be effective in addressing the self-regulation challenges of adolescents: impulsivity, inability to anticipate health risk situations, spur of the moment wavering (Stok et al, 2012).

**IMB Theory Relevance to the Study**

The IMB theory, with its characteristic feature of behavioral skills, is particularly relevant to this proposed mindful eating study. What differentiates this study design, from other lifestyle interventional studies is the inclusion of the behavioral skill set; mindful eating. Similar to the authors of the IMB, Fisher and Fisher this behavioral skill id pivotal to the success of this
research’s behavior outcome of healthy eating behavior. The construct of learning behavioral skills to promote health behavior explains this intervention of teaching mindful eating. Mindful eating….the slow, focused chewing emphasizing satiation is a specific skill which can be practiced, facilitating healthier eating behaviors.

Unlike the IMB’s initial behavioral; skills of role playing condom use, however, mindful eating skills go beyond, and at risk individuals actually practice the needed behavioral skill. Mindful eating, utilized successfully in the past to treat the disordered eating of anorexia and bulimia, plays a pivotal role in satiety. This act of reconnecting eating to the hunger response is crucial to healthy eating. Inducing satiety facilitates healthy eating behavior which underlies the medical interventions that are most efficacious in lowering BMI: bariatric surgery and pharmaceutical appetite suppressants.

The focus on mindful eating aligns well with the concept of learning behavioral skills to facilitate health behavior change. Similar to the IMB’s origins combatting unsafe sex practices with grave long term health consequences HIV, risky eating behavior poses serious health threats to individuals with obesity.

**Operationalized Constructs for a Mindful Eating Intervention Study**

The structure of the IMB theory enables the abstract concepts of mindful eating and satiety to be understood presenting mindful eating as a separate behavior skill, distinguishable from motivation and information.

Figure 4 depicts the operationalization of the IMB theory constructs in this mindful eating intervention study. The Information and Motivation constructs were addressed in this study, with the dissemination of nutritional and exercise information and motivation to participate in
the study and attendance at sessions. The behavioral skill taught was mindful eating in 6 weekly didactic sessions. The outcome, healthy eating behavior was measured with BMI.

Figure 4: Operationalized Constructs for Mindful Eating Intervention Study

This section presents the Information Motivation Behavior Theory as a framework for a mindful eating interventional study.

Origins: The IMB model was developed by Fischer and Fisher in the 1980s, as these two researchers studied the psychology of condom use in the transmission of HIV. This cognitive behavioral theory shares origins and the cognitive perspective of other cognitive theories
including as the health belief model (HBM), social-cognitive theory (SCT), the theories of reasoned action (TRA) (Glanz, Rimer & Viswanath, 2008).

**Meaning of concepts:** The IMB is an integrative framework including two cognitive and one behavioral factor as determinants of preventative health behavior change (Fisher, 1997). The key concepts as defined by Fischer and Fischer and Malloy are:

- **Information:** knowledge of health problem and prevention practices
- **Motivation:** Self efficacy, personal attitudes, intention and perceived normative support for the health behavior
- **Behavioral Skills:** Skills integral in performing the desired health behavior change.
- **Health Behavior:** Behavior which promotes health.

In addition to defining the concepts, meaning is further explored by identifying the concepts as primitive, concrete or abstract. As the concepts Information, Behavioral Skills, Motivation and Health Behaviors are mental representations of agreed upon phenomenon, these concepts are considered abstract (Chinn & Kramer, 2008). The ability to operationalize these terms into less abstract and more empirical terms is evidenced in the corresponding constructs created below for this proposed study: Nutrition Education, Motivation, and Mindful Eating Skills and Healthy Eating behavior. Had these concepts been only definable with examples in lieu of verbal descriptions, i.e., the term “blue”, the concepts would be considered primitive.
Research Question: What is the effect of a mindful eating intervention on BMI in obese adolescent females?

This study utilizes all four constructs of the IMB theory. Each is operationalized in this mindful eating intervention research. These measurable operationalizations provide empirical data to answer the research question while lending further support to the IMB theory. Below are the specific definitions of how the IMB concepts are operationalized as constructs utilizing mindful eating as a behavioral skill to impact healthy eating.

To demonstrate these criteria the IMB theory is proposed as theoretical framework for an interventional anti-obesity study. In this proposed research, the participants are obese adolescents undergoing a mindful eating intervention. A sample of 14-17 year old female obese adolescents was randomized to an intervention group receiving six weeks of mindful eating instruction, and a comparison group a receiving the usual care of a nutritional and physical activity instruction handout alone. Motivation, Mindfulness Awareness and BMI were measured pre and post intervention to assess effectiveness. This study tested a mindful eating intervention to reconnect eating behavior and satiety. This approach addresses the crucial elements lacking in current lifestyle intervention: a lack of emphasis upon teaching eating behavior skills (Fisher & Fisher) and a lack of impact on satiety (Daly, 2010). Additionally, mindful eating interventions empower the affected individual, a critical element for impulsive adolescents struggling with self-regulation (Stok, 2012).

Theory & Research Fit

The IMB addresses key components of this dissertation which stresses that information alone
(nutrition education) and motivation (self-reported desire for weight loss) do not result in healthy behavior. Mindful eating is a behavior skill that can be taught, and practiced increasing the health behavior change of healthy eating as measured by effectively lowering BMI.

Summary

Left unchecked, adolescent obesity is anticipated to decrease the U. S. life expectancy. Our culture had become obesogenic promoting consumption of large quantities of high fat and sugar content foods and a sedentary lifestyle. Adolescents are the most affected subset of this population; adolescent obesity has tripled over the past 30 years. Cultural expectations, body image, depression and social interactions place female adolescents at the greatest risk for physiological and psychological threats stemming from adolescent obesity. Consequently, women who remain obese since adolescence are more likely to have no further education beyond high school and, by the age of 40 years, to have two chronic health problems, and to higher odds of receiving welfare or unemployment compensation.

A review of the interventional literature identifies 3 primary approaches to adolescent obesity: lifestyle interventions which include nutrition and exercise education, and the Endocrine Society’s recommendations of bariatric surgery and appetite suppressant pharmaceuticals. Meta-analysis of current pediatric lifestyle intervention studies reveals these programs promote health but do not impact BMI or satiety. Bariatric surgery and appetite suppressant pharmaceuticals evoke satiety and effectively lower BMI, but have devastating side effects.

A recent pilot study offers employing mindful eating intervention, lowered BMI while promoting a healthy life style. Mindful eating, a cognitive therapy first developed to combat anorexia and bulimia, promotes sustained nonjudgmental awareness of emotional and
physiological states occurring during eating. This awareness, promotes satiety, the key element in lowering BMI for bariatric surgery and appetite suppressants.

The IMB theory offers an understanding of these literature review findings. This theory; was initially developed to explain the disparity between information, motivation and actual health behavior change of practicing safer sex. The IMB theory provided an understanding of the continued spread of HIV/AIDS despite disseminating information about the devastating consequences of unsafe sex practices. Information and motivation alone did impact health behavior. Despite the potential lethal consequences of risky sexual behavior, information alone, did not change the behavior. Instead it was found that behavioral skills needed to be attained and practiced. Adding role playing and practicing safe sex discussions, gave at risk individuals the specific behavioral skills to employ during sexual encounters and facilitated the change to safer sex condom use health behavior.

Mindful eating, like role playing, teaches specific behavioral skills for individuals to employ during eating. This focus beyond information and motivation likely explains why this technique holds great promise for lowering BMI while promoting health.
CHAPTER 3: METHODS OF ANALYSES

Introduction

This chapter describes the research design and analysis plan utilized to address the specific aims of this mindful eating interventional study. The purpose of this study was to test the effects on obese female adolescent participants’ BMI of a mindful eating intervention using the MEAL curriculum compared to dietary and exercise information alone. Chapter Three begins with the design, instrumentation, sampling, participant recruitment, human subjects’ protection and setting of this study. Next, the Instrumentation section presents the measurement of the study’s variables and constructs. The procedures including randomization procedures, the intervention (mindful eating curriculum and dietary and exercise information), and data collection including pre-intervention data collection and post-intervention data collection are discussed. Finally, data management and data analysis plans, and the study specific aims of comparing the effect of a mindful eating intervention (Mindful Eating and Living (MEAL) to usual diet and exercise information on BMI of obese female adolescents are presented.

Additional analysis was performed on the relationships between variables including weight change over time, number of times meditated/ate mindfully as well as Mindfulness Awareness Scores (MAAS). A structured interview was conducted with experimental group participants four weeks post intervention utilizing short written responses and group discussion to identify challenges and strengths of the mindful eating intervention.

Design

This pilot study utilized a two group quasi-experimental, repeated measures design. Figure 5 demonstrates the study time line from recruitment through the intervention with data
collection at baseline, immediately after the intervention and at follow up 4 weeks post intervention. This randomized study design was utilized to determine changes in BMI following a mindful eating intervention compared to usual care of nutrition and exercise information in 30 obese female adolescents. Participants were randomly assigned (R) to:

1) A intervention group (IG) receiving a mindful eating instructional intervention (IGX), as well as nutritional and exercise information (CGX).

2) A control group (CG) receiving nutrition and physical activity instruction alone (CGx).

BMI of all participants was immediately measured at baseline, immediately post intervention (O1). BMI of the experimental group was measured 4 weeks post intervention and assessing the mindful eating intervention’s effectiveness (O2). Data were collected prospectively in the Fall of 2013.
Figure 5: Study Time Line

STUDY TIME LINE

RECRUITMENT

BL → R

IGX → O¹ → O²

CGx → O¹

KEY

BL:
Baseline Data
BMI
Demographic & Intentions Questionnaire
Diary of Past 24 Hour Eating/Exercise Behaviors Questionnaire

R: Random Assignment

IG: Intervention Group

CG: Comparison Group

IGX: Mindful Eating Didactic

CGx: Usual Care Nutrition & Exercise Didactic

O¹:
Time One (Week 5 Completion of Mindful Eating Intervention)
BMI
Demographic & Intentions Questionnaire
Diary of Past 24 Hour Eating/Exercise Behaviors Questionnaire
Interventions Follow Up Questionnaire

O²:
Time Two (3 Weeks after Intervention)
BMI
Demographic & Intentions Questionnaire
Diary of Past 24 Hour Eating/Exercise Behaviors Questionnaire
Setting

The setting for this intervention study was a high school in a Latino community in a university community in southern Arizona. Data collection and the 6 weekly interventional classes were held in a classroom room located at the high school. The mindful eating instruction adapted from the MEAL curriculum was provided by the principal investigator. The principal investigator adapted the regimen for adolescents and subsequently completed the Mindful Eating Conscious Living Professional Training course.

Sample

The target population was adolescent females (ages 14-17 years) with a Body Mass Index (BMI) >90%, meeting the Center for Disease Control’s definition of adolescent overweight/obesity. The sample was drawn from a local Tucson Arizona high school after protection of human subjects was granted by the University of Arizona’s Institutional Review Board (IRB). This convenience sample included female adolescents between the ages of 14-17 years with a BMI >90% from high school in a Latino community in a university community in southern Arizona. Data previously gathered by the school district estimated there were over 400 female adolescents between the ages of 14-17 years at the high school, with a BMI > 90th percentile registered as students at the high school at the time of this study. It was anticipated that an adequate sample was therefore feasible to attain.

Criteria for Participant Inclusion:

1. Female adolescents aged 14-17yrs
2. Willingness to participate in the study
3. BMI > 90th percentile
4. Ability to read and write in English

Criteria for Participant Exclusion:
1. BMI < 90th percentile
2. Self-reported pregnancy at the time of data collection
3. Currently being treated for mood disorder, as these disorders are strongly associated with binge eating, and the medications utilized to treat these are associated with weight gain (Fiedorowicz, Miller, Bishop, Calarge, Ellingrod & Haynes, 2012).

Sample Size

The sample size for this pilot study was determined by current findings in the literature. Dalen’s MEAL study of 10 obese adults utilized the same 6 week mindful eating curriculum and produced statistically significant decreases in BMI. This similar intervention and significant BMI findings give credence to replicating this basic study design, and support a maximum intervention group size of 15. This is further supported by mindful eating certification literature recommending group size of 8-15 participants. Including an equivalent control group randomized to receive the usual care diet and exercise instruction increases the total sample to 30. Allowing for 20% attrition, increases the total sample recruited to 38 actually recruited.

The effect size for this study was estimated by a previous obesity study using the MEAL mindful eating curriculum with obese adults. That pilot study by Dalen et al provided 6 weeks of mindfulness training to 10 obese adults and measured changes in BMI. In this longer, twelve week mindful eating intervention, the average weight dropped from 101kg to 97 kg and BMI dropped from 37 to 35.7 (SD=6.2). This study found a statistically significant reduction in BMI. Since analysis was done with t-tests, Cohen’s $d$ is an appropriate measure of effect size.
Measuring effect size for the BMI in Dalen’s study therefore would be Cohen’s $d$ ($\frac{m1-m2}{SD}$) $(37-35.7/6.2$ or $0.2$. This effect size is consistent with a small effect size.

A sample of 38 obese adolescents was the planned recruitment, allowing for a 20% attrition rate for a desired sample size of 30 in this pilot study. The comparison group design of this study lends itself to paired t-test statistical testing (Hertzog, 2008). Therefore Cohen’s d is an appropriate measure of effect size. Setting a power analysis parameters at the traditional alpha of .05 and power at .8 to detect a moderate effect size using Cohen’s d for t-test of 0.5 (medium effect size for d (Field, 2005). As stated, this is only estimation since Cohen’s d ($m1-m2/SD$) is dependent upon the standard deviation of the participants’ BMI (Insel, K., 2010). These parameters are useful for estimation; this power analysis reveals sample size of 52 would be appropriate if this was not a pilot study (Hepworth, J., 2010). Due to the intensive instructional component of this study, coupled with the recommendation that mindful eating classes should not to exceed 15 participants, this statistically supported larger group size was not feasible for this pilot study.

**Participant Recruitment**

Recruitment flyers were placed at the high school. Potential participants were identified by high school staff and recruitment letters were mailed including the investigators contact information. A recruitment booth was available during on-site registration and interested participants contacted the principal investigator to provide their contact information. These interested participants and their legal guardians were contacted by email and telephone to set up an initial screening interview. The investigator then contacted the participants and explained the study protocol to each potential participant and their legal guardian. Upon agreeing to
participate in the study, a written assent was obtained from participants, and a written consent was obtained (if aged <18 yrs.) from their guardian. Consent and assent forms were offered in both Spanish and English to accommodate the primarily Latino population. After the completion of the consent process, data collection commenced.

**Human Subjects Protection**

Study approval was granted by the Institutional Review Board of the University of Arizona and the school district. Informed consent forms, including participant assent and their legal guardian consent signatures were obtained for each participant and filed with the College of Nursing at the University of Arizona. A separate computer file with participant names and participant ID number was password protected and only accessible to the principal investigator and study mentor.

**Instrumentation**

Two questionnaires and one diary were specifically developed for this study to measure constructs for the Information Motivation Behavioral Skill Theory (IMB). An Adolescent demographic questionnaire was developed to measure external socio-demographic factors. Nutrition and Exercise Information handouts were distributed in small classroom instruction format. Motivation was measured by the development of a motivational questionnaire, attendance at the 6 week intervention sessions, a diary recording implementation of didactic content and willingness to participate in the study. Behavioral skills were measured by the outcome criteria of BMI and the diary recording of implementation of didactic content.
Adolescent Demographic Questionnaire See Appendix A

An Adolescent Demographic Questionnaire was developed specifically for this pilot study to address external variables identified in the literature as impacting adolescent eating behavior. There were questions recording education (3), living situations (3), location where meals are consumed and primary meal preparer/purchaser (4), age and ethnicity. Each individual completed a demographic questionnaire. Mean and standard deviations were calculated for continuous variables (age, school years, GPA, number of persons living in home, height, weight, BMI). Frequency tables were utilized for non-continuous variables (residence, meal preparer, preferred eating place).

Nutrition and Exercise Information Information Handout (see APPENDIX G)

The experimental and comparison groups received the usual care of a nutrition and exercise information handout. This handout was developed specifically for adolescents females. Participants were given information on meal planning, food fat and calorie content and exercise regimens.

The content included:

An overview of popular diets (note that most of the people they surveyed that lost weight used their own ideas, rather than a commercial or popular plan).

My Pyramid, with tables for more than 2000 calories a day (remember, you need about 10 calories per pound each day to maintain your weight, less for weight loss, but note: you can eat more if you are active). Healing Foods Pyramid, an alternative view offered by the University of Michigan (compare to MyPyramid).
ADA info on: Water/hydration, Snack Ideas, 7 Steps to Being More Active,
Food Label info, Weight Management Questions, Calorie Counting (exchange system)

**Motivation**

*Attendance was recorded at each intervention session See Appendix B*

A record of participant attendance was kept for each session. Each participant’s attendance record was then tabulated. The higher number represented the greater amount of sessions attended. Three make-up classes were offered to insure all the experimental group participants received the same intervention.

*Adolescent Motivation Questionnaire was administered at before and after the mindful eating intervention See Appendix C*

An Adolescent Demographic Questionnaire was developed specifically for this pilot study. This questionnaire utilized factors identified in the literature coupled with anted octal clinical experience to demonstrate why participants agree to join studies along with external variables identified in the literature as impacting eating adolescent eating behavior. Motivation was measured by the participants’ selection of the most important motivator for participation in the study. Elements in this questionnaire were evaluated using frequency tables.

Content validity is a check of the operationalization of the construct against the relevant content domain (Trochim & Donnelly, 2007). Expert judgment is utilized to determine whether the instrument items accurately depict the construct being measured. Two nurse practitioners, one an expert in female adolescents and another who provides direct care to adolescents independently reviewed the questionnaire development for clarity, simplicity and relevance and
found it to be inclusive of relevant information as well as appropriate for this participant population.

Construct validity refers to the degree to which inferences can be made from the study’s operationalized constructs to the theoretical constructs on which they are based (Trochim & Donnelly, 2007). This is the fit between operationalized variables definitions and the theoretical constructs. Expert reviews as well as multiple measures of key constructs were utilized to address the threats to construct validity.

**Behavioral Skill Attainment**

*Mindfulness Awareness Attainment Scale (MAAS)*  A Mindfulness instrument with 15 items using a Likert scale was administered. The scores of this psychometric instrument range from 15-80, with the higher number indicating greater mindfulness. The MAAS has been tested in adolescents with high reliability (Crohbach’s alpha =.89-.93), high test–retest reliability (.35-.52), and both convergent and discriminant validity (See Appendix D).

*Participant diary:* A participant diary was specifically developed to measure participants’ utilization of the skills taught during the didactic sessions. Participants recorded an M for meditation practice and an E for each time they followed eating practices outlined in the didactic sessions. These two items were tallied separately. Frequency tables were utilized for reporting these non-continuous variables. This is scored in that the higher number indicates a higher meditation and eating practice score. This participant diary along with the number of classes attended record was correlated with change in BMI to examine the effect of the dose and number of times meditated and mindfulness practice on BMI (See Appendix E).
BMI Outcome Measurement

Determination of BMI percentile was calculated by dividing weight in kilograms by height in square meters (kg/m²) according to study protocol. Participants were considered overweight/obese with BMI > 90th percentile (CDC, 2010). On site measurement of height and weight data for each participant was utilized to calculate BMI.

Reliability is the degree to which a measure is consistent or dependable (Trochim & Donnelly, 2007). This study’s outcome measurement of BMI calculated with standardized equipment eliminates bias of participant fatigue and accommodation. This physical measurement is not subject to researcher or participant bias of a perceived effect.

On-site measured Height: A stadiometer was utilized to measure height. Participants stood motionless with shoes removed, gazing straight ahead. Height was recorded to the nearest 0.2 cm.

On-site measured Weight: Weight: A Health O meter balanced scale was utilized to record participants’ weights in kilograms after balancing the scale to zero prior to weighing participants. Participants stood motionless with both shoes removed on platform after removing heavy outer clothing. Weight was recorded to the nearest 0.1 kg. The Health O Meter Professional Upright Scale 402KL was accurate and reliable within 1% when properly calibrated on a hard surface. Because it functions mechanically rather than electronically, it’s less susceptible to inaccuracies over time or due to low batteries (healthometer.com). The same researcher was utilized to measure each participant to further increase reliability.
Structured Interview Outcome Measurement

Content analysis was conducted on the short written and oral responses to a structured interview with the experimental group participants at the follow up session (four weeks post-intervention). Responses to each question were tabulated and recurrent themes were identified to the following questions:

1. Identify what was most meaningful helpful in the mindful eating class.
2. Identify what was most challenging and least helpful in the mindful eating class.
3. Share your thoughts regarding what could improve class attendance, decreasing absenteeism, and improving future classes.
Procedures

The Consort Flow Chart Mindful Eating 2013

Assessed for eligibility by school district. (n=415) C vs E

Excluded (N = 10)
Not Meeting Inclusion Criteria
(N = 5 (1 Wt 1 Med))
Refused To Participate
(N = 2)
Other Reasons
(N = 3 Sport)

Is it Randomized?
Opportunity sample

37 ENROLLED

Allocated To Intervention
(N = 14)
Received Allocated Intervention
(N = 8)
Attrition (N = 6)
(N = 4)
Give Reasons Did Not Attend Any Classes
Stigma/Scheduling

Allocated To Comparison
(N = 23)
Give Reasons Did Not Come To Test /
Weigh In Sessions

Lost To Follow-up
(N = 0)
Give Reasons
Discontinued Intervention, Came to Fewer
Than 3 Classes
(N = 2)
Give Reasons

Lost To Follow-up
(N = 0)
Give Reasons
Give Reasons: Scheduling And Location
Did Not Come To Test / Weigh Sessions

Analyzed
(N = 8)
Excluded From Analysis
(N = 0)
Give Reasons

Figure 6. Mindful Eating Consort Diagram
Baseline Data Collection

Baseline data were collected at the high school in a face to face orientation meeting. Data were collected in this face to face meeting to assure completion of all items. Folders were provided for each participant including a copy of the introduction to the study letter, two consent forms, the demographic questionnaire and the motivation questionnaire. A sealed random assignment card with the principal researcher’s contact information on the reverse side indicating which day of the week the participant would attend the class was also completed. Consent forms were completed by the participants and/or their legal guardians at an orientation meeting at the high school.

Randomization

Stratified randomization was utilized in lieu of randomly assignment to assign participants to the mindful eating group or usual treatment group. Only 14 of the 28 consented participants attended the baseline data collection session. Despite weekly telephone calls and emails, six of these 14 treatment group participants did not attend any of the mindful eating instruction classes. Unsystematic assignment eliminates many sources of systematic variation and assuring that systematic variation between the two experimental groups was due to the manipulation of the independent variable (Field, 2009). The principal investigator prepared 40 folders containing all the baseline data collection materials. Numbers 1-40 were randomly assigned using Quick calcs Graphpad software. Contact information sheets were created. After completing all the baseline data, the attending participants were assigned to the intervention group. Participants who did not attend the baseline collection meeting were subsequently approached individually the MAAS was administered and their weights recorded.
**Usual Care Nutrition and Exercise Handout**

After randomization, each participant received the usual care Nutrition and Exercise information handout, and were encouraged to incorporate the guidelines into their lifestyle.

**Variables and Measures**

The Information Behavioral Skills health Model provided the theoretical framework for the study. This health centered framework’s focus on behavior was particularly applicable to this study with its behavioral skill of mindful eating intervention. The emphasis on practicing the desired skill resulting in increasing the desired health behavior change outcome was crucial to this design contrasting this intervention to information dispersing, instructional handout with no active skill practice. Consistent with this model, the weekly mindful eating skills practiced with the experimental group and BMI was recorded as the primary outcome variable of actual healthy eating behavior change.

**Mindful Eating Intervention Variables**

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<th>Variables</th>
<th>Measure/Instrument</th>
<th>Frequency</th>
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<td>Age in years</td>
<td>Demographic questionnaire</td>
<td>BL</td>
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<td>Demographic questionnaire</td>
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<td>Demographic questionnaire  BL</td>
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<tr>
<td>Favorite eating place</td>
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<td>Meals eaten in home</td>
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<td>Reason to participate</td>
<td>Motivation Questionnaire  BL, O1</td>
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<td>Mindful Eating Behavioral Skills</td>
<td># times/week Meditation Practice Daily Diary weekly, 0,1,0²</td>
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<td># times/week Mindful Eating Daily Diary weekly, 0,1,0²</td>
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<td>Healthy Behavior Outcome Measure</td>
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<tr>
<td></td>
<td>Weight  .0²</td>
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</tr>
</tbody>
</table>
Data Collection

Data were collected at the high school site prior to the first mindful eating class, and repeated at the end of the instructional series and at a 4week follow up.

Interventions

Mindful Eating Intervention MEAL Curriculum (See APPENDIX F)

The experimental group participated in a mindful eating intervention. The Mindful Eating and Living (MEAL) curriculum developed specifically for obese adults was adapted for adolescent females. This 6 week curriculum was taught in weekly 1 hour sessions. Participants engaged in mindful eating practice including meditation and group discussion. This curriculum paired meditation with eating, enabling participants to focus upon hunger and satiety cues. Each MEAL class included an eating exercise with a variety of different foods. Practicing this behavioral skill enabled participants to identify the qualities of the foods they crave, as well as the cognitive and emotional states associated with eating.

Data Management and Analysis Plan

Participant Confidentiality Management

Participant confidentiality was protected by assigning a study number to each participant, and keeping signed consent forms in a locked file cabinet. The assigned study number was the only identifier and was recorded on a password protected master study list containing participant contact information. This master list was destroyed after the study findings were reported. Data were double entered into the Statistical Package for the Social Sciences (SPSS) using the study number identifiers. Double entering of data into SPSS was utilized to insure input accuracy.
Data were screened by the principal investigator checking for outliers using frequency testing. Raw data will be destroyed by shredding 5 years after publication of the study’s findings.

**Data Analysis Plan**

SPSS version 22.0 was utilized and descriptive statistics were computed for all variables including means, standard deviations. Scatterplots were generated to evaluate distribution patterns and identify outliers.

**Study Participant Characteristics**

Descriptive statistics were computed for all variables including means and SD of continuous variables as well as frequencies and percentages of categorical variables. Exploratory data analyses were utilized to determine normal distributions, outliers and heterogeneity of variance to determine if data transformation was needed. Scale and categorical characteristics of experimental and comparison groups’ participants were compared utilizing *t*-tests and chi-squared analysis respectively.

**Aims and Statistical Analysis**

Aim 1: To determine the effect of a mindful eating intervention (Mindful Eating and Living (MEAL) compared to usual diet and exercise information on BMI of obese female adolescents. Two group (experimental and comparison) and two times (baseline and 6 weeks) repeated measures analysis of variance (ANOVA) were used to compare baseline, and 6 week (immediately after intervention) means on the outcome variable of BMI.

Aim 2: To determine if the effect of a mindful eating intervention (MEAL) on BMI of obese adolescents is sustained over time. One group (experimental) and three times baseline, 6 weeks,(intervention end) and at 10 weeks (4 weeks after intervention completion) repeated
measures was used to compare the outcome variable of BMI for the mindful eating intervention group.

Aim 3: To determine the feasibility of conducting a group mindful eating intervention over six weeks for obese adolescent girls in their school setting. The percentage of participant attrition across the study was compared to an established attrition percentage. Feasibility was determined comparing actual study attrition to an established attrition rate of 45% from the review of the literature.

Additional Analysis

Weight change between the experimental and comparison group was analyzed using a two group (experimental, comparison) and two times (baseline and 6 weeks intervention end) repeated measures analysis of variance (ANOVA). There was a significant difference in the experimental and the comparison group for weight over time. Sustained weight change of the experimental group was analyzed for the experimental group three times: baseline, at 6 weeks (intervention end), and 10 weeks (4 weeks post intervention) using repeated measures analysis of variance (ANOVA).

The participant diary along with the number of classes attended record was correlated with change in weight to examine the effect of the dose and number of times meditated and mindfulness practice on weight change. The relationship between number of times participants recorded mindful eating and meditation were correlated. The change in mindfulness awareness (MAAS) scores at baseline and 6 weeks (intervention end) was correlated with the change in weight of the two groups (experimental, comparison).
There was no significant correlation between reasons participants joined the study and weight loss. A one way ANOVA and Kruskal-Wallis was utilized to analyze the reported primary reason participants joined the study and weight change.

A plan was developed for missing data, since missing data threaten conclusion validity (Trochim & Donnelly, 2007). The design of in-person questionnaire completion reduces this threat. Missing data was analyzed in an ongoing fashion to addressing underlying reasons for missingness. If procedurally there was not a means to get more complete information, then a missing data analysis was be performed using SPSS to determine if there was a systematic pattern and therefore nonignorable missing data. If this occurs, listwise deletion was utilized and only complete cases were analyzed. Paired deletion was utilized if participants miss more than 2 didactic sessions. If participants miss 1 or 2 didactic sessions, missing data was imputed using SPSS software maximum likelihood procedures.

**Analysis and IMB Theory Concepts**

The IMB theory has 4 major concepts, Information, Motivation, Behavioral Skills and the outcome of Healthy Behavior. Each of these concepts is addressed in this statistical analysis. Information’s impact on BMI is measured with the control groups BMI baseline post information hand out intervention. Information was addressed by providing the usual care of the Nutrition and Exercise Information handout to both control group and experimental group participants. Motivation is measured with the motivational questionnaire and frequency tables of attendance at mindful eating sessions as well as the mindful eating practice diary.
Behavioral skills are measured with frequency tables of attendance at mindful eating sessions and mindful eating practice diary. BMI was used as an outcome measure of the desired health behavior change of healthy eating. Each of the key concepts: Information, Motivation and Behavioral Skills were correlated to the outcome behavior of healthy eating as measured by BMI.

This study emphasizes the IMB theoretical crux concept of practicing behavioral skills’ impact on healthy behavior. This was tested in this pilot interventional study after the MEAL curriculum was adapted for an adolescent population by adding a focus on adolescent culture including food preferences, school environment and peer pressure.

**Structured Interview Content Analysis**

Qualitative data was collected during the scheduled 4-week post intervention follow-up session.

A structured interview was planned in order to identify what was most meaningful and most challenging to participants as well as to identify barriers to participation. In addition to the planned review of the participants’ progress and challenges and repeated completion of the Mindfulness Awareness questionnaires, additional questions were posed to the class. Data was collected at the time of the interview. Participants responded with short written answers to the question listed below and participated in a brief group discussion of each of the questions. Notes of the interviews were transcribed and responses were tabulated and were presented in table format. These questions helped to identify benefits, challenges and barriers to study participation. This qualitative data was analyzed to uncover recurrent themes. Content analysis was conducted on the written and oral responses to the structured interview. Responses to each question were tabulated and recurrent themes were identified to the following questions:
1. Identify what was most meaningful helpful in the mindful eating class.

2. Identify what was most challenging and least helpful in the mindful eating class.

3. Share your thoughts regarding what could improve class attendance, decrease absenteeism, and improve future classes.

Summary

This chapter described the design, sampling, data collection and analysis plan utilized to address the specific aims of this mindful eating intervention study utilizing the framework of the IMB theory. This theory driven intervention research investigates a solution to the burgeoning challenge of adolescent female obesity. Nurses, having a holistic model of health and background in nutrition are uniquely qualified to address this obesity crisis. It is crucial for Nursing as a practice profession, to evaluate nursing knowledge applying theoretical frameworks to intervention research. This chapter presented this mindful eating intervention study’s design including the measurement of the study’s variables and constructs, and management and analysis of data answering the study’s specific aim.
CHAPTER 4: RESULTS

The purpose of this study was to test the effects of a mindful eating intervention on the outcome of BMI in overweight adolescent girls. In this chapter the study sample is described and the data analysis for each research aim is reported.

**Description of the Sample**

The details of the experimental and the comparison group physiologic and mindfulness characteristics are summarized in Table 2. T-test analysis demonstrated no significant differences in these characteristics between the experimental and comparison group participants. Height $t(21) = -0.519, p < .05$; weight $t(21) = -1.062, p < .05$; BMI $t(21) = -1.144, p < .05$; age $t(21) = -0.418, p < .05$; total MAAS score $t(21) = -0.944, p < .05$ A significance level of $p < .05$ was set for all statistical testing. The experimental and comparison groups’ initial descriptive data were similar in the factors of age, weight, height, BMI and initial Mindfulness Assessment scores.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental Group (n=8) %</th>
<th>Comparison Group (n=15) %</th>
<th>$T$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>63.6±3.3</td>
<td>63.1±1.9</td>
<td>-0.519</td>
<td>0.609</td>
</tr>
<tr>
<td>Weight</td>
<td>214.9±47</td>
<td>195.3±39</td>
<td>-1.062</td>
<td>0.470</td>
</tr>
<tr>
<td>BMI</td>
<td>37.7±7.6</td>
<td>34.3±6.2</td>
<td>-1.144</td>
<td>0.266</td>
</tr>
<tr>
<td>Age</td>
<td>15.4±1.4</td>
<td>15.6±0.9</td>
<td>0.418</td>
<td>0.722</td>
</tr>
<tr>
<td>Initial MAAS score</td>
<td>52.9±12.8</td>
<td>58.1±12.7</td>
<td>0.942</td>
<td>0.753</td>
</tr>
</tbody>
</table>

Notes: Height recorded in inches (in). Weight recorded in pounds (lbs.) Age recorded in years

BMI = (Weight in Pounds / (Height in inches x Height in inches) x 703. Adapted from CDC, 2010.
The details of the experimental and the comparison group socio-cultural characteristics are summarized in Table 3. Chi-square analysis demonstrated no significant differences for any of these variables. \(X^2 (2) = 4.107, p = .128\). All participants attended the same public high school in a predominantly Latino community. Ninety-one percent (n=21) self-reported as Latino, only two of the 23 participants did not self-identify as Latino, one of these participants self-identified as Native American, and the other identified herself as Mexican/German. Participants were distributed across all four grades. There was no concurrence among participants regarding location most meals were consumed and no pattern was identified as the primary meal preparer in the home. The samples also differed in there were more participants in Grade 12 in experimental and more participants in Grade 11 in the comparison group.

Table 3. Socio-cultural Characteristics of Participants

| Variable                        | Experimental Group (n=8) % | Comparison Group (n=15) % | \(X^2\) | \(p\) \\
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lives with Mother</td>
<td>100</td>
<td>100</td>
<td>NS</td>
<td>-</td>
</tr>
<tr>
<td>Lives with Father</td>
<td>62.5</td>
<td>60</td>
<td>.627</td>
<td>.59</td>
</tr>
<tr>
<td>Public School</td>
<td>100</td>
<td>100</td>
<td>.677</td>
<td>.62</td>
</tr>
<tr>
<td>Latino Ethnicity</td>
<td>75</td>
<td>100</td>
<td>4.107</td>
<td>.11</td>
</tr>
<tr>
<td>Restaurant=Favorite Eating Place</td>
<td>50</td>
<td>40</td>
<td>1.381</td>
<td>.60</td>
</tr>
</tbody>
</table>

NS= No statistics are computed because Mom live in Home is a constant

Participants in the experimental and comparison groups attended Grade 9 (50%, n=4; 46.7%, n=7), Grade 10 (12.5%, n=1; 26.6%, n=4), Grade 11 (0%, n=0; 20%, n=3), and Grade 12 (37.5%, n=3; 6.7%, n=1). Participants in the experimental and comparison group reported eating
at school an average of 2.6 ±SD 1.8 times per week and eating at a restaurant 3.2±SD2.0 per week.

Participants in the experimental and comparison groups reported their primary motivation to join the study as follows: to lose weight (75%, n=6; 53.3%, n=8), friends and family wanted me to join (12.5%, n=1, 33%, n=5) and to control eating (12.5%, n=1, 13.3% n=2). No participants reported their health care provider wanted them to join as their primary motivation to join the study. Chi-square analysis testing equiprobability between the proportions of participants choosing each motivation reason were not significant, \(X^2 (2) = .67, p=.715\). Upon further analysis, z-test demonstrated column proportions for each subset of primary motivation to participate in the study did not differ significantly between the experimental and comparison group at the .05 level.

**Results of Study Aims**

**Aim 1:** A group mindful eating intervention for obese adolescent girls had a significant effect on lowering BMI compared to the usual diet and exercise information. BMI change was analyzed using a two group (experimental, comparison) and two times (baseline and 6 weeks [intervention end]) repeated measures analysis of variance (ANOVA). \(F(1,21) =23.61, p<.001\). There was a significant difference in the experimental and the comparison group for BMI over time. A large effect size was indicated by partial Eta squared of .529 which is equivalent to \(r=0.73\) (Field, 2009). The details of the experimental and the comparison group BMI change from baseline to 6 weeks (intervention end) are in Table 4 and Figure 7. As shown in Table 4 an ANOVA analyzed BMI differences between the two groups after the assumptions of sphericity
and homogeneity of variance were met Mauchly’s $W$, $x^2(0) = 1.00$ and Boxes $M$, $2.32 \ F = .68$ respectively, were not significant using a computed alpha=0.5.

Table 4. **BMI/Weight of Participants**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental Group (n=8) Mean +SD</th>
<th>Comparison Group (n=15) Mean +SD</th>
<th>$F$</th>
<th>Partial Eta Squared</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI at Baseline</td>
<td>37.7±7.6</td>
<td>34.3±6.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI at 6 weeks</td>
<td>36.6±8.2</td>
<td>35.1±6.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI difference</td>
<td>-1.1±1.0</td>
<td>.72±.75</td>
<td>23.615</td>
<td>.529</td>
<td>.000*</td>
</tr>
<tr>
<td>Weight at baseline</td>
<td>214.9±47</td>
<td>195.3±39.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight at 6 weeks</td>
<td>209.6±50.</td>
<td>199. 5± 40.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(intervention end)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Difference</td>
<td>-5.25±5.1</td>
<td>4.00±4.1</td>
<td>22.241</td>
<td>.514</td>
<td>.000*</td>
</tr>
</tbody>
</table>

Note: *p < .001
Aim 2: The BMI lowering effect of a group mindful eating intervention for obese female adolescents was sustained over time.

Details of the experimental group BMI change over time are summarized in Table 5 and Figure 8. The experimental group demonstrated a sustained effect with BMI decreasing over time at 10 weeks (4 weeks after completion of the mindful eating intervention). BMI change was analyzed for the intervention group three times: at baseline, 6 weeks (intervention end), and 10
weeks (4 weeks post intervention) utilizing a repeated measures analysis of variance (ANOVA). 

\[ F(2,14)=9.24, \ p<.05. \]

The ANOVA assumptions of sphericity and homogeneity of variance were met with Mauchly’s \( W \), \( x^2(2) = .857 \) and multivariate tests respectively. Neither were significant using a computed alpha=0.5. Trend analysis of within subjects’ contrasts reveals a linear effect consistent with the BMI continuing to decrease at follow up as evidenced in Figure 8. This repeated measures analysis requires a Bonferroni’s correction, therefore necessitating an alpha of 0.05/3 or 0.017. Despite this correction BMI decrease over time was significant \( F(2,14)=9.24 \) \( p<.05. \) There was a large effect size indicated by partial Eta squared was .504 which is equivalent to \( r=0.71 \) (Field, 2009).

<table>
<thead>
<tr>
<th>BMI</th>
<th>Experimental Group (n=8)</th>
<th>Partial Eta Squared</th>
<th>( F )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>37.7±7.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 weeks (Intervention end)</td>
<td>36.6±8.2</td>
<td>.529</td>
<td>23.615</td>
<td>.000*</td>
</tr>
<tr>
<td>10 weeks (4 weeks post intervention)</td>
<td>36.3±7.7</td>
<td>.504</td>
<td>9.24</td>
<td>.019*</td>
</tr>
</tbody>
</table>

Note:* \( p<.05 \)
Figure 8: Experimental Group BMI Over Time (10 Weeks)

**Aim 3**: As evidenced by the consort flow diagram (Figure 6), attrition in this mindful eating intervention pilot study was 38%. Of the 415 eligible participants identified by the school district, 47 were recruited, 10 of these participants either did not meet study criteria or did not complete enrollment. The remaining 37 participants were enrolled in the study, 14 were allocated to the experimental group and 23 were allocated to the comparison group. There was a total attrition of 14 participants from the 37 enrolled participants, 6 participants from the experimental group and 8 participants from the comparison group. This loss of 14 of the 37
initially enrolled participants resulted in a 38% attrition rate, which was less than the *apriori* established 45% attrition rate. Feasibility was determined as less than 45% attrition across the study. Therefore conducting a group mindful eating intervention over six weeks for obese adolescent girls in their school is feasible.

**Additional Analysis**

**Weight Change in Experimental and Comparison Group Intervention End**

A group mindful eating intervention for obese adolescent girls had a significant effect on lowering weight compared to the usual diet and exercise information. Weight difference was analyzed using a two group (experimental, comparison) and two times (baseline and 6 weeks [intervention end]) repeated measures analysis of variance (ANOVA). There was a significant difference in the experimental and the comparison group for weight over time. F(1,2)=22.24, p<.001. A large effect size was indicated by partial Eta squared of .514 which is equivalent to \( r=0.72 \) (Field, 2009). The details of the experimental and the comparison group weight differences from baseline to 6 weeks (intervention end) are summarized in Table 6 and Figure 9.

The ANOVA assumptions of sphericity and homogeneity of variance were met Mauchly’s \( W, \chi^2(0) =1.00 \) and Boxes \( M, 2.14 F=.63 \) respectively were not significant using a computed alpha=0.5.
### Table 6. Weight of Participants Experimental and Comparison Group

<table>
<thead>
<tr>
<th>Weight</th>
<th>Experimental Group (n=8) Mean ±SD</th>
<th>Comparison Group (n=15) Mean ±SD</th>
<th>F</th>
<th>Partial Eta Squared</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>214.9±47</td>
<td>195.3±39.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 6 weeks (intervention end)</td>
<td>209.6±50.</td>
<td>199.5±40.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Difference</td>
<td>-5.25±5.1</td>
<td>4.00±4.1</td>
<td>22.241</td>
<td>.514</td>
<td>.000*</td>
</tr>
</tbody>
</table>

Note: *p < .001

![Experimental and Comparison Weight Over Time](image)

Figure 9: Experimental and Comparison Group Weight Over Time (6 Weeks)
Experimental Group Sustained Weight Loss

Details of the experimental group weight loss over time are summarized in Table 7 and Figure 10. The experimental group’s main effect demonstrated a sustained weight loss at 10 weeks (4 weeks after completion of the mindful eating intervention). Weight change was analyzed for the experimental group three times: baseline, at 6 weeks (intervention end), and 10 weeks (4 weeks post intervention) using repeated measures analysis of variance (ANOVA). $F(1, 7)=6.47$ $p<.05$.

ANOVA assumptions of sphericity and homogeneity of variance were met, Mauchly’s $W, x^2(2) =.652$ and multivariate tests respectively were not significant using a computed alpha=0.5. Trend analysis of within subjects contrast reveals a quadratic effect consistent with the weight loss sustained over time as evidenced in Figure 10. The initial ANOVA of weight loss over time was significant $F(1, 7)=6.47$ $p<.05$, however, this repeated measure analysis requires a Bonferroni’s correction. This necessitates reducing the alpha of .05/3 to .017. With this correction the final weight loss over time was not significant. This Bonferroni’s calculation corrects for a Type I error, with this small sample size it may have contributed to a Type II error. Prior to this necessary correction there was a moderate/large effect size indicated by partial Eta squared was .480 which would be equivalent to $r=0.69$ (Field, 2009).
Table 7. Weight Changes in Experimental Group Over Time

<table>
<thead>
<tr>
<th>Weight</th>
<th>Experimental Group (n=8)</th>
<th>Mean Difference from Baseline</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>37.7±7.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 weeks (Intervention end)</td>
<td>36.6±8.2</td>
<td>-5.25</td>
<td>22.241</td>
<td>.023*</td>
</tr>
<tr>
<td>10 weeks (4 weeks post intervention)</td>
<td>36.3±7.7</td>
<td>-4.875</td>
<td>6.47</td>
<td>.038*</td>
</tr>
</tbody>
</table>

Note: *p<.05

Figure 10: Experimental Group Weight Over Time (10 weeks)
Mindful Eating and Meditation Practice Diary and Weight Change

The number of times mindful eating and meditation were practiced by the experimental group did not correlate significantly with the amount of weight lost. All participants in the experimental group reported practicing mindful eating and meditation, the group’s average weight loss was 5.25 lbs. over the six week intervention. Details of the experimental group’s mindful eating practice and meditation as reported in participants’ weekly diaries are summarized in Tables 8 and 9. Mindful eating practice and meditation practice correlated significantly with each other \( r = .81, p < 0.015 \), but not with weight loss.

Table 8. Meditation, Mindful Eating and Weight Loss in Experimental Group

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>±SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Difference (Baseline to 6 weeks)</td>
<td>-5.25</td>
<td>5.1</td>
<td>8</td>
</tr>
<tr>
<td>Number of Times Meditated</td>
<td>11</td>
<td>4.5</td>
<td>8</td>
</tr>
<tr>
<td>Number of Times Ate Mindfully</td>
<td>16</td>
<td>10</td>
<td>8</td>
</tr>
</tbody>
</table>

Note: Weight in Pounds.
Table 9. Diary Recordings of Meditation and Mindful Eating and Weight Change Correlations

<table>
<thead>
<tr>
<th></th>
<th>Number of times meditated</th>
<th>Number of times ate mindfully</th>
<th>Weight Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of times meditated</td>
<td>Pearson Correlation</td>
<td>.809*</td>
<td>.02</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Number of times ate mindfully</td>
<td>Pearson Correlation</td>
<td>.809*</td>
<td>.106</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.02</td>
<td>.803</td>
</tr>
<tr>
<td>N</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Weight Difference</td>
<td>Pearson Correlation</td>
<td>.017</td>
<td>.106</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.968</td>
<td>.803</td>
</tr>
<tr>
<td>N</td>
<td>8</td>
<td>8</td>
<td>23</td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.05 level (2-tailed).

Mindful Awareness Scores and Weight Change

The change in Mindfulness Awareness (MAAS) scores of the experimental and comparison groups at baseline and 6 weeks (intervention end) are summarized in Tables 10 and 11. There were no statistically differences between groups or over time. The change in (MAAS) scores at baseline and 6 weeks (intervention end) were correlated with the change in weight of the two groups (experimental, comparison). There was no significant correlation between MAAS scores and weight change. Although weight change was significantly correlated with group at $p<.001$ level, the correlation with change in MAAS scores was not significant. The details of the comparison and the experimental groups’ Mindfulness Score (MAAS) and Weight Change during the study as are summarized in Table 10 and 11. Although as mindfulness scores rose...
while weight declined, the correlation was not significant. The low Pearson’s Correlation $p=.239$, may be related to the small sample size.

Table 10. *Mindfulness Awareness Scores of Participants*

<table>
<thead>
<tr>
<th>Total MAAS score</th>
<th>Experimental Group</th>
<th>Comparison Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=8)</td>
<td>(n=15)</td>
</tr>
<tr>
<td></td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
</tr>
<tr>
<td>Baseline MAAS Score</td>
<td>52.9±12.8</td>
<td>58.1±12.7</td>
</tr>
<tr>
<td>6 week (Intervention end) MAAS Score</td>
<td>56.1±15.3</td>
<td>57±16.4</td>
</tr>
</tbody>
</table>

Table 11. *Mindfulness Score Weight Change Correlations*

<table>
<thead>
<tr>
<th>Group Control or Experiment</th>
<th>Weight Difference</th>
<th>Mindful Score Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>1</td>
<td>-.717*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.118</td>
</tr>
<tr>
<td>N</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Weight Difference</td>
<td>-.717*</td>
<td>1</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td></td>
<td>-.351</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.702</td>
</tr>
<tr>
<td>N</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Mindful Score Difference</td>
<td>.118</td>
<td>-.351</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.702</td>
<td>.239</td>
</tr>
<tr>
<td>N</td>
<td>13</td>
<td>13</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.01 level (2-tailed).
Motivation to Join the Study and Weight Change

There was no significant relationship between reasons participants joined the study and weight loss. The Kruskal-Wallis test of the reported primary reason participants joined the study did not demonstrate a relationship between the primary reported reason to participate in the study and the amount of weight lost \( p = 0.976 \). The Null Hypothesis was retained as weight difference remained the same across categories of primary motivation to participate in the study.

Structured Interview Responses

Content analysis was conducted on the short written and oral responses to the structured interview. Responses to each question were tabulated (Table 12) and recurrent themes were identified to the following questions:

1. Identify what was most meaningful helpful in the mindful eating class.
2. Identify what was most challenging and least helpful in the mindful eating class.
3. Share your thoughts regarding what could improve class attendance, decreasing absenteeism, and improving future classes.

Identified Themes included:

1. Gaining Control (over eating, emotions, situations)
2. Identifying factors which enabling control over eating
3. Increasing time spent practicing yoga
4. Absenteeism/Attrition reasons including fear, stigma and scheduling/additional responsibilities.
Two recurrent themes were identified in the analysis of question one: gaining control, and identification of individual factors that enabled the participant to control their eating. There were 16 responses to question one. Eight responses grouped as a theme of control 50% (n=8) of responses cited gaining control as most meaningful and helpful. Six responses grouped as a second theme, identification of individual factors which enabled the participant to control their eating, 37% (n=6) of responses cited these eating control factors as most meaningful and helpful.

There were 10 responses to question two. Participants universally responded that they could not identify challenges in the class, stating they would not change the classes. Following this response however, two participants commented that they desired more yoga time during class. There were two responses grouped as one theme to question two, 20% (n=2) of responses cited more yoga might improve class.

Question three prompted a prolonged discussion which focused on attrition and absenteeism. Although the eight participants in the interview did not miss any sessions, they postulated about the six participants that only attended the first session and never returned. They cited fear/stigma 50% (n=4) of responses and not being ready 25% (n=2) of responses as contributing to the attrition of the six participants who never returned after the first session.

### Table 12. Structured Interview Table

<table>
<thead>
<tr>
<th>Meaningful and helpful Themes</th>
<th>Participant Quotations</th>
</tr>
</thead>
</table>
| **1. Gaining control Eating/Emotions (8 participant responses)** | **How to control my eating**  
**How to keep calm in difficult situations**  
**Knowing when to stop because I’m going overboard with non-healthy thing**  
**Cutting down on**  
**Getting smaller sizes**  
**Choosing to eat helpful(healthful)** |
### Controlling my eating

How to eat what to eat, what not to eat

| 2. Factors enabling control over eating (6 participant responses) | learning about types of hunger  
practicing eating healthy foods,  
gaining nutrition knowledge  
sharing feelings, discussing challenging situations,  
gaining motivation by class attendance,  
overcoming emotional eating  
learning portion control  
how to eat what to eat, what not to eat  
making healthy choices at home  
not eating when I’m bored |
|---|---|

### Challenges and Improvement Themes

<table>
<thead>
<tr>
<th>Participant Quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Class not needing improvement (8 participant responses)</td>
</tr>
</tbody>
</table>
| Nothing (8 participant responses)  
No because I think classes good enuf  
I would not change anything because it was fun |
| 2. Yoga (2 participant responses) |
| Yoga… I thought there would be more yoga |

### Absenteeism Themes

<table>
<thead>
<tr>
<th>Participant Quotations</th>
</tr>
</thead>
</table>
| 1. Scheduling/other commitments/tired  
(5 participant responses) |
| I had arrangements/compromises that I needed to go to  
To finish my work  
I had to make food for my family  
Not having energy  
I never missed |
| 2. Fear Readiness Social Stigma |
| Ideas about the six participants who left the study after the first session (6 participant responses) |
| Fear/Social Stigma x 4  
They were not ready x2  
Seeing a skinny girl  
Seeing other girls who are big like me |
CHAPTER 5: CONCLUSIONS

The purpose of this study was to test the effects of a mindful eating intervention on BMI outcomes in obese adolescent females aged 14-17yrs. Guided by the Information, Motivation, Behavioral Skills Theory (IMB), the dependent variable of BMI was measured at the end of a 6-week class emphasizing the behavioral skill of mindful eating and at 10 weeks (4 weeks post intervention). This study provides a better understanding of the impact of teaching the behavioral skill of mindful eating on actual eating behavior change as measured by decreasing BMI. Changes in BMI were also measured in a comparison group receiving the usual care of information alone (nutrition and physical activity handout). Conclusions from the analyses are presented; the study aims and limitations are reviewed. Implications for nursing practice and future research are also discussed.

Discussion of Findings

Aim 1

A group mindful eating intervention for obese adolescent girls had a significant effect on lowering BMI compared to the usual diet and exercise information.

There was a significant change in BMI between the experimental and comparison groups. BMI decreased in the experimental group receiving the mindful eating instruction by 1.01, whereas BMI increased in the comparison group by .71 over the same 6 week period. The significant lowering of BMI for the experimental group after weekly mindful eating classes aligns with the IMB theory’s primary premise that practicing a behavioral skill is crucial in effecting behavior change. The female adolescents with a BMI > 90th percentile in the
The experimental group did not follow the otherwise anticipated increasing BMI trajectory of their comparison group counterparts.

Nutrition and physical activity information alone were not effective in lowering the increasing BMI trajectory of the comparison group obese adolescent females, who continued to follow the expected growth curve of obese adolescents gaining an average of 4 lbs. over the same 6 week intervention period. This finding is consistent with multiple meta-analyses of lifestyle intervention studies which find interventions which offer only lifestyle education (exercise and nutrition information) do not significantly lower BMI (Gonzalez-Suarez, et al., 2009; McGovern, et al., 2008; Kamath, et. al., 2008; Doak, Renders & Siedell, 2006).

Consistent with the IMB theory, the element of teaching a specific behavioral skill (mindful eating), appears to be critical in attaining behavior change, which was reflected in the decreasing BMI of the experimental group. This trajectory stands in sharp contrast to the increasing BMI of the comparison group. It should be noted that the experimental group’s confounding variable of meeting each week, likely reinforced the focus on healthy eating, thereby lowering BMI. This confounding variable of the experimental group’s weekly meetings promoted interaction between the experimental group participants. This in turn may have facilitated bonding among group members. This group support may have contributed to weight loss. This effect would be similar to commercial weight loss programs, which meet weekly to motivate participants (Jebb, Ahern et al. 2011). It is therefore possible that increased motivation and group support may have facilitated the behavior change. Although there was no weekly weigh-ins or motivators per se in the mindful eating curriculum, the meetings themselves may have been an important factor in promoting weight loss.
Aim 2

The BMI lowering effect of a group mindful eating intervention for obese female adolescents was sustained over time.

This finding is consistent with the literature which recognizes the success of mindful eating interventions in adolescents and children (Burke, 2010). BMI continued to decline, although less dramatically in the experimental group at the 10 week (4 weeks post intervention), indicating the BMI lowering effect of the mindful eating intervention was sustained over time. This plateauing effect suggested the groups’ ability to maintain mindfulness persisted, but waned over time. This finding is consistent with commercial weight loss programs with underlying principles of attending regular meetings to maintain motivation and weight loss (Jebb, Ahern et al. 2011). It should be noted that the afore mentioned confounding variable of weekly meetings may have contributed to the more dramatic initial BMI decrease was eliminated in this follow up. Of note is the BMI decrease was sustained over time without weekly meetings. This finding supports the hypothesis that the gained mindful eating skill facilitated the lowering of BMI, not group support.

Aim 3

Conducting a group mindful eating intervention over six weeks for obese adolescent girls in their school is feasible.

Feasibility was determined as less than 45% attrition across the study. As evidenced by the consort diagram Figure 6, attrition in this mindful eating intervention pilot study was 38%, due to the loss of six participants in the experimental group and eight participants in the comparison group. Attrition was a major challenge in this study due to the small sample size
required by mindful eating instruction. The recommended range of 8-15 participants per mindful eating class (MEAL, 2009) limited the size of this study.

Attrition is noted in the literature to be a crucial factor in the success of both weight loss and after school programs (Fabricatore, Wadden et al. 2009; Weisman and Gottfredson, 2001). Although scheduling class on campus after school eliminated transportation issues for this adolescent population, attrition remained an issue. The Weisman and Gottfredson study notes after-school program attrition rates range from 30-50% (Weisman and Gottfredson, 2001). Commercial weight loss programs report attrition rates of 50% at three weeks, and 70% at 12 weeks (Fabricatore, Wadden et al. 2009). This mindful eating study’s 38% attrition rate impacted the power of this study’s results; however it remained below the 45% attrition rate established from the literature (Volkmar, Stunkard et al. 1981; Fabricatore, Wadden et al. 2009; Gill, Karmali et al. 2012). Thus a group mindful eating intervention over six weeks for obese adolescent girls in their school is feasible.
Additional Analysis

Weight Change in Experimental and Comparison Group Intervention End

The weight loss in experimental group who received the mindful eating intervention is consistent with Dalen’s pilot mindful eating study in obese adults. The simultaneous weight gain in the comparison group receiving only nutrition and exercise information reflects multiple meta-analyses findings that lifestyle changes alone do not result in weight loss of obese participants. The mean weight loss in the mindful eating group of 5.25 lbs. over the 6 week intervention period is consistent with Dalen’s mindful eating study in obese adults who lost an average of 8.8 lbs. over 12 weeks (Dalen, et al 2010).

Experimental Group Sustained Weight Loss

The experimental group sustained weight loss was sustained over time. This finding is consistent with AIM 2 and shares its confirmation of literature findings. The 3 measure design of this ANOVA required a Bonferroni’s correction. At this lowered alpha, the sustained weight loss was not significant. The Bonferroni’s correcting for a Type I error; with this small sample size may have contributed to a Type II error.

Meditation and Mindful Eating Practice Diaries and Weight Change

Meditation and Mindful Eating Practice Diaries did not correlate with weight change. This finding is in contrast to meta-analysis findings of the effectiveness of mindfulness training in children and adolescents (Burke, 2010). The experimental group participants’ paper record submitted weekly may have been a poor tool for this adolescent population. A technological solution recorded in real time may have better tracked the actual amount of time spent meditating
and practicing mindful eating. In the structured interview, no participants cited meditation as an important factor in controlling their eating.

**Mindfulness Awareness Scores and Weight Change**

Mindfulness Awareness Scores did not change significantly over time and did not correlate with weight change. This does not align with the literature which supports the success of mindfulness intervention studies in adolescents and children. A meta-analysis of mindfulness training has been found to be appropriate and effective for younger age groups (Burke, 2010), and indeed was effective in lowering the weight of the experimental group. This lack of correlation between mindfulness as measured by the MAAS may be due to small sample size. The lack of a relationship between weight, the mindful eating intervention and the MAAS score may also be related to the instrument. The MAAS questionnaire assesses overall mindfulness. This MEAL curriculum, however does not teach general mindfulness but rather focuses very specifically on mindful eating behavioral skills. The relatively short 6 week intervention focused exclusively on teaching mindful eating techniques. The 14 question MAAS contains only one question that assesses eating “I snack without being aware of what I am eating”. The MAAS Tool’s broad measure of mindfulness may not be an accurate measure of the specific behavioral skill of mindful eating.

**Motivation to Join the Study and Weight Change**

Motivation to participate in the study as measured by the demographic questionnaire developed for the study did not change significantly over time and did not correlate with weight change. This newly developed questionnaire may not have accurately captured the underlying motivation of participants to join this mindful eating study. This four option questionnaire may
have been to brief; further development of this instrument should be considered for future mindful eating intervention studies.

**Study Criteria**

BMI, a standard measure of obesity is calculated from both weight and height, and is considered a better barometer than weight alone in determining obesity in all age groups (Okorodudu & Jumean, 2010). Although BMI is calculated from weight, the inclusion of height in this calculation is most appropriate for adolescents due their accelerated growth during puberty (CDC, 2010). For this reason, BMI $\geq$90th percentile was utilized as inclusion criteria for this study. Predictably during this short study, there were no measurable changes in height of the obese female adolescent participants, thus effects of weight and BMI were similar.

**Structured Interview Responses**

Several themes recurred in the participants’ responses to the structured interview questions. Participants responded in a group discussion and with written short answers. Question included identifying what was most meaningful and most challenging in the mindful eating class. Participants were also asked to share their thoughts were regarding improving class attendance, decreasing absenteeism, and improving future classes.

Gaining control over eating was a recurring theme in the responses to the question what was most meaningful and helpful in the mindful eating classes. Factors identified as promoting control however were as varied as the participants. Various aspects of the mindful eating classes were cited as facilitating eating control. Factors identified as crucial to eating control included learning about types of hunger, practicing eating healthy foods, gaining nutrition knowledge, sharing feelings, discussing challenging situations, gaining motivation by class attendance,
overcoming emotional eating, “really changing and now able to help family members”, and learning portion control.

The most common written response to what was challenging and needing improvement in class was stating there were no challenges and they enjoyed the class. Two participants shared a desire for more yoga time during class. Several participants cited their personal challenges to mindful eating as opposed to challenges and improvements needed for the mindful eating class. These responses included “eating when I am bored”, “remembering what I should eat”.

Participants who completed the mindful interventions hypothesized about the six participants who never returned after the first mindful eating session. Almost universally they replied the attrition was due to participants being not ready, fearful or stigmatized. These participants shared their experience of feeling awkward entering a room of fellow obese adolescent females, and noticing whether other participants were smaller or larger than themselves. Citing fear/stigma as deterrent from class attendance aligned with two observed events. The first meeting of the experimental group required recording height and weight and completion of questionnaires, and an introduction to mindful eating concepts while eating healthy food. Our classroom was scheduled in the In-School Suspension classroom, supervised by the athletic coach. Entering the classroom we encountered an unresponsive athletic coach and several male athletes. The coach allows these male athletes to store their athletic gear in his classroom. The athletes were curious about our class and very interested in accessing our food. Although we prevailed, 6 participants never returned despite weekly telephone calls, text messages, locker reminders and emails. Another event supports the report of stigma/fear of change as challenges to retention. Following this attrition, multiple approaches were executed to
recruit more participants including snowballing. The attending participants sought new recruits. One new recruit, a friend of an attending participant, met the study’s BMI criteria, and came to the classroom. Despite encouragement from the primary researcher and her attending participant friend, she stated she simply could not walk through the threshold into the classroom. Eventually she left.

Increasing the amount of yoga time was cited by half of the respondents as a recommendation to improve attendance. Conflicting after school appointments was cited as the primary challenge to attendance. The participants had no recommendations for future improvements to the class, universally stating they liked the class. One participant did recommend involving parents more in future classes.

Several themes recurred in the participants’ responses to the structured interview questions. Participants identified social stigma, fear and scheduling as barriers to mindful eating class attendance. Participants identified practicing eating, yoga, social support as most helpful in mindful eating class. The most commonly identified theme was control, primarily of eating, but also of emotions. These identified themes need to be taken into consideration in the design of future mindful eating adolescent anti-obesity intervention research.

Strengths

The homogeneity of the participant population and randomized design with an experimental and comparison group were strengths of the study. The procedure of recording participants’ weights, in real time, in lieu of weight self-reported by participants is an additional strength. Self-report of weight has been demonstrated to be unreliable in numerous studies (Machado Rodrigues, Coelho e Silva et al. 2012; Warner, Wolin et al. 2012). Additionally, only
the principle investigator measured and recorded weights, on the same scale in the school nurse’s office. This increased reliability of measurements and consistency of procedures. Another strength of the study was that all participants in the experimental group received the same group intervention, at the same time from the same instructor. The 10 week (4 weeks post intervention) intervention design further strengthened the study. The continued sustained decrease of BMI over time supports the hypothesis, that weight and BMI decrease was not the of group support, and lends support to the hypothesis that the behavioral skill resulted in changed eating behavior reflected in decreased BMI of the experimental group. Attaining a behavioral skill, which may be utilized in all eating situations, is well suited for erratic schedules of adolescents.

**Limitations**

A significant study limitation was not collecting menstrual cycle information from these adolescent female participants. Menstruating females weights may shift several pounds throughout their menstrual cycle (Janowsky, Berens et al. 1973; Hagobian and Braun 2010). The 6 week length of intervention may have helped compensate for this oversight. Additionally, self-selection limits the study’s findings in that all participants chose to participate in this mindful eating study. This self-selection may indicate readiness for change; this pre-contemplative state may be necessary for the behavior skill instruction to effect change. Alternately, it should be noted that the comparison group also self-selected to join the study, yet these participants continued to gain weight over time.

**Internal Validity**

Although the study’s design included two group randomization, and baseline measurements revealed no quantifiable differences between the experimental or comparison
group, several threats to internal validity remain. Self-selection was a threat to the study’s internal validity. The obese adolescent females who volunteered for this study may have readiness for change as previously discussed. Self-report of meditation and mindful eating practice was an additional threat to the study’s internal validity. This weekly paper diary was not recorded in real time.

**Generalizability**

The results from this pilot study cannot be generalized to other populations. As evidenced in the descriptive data, the participants in this study were drawn from a rather homogenous sample, obese adolescent females aged 14-17 yrs. with a BMI >90th percentile. Most participants were Latino females; all attended the same high school. These self-selected participants may have had readiness for change, not shared with the general population. If replicated, the study should include other population samples.

**Future Recommendations**

Future studies could include mindful eating instruction for all high school students, thus eliminating self-selection as well as the social stigma of adolescent obesity. Offering classes during school hours as part of the curriculum would also address the issues of conflicting responsibilities after school reported in the structured interview. Alternatively, potential future mindfulness classes could be offered on-line in a virtual environment, likely appealing to the technical propensity of this adolescent age group and offering relative anonymity for this stigmatized group. Recruiting a larger sample to take into account the attrition associated with obesity, resulting in the maximum number of 15 participants in the experimental group would further enhance the study. The use of a reward gift card should be replicated in future studies.
especially for the comparison group which does not form a bond with other participants or the instructor. The comparison group participants are required to attend data collection sessions, and which include the recording of participants’ weights. Although this occurs in private, the recording the weight of obese female adolescents is a stressful event and thus including a nominal incentive may impact retention. Additional mindful eating sessions to reinforce mindful eating practice and maintain effect may also increase effectiveness. Finally, future studies in diverse populations would be increase generalizability, which is limited from this study due to this homogenous population of Latino adolescent females from the same high school.

**Implications for Nursing Practice**

Nurses are uniquely qualified to promote mindful eating. Our expertise in teaching nutrition and promoting coping skills are ideal for facilitating mindful eating interventions. The empowerment associated with mindful eating aligns well with nursing’s crucial role as patient advocates, and stands in marked contrast to the medical model recommendations of bariatric surgery and appetite suppressant pharmaceuticals. The findings of this pilot study support the effectiveness of mindful eating in lowering BMI of obese adolescent females. Future studies should include a school based interventions with larger more diverse samples. Offering mindful eating classes on a larger scale, for example, all incoming high school freshman would also address the stigma of gathering obese adolescents in their school setting.

The adaptable approach of teaching the behavioral skill of mindful eating holds great promise for combatting obesity in adolescents. It aligns with our profession’s role of health promotion and self-empowerment, addressing individuals’ health needs within their environment
APPENDIX A

MINDFUL EATING DEMOGRAPHIC QUESTIONNAIRE
MINDFUL EATING DEMOGRAPHIC QUESTIONNAIRE

Date: ________________

For ADMINISTRATIVE use only. DO NOT WRITE IN THIS BOX:

Date of Appointment: ________________________

Height: _____________ inches

Weight: _____________ pounds

BMI: ________________

1. What is your present age in years? ________________

2. What is the highest grade in school that you finished? Please check one.

   _____ 1. 8th Grade

   _____ 2. 9th Grade

   _____ 3. 10th Grade

   _____ 4. 11th Grade

   _____ 5. 12th Grade

   _____ 6. Not currently in school

3. How would you describe your racial group?

   _____ 1. African American or Black

   _____ 2. American Indian or Alaskan Native

   _____ 3. Asian or Pacific Islander (ancestry is Chinese, Japanese, Korean, Vietnamese, Philippine) Please specify ________________________________

   _____ 4. Hispanic/Latino (ancestry is Mexican, Cuban, Puerto Rican, Central American, or South American) Please specify ________________________________

   _____ 5. White (not of Hispanic origin)

   _____ 6. Other Please specify ________________________________
4. Where do you attend school? Please check one.
   ______ 1. Private school (privately funded)
   ______ 2. Public school (funded by the government)

5. What is your average GPA in school? Please check one.
   ______ 1. Overall, I am an A student (GPA > 3.5)
   ______ 2. Overall, I am a B student GPA (>2.5)
   ______ 3. Overall, I am a C student GPA (>2.0)
   ______ 4. Overall, Currently I am not passing (GPA < 2.0)

6. What is your best describes where you live? (place where you sleep most nights). Please check one.
   ______ 1. Apartment
   ______ 2. Single family house
   ______ 3. Multiple family house
   ______ 4. Condominium

7. Who do you live with? Please indicate number, not including yourself:
   ______ 1. Number of adults living in home (people 18yrs and older)
   ______ 2. Number of children living in home (people <18yrs old)

8. Do your parents live with you? Please check
   ______ 1. Does your mother live with you?
   ______ 2. Does your father live with you?
9. What person prepares most of your meals? Please check one.

_____ 1. Mother
_____ 2. Father
_____ 3. Self
_____ 4. Other person living in home
_____ 5. Food prepared outside of the home

10. Number of times per week eating at restaurants (include fast food/coffee shops): Please circle the appropriate number

1, 2, 3, 4, 5, 6, 7, 8 or more

11. Number of times per week eating at school: Please circle the appropriate number

1, 2, 3, 4, 5, 6, 7, 8 or more

12. What is your favorite place to eat? Please check one.

_____ 1. Sit down restaurant
_____ 2. Fast food restaurant
_____ 3. Coffee Shop
_____ 4. Home
_____ 5. Other friends or relatives home
APPENDIX B

MINDFUL EATING CLASS ATTENDANCE
# Mindful Eating Class Attendance

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APPENDIX C

MOTIVATION QUESTIONNAIRE
### MOTIVATION QUESTIONNAIRE

Please select the ONE most important reason for choosing to participate in this study

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<tbody>
<tr>
<td>1.</td>
<td>I want to lose weight</td>
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<td>2.</td>
<td>I want to control my eating</td>
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<td>3.</td>
<td>Friends/Family members want me to join the study</td>
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<td>4.</td>
<td>My health care provider (physician/nurse practitioner) wants me to join this study</td>
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<td>5.</td>
<td>Other reason’</td>
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APPENDIX D

MINDFUL ATTENTION AWARENESS SCALE
**Mindful Attention Awareness Scale**

**Description:**
The MAAS is a 15-item scale designed to assess a core characteristic of dispositional mindfulness, namely, open or receptive awareness of and attention to what is taking place in the present. The scale shows strong psychometric properties and has been validated with college, community, and cancer patient samples. Correlational, quasi-experimental, and laboratory studies have shown that the MAAS taps a unique quality of consciousness that is related to, and predictive of, a variety of self-regulation and well-being constructs. The measure takes 10 minutes or less to complete.

**Day-to-Day Experiences**

Instructions: Below is a collection of statements about your everyday experience. Using the 1-6 scale below, please indicate how frequently or infrequently you currently have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be. Please treat each item separately from every other item.

<table>
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<th>Item</th>
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<td>I could be experiencing some emotion and not be conscious of it until sometime later.</td>
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<td>I break or spill things because of carelessness, not paying attention, or thinking of something else.</td>
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<td>I find it difficult to stay focused on what's happening in the present.</td>
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<td>I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.</td>
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<td>I tend not to notice feelings of physical tension or discomfort until they really grab my attention.</td>
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<td>I forget a person's name almost as soon as I've been told it for the first time.</td>
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<td>It seems I am &quot;running on automatic,&quot; without much awareness of what I'm doing</td>
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<td>I rush through activities without being really attentive to them.</td>
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<td>I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there.</td>
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<td>I do jobs or tasks automatically, without being aware of what I'm doing.</td>
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<td>I find myself listening to someone with one ear, doing something else at the same time.</td>
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<td>I find myself preoccupied with the future or the past.</td>
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<td>I find myself doing things without paying attention.</td>
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<td>I snack without being aware that I'm eating.</td>
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**Scoring information:** To score the scale, simply compute a mean of the 15 items. Higher scores reflect higher levels of dispositional mindfulness.
APPENDIX E

MEDITATION AND MINDFUL EATING DIARY
Daily record M for each time you meditated
Daily record E for each time you eat following the guidelines from class

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APPENDIX F

MEAL CURRICULUM
MEAL CURRICULUM

Brief description: This discussion presents the Mindful Eating and Living (MEAL) curriculum.

Rationale
MEAL was designed to help obese individuals reduce obstacles to healthy living. All participants in MEAL curriculum comes to the class with the knowledge that weight loss can be achieved through eating less and burning more calories, but they have not been able to achieve and maintain this. By reducing stress and increasing awareness, participants are better able to act more wholesomely, out of their knowledge and experience and intention.

MEAL was intended to be universally applicable to those seeking to lose weight, people with binge eating disorder and people with diabetes. The primary emphasis was on the direct experience of mindfulness through brief daily meditation. MEAL avoids excessive lecturing and didactics, but some basic and accessible information on nutrition and exercise was provided. There was no endorsement of any specific diet plan or food groups; participants are encouraged to follow a plan that works for them, based on their previous and current experience. There was a low homework and practice burden. The course was short in duration (6 weeks), but the opportunity for regular extended follow-up was also provided.

Curriculum development
The development of the curriculum was initially developed by Brian Shelley MD and has many similarities to MB-EAT (as of early 2006): Adapted many exercises and themes from MB-EAT, especially: attention to hunger cues, abstinence violation effect, buffet training, eating trigger foods and unhealthier foods together, taste-specific satiety, numeric scales, inner wisdom

Differences from MB-EAT: Targeted obese people seeking weight loss, not just those with BED; targeted weight loss, not reduction in BES scores; lower homework burden: no reading required, no written work required, only 10 minutes of meditation “required” each day; no major education on cognitive behavioral concepts, calories; much shorter (6 week MEAL curriculum versus 12 week MB-EAT program); targets anxiety, trigger foods more quickly (week 3 vs later in MB-EAT).

6-Week MEAL Curriculum
The curriculum consists of brief insight meditations, meditative eating exercises, yoga, and walking meditation. Attention is directed toward states of dysregulation and binge-type eating, toward situations and emotions associated with overeating, and hunger and satiety cues.

Attention is also paid to conditioned responses such as needing to finish all food on a plate, or food which is served from a large container, or eating when one is not actually hungry. After the six weekly sessions, monthly follow-up classes are held. The following MEAL curriculum overview details the specific activities in each week. Group discussion occurs at every meeting.

Week 0
Orientation Group format.

Week 1
Themes: Intention (other than weight loss), relationship to self and food; mindfulness; specific taste awareness: sweetness; kindness toward self, Mindfulness practice: Sitting meditation, (10 minutes), eating meditation Eating exercise: Eating a raisin mindfully (as in the first week of the MBSR curriculum)
Homework: Sitting meditation once a day with CD; attempt eating meditation several times during the week; read the general nutrition and exercise information in the manual provided: New York Times article on the Middle Way, between deprivation and indulgence. Food for Thought—from the Center for Mindful Eating (see website www.tcme.org). Consumer Reports review of Popular Diets, provided as an overview (note that most of the people they surveyed who lost weight used their own ideas, rather than a commercial or popular plan).

My Pyramid, with tables for more than 2000 calories a day (remember, you need about 10 calories per pound each day to maintain your weight, less for weight loss, but note: you can eat more if you are active). Healing Foods Pyramid, an alternative view offered by the University of Michigan (compare to MyPyramid).

ADA info on: Water/hydration, Snack Ideas, 7 Steps to Being More Active, Food Label info, Weight Management Questions, Calorie Counting (exchange system)

Week 2
Themes: Specific taste awareness: fat; choices; inner wisdom; movement; kindness
Mindfulness practice: Standing Yoga (CDs provided), sitting meditation
Eating exercise: Chips (Ruffles, Lays) and cookies (Milanos, Oreos)
Homework: Make one food and activity goal for the week; attempt more mindful eating; continue to perform sitting meditation once a day; experiment with rating hunger and fullness using numeric scales; bring “trigger food” to next class, try not to be hungry at next class

Week 3
Themes: Emotions, triggers, cognitive restraint around at time of fullness; awareness of caloric content of foods using Calorie King books
Mindfulness practice: Sitting meditation, yoga
Eating exercise: Trigger food (after meditation)
Homework: Flip through Calorie King book and use as you like; special attention to fact that 1200 calories a day is often excessively restrictive for gradual and sustained weight loss, especially if one is obese; try to be hungry at start of next class (food provided); experiment with meditating without the CD; continue to gradually increase physical activity; experiment with thought record

The Calorie King Calorie, Fat & Carbohydrate Counter 2007 Edition

Week 4
Themes: Social situations/anxiety and eating; noticing and tolerating mild hunger; noticing body signals around fullness; thirst vs. hunger
Mindfulness practice: Standing meditation (mountain pose); walking meditation
Eating exercise: Drinking and eating while hungry, noticing effect of drinking on “hunger”; noticing when hunger disappears; noticing how talking while eating impacts ability to be mindful
Homework: Bring food for pot-luck, one healthy item and one less healthy item; continue daily practice; continue to increase physical activity

Week 5
Themes: Leaving food on plate; noticing impact of caffeine, TV, and alcohol on food intake
Mindfulness practice: Sitting meditation (longer), walking meditation
Eating exercise: Pot-luck buffet, leaving food on plate
Homework: Continue daily practice; continue to increase physical activity

Week 6
Themes: Celebration; maintenance; shopping ideas, how to continue practice
Mindfulness practice: Standing meditation (mountain pose)
Eating exercise: Healthy snacks and drinks
Homework: Continue daily practice; continue to increase physical activity; return for monthly sessions

Follow-up sessions
Themes: Maintenance; keeping practice fresh; new foods and tastes
Mindfulness practice: Varied; usually sitting and/or walking meditation for 20-30 minutes
Eating exercise: Varied; include chocolate, protein-rich foods, trail mix
Homework: Continue daily meditations
Consumer Reports review of Popular Diets, provided as an overview (note that most of the people they surveyed who lost weight used their own ideas, rather than a commercial or popular plan).
My Pyramid, with tables for more than 2000 calories a day (remember, you need about 10 calories per pound each day to maintain your weight, less for weight loss, but note: you can eat more if you are active).
ADA info on: 7 Steps to Being More Active

First, Get Your Doctor’s Okay
Since people with pre-diabetes and diabetes may have a heart or other diabetes-related problem, ADA suggests you get your doctor’s OK.

Find a Few Activities You Enjoy
Make sure these fit into your busy schedule. Perhaps you choose one you can do outside and one inside for when the weather is bad or it’s too cold. Select one activity that helps you burn calories and glucose (like walking or biking) and another one that helps you build muscles (like lifting or walking with light weights or using the machines at a fitness place).

Start Slowly
Set your first goal at three ten minute walks each week or even less. If you reach this goal, increase the number of minutes you walk. Then increase the number of times a week you walk.
Find a Partner or Join an Exercise Group
This can help you stay on track and make exercise more fun. Look in your area for a mall or local walking program. Or find an online group.

Be Active in 10-minute Spurts
Don’t feel that if you can’t exercise for 30 minutes at a time, it’s not worth it. It’s just as good to add up 10 minutes here and 10 minutes there for a total of 30 minutes. This may be easier to fit in.

Be More Active All Day
Think about what you do each day and how you can work in more steps. Can you take the stairs more often instead of an elevator? Can you park further away from where you work, shop, or do errands? Can you get up to change the TV channel rather than using the remote? You’ll be amazed at how these extra minutes and steps add up.

Make a Plan
People tend to be more successful when they set specific physical activity goals for themselves. Once you set a realistic, specific goal for yourself, make a plan to achieve that goal. It may help to write down your goals and your plan.
APPENDIX H

RESEARCH SUMMARY SHEET
Thank you for your interest in participating in the Mindful eating intervention study. Your involvement in this research project is much appreciated and will contribute to the quality of health care for adolescent females in our community by providing valuable information about decreasing risk from obesity. I hope that the study results will be useful for I plan to share these results in presentations and publish them in professional health care journals. Strict privacy and confidentiality of participant information will be maintained throughout the study including during the presentation and publication of results. This research project will be studying females ages 14 to 17 who are living in Tucson area to determine how mindful eating impacts obesity. There is no cost to participate in the study except your time. You are expected to provide transportation to and from all meetings. You may choose to stop participating due to emotional discomfort or for any reason during the study. You may stop participating at any time without penalty or loss of benefits. This research project is part of the requirements of my PhD program through the College of Nursing with the University of Arizona. If you agree to participate in the study, you will be asked to sign a consent form. The entire study will be completed in about 10 weeks. As part of the study requirements, you are to attend a Study Orientation:

Date: ________________________________

Time: ________________________________

Location: ______________________________

The only potential risk I know of in this study is its focus upon eating can be emotionally distressing. If you decide to participate in this study I guarantee that your responses will be kept strictly confidential. If you have any questions or concerns about being in this study, you may email me Patricia Daly FNP, MS, doctoral student at pdaly@nursing.arizona.edu.
APPENDIX I

CONSENT TO PARTICIPATE IN RESEARCH
Consent to Participate in Research

Attention Parent/Legal Guardian, your teenage girl is being asked to voluntarily participate in a research study.

**Purpose:** The purpose of this study is to determine the effect of a mindful eating intervention on overweight teenage girls.

**Selection Criteria:** 14-17 year old females with a body mass index BMI > the 90th percentile. Your teenager must be able to read at the 8th grade level to complete questionnaires. Your teenager must not be pregnant or taking prescription medication for mood disorder symptoms.

**Procedures:** This study will last 10 weeks. You and she may ask any question at any time during the study. Your teenager will need to attend 3 meetings and if randomly assigned to the mindful eating class, 6 additional weekly classes. During the 3 meetings her height and weight will be measured in a privately screened area and she will complete questionnaires. She will be asked to complete questionnaires honestly and completely answer written questions about her health and mindfulness. The questionnaires will take approximately 30 minutes to complete. At the first meeting, she will be randomly assigned to a comparison group (nutrition and exercise information group) or an intervention group (mindful eating class group). She will have an equal chance of being randomly assigned to either group.

Comparison group (Nutrition and exercise information): If she is randomly assigned to the nutrition and exercise information group, she will receive nutrition and exercise information. She will be asked to attend a data collection meeting at 6 weeks and then 4 weeks later. At both these meetings her height and weight will be measured and she will complete the questionnaires.

Intervention group (Mindful eating classes): If she is randomly assigned to the mindful eating classes group, she will attend 6 weekly mindful eating classes. She will also be asked to attend a data collection meeting at 6 weeks and then 4 weeks later. At both these meetings her height and weight will be measured and she will complete the questionnaires.

**Benefits:** The main benefit of this study is receiving nutrition and exercise information, measuring her height and weight and calculating her BMI. The findings of this study may benefit other overweight teenage girls. Participants can stop participating at any time without penalty or loss of benefits.

**Risks:** The main risk of this study is focusing upon eating which can be emotionally distressing to your teenager. Although unlikely, if your teenager should become overly emotionally distressed during the study, she will be referred to a counselor. The principal investigator will report any signs of abuse in this minor population to the appropriate law enforcement agency.

**Confidentiality:** Participation in the study is completely confidential. Your teenager will be randomly assigned a personal study number and it will be used to identify her information. Her name will not appear on any of the documents. There will be 30 participants in this study (15 in each group). Participants will be asked not to disclose any information shared in meetings.

**Participant costs and compensation:** There is no cost to participate except your time. You are expected to provide transportation to and from all meetings. You or she may choose to stop participating at any time during the study.

Participants Initials ______
Contact Information: If you have concerns or questions about the study, or need further information you may contact the principal investigator, Patricia Daly, FNP, MS, doctoral student at (706) 575-2867 or email her at pdaly@nursing.arizona.edu. If you agree to participate, you will be given a signed copy of this document and a written summary of the research. You will not give up any legal rights by signing this consent form.
You may contact Patricia Daly, FNP, MS, and doctoral student at phone number at (706) 575-2867 any time you have questions about the research.
You may contact Patricia Daly, FNP, MS, and doctoral student at phone number at (706) 575-2867 if you have questions about your rights as a research subject or what to do if you are injured.
Your participation in this research is voluntary, and you will not be penalized or lose benefits if you refuse to participate or decide to stop.
Signing this document means that the research study, including the above information, has been described to you orally, and that you voluntarily agree to participate.

_____________________________ ____________
Signature of parent/legal guardian     date

_____________________________ ____________
Signature of witness                           date
APPENDIX J

ASSENT TO PARTICIPATE IN RESEARCH
Assent to Participate in Research

You are being asked to voluntarily participate in a research study.

**Purpose:** The purpose of this study is to determine the effect of a mindful eating intervention on overweight teenage girls.

**Selection Criteria:** 14-17 year old females with a body mass index BMI $\geq 90^{th}$ percentile. You must be able to read at the 8th grade level to complete questionnaires. You must not be pregnant or taking prescription medication for mood disorder symptoms.

**Procedures:** This study will last 10 weeks. You will need to attend 3 meetings and if randomly assigned to the mindful eating class, 6 additional weekly classes. During the 3 meetings, your height and weight will be measured in a privately screened area and you will complete questionnaires. You will be asked to complete questionnaires honestly and completely answer written questions about your health and mindfulness. You may ask any question at any time during the study. The questionnaires will take approximately 30 minutes to complete. At the first meeting you will be randomly assigned to a comparison group (nutrition and exercise information group) or an intervention group (mindful eating class group). You will have an equal chance of being randomly assigned to either group.

Comparison group (Nutrition and exercise information): If you are randomly assigned to the nutrition and exercise information group you will receive nutrition and exercise information. You will be asked to attend a data collection meeting at 6 weeks and then 4 weeks later. At both these meetings, your height and weight will be measured and you will complete the questionnaires.

Intervention group (Mindful eating classes): If you are randomly assigned to the mindful eating classes group you will attend 6 weekly mindful eating classes. You will also be asked to attend a data collection meeting at 6 weeks and then 4 weeks later. At both these meetings your height and weight will be measured and you will complete the questionnaires.

**Benefits:** The main benefit of this study is receiving nutrition and exercise information, measuring your height and weight and calculating your BMI. Participants can stop participating at any time without penalty or loss of benefits.

**Risks:** The main risk of this study is focusing upon eating which can be emotionally distressing to you. Although unlikely, if you should become overly emotionally distressed during the study, you will be referred to a counselor. The principal investigator will report any signs of abuse in this minor population to the appropriate law enforcement agency.

**Confidentiality:** Your participation in the study is confidential. You will be randomly assigned a personal study number and it will be used to identify your information. Your name will not appear on any of the documents. There will be 30 participants in this study (15 in each group). Participants will be asked not to disclose any information shared in meetings.

**Participant costs and compensation:** There is no cost to participate except your time. You are expected to provide transportation to and from all meetings. You may choose to stop participating at any time during the study.

Participants Initials ____
**Contact Information:** If you have concerns or questions about the study, or need further information you may contact the principal investigator, Patricia Daly, FNP, MS, doctoral student at (706) 575-2867 or email her at pdaly@nursing.arizona.edu. If you agree to participate, you must be given a signed copy of this document and a written summary of the research. You will not give up any legal rights by signing this consent form.

You may contact Patricia Daly, FNP, MS, and doctoral student at phone number at (706) 575-2867 any time you have questions about the research.

You may contact Patricia Daly, FNP, MS, and doctoral student at phone number at (706) 575-2867 if you have questions about your rights as a research subject or what to do if you are injured.

Your participation in this research is voluntary, and you will not be penalized or lose benefits if you refuse to participate or decide to stop.

Signing this document means that the research study, including the above information, has been described to you orally, and that you voluntarily agree to participate.

_____________________________  ____________  
Signature of participant                       date

_____________________________   ____________  
Signature of witness                            date
APPENDIX K

POTENTIAL PARTICIPANT IDENTIFYING SCRIPT FOR SCHOOL STAFF
Potential Participant Identifying Script for School Staff

(You/Your teenage girl) meet the participant guidelines for a study for overweight teenage girls. May I discuss the study briefly with you?

If yes;
This is a 10 week study that will be conducted in Tucson, Arizona. It focuses on teaching mindful eating and nutrition to overweight 14-17 year old girls.
Are you are interested in participating in the study? If so, kindly contact Patti Daly, MSN, RN at (706) 575-2867 or email her at pdaly@nursing.arizona.edu.

If you prefer, I can take your name and phone number and/or email and Patti Daly, MSN, RN will contact you to answer your questions. (Get name and phone number and/or email.)
APPENDIX L

RECRUITMENT SCRIPT FOR PRINCIPAL INVESTIGATOR
Recruitment Script for Principal Investigator

(You/Your teenage girl) meet the participant guidelines for a study for overweight teenage girls. May I discuss the study briefly with you?

If yes;
This is a 10 week study that will be conducted in Tucson, Arizona. It focuses on teaching mindful eating and nutrition to overweight 14-17 year old girls. All of the teenage girls will receive information regarding nutrition and exercise. Half of the teenage girls will also attend a mindful eating class once a week for 6 weeks. Mindful eating is an eating technique in which you learn to eat slowly and pay attention to body sensations. The class is free. The study will be looking at how the teenage girls react to the mindful eating class as compared to the teenage girls who do not attend the class.

The study results may be shared in presentations and published in professional health care journals. Patient confidentiality will be strictly protected and no individual information will be disclosed. I am a doctoral student in the College of Nursing. This research project is part of the requirements of my PhD program through the College of Nursing with the University of Arizona.

Are you interested in participating in the study? If so, kindly contact Patti Daly, MSN, RN at (706) 575-2867 or email her at pdaly@nursing.arizona.edu.

If you prefer, I can take your name and phone number and/or email and Patti Daly, MSN, RN will contact you to answer your questions. (Get name and phone number and/or email.)
APPENDIX M

RECRUITMENT SCRIPT FOR PRINCIPAL INVESTIGATOR
Qualitative Inquiry for at 4 week Follow Up

Please share your thoughts on the following:

1. From your perspective, what was most meaningful and helpful in your mindful eating classes?

2. What was most challenging, needing improvement in your mindful eating classes?

3. What do you feel improved class attendance?

4. What do you feel increased absenteeism?

5. What would you change to improve future classes?

Interview questions were content analyzed to identify themes
REFERENCES


Coviello, A. D., Legro, R. S., & Duniaf, A. (2006). Adolescent girls with polycystic ovary syndrome have an increased risk of the metabolic syndrome associated with increasing androgen levels independent of obesity and insulin resistance. *Journal of Clinical Endocrinology & Metabolism, 91*(2), 492-497.


Richdeep S. Gill, MD, PhD,* Shahzeer Karmali, MD,† Ghassan Hadi, MD,† David P. Al-Adra, MD,* Xinzhe Shi, MPH,† and Daniel W. Birch, MSc, MD(2012)† Predictors of attrition in a multidisciplinary adult weight management clinic *Canadian Journal of Surgery* (CJS)Aug. 1, 2012


