

Using a non-diet approach to prevent overweight and obesity among 6<sup>th</sup> to 8<sup>th</sup> grade youth in a  
low-income racial/ethnic community in Kansas

by

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B.E., Shenyang Pharmaceutical University, 2010  
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AN ABSTRACT OF A DISSERTATION

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Department of Food, Nutrition, Dietetics and Health  
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## Abstract

**Objective:** The purpose of this study is to promote healthy dietary and physical activity (PA) behaviors in adolescents using a six-module nutrition education resource—Wise Eating (WE)—which was designed specifically for the adolescent population based on the concept and principles of Intuitive Eating (IE).

**Study Design:** Repeated measures study with pre-assessment and post-assessment.

**Outcome Measures and Analysis:** This study assessed participating adolescents' breakfast intake, fruit and vegetable (FV) consumption, and PA behaviors; perceptions of IE factors; and perceptions of the Theory of Planned Behavior (TPB) variables. Independent samples *t*-tests and one-way ANOVAs were used to determine differences in demographic variables and differences between the control and the intervention group. Paired *t*-tests were performed to compare the behavioral and perception changes from the pre-assessment to the post-assessment. Multiple linear regressions were performed to examine the relationship between TPB variables and FV consumption and PA participation intent and behaviors.

**Results:** The total number of participants at the pre- and the post-assessment was 154 and 148, respectively. Participant's gender and grade level were evenly distributed. Hispanic was identified as the predominant ethnic population at both the pre- and the post-assessment. At post-assessment, participants in the intervention group significantly increased their breakfast intake frequency, FV consumption frequency, and PA participation frequency ( $P < .05$ ). Sixth graders had significantly higher breakfast intake frequency, FV consumption frequency, and PA participation frequency when compared with 7<sup>th</sup> and 8<sup>th</sup> graders ( $P < .05$ ). The TPB variables significantly predicted FV consumption and PA intent and behaviors at both the pre- and the post-assessment, and the perceived behavioral control served as the most consistent predictor.

For the intervention group, the IE total and Factor 1—Unconditional Permission to Eat scores were significantly increased at the post-assessment when compared with the control group ( $P \leq .001$ ).

***Conclusions:*** These findings tested the effectiveness of WE education modules and further emphasized the need for more interventions on IE to improve dietary and PA behaviors change in the adolescent population.

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# Table of Contents

List of Figures .....	xii
List of Tables .....	xiii
Acknowledgements .....	xiv
Chapter 1 - Introduction.....	1
Problem Statement.....	1
Adverse Health Outcomes of Adolescent Obesity.....	2
Poor Dietary and Physical Activity Guidelines Adherence .....	3
Dieting, Binging, and Emotional Eating Problems and Consequences .....	4
Breakfast Skipping Behavior .....	6
Justification.....	7
Purpose of Study .....	8
Chapter 2 - Literature Review.....	19
Dietary and Physical Activity Guidelines for Adolescents .....	20
Theories on Health Behaviors.....	21
Health Belief Model.....	22
The Social Cognitive Theory .....	24
The Transtheoretical Model of Behavior Change/Stages of Change.....	26
The Social Ecological Model.....	28
The Theory of Planned Behavior .....	30
The Intuitive Eating Method to Promote Healthy Dietary and Physical Activity Behaviors...	32
Background .....	32
Intuitive Eating Principles.....	33
Principle 1: Reject the Diet Mentality .....	33
Pros and Cons of Principle 1: Reject the Diet Mentality .....	34
Principle 2: Honor Your Hunger.....	35
Pros and Cons of Principle 2: Honor Your Hunger .....	36
Principle 3: Make Peace with Food .....	37
Pros and Cons of Principle 3: Make Peace with Food.....	38
Principle 4: Challenge the Food Police.....	38



Pros and Cons of Principle 4: Challenge the Food Police .....	39
Principle 5: Feel Your Fullness.....	40
Pros and Cons of Principle 5: Feel Your Fullness .....	41
Principle 6: Discover the Satisfaction Factor.....	41
Pros and Cons of Principle 6: Discover the Satisfaction Factor .....	42
Principle 7: Honor Your Feelings without Using Food .....	42
Pros and Cons of Principle 7: Honor Your Feelings without Using Food.....	43
Principle 8: Respect Your Body .....	44
Pros and Cons of Principle 8: Respect Your Body .....	45
Principle 9: Exercise—Feel the Difference .....	46
Pros and Cons of Principle 9: Exercise—Feel the Difference .....	47
Principle 10: Honor Your Health.....	47
Pros and Cons of Principle 10: Honor Your Health .....	48
Development of Measurement for Intuitive Eating .....	48
Intuitive Eating in Adolescents .....	51
Reference .....	56
Chapter 3 - An Examination of Factors Affecting Fruit and Vegetable Intake and Physical	
Activity Behaviors among Adolescents in a Low-income Racial Community in Kansas ....	67
Abstract.....	67
Introduction.....	68
Method .....	71
Communities and Participants .....	72
Measures .....	72
Dietary behaviors and perceptions.....	73
Physical activity behaviors and perceptions .....	74
Intuitive Eating perceptions .....	74
Data analyses .....	74
Results.....	75
Participant Characteristics .....	75
Dietary Behaviors and Perceptions .....	76
Physical Activity Behaviors and Perceptions .....	77

The Theory of Planned Behavior Variables and Fruit and Vegetables Intake Intention and Behavior .....	78
The Theory of Planned Behavior Variables and Physical Activity Intention and Behavior .....	80
Intuitive Eating Factors in Association with Breakfast Intake, Fruit and Vegetable Consumption, and Physical Activity Behaviors .....	81
Discussion .....	83
Conclusions and Implications for Research and Practice .....	86
Reference .....	88
Chapter 4 - Using Wise Eating Approach to Promote Healthy Dietary and Physical Activity Behaviors among Adolescents in a Low-income Racial Community in Kansas: A Pilot Study .....	93
Abstract .....	93
Introduction .....	94
Method .....	98
Communities and Participants .....	99
Instruments .....	99
Wise Eating Modules Development .....	99
Wise Eating Questionnaires for Teachers .....	100
Wise Eating Questionnaires for Students .....	100
Dietary behaviors and perceptions .....	101
Physical activity behaviors and perceptions .....	102
Intuitive Eating perceptions .....	102
Wise Eating Intervention Implementation .....	103
Data analyses .....	103
Results .....	103
Participants Characteristics .....	103
Dietary Behaviors and Perceptions .....	104
PA Behavior and Perceptions .....	106
Intervention Effect .....	107
The Theory of Planned Behavior Variables and Fruit and Vegetables Consumption ....	107
The Theory of Planned Behavior Variables and PA behavior .....	109

Intuitive Eating Factors .....	109
Teachers' Responses .....	110
Discussion .....	111
Conclusions and Implications for Research and Practice .....	113
Reference .....	115
Chapter 5 - Discussions, Conclusions and Recommendations for Future Research and Practice .....	120
Discussions .....	120
Conclusions and Implications for Research and Practice .....	125
Reference .....	126

## **List of Figures**

Figure 2.1 The Health Belief Model adapted from Rosenstock et al. (1998).....	23
Figure 2.2 The social Cognitive Theory adapted from Bandura (1997).....	25
Figure 2.3 The Transtheoretical model of Behavior Change/Stage of Change adapted from Prochaska and Diclemente (1983) .....	28
Figure 2.4 The Social Ecological Model adapted from Bronfenbrenner (1979) .....	29
Figure 2.5 The Theory of Planned Behavior adapted from Ajzen (2006) .....	31
Figure 2.6 the Modified Acceptance Model of Intuitive Eating for Adolescent Girls by Andrew et al. (2014) .....	54

## List of Tables

Table 3.1 Demographic Characteristics of Participating Students .....	75
Table 3.2 Multiple Linear Regressions for Fruit and Vegetable Consumption and Physical Activity Intentions and Behaviors .....	79
Table 3.3 Multiple Linear Regressions for Breakfast Intake, Fruit and Vegetable Consumption and Physical Activity Behaviors .....	82
Table 4.1 Demographic Characteristics of Participating Students at Pre- and Post-Assessment	104
Table 4.2 Differences of Behaviors and Perceptions between the Control and the Intervention Group at Post-Assessment .....	105
Table 4.3 Differences of Behaviors and Perceptions between the Control and the Intervention Group at Pre- and Post-Assessment .....	106
Table 4.4 Multiple Linear Regressions for FV Consumption and PA Intentions and Behaviors .....	108
Table 4.5 Differences of IE Factors Scores between the Control and the Intervention Group at Pre- and Post-Assessment .....	110

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## **Chapter 1 - Introduction**

The prevalence of overweight and obesity among adolescents has been considered as one of the most critical public health concerns in the United States. Healthy People 2020 identified ‘Nutrition, Physical Activity (PA), and Obesity’ as one of the twelve leading health concerns.<sup>1</sup> Since 1960, the National Health and Nutrition Examination Survey (NHANES) have been used as the data source to monitor the national prevalence of overweight and obesity. In adolescents, obesity or class I obesity is defined as a body mass index (BMI) at or above the 95<sup>th</sup> percentile for children and teens of the same age and sex; and severe obesity, which includes class II obesity and class III obesity, is defined as BMI at or above 120% of the 95<sup>th</sup> percentile or BMI at or above 140% of the 95<sup>th</sup> percentile, respectively.<sup>2</sup> According to the most recent national estimates of obesity and severe obesity prevalence among children and adolescents aged 2 to 19 years, the obesity rates had increased significantly from 1999 through 2014, despite considerable clinical and policy efforts to address the issue.<sup>2</sup> In particular, the severe obesity rate has significantly increased to 8.7% in adolescents.

### **Problem Statement**

Data from the NHANES shows that almost one in three (33%) adolescents ages 6 to 19 are considered to be overweight or obese (BMI at or above 85% of the 95<sup>th</sup> percentile), and 18% are considered to be obese (BMI at or above 95% of the 95<sup>th</sup> percentile).<sup>3,4</sup> Compared with the prevalence of obesity among White youth (15%), the obesity rates among Black and Hispanic youth (26% and 23%, respectively) are significantly higher. Particularly, more than two in five Black and Hispanic youth (> 41%) are considered to be overweight or obese.

## **Adverse Health Outcomes of Adolescent Obesity**

As the prevalence of childhood and adolescent obesity increases, its health implications are becoming more evident.<sup>5</sup> Obesity in children and adolescents is associated with significant health problems in the pediatric age group and is an important early risk factor for much of the adult morbidity and mortality.<sup>6</sup> Childhood obesity frequently persists into adulthood, with up to 80% of obese children reported to become obese adults.<sup>7</sup> Studies have shown that many of the obesity-related health conditions once thought applicable only to adults are now being seen in children and adolescents with increasing frequency. Examples include high blood pressure, early symptoms of hardening of the arteries, type II diabetes, nonalcoholic fatty liver disease, polycystic ovary disorder, and disordered breathing during sleep.<sup>6</sup>

Furthermore, obesity in children and adolescents also increases psychological burden that could persist into adulthood. Studies on psychological correlates of obesity linked obesity with depression, and obesity is believed to increase depressive symptoms among children and adolescents.<sup>8-10</sup> In turn, depressed adolescents are at a greater risk for the development and persistence of obesity during adolescence.<sup>11</sup> Also, obesity has been shown to be a leading cause of lower self-esteem and negative body image among adolescents and young adults, especially Hispanic and non-Hispanic white females.<sup>8,12</sup>

Economically, studies have shown that nearly \$80 billion was spent on obesity-related medical expenses in 1998, with a projected increase to \$147 billion in 2008.<sup>13</sup> Currently, estimates for obesity-related costs range from \$147 billion to nearly \$210 billion per year.<sup>14</sup> Additionally, obese individuals have been shown to spend, on average, \$1,429 greater per year on medical care than a person of normal weight.<sup>13</sup> Improving dietary intake and increasing PA can decrease obesity as well as lower healthcare costs associated with fewer doctor visits, tests,



prescription drugs, sick days, emergency room visits and admission to the hospital, and lower the risk for developing numerous obesity-related diseases.<sup>15</sup> Because obese children and adolescents are more likely to become obese adults,<sup>7</sup> strategies and interventions that focus on promoting healthy lifestyle behaviors specific to adolescents are needed.

### **Poor Dietary and Physical Activity Guidelines Adherence**

Although dietary and PA guidelines have been established for adolescents to promote healthy lifestyle behaviors and decrease the onset of obesity, many adolescents failed to meet these suggested recommendations. The national estimated FV consumption in adolescents showed only 16% to 26% of adolescents met the FV intake recommendations,<sup>16</sup> with obese adolescents showing even lower adherence rates.<sup>17</sup> Another population study also revealed a mean daily decrease of 0.7 servings of FVs among adolescent girls and a mean daily decrease of 0.4 servings of FVs among adolescent boys between 1999 and 2004.<sup>18</sup> Likewise, according to the current estimated trends in PA, PA decreased significantly between ages 9 and 15 years,<sup>19</sup> and only one-quarter of US adolescents aged 12-15 years met the PA recommendations.<sup>20</sup> Although adolescent boys were more active than adolescent girls, the rate of decrease in PA was the same for both adolescent boys and girls.<sup>19</sup>

One reason adolescents may have failed to meet the suggested recommendations is related to low intent.<sup>21-23</sup> In the Theory of Planned Behavior (TPB), intention represents an individual's readiness to perform a given behavior and is considered to be the best predictor of a certain behavior.<sup>22</sup> Additionally, individuals' attitude towards a specific behavior, their subjective norms, and their perceived behavior control serve as three important determinants of intention.

## **Dieting, Binging, and Emotional Eating Problems and Consequences**

Besides the poor dietary and PA guidelines adherence, concerns with weight and shape are extremely common among adolescents. Adolescents have been exposed to an overemphasis on the importance of controlling weight as portrayed in the media.<sup>24</sup> Daee et al.'s (2002) review study of adolescents' dieting behavior indicated that 41% to 66% of adolescent girls and 20% to 31% of adolescent boys have attempted to lose weight at some point in the past.<sup>25</sup> Moreover, dieting, once the most popular and recognized way of reducing weight and preventing obesity, has been accused of potentially causing eating disturbances and promoting weight gain among adolescents.<sup>26-28</sup> In prospective studies, dieting has been associated with a 5-fold to 18-fold increased risk of developing an eating disorder.<sup>29,30</sup> Polivy's (1996) review study identified dieting as the cause that led to binge eating once food became available.<sup>31</sup> Additionally, dieting frequency in adolescents has also been associated with other behavioral issues such as a history of alcohol and tobacco use.<sup>26</sup>

Adolescents diet for various reasons, but body image dissatisfaction and the desire to be thinner or to be muscular are considered to be the major causes.<sup>32</sup> Adolescents place more emphasis on being slender or being muscular than being healthy. Unrealistic media images foster the distorted body images and low self-esteem that initially prompt dieting.<sup>33</sup> Studies have indicated that adolescent girls with body image distortion are more likely to associate it with dieting behaviors, whereas adolescent boys were more likely to experience increased psychological stress compared to their peers who possess an undistorted view of self.<sup>26,28</sup>

Dieting is also negatively associated with potential physical and psychological health outcomes in adolescents. In growing adolescents, the reduction in food and energy intake can lead to nutrition deficiencies (particularly iron and calcium) and stunted growth, which poses

risks to both short- and long-term health issues.<sup>34</sup> Disordered eating has been found to be associated with menstrual irregularity, including secondary amenorrhea in girls.<sup>35,36</sup> Additionally, osteopenia and osteoporosis in dieting girls also pose further concerns for long-term health.<sup>37</sup>

Studies on the psychological influence of dieting have shown that adolescents with lower self-esteem are more likely to diet, often in an attempt to feel better about themselves if weight loss is successful.<sup>38-40</sup> However, dieting tends to reduce weight for a short period, but normally causes weight gain in the long-term. Thus this process of dieting may make the situation worse and have a further negative impact on an adolescent's self-esteem because self-esteem is largely defined by successes and failures during adolescence.<sup>41,42</sup> Stice et al.'s prospective study of adolescents indicated negative body image and self-esteem were found to be precursors to dieting, disordered eating behaviors, and weight gain over time.<sup>43</sup> Moreover, Plivy's review study had also shown that dieting appeared to result in psychological manifestations such as preoccupation with food and eating, increased emotional responsiveness and dysphoria, and distractibility.<sup>31</sup>

Aside from dieting, emotional states and psychological conditions also lead to changes in eating behaviors, and it may result in overeating in many cases. Studies showed that negative emotions could result in overeating in either obese individuals or normal-weight dieters.<sup>44,45</sup> Nguyen-Michel et al.'s study further identified that emotional eating in adolescents was associated with increased frequent intake of sweet or salty energy-dense foods, such as cake, ice cream, and chips, and sugar-sweetened soda.<sup>46</sup>

## **Breakfast Skipping Behavior**

Among the three meals a day—breakfast, lunch, and dinner—skipping breakfast is most common, and it is highly prevalent among adolescents in the United States.<sup>47,48</sup> Unfortunately, the breakfast consumption rate by children and adolescents in the United States has declined over time. Between 1965 and 1991, breakfast consumption in preschoolers, children ages 8 to 10 years old, and adolescents declined from 5%, 9%, and 14% to 20%, respectively.<sup>49</sup> Twenty-one percent of 8 to 9 years old children and 42% of 12 to 13 years old adolescents indicated that they do not eat breakfast every day,<sup>47,50</sup> and 4% of children and adolescents reported that they habitually skip breakfast.<sup>51</sup>

There is growing evidence to suggest that eating breakfast has positive health- and school-related outcomes for children and adolescents. Breakfast consumption is associated with improved cognitive function, attention, and memory,<sup>52</sup> improved academic performance and attendance,<sup>53</sup> and lower BMI.<sup>54</sup> Additionally, individuals who consumed breakfast regularly had more adequate micronutrient intakes and better dietary quality than those who did not.<sup>49,55,56</sup> On the contrary, breakfast skipping is associated with higher BMI and poor nutrient intake in adolescents.<sup>48,57</sup> The major reasons that lead to adolescents skipping breakfast include lack of time in the morning, do not feel hungry in the morning,<sup>58</sup> and want to control weight.<sup>59,60</sup>

An inverse relationship has been observed between individuals' frequency of eating breakfast and their body weight and BMI.<sup>57</sup> Skipping breakfast to control or to lose weight is typically more prevalent in adolescents, especially for adolescent girls.<sup>59,60</sup> However, as shown in several cross-sectional and prospective studies, instead of losing weight, breakfast skipping can cause adolescents to be in a constant state of hunger, which can further lead to overeating when food becomes available.

The transition from adolescence to adulthood has been identified as a critical stage for health promotion because during this period, adolescents reach maturity, develop more sophisticated reasoning ability, and make important decision that will shape their future.<sup>61</sup> Therefore, these biological, cognitive, and psychosocial changes during this period create a need for more studies and interventions to target improving healthy behavior patterns for adolescents that contribute to the development of a healthy lifestyle.

### **Justification**

The World Health Organization expert committee recommends the prevention and treatment of childhood and adolescent overweight and obesity should at least include the following dietary and PA behaviors: (1) limit the consumption of sugar-sweetened beverages (SSB); (2) encourage diets that include the recommended servings of FVs; (3) limit television and other screen time usage; (4) eat breakfast daily; (5) limit eating out at restaurants, particularly fast food restaurants; (6) encourage family meals in which parents and children eat together; (7) limit portion sizes; (8) eat a balanced diet high in calcium and fiber; (9) promote moderate- to vigorous-intensity PA (MVPA) for at least 60 minutes per day; and (10) limit consumption of energy-dense, nutrient-deprived foods. Exploring factors that influence adolescents' dietary and PA behaviors will support the design of appropriate and practical interventions that will encourage healthy lifestyle changes in this population.

Nutrition education has been defined as “any combination of educational strategies, accompanied by environmental supports, designed to facilitate voluntary adoption of food choices and other food and nutrition related behaviors beneficial to health and well-being; nutrition is delivered through multiple venues and involves activities at the individual, community, and policy levels.” The use of nutrition education programs and resources

encourage individuals and their families to make healthier choices regarding the dietary and PA behaviors. It has been proven that nutrition education is a key element in promoting lifelong healthy eating and exercise behaviors and should start from the early stages of life.<sup>62,63</sup>

Compared to young children whose parents decide and prepare the food for them, adolescents progressively become more independent and have more autonomy about their food and PA choices.<sup>64,65</sup> Hence, school, teachers, peers and other people at school, become more important to adolescents' dietary and PA decisions and have a significant influence in shaping adolescents' habits and lifestyles. Also, the in-school group-setting nutrition education allows the mapping of major health beliefs that may help adolescents perform a favorable behavior.

### **Purpose of Study**

Given the potentially adverse effects on adolescent of nutrition programs that encourage restrictive eating or excessive exercise messages to control weight, alternative approaches to promoting healthy eating and PA behaviors may be beneficial for school populations. One example is an anti-dieting and adaptive eating approach which emphasizes following the body's natural cues about eating and enjoying the pleasure of being physically active called Intuitive Eating (IE).<sup>66</sup> The IE approach encourages individuals to accept all foods rather than simply to classify them into acceptable and unacceptable categories and to focus on internal cues of hunger and satiety as a guideline for eating. The IE approach in promoting healthy dietary and PA behavior change in adults has been proven as effective in many studies.<sup>67-72</sup> In these studies, IE has been (1) negatively associated with BMI, body dissatisfaction, pressure for thinness, and eating disorder symptomatology; and (2) positively associated with various psychological health indicators, dietary intake and eating behavior, and higher levels of PA. Although these IE studies have provided support for the effectiveness of IE as promoting a healthy lifestyle change,

very few researchers have examined these associations in the adolescent population.<sup>73-76</sup> By adulthood, views of food and exercise are relatively stabilized, thus, examining this construct during a time frame when attitudes and behaviors are still developing could prove to be beneficial.

Therefore, the purpose of this study is to test the effectiveness of a six-module nutrition education resource—Wise Eating (WE)—which was designed specifically for the adolescent population based on the concept and principles of IE to promote healthy dietary and PA behaviors. Based on the TPB framework, this project will focus on answering the following research questions: (1) Will there be an improvement in the adolescents' dietary and PA behaviors after they complete the WE modules?; (2) Will there be an increase in the adolescents' intent for FV consumption and PA participation after they complete the WE modules?; (3) Will there be an improvement in the adolescents' attitudes/perceived behavioral control/subjective norm towards eating healthy and being physically active after they complete the WE modules?; and (4) Will there be an increase in the adolescents' perceptions of IE after they complete the WE modules?

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## **Chapter 2 - Literature Review**

The rise in adolescent obesity could be caused by any of the factors that influence energy intake or expenditure. In the past few decades, there have been increases in the consumption of fast foods, pre-prepared meals, sugar-sweetened beverages, and sugary foods among adolescents,<sup>1</sup> whereas the fruit and vegetables (FVs) consumption rate tends to drop<sup>2</sup> especially among adolescent girls.<sup>3</sup> Meanwhile, physical activity (PA) patterns in adolescents have changed significantly as a result of the increase in screen time, which includes watching television, playing video games and using internet, as well as the decrease in the opportunities for PA in schools and communities.<sup>4,5</sup>

Socioeconomic status (SES) is another important cause of the obesity prevalence among both adults and adolescents. The inadequacies of the built environment for nutritious food and PA resources (parks, fitness centers, sport facilities, trails, and etc.) in the low-SES communities have been widely implicated as risk factors for overweight and obesity among adolescents.<sup>6,7</sup> Furthermore, ethnic minority communities in the US are more likely to live in areas of high deprivation.<sup>7</sup>

The availability of nutritious opportunities in low-SES communities is largely limited. Compared with high-SES communities, low-SES communities are less likely to have large supermarkets nearby that offer high-quality, nutritious, and low-cost foods;<sup>8,9</sup> whereas convenience stores and fast food restaurants that offer high-calorie or low nutrient-dense foods are more common.<sup>10</sup> Thus, adolescents with limited resources are more likely to have access to small corner grocery or convenience stores than to supermarkets, and these small stores tend to have limited and more costly nutritious options.<sup>11</sup>

The lack of availability of healthy foods in low-SES communities could also attribute to the lower demand for healthy food options due to lower education background.<sup>6,12</sup> Low-SES households generally have a lower education background and relatively higher rates of teen parenting.<sup>6</sup> Thus the limited nutrition knowledge and the lack of information on how to choose and prepare healthy food have been related to poor food choices and weight gain within the low-SES communities.<sup>6</sup> The increased obesity prevalence among adults in minority and low-income populations may also affect their children's weight status, since the low-SES parents may not perceive their child as being overweight or obese.<sup>13</sup> Many low-income mothers tend to believe that their child will outgrow being overweight or obese once the child becomes older, taller, and more active.<sup>14</sup>

Besides limited healthy food options, the availability of PA resources in low-SES communities is also concerning. The location and density of PA related resources are not equitably distributed according to the SES and the ethnicity of communities.<sup>15-18</sup> Studies have shown that minority neighborhoods are less likely to have PA resources when compared with high-income neighborhoods, and the facilities are less dense and have not been maintained well. Additionally, residents from low-SES communities tend to perceive their neighborhoods as less pleasant and less safe to be physically active.<sup>19</sup> Thus, lacking access to such resources may discourage PA and lead to obesity risks among adolescents due to the reason that adolescents typically have less autonomy than adults and are more susceptible to their surrounding environment.

### **Dietary and Physical Activity Guidelines for Adolescents**

Healthy lifestyle habits, particularly eating nutritious food and being physically active, have been proven effective for decreasing adolescents' risk of becoming obese and developing

related diseases later in their life.<sup>20</sup> Dietary and PA recommendations have been established for Americans of all ages to promote healthy eating and PA behaviors.<sup>21,22</sup> Evidence have shown that healthy eating and exercise patterns are associated with positive health outcomes, which include reduced risks of cardiovascular disease, type 2 diabetes, certain types of cancers, overweight, and obesity. The transition from adolescence to adulthood is a critical period because identities are being formed and a sense of autonomy is being developed.<sup>23</sup> Thus, the healthy lifestyle behaviors adolescents establish and the decisions they make during this period can have long lasting impact in their life.

The 2015-2020 Dietary Guidelines for Americans encourage adolescents to eat at least 4.5 cups of FVs per day.<sup>21</sup> Although the increased consumption of FVs have been linked to positive health indicators and lower the risks of chronic health condition, only 16% to 26% of adolescents meet FV intake recommendations, with obese children showing even lower adherence rates.<sup>24,25</sup> Larson et al. (2007) also indicated adolescent girls significantly decreased their daily FV intake during the transition from early to middle adolescence.<sup>3</sup>

According to the Physical Activity Guidelines for Americans, adolescents need at least 60 minutes of PA per day, which should include MVPA, muscle-strengthening, and bone-strengthening activities.<sup>22</sup> Tremblay et al. (2000) have shown that physically active adolescents have stronger cognitive and academic performance, higher self-esteem, and lower adiposity when compared to their less active peers.<sup>26</sup> However, only one-quarter of US adolescents aged 12-15 years met the PA guideline according to the current estimated trends in PA.<sup>27</sup>

### **Theories on Health Behaviors**

The Population Reference Bureau (2005) in the US suggested that human behavior is the central factor in most leading causes of mortality and morbidity, and they advocate that behavior

change strategies should be at the forefront of any attempts to reduce mortality and morbidity. Being able to predict behavior makes it easier to plan an intervention.<sup>28</sup> Therefore, the first stage of programming a successful intervention is to analyze the behavioral aspects of the health problem.<sup>29</sup>

Theory enables the researcher to predict the outcomes of interventions and the relationships between internal and external variables, which allows identification of the actions needed to change a particular behavior and highlights the pathways of influence that either hinder or promote that behavior. Instead of specifically identifying an intervention to follow, theory helps generate a series of ideas for a theory-based intervention to adopt.

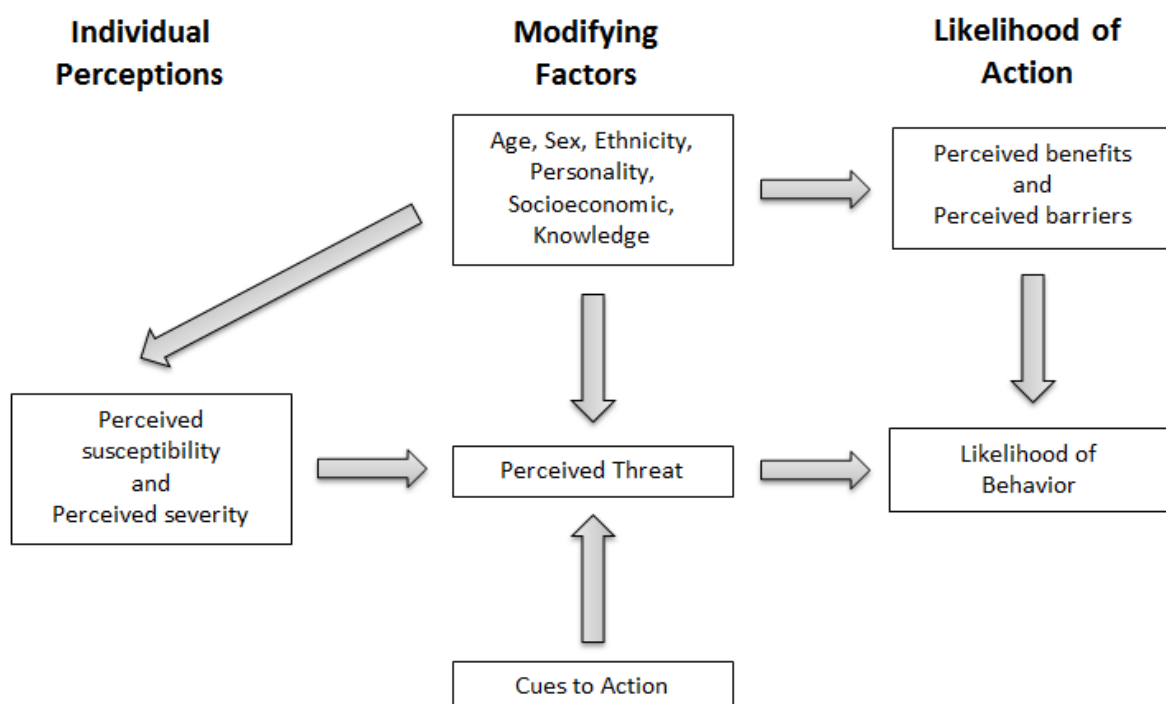
Theories are valued in the field of health promotion because of their use in explaining influences on health along with the ability to suggest ways where individual change could be achieved.<sup>30</sup> They can be used to design and plan health promotion strategies and to generate decisions and solutions, ensuring that all variables are taken into consideration.<sup>28,31</sup> Additionally, theoretical models in health promotion usually seek to include key elements essential to behavior and decision-making processes.

There are multiple theoretical models that can be used in health promotion interventions, such as the Health Belief Model (HBM), the Social Cognitive Theory (SCT), the Transtheoretical Model of behavior change/Stages of Change (TTM), the Social Ecological Model (SEM), and the Theory of Planned Behavior (TPB). These models are known for their suitability and popularity for studying and promoting healthy behaviors.

### **Health Belief Model**

First developed in the 1950s, the HBM has been used as a pattern to evaluate or influence individual behavior change.<sup>32</sup> The current HBM has six main constructs, including the perceived

susceptibility (beliefs of one's chances of getting a condition), the perceived severity (beliefs of the seriousness and consequences of a condition), the perceived benefits (beliefs in the efficacy of the advised action to reduce risk or seriousness of impact), the perceived barriers (beliefs of costs and obstacles associated with the advised action), the cues to action (factors that influence the advised action), and the self-efficacy (confidence in one's ability to take the advised action) [Figure 2.1].



**Figure 2.1 The Health Belief Model adapted from Rosenstock et al. (1998)**

This model proposes that individuals' behavior can be predicted based on how vulnerable the individuals consider themselves to be. The meaning of 'vulnerable' in the HBM is expressed through risk (perceived susceptibility) and the seriousness of consequences (perceived severity). These two vulnerability variables need to be considered before a decision can take place. This means an individual has to weigh the pros (perceived benefits) and cons (perceived barriers) or the costs and benefits of performing a certain behavior, and this process is proposed as

accounting for an individual's "readiness to act." Additionally, the HBM suggests that the 'cue to action' prompts the readiness and stimulates overt behavior and self-efficacy aids in behavior changing process.

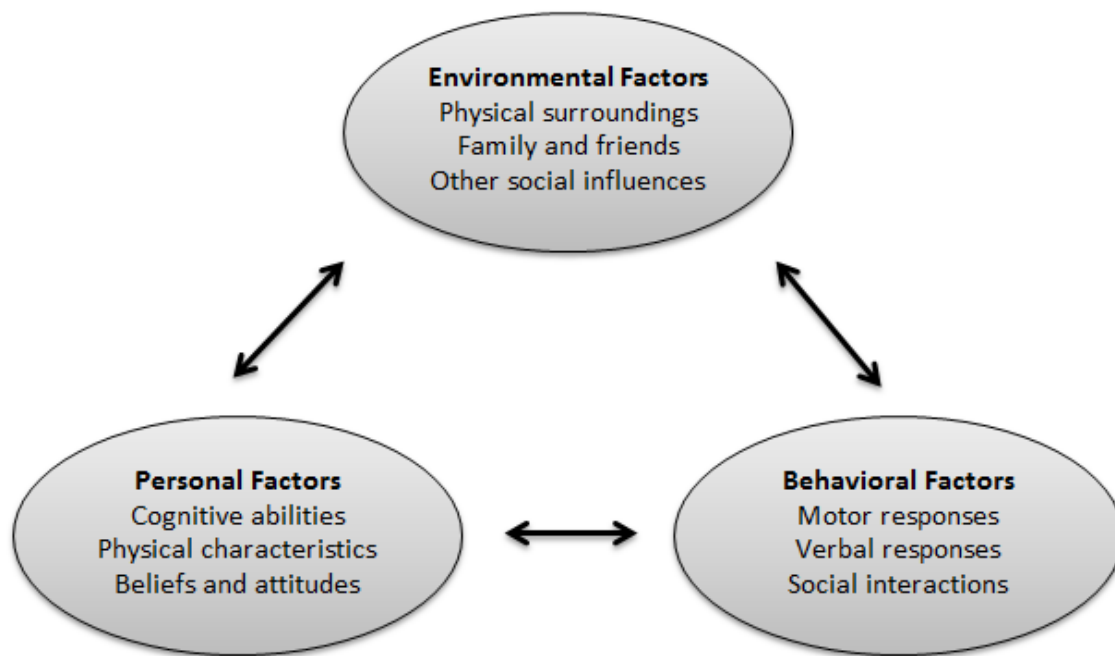
Despite the 'perceived barriers' and 'perceived susceptibility' constructs of the HBM that have been used to predict preventive health behavior in many cases,<sup>31</sup> the HBM may not be a useful theoretical model for planning interventions for the adolescent population due to the reason that adolescents do not perceive themselves as being at risk for obesity.

### **The Social Cognitive Theory**

Social cognitive theory (SCT) is one of the most commonly applied theoretical models that can be used to describe, explain, and predict behavior change.<sup>33,34</sup> In SCT, behavior is explained in terms of a three-way, dynamic and reciprocal learning process in which behavioral, personal, and environmental influences continuously interact to determine motivation and behavior.<sup>35</sup> Thus, the reciprocal determinism of SCT is defined as environmental factors can influence individuals and groups, but individuals and groups can also influence their environments and regulate their own behavior [Figure 2.2].

The SCT primarily focuses on increasing individual's self-efficacy when directing behavior change and has integrated behavioral capability, outcome expectations, observational learning, and reinforcement in the process to ensure the change. Self-efficacy (SE) identifies the strength of one's confidence to perform a particular behavior successfully and persist with it; therefore it has an especially critical influence on motivation and determines whether a behavior will be initiated, how much effort will be expended, and how long it will be sustained in the face of obstacles or aversive experiences.<sup>36</sup> Behavior capability stands for the knowledge and skill of an individual to perform a given behavior.<sup>33</sup> Outcome expectation refers to the beliefs about the

likelihood and value of the consequences of behavioral choices. It can be a physical outcome expectation, self-evaluative outcome expectation, or social outcome expectation. Observational learning, or modeling, is learning to perform new behaviors by exposure to interpersonal or media displays rather than through one's own experience. Reinforcement means the responses to a person's behavior that increase or decrease the likelihood of behavior reoccurrence.<sup>33</sup>



**Figure 2.2 The social Cognitive Theory adapted from Bandura (1997)**

The use of SCT in programming healthy dietary and PA behaviors change interventions for adolescents has been proven effective in many studies. Social cognitive theory findings from previous study on correlates of FV intake showed SE serves as a strong personal facilitator for dietary changes.<sup>37</sup> Kreausukon et al.'s (2011) randomized control study found that the SCT intervention focused on improving SE for FV consumption effectively improved FV intake,<sup>37</sup> and Fernandez et al.'s (2014) longitudinal study showed that SE was positively associated with dietary guideline adherence rate.<sup>38</sup> Moreover, adolescents' level of SE for PA serves as a strong

predictor for their PA participation.<sup>39</sup> Vander Horst et al. (2007) indicated a higher SE and positive attitudes toward PA contributed to PA participation among adolescents.<sup>40</sup> Prior cross-sectional by Dowda et al. (2007) and longitudinal studies by Shields et al. (2008) also support the role of SE as a mediator between social correlates (peer and family influence) and PA participation in both adolescent boys and girls.<sup>41,42</sup> Peer and family support was a major theme that motivated most adolescents' level of PA.<sup>43</sup>

Due to the nature of in-school nutrition education, the environmental construct of SCT, such as the physical surrounding, cannot be included and evaluated in the intervention design. However, other theories like the HBM, the TTM, and the TPB have also incorporated the important piece of the SCT—self-efficacy—as part of the their model construct, which may compensate the model and help with the intervention design.

### **The Transtheoretical Model of Behavior Change/Stages of Change**

The TTM is an integrative, biopsychosocial model to assess an individual's readiness to act on a new healthy behavior.<sup>44</sup> The TTM recognizes that the behavior change is a gradual process, and the different stages of change lie at the heart of TTM. There are six stages included in the TTM: the precontemplation stage, the contemplation, the preparation stage, the action stage, the maintenance, and the termination stage [Figure 2.3]. In the precontemplation stage, individuals do not intend to take action in the foreseeable future (within the next six months) and they do not perceive their behavior as problematic or producing negative consequences. Individuals in this stage often underestimate the pros of changing behavior and place too much emphasis on the cons of changing behavior. When individuals are intending to start the healthy behavior in the foreseeable future (within the next six months) and have recognized their behavior may be problematic, they are in the contemplation stage. However, even with the

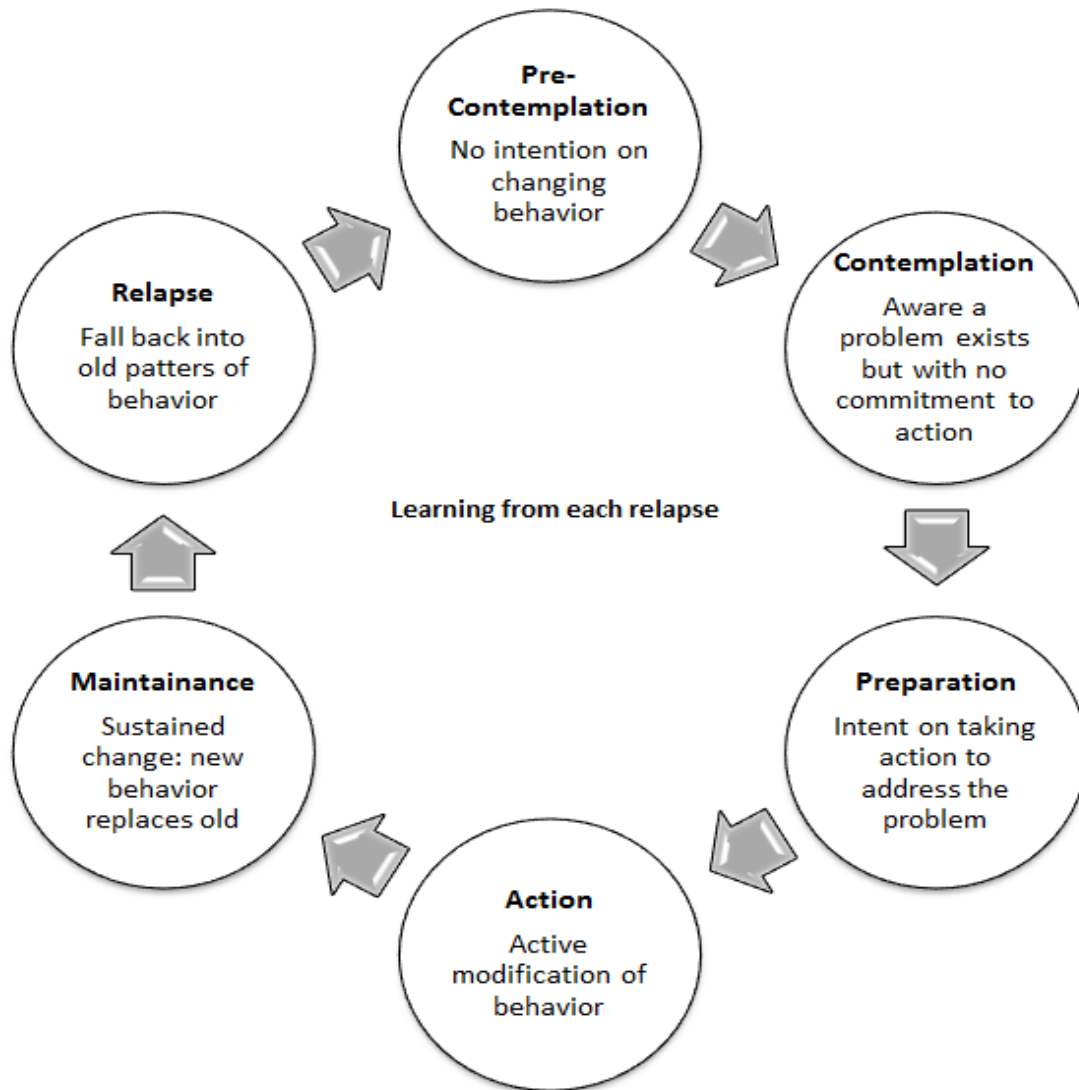


recognition, individuals may still feel ambivalent toward changing their behavior. In the third preparation stage, individuals are ready to take action within the next thirty days and they start to take small steps toward the behavior change. Individuals in this stage start to take small steps toward the behavior change, and they believe changing their behavior can lead to a healthier life. In the next action stage, individuals have recently changed their behavior (within the last six months) and intend to keep moving forward with the behavior change. When individuals move forward to the maintenance stage, they have sustained their behavior change for a while (more than six months) and intend to maintain the behavior change. Also, individuals in this stage work to prevent relapse to earlier stages. In the last termination stage, individuals have no desire to return to their unhealthy behavior and are sure they will not relapse. However, since the last stage is rarely achieved and individuals tend to stay in the maintenance stage, this stage is often not considered in health promotion interventions.

Although the time an individual stays in each stage may vary, the tasks required to move to the next stage are not. Certain principles (decisional balance, self-efficacy, and processes of change) and processes of change work best at each stage to reduce resistance, facilitate progress, and prevent relapse. Additionally, TTM seeks to include and integrate key constructs from other behavior change theories into a more comprehensive theory of change that can be applied to a variety of behaviors, populations, and settings.

Research has shown that the TTM has been successfully applied to a variety of health behaviors, including smoking cessation,<sup>45</sup> weight control,<sup>46,47</sup> reduction in dietary fat intake,<sup>48</sup> exercise acquisition,<sup>49</sup> and eating disorders;<sup>50</sup> and people in these studies were found moving through a series of stages when modifying their behaviors. Because the TTM assesses individual

level's readiness to act on a new healthier behavior, it is not applicable to group settings such as an in-school nutrition education.

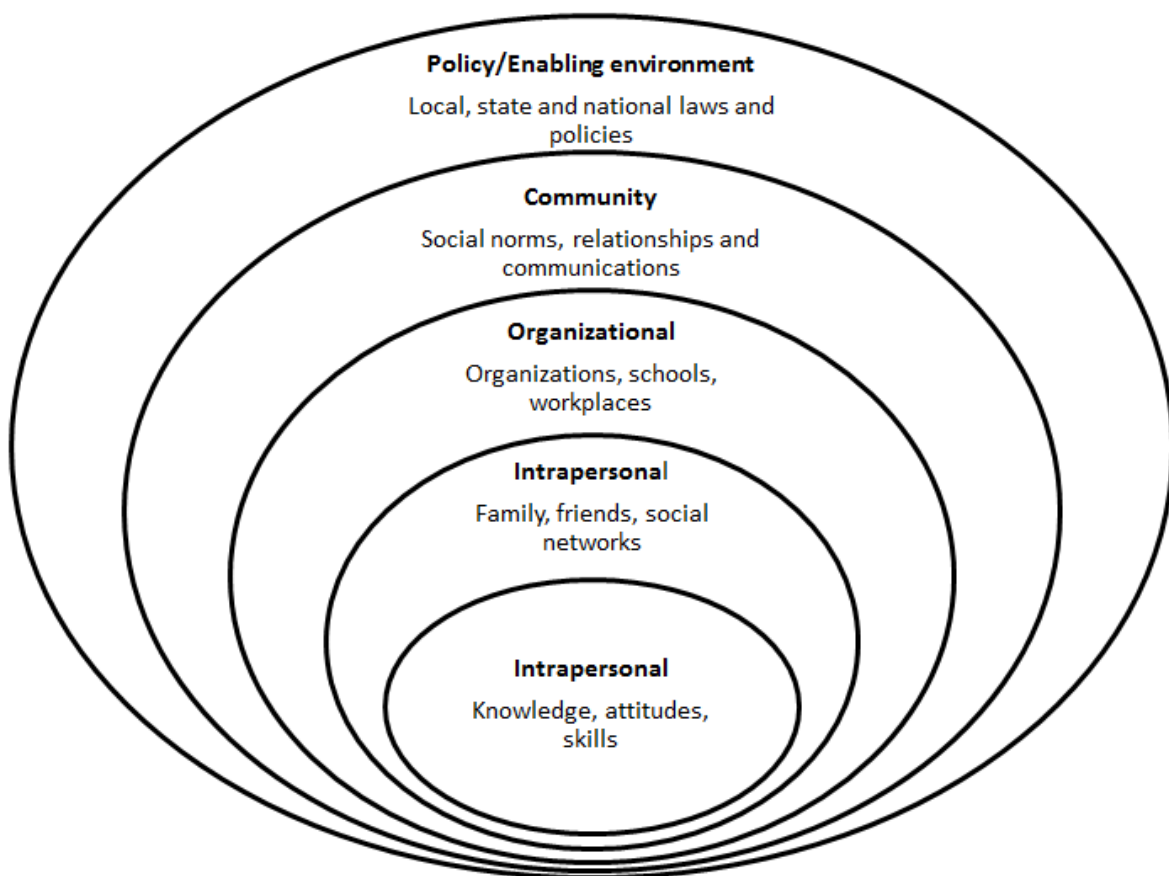


**Figure 2.3 The Transtheoretical model of Behavior Change/Stage of Change adapted from Prochaska and Diclemente (1983)**

### **The Social Ecological Model**

The SEM is a theory-based framework for understanding the multifaceted and interactive effects of personal and environmental factors that determine behaviors, and for identifying behavioral and organizational leverage points and intermediaries for health promotion within

organizations.<sup>51</sup> There are five nested, hierarchical levels of the SEM: intrapersonal, interpersonal, organizational, community, and policy/enabling environment [Figure 2.4]. Based on these nested, hierarchical levels, four core principles of the SEM of health behavior are proposed: (1) There are multiple influences on specific health behaviors, including factors at the intrapersonal, interpersonal, community, organizational, and policy/enabling environment levels; (2) Influences on behaviors interact across different levels; (3) The use of SEM should be behavior-specific and should be able to focus on identifying the most relevant potential influences at each level; and (4) Multi-level interventions should be most effective in changing behavior.



**Figure 2.4 The Social Ecological Model adapted from Bronfenbrenner (1979)**

The purpose of using SEM in health behavior promotion intervention is to inform the development of comprehensive intervention approaches that can systematically target

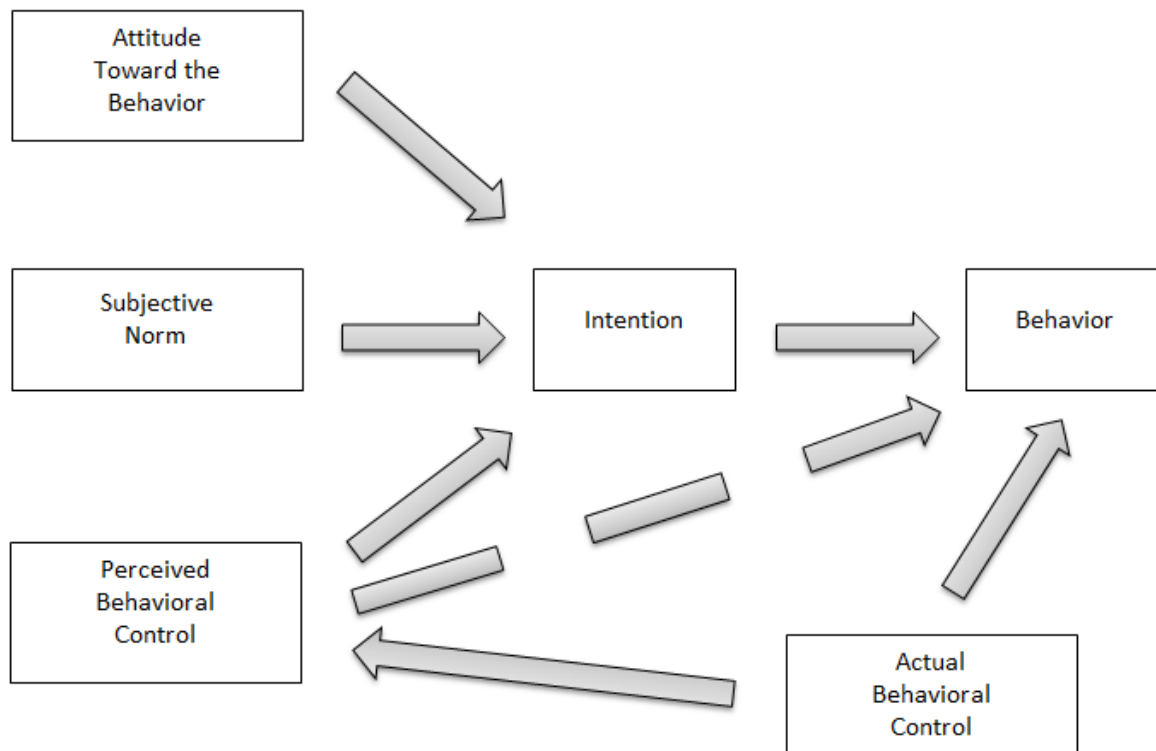
mechanisms of change at several levels of influence. Behavior change is expected to be maximized when environments and policies support healthful choices, when social norm and social support for healthful choices are strong, and when individuals are motivated and educated to make those choices. Therefore, the most effective approach to health behavior promotion is to use a combination of interventions at all levels of the model.

The use of the SEM in health behavior interventions has shown effective in many studies, for example, PA promotion programs for African American women<sup>52</sup> and for adolescent girls,<sup>53</sup> an illness management program for adolescents with type I diabetes,<sup>54</sup> and a community-level intervention to promote active living.<sup>55</sup> However, the in-school nutrition education program is not able to include the community, organizational, and policy/enabling environment levels in the intervention design.

### **The Theory of Planned Behavior**

According to the TPB, human behavior is guided by three kinds of considerations: beliefs about the likely consequences of the behavior (behavioral beliefs), beliefs about the normative expectations of others (normative beliefs), and beliefs about the presence of factors that may facilitate or impede performance of the behavior (control beliefs).<sup>56</sup> In their respective aggregates, behavioral beliefs produce a favorable or unfavorable attitude toward the behavior; normative beliefs result in perceived social pressure or subjective norm; and control beliefs give rise to perceived behavioral control. The perceived behavioral control originates from the SE of SCT and refers to the degree to which a person believes that they control over any given behavior. SE has been considered the most important precondition for behavioral change. In combination, attitude toward the behavior, subjective norm, and perception of behavioral control (SE) lead to the formation of a behavioral intention. The more favorable the attitude and

subjective norm, and the greater the perceived behavioral control, the stronger should be an individual's intention to perform the particular behavior. Given a sufficient degree of actual control over the behavior, individuals are expected to carry out their intentions when the opportunity arises. Intention is thus considered to be the immediate antecedent and the best predictor of behavior. However, since many behavior pose difficulties of execution that may limit volitional control, it is helpful to consider perceived behavioral control in addition to intention. Therefore, in TPB, perceived behavioral control serves as a proxy for actual control and contributes to the prediction of the particular behavior. Figure 2.5 is a schematic presentation of the theory by Ajzen (2006).



**Figure 2.5 The Theory of Planned Behavior adapted from Ajzen (2006)**

Application of the TPB is particularly useful when the accessibility to group setting is available, which allows the mapping of major beliefs that may help performance of a favorable behavior. Another advantage of this model is the inclusion of the ‘subjective norm’ allowing focus on peer or family influences.

The TPB has been widely applied in the context of understanding and predicting behavior.<sup>57</sup> It has been used for a number of different health behaviors, including promoting walking among sedentary adults,<sup>58</sup> smoking cessation,<sup>57</sup> exercise motivation,<sup>59</sup> predicting adolescents’ MVPA behavior,<sup>60</sup> and predicting FV consumption among adolescents.<sup>61</sup> In addition, the TPB framework has been used to fill the gap of knowledge about the appropriateness of the model for different subgroups of the adolescent population.

## **The Intuitive Eating Method to Promote Healthy Dietary and Physical Activity Behaviors**

### **Background**

As first coined by Tribole and Resch, Intuitive Eating (IE) reflects a strong trust and connection with the internal hunger and satiety cues that signal when and how much to eat.<sup>62</sup> Individuals that eat intuitively are not preoccupied with the dieting mentality and food, do not simply categorize food as “good” or “bad,” and their food choices are a reflection of preferred sensory property and a desire to assist the body’s functioning.

In support of this conceptualization of IE, studies have shown that individuals who eat in response to internal hunger and satiety cues engage in less overeating in the absence of hunger, less eating in response to emotional or situational triggers, and less food preoccupation.<sup>63-65</sup> Although much of IE is focused on the body’s natural signals about hunger and satiety; PA is also emphasized in IE.<sup>66</sup> Individuals who practice IE would pursue enjoyment and pleasure in

exercise but not focus on burning more calories as another dieting method. Evidence shows individuals who have been trained to eat intuitively are able to increase and maintain their PA levels significantly when compared with those who have participated in traditional restrictive eating program.<sup>67</sup>

## **Intuitive Eating Principles**

The IE approach to promote healthy dietary and PA behaviors has come to include ten principles that can be used to train an individual to establish a healthy relationship with food, exercise and their bodies.

### **Principle 1: Reject the Diet Mentality**

*“Throw out the diet books and magazine articles that offer you false hope of losing weight quickly, easily, and permanently. Get angry at the lies that have led you to feel as if you were a failure every time a new diet stopped working and you gained back all of the weight. If you allow even one small hope to linger that a new and better diet might be lurking around the corner, it will prevent you from being free to rediscover Intuitive Eating”*

The primary principle of IE is to reject the dieting mentality and then permanently stop dieting. The reasons that cause individuals to go on a diet various, but weight management is one of them. Dieting to lose weight, with its focus on restricting calorie intake, may disrupt IE processes. Additionally, concerning the dieting realities, especially among adolescents, it appears necessary that alternative approaches to promote healthy weight management be developed and evaluated. Thus, the anti-dieting approach—IE—is one of the possibilities that could be considered for promoting healthy weight and eating habit.

In support of this principle to reject the dieting mentality, studies have found IE is positively associated with weight outcomes and negatively associated with dieting.<sup>63,66</sup> Smith

and Hawk (2006) indicated that IE had a stronger impact on healthy weight management when it was compared to dieting.<sup>68</sup> Their cross-sectional study investigated the relationship between IE, diet composition, and the meaning of food in college students. According to the results, students who scored higher in IE had lower BMI scores, fewer dieting behaviors and food anxieties, and higher levels of pleasure and enjoyment associated with food and eating. Another cross-sectional study by Bacon et al. (2002) compared the difference in health at every size approach (size acceptance and IE) and dieting approach in maintaining long-term behavior change.<sup>67</sup> Their results indicated that encouraging size acceptance, reduction in dieting behavior, and heightened awareness and response to body signals resulted in improved health risk indicators in obese adult female. Additionally, a randomized controlled trial study by Hawks et al. (2004) examined the relationship between IE and various health indicators among female college students.<sup>69</sup> Their results found IE was significantly correlated with lower BMI, lower triglyceride levels, higher levels of high-density lipoprotein, and improved cardiovascular risk. Furthermore, with regard to the adolescent population, a cross-sectional study by Moy et al. (2013) examined the relationship between IE and dieting to lose weight, and they found a negative association between them.<sup>66</sup>

### ***Pros and Cons of Principle 1: Reject the Diet Mentality***

Despite calorie restriction might still serve as a better way to control weight in overweight or obese adults,<sup>70,71</sup> restricting calorie for weight loss purpose is not recommended for children or adolescents who are still growing and developing. The basis of treatment for adolescent obesity involves changes in diet and increased level of PA.<sup>72</sup> It is important for parents and the adolescents to be ready and willing to make the change. Thus, the goal of treating adolescent obesity is to maintain their weight by improving dietary behavior and



encouraging PA participation while they continue to grow taller. Dieting to lose weight may only be recommended for obese adolescents who have completed their growth or who weigh more than their healthy adult weight.

## **Principle 2: Honor Your Hunger**

*“Keep your body biologically fed with adequate energy and carbohydrates. Otherwise you can trigger a primal drive to overeat. Once you reach the moment of excessive hunger, all intentions of moderate, conscious eating are fleeting and irrelevant. Learning to honor this first biological signal sets the stage for re-building trust with yourself and food”*

Current unhealthy dietary behaviors in adolescents may have detrimental consequences on their health. One of the unfavorable eating habits that can cause adverse health outcomes like obesity is the inconsistent meal pattern. An inconsistent meal pattern means skipping meals to reduce or to avoid caloric intake. Daily meal frequencies, and skipping breakfast, in particular, have been linked to risk of overweight and obesity in all age groups in the US,<sup>73-75</sup> and are associated with poor nutrient intake, poor health indicators, and higher BMI.<sup>76-79</sup> Although there is growing evidence to suggest that eating breakfast has positive health- and school-related outcomes for children and adolescents, the breakfast consumption rate by children and adolescents still has declined over time.<sup>80</sup>

To solve the hunger-obesity paradox, respecting hunger is an important step towards establishing a healthy relationship with body and food. It is believed that intuitive eaters are aware of their internal hunger signals and trust these signals to guide their eating behavior. Although this awareness is inborn and has been supported by laboratory experiment, some adolescents have experienced external rules over their eating behaviors by caregivers, which disrupted the connection from internal cues for hunger and innate ability to regulate food

intake.<sup>81</sup> Therefore, the second principle of IE is to rediscover the awareness of hunger by keeping the body biologically fed in a healthy manner with adequate food and energy.

In support of this principle, evidence has shown that eating in response to hunger and satiety signals is associated with positive health outcomes. Ciampolini et al. (2013) demonstrated that the recognition of hunger improves insulin sensitivity and lowers the BMI among individuals who had been trained with hunger recognition technique, compared to non-trained controls.<sup>82</sup> Tylka (2006) found the reliance on internal hunger cues was negatively related to eating problems and positively related to satisfaction with life.<sup>83</sup> Madden et al. (2012) indicated eating in response to hunger and satiety signals was strongly associated with lower BMI in mid-age female.<sup>84</sup>

### ***Pros and Cons of Principle 2: Honor Your Hunger***

Respecting hunger cues is an important step towards improving eating habits. When individuals can follow their internal hunger cues, he or she will eat when feeling slightly or moderately hungry without reaching a state of excessive hunger. Additionally, adding healthy snacks like nuts, fresh/dried fruits and vegetables, low-fat cheese, and low-fat dairy products between meals can also prevent individuals from becoming overly hungry. For the adolescent population particularly, a consistent meal pattern and healthy snacks between meals benefit them through improving their physical and mental performance, increasing their attention span, decreasing irritability and absenteeism, helping them to meet their daily nutritional needs, and helping them to maintain and achieve a healthy body size. However, eating when hungry without a consideration of the food choices and moderation may not be a satisfying experience, and may also lead to disordered eating behaviors like bingeing, overeating, or meal skipping when food becomes available.

### **Principle 3: Make Peace with Food**

*“Call a truce, stop the food fight! Give yourself unconditional permission to eat. If you tell yourself that you can't or shouldn't have a particular food, it can lead to intense feelings of deprivation that build into uncontrollable cravings and, often, bingeing. When you finally “give-in” to your forbidden food, eating will be experienced with such intensity, it usually results in Last Supper overeating, and overwhelming guilt.”*

The third principle of IE focuses on promoting individuals' capability to eat whatever types of foods that they feel like to eat in response to the internal physiological hunger signals. Intuitive eaters who practice this principle do not try to ignore their hunger signals, do not simply classify foods as acceptable or unacceptable, and do not attempt to avoid food in the latter category. One reason that having the unconditional permission to eat is important is because of the habituation response. Habituation explains why individuals quickly adapt to a repeated experience—and subsequently experience less pleasure each time. Studies have identified food habituation as a form of neurobiological learning, in which repeated eating the same food causes a decrease in behavioral and physiological responses.<sup>85</sup> Additionally, several other studies have shown that eating “forbidden food” as part of the treatment process decreases binge eating problem among binge eaters.<sup>86,87</sup> Another important reason to eat with unconditional permission is because individuals who restrict the time, amount, and types of food are eaten increase their likelihood of feeling deprived and preoccupied with food.<sup>62,88</sup> Faith et al. (2004) showed adolescents whose caregivers restricted their food intake were more likely to eat in the absence of hunger and had higher BMI than adolescents whose caregivers did not exert the restriction.<sup>89</sup> Moreover, restrained eaters have been shown overindulge in food as a result of perceiving that dietary rules have been broken or that they have eaten a forbidden food.<sup>90</sup>

In support of this principle, Polivy and Herman (1999) indicated individuals who allow themselves to eat unconditionally are less likely to overindulge in food, engage in binge eating, and experience guilt when eating.<sup>90</sup> Moreover, Tylka and Wilcox (2006) also indicated the unconditional permission to eat was negatively associated with binge eating and food preoccupation in female college students.<sup>91</sup>

### ***Pros and Cons of Principle 3: Make Peace with Food***

One advantage of eating with unconditional permission is it releases the dietary restraint due to the habituation responses, which further decreases food preoccupation.<sup>88</sup> Also, eating desired food promotes psychological feelings, such as increased the pleasure of eating and the enjoyment of life. However, the adolescent population whose food choices are primarily driven by food cravings and the sensory property of food,<sup>92,93</sup> eating with unconditional permission and without moderation may result in unconstrained overeating or binge eating.

### **Principle 4: Challenge the Food Police**

*“Scream a loud “NO” to thoughts in your head that declare you’re “good” for eating minimal calories or “bad” because you ate a piece of chocolate cake. The Food Police monitor the unreasonable rules that dieting has created. The police station is housed deep in your psyche, and its loud speaker shouts negative barbs, hopeless phrases, and guilt-provoking indictments. Chasing the Food Police away is a critical step in returning to Intuitive Eating”*

Individuals’ eating behaviors can be quite distinct, so are their food perceptions. Compared with non-dieters, dieters have more “sense of guilty” when eating, which was largely due to the dietary rules that had been implanted into their mind.<sup>94</sup> Likewise, compared with non-vegetarians, vegetarians were more likely to binge eat with loss of control, and were more likely to engage in extreme unhealthful weight-control behaviors.<sup>95</sup> Thus, similar to the Principle 3—

Make Peace with Food, the fourth principle of IE is to challenge the dietary rules that cause guilty and food worry when eating and invoke the intuitive sense of eating. Instead of simply labeling foods as “good” or “bad,” intuitive eaters have the unconditional permission to eat the food they like, and they tend to have no guiltiness and anxiety of eating the food they like.

To support this principle, Tylka and Wilcox (2006) examined the association between the unconditional permission to eat and binge eating and food preoccupation in female college students, and the result showed they were negatively associated.<sup>91</sup> Moreover, Healy et al. (2015) indicated adolescents who had been trained with IE made a significant improvement in their positive eating attitudes based on the IE scale.<sup>64</sup>

#### ***Pros and Cons of Principle 4: Challenge the Food Police***

An obvious advantage of challenging the food police in one’s mind is that it greatly relieves the psychological burden dieters frequently face. Eating is a process that is essential for the survival of humans and animals. However, along with the development of modern society, eating is inevitably embedded with meanings beyond its biological function. For dieters, eating, regardless of the form or amount of the food, is strongly and wrongly associated with a sense of guiltiness.<sup>79</sup> This self-inflicted emotion not only affects one’s psychological health in the long term but also potentially jeopardizes the efficiency of food digestion after eating, which may cause physiological consequences to people’s health.

Admittedly, there will be a side effect of this emotional adjustment when handled incorrectly. For example, one can subconsciously choose to ignore the body’s biological signals for fullness and/or hunger for the sake of pursuing peace with the food police. In this case, the concept of “eating without the feeling of guilt” and “eating without the feeling of fullness” can be easily confused, which can cause a negative effect on health by overeating.

### **Principle 5: Feel Your Fullness**

*“Listen for the body signals that tell you that you are no longer hungry. Observe the signs that show that you're comfortably full. Pause in the middle of a meal or food and ask yourself how the food tastes, and what is your current fullness level?”*

Stop eating when feel full serves as one of the most important skills to prevent disordered eating behavior, although sometimes it might not be easy. As early research has shown, under certain environmental and psychological circumstance, for instance during weekend or family reunion, individuals tend to forget their body signals and eat oversized meals due to decreases in consciousness and mindfulness.<sup>96</sup> Additionally, the eating behavior of adolescents is less predictable than that of the adults because adolescents lack a correct understanding of the interpretation of their body's signals sometimes. For adolescents, the meal size is not controlled biologically but rather psychologically, rendering them more susceptible to overeat and its concomitant consequences.<sup>97,98</sup> Moreover, it is common that adolescents have been taught to finish everything on the plate and to respect the value of food by their parents. Carper et al. (2000) indicated adolescents' dietary restraint was related to their perceptions of parental pressure to eat more.<sup>99</sup> The parental control in child feeding may significantly influence children's perception of food and eating behaviors.

Therefore, the fifth principle of IE is to respect the fullness by following the body signals to stop eating when no longer feeling hungry. It is assumed that intuitive eaters are able to pause during eating to consider either continue or stop eating in response to their hunger and satiety cues. To support this principle, studies have shown that individuals who engage in IE are both aware of their internal hunger and satiety signals and trust these signals to guide their eating

behavior.<sup>62,99</sup> Madden et al. (2012) also indicated that eating in response to hunger and satiety signals is strongly associated with lower BMI.<sup>84</sup>

### ***Pros and Cons of Principle 5: Feel Your Fullness***

This principle helps and enables individuals to recognize comfortable satiety through conscious and mindful eating. Being more mindful and conscious about eating has been shown to reduce impulsive food choices among both adolescents and adults, which helps to maintain and achieve a healthy weight.<sup>100</sup> However, the feeling of comfortable satiety is highly individual, thus it will need to be experienced at personal level.

### **Principle 6: Discover the Satisfaction Factor**

*“The Japanese have the wisdom to promote pleasure as one of their goals of healthy living. In our hurry to be thin and healthy, we often overlook one of the most basic gifts of existence--the pleasure and satisfaction that can be found in the eating experience. When you eat what you really want, in an environment that is inviting and conducive, the pleasure you derive will be a powerful force in helping you feel satisfied and content. By providing this experience for yourself, you will find that it takes much less food to decide you've had "enough"”*

Finding satisfaction in eating is a driving force of the IE process. To feel satisfied during eating, individuals need to take the time to figure out what they really want to eat when they are not overly hungry and stop eating when they feel comfortably full. Studies have shown that a satisfying eating experience is associated with less food consumption, whereas an unsatisfying eating experience is associated with increased food consumption regardless of the satiety level.<sup>101,102</sup> One study on artificial sweetener consumption indicated that the use of artificial sweetener in food might lead to weight gain rather than weight loss due to reason that artificial sweetener provided a less satisfying eating experience, which resulted in an increase in appetite, as well as

an increase in the craving of sugary foods.<sup>103</sup> Moreover, feeling a sense of satisfaction in a meal actually decreases the demand for foods at a later time. Studies have shown that when individuals allow themselves to eat with pleasure and satisfaction, their total consumption of food decreased.<sup>91,104</sup>

Thus, the sixth principle of IE focuses on helping individuals to regain their pleasure in eating. It is assumed that intuitive eaters are able to stop eating when he or she has had just enough to fill the stomach comfortably without feeling stuffed. To support this principle, studies have shown that individuals who scored higher on the IE scales were more likely to feel satisfied during eating and were more likely to have a healthy relationship with food and eating.<sup>105</sup>

### ***Pros and Cons of Principle 6: Discover the Satisfaction Factor***

The positive perspective of discovering the satisfaction factor is that it could increase the pleasure of eating and make the eating experience more enjoyable. Feeling a sense of satisfaction in a meal will decrease the desire for foods at a later time. In addition, it decreases individuals' food worry when they are eating their favorite food, either healthy or unhealthy, because they know where their satisfaction factor is and when to stop. However, the negative perspective is that the satisfaction factor could be difficult to determine. Since the feeling of fullness and satisfaction is highly individual, it needs to be experienced at personal level first. Feeling satisfied could be a step before feeling full because satisfaction means no longer feeling hungry, while fullness means there are plenty of food in the stomach.

### **Principle 7: Honor Your Feelings without Using Food**

*“Find ways to comfort, nurture, distract, and resolve your issues without using food. Anxiety, loneliness, boredom, anger are emotions we all experience throughout life. Each has its own trigger, and each has its own appeasement. Food won't fix any of these feelings. It may*



*comfort for the short term, distract from the pain, or even numb you into a food hangover. But food won't solve the problem. If anything, eating for an emotional hunger will only make you feel worse in the long run. You'll ultimately have to deal with the source of the emotion, as well as the discomfort of overeating”*

Emotional states and situations can affect individuals' eating patterns with regard to food choices and food intake. Although emotional eating is most often precipitated by negative emotions such as anger, depression, boredom, anxiety, or loneliness, it is also associated with positive emotions like happy, excitement, or satisfaction.<sup>106</sup> A few quantitative measures of emotional eating have suggested an association between emotional eating and overeating and increased weight,<sup>107,108</sup> whereas some other studies suggested emotional eating is associated with undereating and lower BMI.<sup>109,110</sup> Finding a different distraction other than food can help individuals lessen the burden on the body brought by either overeating or undereating. Therefore, this principle of IE seeks to encourage individuals to develop alternative ways to relieve and handle their emotional stress without using food. For intuitive eaters, nutritional urgings of the body are honored without reference to emotional states or external plans.

To support this principle, Tylka et al. (2013) have shown that individuals who use food to satisfy physical hunger rather than cope with their emotions were less likely to have the disordered eating symptomatology.<sup>105</sup> Moreover, eating for physical rather than emotional reasons was also negatively related to body dissatisfaction and pressure for thinness in adults.<sup>91</sup>

### ***Pros and Cons of Principle 7: Honor Your Feelings without Using Food***

Eating in response to hunger signals rather than emotional reasons helps individuals to eat more intuitively. It also enables individuals to develop alternative ways to relieve the emotional stress and distracts them from psychological and emotional feelings that may cause

disordered eating problems. However, some emotional attachment to food can be hard to disconnect. For example, food that reminds individuals about childhood's memories with relatives or friends can be hard to detach using alternative ways. Another dilemma runs into using this principle is that inappropriate distraction can promote food intake, leading to bigger biologically damage. The study done by Long et al. (2011) shows that distraction during eating can promote food intake in all non-clinical consumers, irrespective of individual differences in eating behaviors.<sup>111</sup>

### **Principle 8: Respect Your Body**

*“Accept your genetic blueprint. Just as a person with a shoe size of eight would not expect to realistically squeeze into a size six, it is equally as futile (and uncomfortable) to have the same expectation with body size. But mostly, respect your body, so you can feel better about who you are. It's hard to reject the diet mentality if you are unrealistic and overly critical about your body shape.”*

Instead of serving as a weight-centered approach, IE promotes size-acceptance and body appreciation to end weight discrimination and to lessen the cultural obsession with weight loss and thinness. Individuals naturally differ with regard to bone structure, muscle mass, and body fat. Aside from the extremes, body weight and body fat may be relatively poor predictors of health, fitness, and longevity. Thus, this principle of IE particularly encourages individuals to accept and respect the diversity of body shapes and sizes, and to recognize that health and well-being are multidimensional which include physical, social, emotional, and intellectual aspects. It is assumed that intuitive eaters are more likely to accept and respect their body image and to rely on their body signals to support positive health behaviors.

To support this principle, studies have recognized that body appreciation and IE are positively correlated and the body appreciation predicted IE behavior.<sup>112,113</sup> Tylka (2006) developed the initial psychometric evaluation of IE which measured three factors: (1) Unconditional Permission to Eat; (2) Eating for Physical Rather Than Emotional Reasons; and (3) Reliance on Internal Hunger/Satiety Cues.<sup>83</sup> Supporting the construct validity of the scale, IE scores had been shown negatively related to eating disorder symptomatology, body dissatisfaction, poor interoceptive awareness, pressure for thinness, and BMI; and positively related to personal well-being. Another study by Avalos and Tylka (2006) found that body acceptance and body appreciation were associated with greater awareness of body signals and greater tendency to honor these signals.<sup>112</sup>

Moreover, most of the so-called ‘weight-related health problems’ can be improved independently of weight loss. Bacon et al.’s (2002) cohort study on obese female indicated that ‘fat’ and ‘fit’ are not mutually exclusive terms, and fit and healthy bodies come in all shapes and sizes.<sup>67</sup> Their study primarily examined a body acceptance and IE model that encourages health at every size as opposed to weight loss. Their results showed encouraging size acceptance, reduction in dieting behavior, and heightened awareness and response to body signals contributed to improved health risk factors for obese female, which further proved that size acceptance and IE enabled individuals to maintain long-term behavior change, whereas the diet approach did not.

### ***Pros and Cons of Principle 8: Respect Your Body***

This principle helps individuals to accept and respect the natural diversity of body sizes and shapes. It also facilitates individuals to eat in a flexible manner that balances nutritional needs, hunger, satiety, appetite, and pleasure; and promotes all aspects of health and well-being

for individuals of all sizes. Since IE emphasizes responding to internal cues, individuals who eat intuitively on a regular basis are more likely to be at a weight that is appropriate for their body type and have higher levels of psychological well-being. However, it has to be noted that the association between obesity and chronic disease prevents individuals from being healthy at every size. For instance, Wing' et al. (2011) indicated that modest weight losses of 5 to < 10% were associated with significant improvements in cardiovascular disease risk factors in individuals with type 2 diabetes.<sup>114</sup>

### **Principle 9: Exercise—Feel the Difference**

*“Forget militant exercise. Just get active and feel the difference. Shift your focus to how it feels to move your body, rather than the calorie burning effect of exercise. If you focus on how you feel from working out, such as energized, it can make the difference between rolling out of bed for a brisk morning walk or hitting the snooze alarm. If when you wake up, your only goal is to lose weight, it's usually not a motivating factor in that moment of time.”*

Physical activity is beneficial to everyone regardless of their weight, age, or gender. In the context of IE, PA does not serve as a driving force for burning more calories as another dieting method. Instead, intuitive eaters are active for the sake of feeling good and the attunement of food, body and mind. In support of this principle, Bacon et al.'s (2002) study indicated individual who trained with IE was able to maintain and increase their PA level significantly when compared with individuals who participated in traditional restrictive eating program.<sup>67</sup> Furthermore, Gast et al.'s (2015) cross-sectional study that examined the motivation for eating and PA of female college students had shown that female students who demonstrated internal motivation related to eating were also internally motivated to participate in regular PA

for pleasure.<sup>115</sup> Most importantly, female students who reported high levels of IE had significantly lower BMI score than those reporting medium or low levels of IE.

### ***Pros and Cons of Principle 9: Exercise—Feel the Difference***

The positive perspective of being physically active in an intuitive way is that it helps individuals to exercise in a more enjoyable way so that PA would become sustainable as a lifelong commitment.<sup>116</sup> In addition, PA is positively associated with energy level, stress tolerance, sense of well-being and empowerment, and good mood; and negatively associated with health risk factors. However, it has to be noted that this principle fails to emphasize the importance of meeting the daily PA recommendations.

### **Principle 10: Honor Your Health**

*“Gentle Nutrition Make food choices that honor your health and tastebuds while making you feel well. Remember that you don't have to eat a perfect diet to be healthy. You will not suddenly get a nutrient deficiency or gain weight from one snack, one meal, or one day of eating. It's what you eat consistently over time that matters; progress not perfection is what counts.”*

Eating nutritious foods is important to IE, and the role of eating nutritious foods in the prevention of chronic diseases has long been recognized.<sup>117</sup> The tenth principle of IE is to improve individuals' capability of eating and composing moderate, balanced and various diets. Given that IE encompasses the notion of ‘body wisdom’ (that the body will instinctively drive the variety of food needed to maintain good health), it might be expected that intuitive eaters would have a more nutritious dietary intake and more positive eating patterns than non-intuitive eaters. It is assumed that intuitive eaters are capable of intuitively sensing the nutritional needs of the body and consider the possibilities of the full range of food, as well as carefully weigh available choices against physical promptings.

However, the evidence for this contention is mixed. Hawley et al.'s (2008) study reported that all three groups participating in variations of an IE program improved their nutritional intake as measured by the nine-item Dietary Quality Score.<sup>118</sup> Madden et al.'s (2012) cross-sectional study found positive associations between IE and vegetable intake and time taken to eat the main meal, and negative associations with binge eating and self-reported rates of eating.<sup>84</sup> They found no association, however, between IE and other nutritional intake, including consumption of fruit and several types of foods with high levels of saturated/trans fats and/or refined carbohydrate. In the studies which found no association between IE and dietary intake, the sample sizes were small and homogeneous and in one of the studies, participants were characterized as 'intuitive eaters' or 'dieters' based purely on whether they score above or below the mean on the IE scale.<sup>119,120</sup>

### ***Pros and Cons of Principle 10: Honor Your Health***

The positive perspective of this principle is that the healthy relationship with food means individuals are not morally superior or inferior based on their food decisions, instead, eating healthfully can simply make individuals feel good and satisfied. So that when the guilt and morality of eating have been removed, individuals can feel the physical sensations that derived from eating. This principle fails to encourage individuals to meet the daily dietary recommendations of each food group.

### **Development of Measurement for Intuitive Eating**

Given the growing pervasiveness of IE as a professional avenue for promoting healthy dietary and PA behaviors, scales to measure IE have been developed and validated in several studies. The first IE scale (IES) was developed and tested by Hawks et al. (2004).<sup>69</sup> This thirty-item Liker-type IES was developed based on a systematic survey of self-help and counseling

literature on IE and reviewed by a panel of experts and university students who enrolled in upper division health courses. Based on the responses from 391 university students, the IES was evaluated for internal consistency, with each of the factors ranged from 0.42 to 0.93. Retesting after four weeks yielded a reliability estimate for the total scale of 0.87. Construct validity was supported by findings of inverse relationships between IES scores and obesity, presence of an eating disorder and restrictive eating, as well as higher IES scores for men. These findings provided tentative support for the use of the IES in identifying IE attitudes and behaviors among college population.

Developed in 2006, Tylks's (2006) twenty-one-item IES was based on the ten principles of IE.<sup>83</sup> Exploratory and confirmatory factor analyses uncovered three domains: (1) Unconditional Permission to Eat; (2) Eating for Physical Rather Than Emotional Reasons; and (3) Reliance on Internal Hunger/Satiety Cues, with three domains loading on a higher-order IE factor. Among female college students, the internal consistency estimates for the total scale ranged from 0.85 to 0.88, and the scale was stable over a three-week period ( $r = 0.90$ ). Supporting its construct validity, IES scores were negatively related to eating disorder symptomatology, body dissatisfaction, poor interoceptive awareness, pressure for thinness, internalization of the thin ideal, and BMI; and positively related to several indexes of well-being; as well as unrelated to impression management. Many subsequent studies have supported the construct validity of its scores with female, finding that the scale is negatively associated with disordered eating symptomatology and BMI;<sup>91,112,121,122</sup> and positively associated with body appreciation and various other measures of psychological well-being.<sup>91</sup>

Dockendorff et al. (2012) developed the first IES for adolescent population based on Tylka's IES.<sup>63,83</sup> The IES for adolescent (IESA) included seventeen items and exploratory

factor analysis identifies four domains: (1) Unconditional Permission to Eat, (2) Eating for Physical Rather Than Emotional Reasons, (3) Trust in Internal Hunger/Satiety Cues, and (4) Awareness of Internal Hunger/Satiety Cues. Among 515 middle-school boys and girls, the internal consistency estimates for the total scale ranged from 0.60 to 0.85. Supporting its validity, IESA scores were inversely associated with BMI, body dissatisfaction, negative affect, pressure for thinness and internalization of the thin ideal, and positively associated with satisfaction with life and positive affect. Dockendorff et al. (2012) also indicated the seventeen-item four-factor model was closely paralleled the original three-factor model that was developed using female college students.

To improve the original IES,<sup>83</sup> a twenty-three-item instrument—Intuitive Eating Scale-2—was developed by Tylka and Kroon Van Diest (2013).<sup>105</sup> Changes to the original IES include: adding seventeen positively scored items; integrating an additional component of the IE (body food choice congruence); and testing the new scale with 1,405 female and 1,195 male across three studies. Exploratory and second-order confirmatory factor analyses upheld its four-factor structure, with the four subscales loading on a higher order IE factor. IES-2 scores have been estimated to be internally consistent ( $\alpha = 0.87$  and  $\alpha = 0.89$  for female and male, respectively). Retesting after a 3-week period yielded reliability estimates for the total scale of 0.88 and 0.92, respectively for female and male. Construct validity was supported by findings of positive relationships between IES-2 scores and body appreciation, self-esteem and satisfaction with life; as well as negative relationships between IES-2 scores and eating disorder symptomatology, poor interoceptive awareness, body surveillance, body shame, BMI and internalization of media appearance ideals; and negligibly related to social desirability.



Incremental validity has also shown by its prediction of psychological well-being above and beyond eating disorder symptomatology.

### **Intuitive Eating in Adolescents**

Currently, there are only four studies that have assessed IE in adolescence.<sup>63,64,66,123</sup> These studies examined IE constructs in association with health indicators and psychological well-being among middle-school aged and high-school aged boys and girls. The first IE study on adolescent was published by Dockendorff et al. (2012).<sup>63</sup> This study proved that constructs of IE were viable for middle-school aged adolescents and the IESA can be used to examine IE in this age group. The IESA identifies four domains, which included: (1) Unconditional Permission to Eat, (2) Eating for Physical Rather Than Emotional Reasons, (3) Trust in Internal Hunger/Satiety Cues, and (4) Awareness of Internal Hunger/Satiety Cues. Adolescents who scored higher on Unconditional Permission to Eat tended to be of normal weight and reported experiencing fewer behaviors that promote dieting and pressures to be thinness. Significant gender difference was observed on Eating for Physical Rather Than Emotional Reasons: girls were more likely than boys to use food to cope with their emotions. Adolescents who scored higher on the Trust in Internal Hunger/Satiety Cues were more likely to be of normal weight; less likely to internalize social appearance and weight ideals; experience fewer pressures to lose weight, diet, and have a thin body; and feel fewer negative emotions. Moreover, this factor was also related positively to greater satisfaction with body size and shape and with life in general. However, no significant relationship with the physical and psychosocial constructs was observed on the Awareness of Internal Hunger/Satiety Cues factor. Findings from this study indicated that the IESA scores were negatively associated with BMI, body dissatisfaction, negative affect,

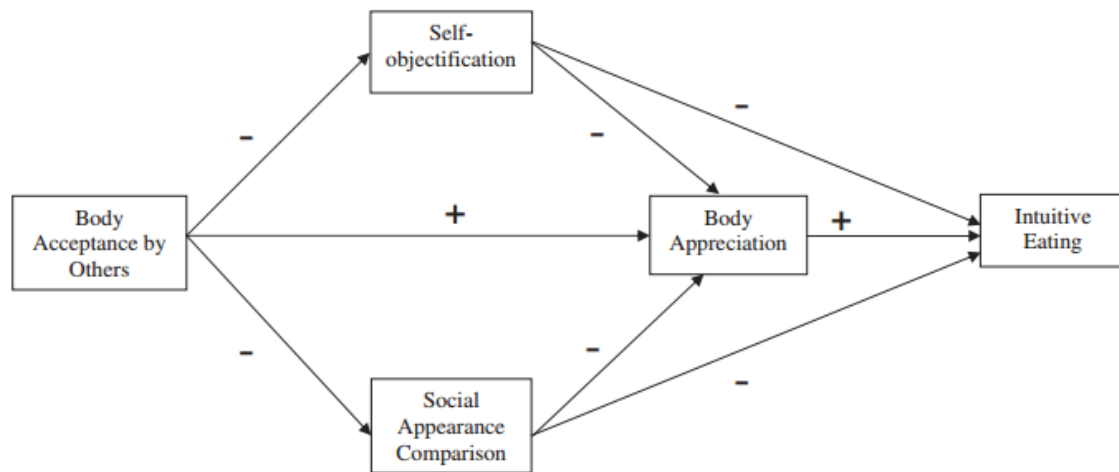
pressure for thinness, and internalization of the thin ideal, and positively associated with satisfaction with life and positive affect among middle school boys and girls.

In the second IE study, Moy et al. (2013) examined the relationships between dieting, exercising, and IE among middle school students.<sup>66</sup> Results from this study showed that regardless of participants' gender or exercise status, and controlling for BMI, dieting to manage weight was related inversely to participating students' IES—specifically for the Unconditional Permission to Eat and Eating for Physical Rather Than Emotional Reasons subscales. Students who dieted were more likely to constrain in what they allowed themselves to eat and were more likely to eat for emotional reasons. Moy et al. (2013) further indicated that students who were exercising to manage their weight reported feeling less free to eat what they wanted, but were more likely to eat for physical reasons. Significant gender difference was observed on Reliance on Hunger/Satiety Cues subscale, girls were more aware and trusted their hunger and satiety cues when compared with boys, but when boys were exercising they reported similar levels of awareness and trust in their internal hunger and satiety cues to the girls.

The third IE study investigated the effects of an IE education program on eating attitudes of high school students.<sup>64</sup> In this quasi-experimental study, 48 high school students received instruction on IE or a comparison program over seven days during health classes. Presentations that addressed the ten principles of IE were utilized to teach participating students about IE. Participants were also given step-by-step guidelines to help them follow each principle. Findings from this study showed high school students who received the IE program showed a significant improvement in their overall healthy eating attitudes when compared with students in the comparison program. Moreover, students who received the IE program also showed significantly increase in the Unconditional Permission to Eat subscale score. These findings

indicated that students in the IE program may have shifted their attitudes from food categorization toward greater acceptance of a broad variety of foods and less restrictive eating.

The fourth study examined the predictors of IE in adolescent girls through a modified acceptance model of IE.<sup>123</sup> The original acceptance model was developed by Avalos and Tylka (2006) in adult female, termed “the acceptance model of IE.”<sup>112</sup> The acceptance model of IE was first examined in female college students and subsequently in female college athletes and emerging, early- and middle-aged adult female.<sup>121,122</sup> The model posits that body acceptance by others contributes to resistance of self-objectification. Females who resist self-objectification are proposed to have higher levels of body appreciation, which refers to the acceptance of and respect for the body, regardless of the perceived flaws. In this study, Andrew et al. (2015) further modified the model by adding a social appearance comparison component to the acceptance model, and proposed that perceived body acceptance will be associated with reduced self-objectification and reduced social appearance comparison. In turn, reduced self-objectification and social appearance comparison are expected to be associated with both increased body appreciation and IE [Figure 2.6]. Findings from this study indicated that the modified acceptance model (body acceptance by others, self-objectification, and body appreciation) showed significant association with IE in the sampled adolescent girls. Moreover, self-objectification and social appearance comparison were negatively associated with body appreciation and intuitive eating. These findings offer several targets for interventions that attempt to increase IE in adolescent girls.



**Figure 2.6 the Modified Acceptance Model of Intuitive Eating for Adolescent Girls by Andrew et al. (2014)**

Together, these four studies confirmed that IE serves as an important and relevant concept for both adolescent boys and girls. However, considering the success of IE as promoting healthy dietary and PA behaviors, the research has been largely limited to examining adults only. The transition from adolescence to adulthood is a critical period because identities are being formed and a sense of autonomy is being developed. Thus, the behaviors adolescents establish and the decisions they make during this period can have a long lasting impact in their life. In fact, it is during childhood and adolescence that the problematic eating behaviors such as dieting, bingeing or emotional eating may begin.<sup>124-126</sup> Such dietary behavior change may interfere with adolescents' natural self-regulatory mechanisms about eating and lead them to restrictive in what they allow themselves to eat, less aware of hunger and satiety cues, less able to trust their internal hunger and satiety cues, and more likely to eat for emotional reasons. Given the expected benefits of IE, it may be a promising avenue for encouraging the development of healthy dietary and PA behaviors and attitudes in the adolescent population, which may then promote life-long well-being and reduce the risk of obesity.

However, caution should be exercised when applying some of the principles to adolescents in a group setting nutrition education programs, since the IE was originally developed based on existing research and experiences with nutrition counseling clients who had the confidentiality. In the group setting nutrition education for adolescents, the concepts of susceptibility to peer pressure and body image dissatisfaction have been regarded as important factors mediating the behavior.<sup>127</sup> The sense of belonging to a group of friends influences adolescents' socialization and behaviors. Although the peer pressure serves as a key aspect of the normal adolescent development, there may be costs associated with becoming a member of a group of people. Peer pressure among adolescents has been identified as a major barrier to a healthy lifestyle.<sup>128</sup> One focus group study on adolescents by Cullen et al. (2006) revealed that peer influence was negatively associated with vegetable intake in the way of eliciting negative comments from peers;<sup>129</sup> and another focus group study by Hesketh et al. (2006) on adolescents' parents acknowledged the difficulty of enforcing healthy eating and limiting sedentary activities when their children want to conform to what their friends are eating and doing.<sup>128</sup> Moreover, adolescents who are dissatisfied with their bodies are more likely to have a negative body image.<sup>130</sup> Tiggemann et al. (2009) indicated that many adolescent boys are reluctant to discuss their feelings about body image openly due to the belief that it is a feminine issue, or because of a broader reluctance to appear sensitive or vulnerable.<sup>131</sup> Jones et al. (2016) also suggested that the peer critical comment was the strongest direct predictor of body image for the boys, and critical comments from peers have a decided impact on adolescents' feelings about their bodies.<sup>132</sup> Therefore, for adolescents, the nutrition education based on IE must be planned differently than it is for adults because of the cognitive and social developmental processes and changes during adolescence.

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# **Chapter 3 - An Examination of Factors Affecting Fruit and Vegetable Intake and Physical Activity Behaviors among Adolescents in a Low-income Racial Community in Kansas**

## **Abstract**

**Objective:** To identify differences in dietary and physical activity (PA) behaviors and perceptions between genders, grades, and ethnicities among 6<sup>th</sup> through 8<sup>th</sup> grade adolescents in rural Kansas.

**Study Design:** Cross-sectional evaluation at pre-assessment.

**Outcome Measures and Analysis:** This study examined adolescents' breakfast intake, fruit and vegetable (FV) consumption and PA behavior, as well as the percentage of participants that met the national FV and PA recommendations. The theory of planned behavior (TPB) variables and Intuitive Eating (IE) factors that contributed to breakfast intake, FV consumption and PA behaviors were identified, and differences across demographics were described.

**Results:** The total number of participants at the pre-assessment was 154. 11% participants met FV recommendation and 31% reported consuming breakfast every day of the week. Significant differences ( $P \leq .01$ ) across grade levels were observed with regard to the perceived behavioral control for healthy eating, intent to make healthy food choices, and subjective norm about family and peer influences. The attitude towards healthy eating and the confidence in making good food choices significantly contributed to FV consumption intent and behavior ( $P < .001$ ). FV consumption behavior was also significantly predicted by IE factors ( $P = .04$ ). 24% participants met PA recommendation and the confidence of meeting PA recommendation significantly contributed to PA intent and behavior ( $P < .001$ ).

**Conclusions:** These findings identified key determinants affecting FV consumption (attitude, perceived behavioral control) and PA participation (perceived behavioral control) in adolescents, which provided potential focuses for IE intervention development.

## **Introduction**

Considerable evidence exists supporting the health benefits of eating fruits and vegetables (FVs) and engaging in regular physical activity (PA) for adolescents.<sup>1-4</sup> To promote healthy eating and PA behaviors, dietary and PA recommendations have been established for Americans of all ages.<sup>5,6</sup> Adolescents' dietary intake and PA patterns are associated with important aspects of their health outcomes, and research have proven that healthy lifestyle habits can lower adolescents' risk of becoming obese and developing related diseases later in their life.<sup>4</sup>

According to the 2015-2020 Dietary Guidelines for Americans, adolescents aged 9 to 18 years are encouraged to consume at least 4.5 cups of fruits and vegetables (FV) per day.<sup>5</sup> Although the increased consumption of FVs have been linked to positive health indicators and lower risks of chronic health condition, only 16% to 26% of adolescents met FV intake recommendation, with obese children showing even lower adherence rates.<sup>7,8</sup> Larson et al.'s (2007) population study also indicated adolescent girls significantly decreased their daily FV intake during the transition from early to middle adolescence.<sup>8</sup>

With regard to the Physical Activity Guidelines for Americans, 9 to 18 years old adolescents are encouraged to participate in moderate- to vigorous-intensity aerobic (MVPA), muscle-strengthening, and bone-strengthening activities for at least 60 minutes per day.<sup>6</sup> Tremblay et al.'s (2000) study have shown that physically active adolescents have stronger cognitive and academic performance, higher self-esteem, and lower adiposity when compared to their less active peers.<sup>9</sup> However, concerning PA recommendations adherence, PA declines

steeply during adolescence and only one-quarter of US adolescents aged 12-15 years met the PA guideline.<sup>3,10</sup>

One reason that adolescents failed to meet these suggested guidelines may be attributed to their low-intent of performing the behavior.<sup>11,12</sup> As emphasized in the theory of planned behavior (TPB), intention represents an individual's readiness to perform a given behavior and it is considered to be the best predictor of a certain behavior.<sup>13</sup> Individuals' attitude towards a specific behavior, the subjective norm and the perceived behavior control serve as three important determinants of intention. Additionally, the perceived behavioral control accounted for significant amounts of variance in intention and behavior. The successful application of the TPB to numerous behaviors has provided extensive support to show that attitude, subjective norm and perceived behavioral control are all predictive factors of intention to perform a specific behavior.<sup>11,12,14,15</sup>

Theory of planned behavior findings from previous studies confirmed the efficacy of the TPB model in predicting adolescent' FV consumption and PA participation behaviors. Gratton et al. (2007) found that motivational and volitional interventions based directly on manipulated TPB variables and the formation of an intention respectively, significantly increased FV consumption in school-age adolescents.<sup>16</sup> Lien et al. (2016) indicated that TPB explained adolescents' intention to eat FV, and gender appeared to have moderating effects on the relationships between attitudes and intention and between intentions and behaviors.<sup>14</sup> With regard to PA behavior, Hamilton and White (2008) indicated adolescents' attitude, subjective norm, and perceived behavior control significantly predicted adolescents' intentions to engage in regular PA.<sup>17</sup> Hagger et al.'s (2002) meta-analysis of TPB also suggested the TPB accounted for

variance in PA intentions and behavior, and the perceived behavioral control explained unique variance in PA intention.<sup>18</sup>

As first coined by Tribole and Resch, Intuitive Eating (IE) reflects a strong trust and connection with the internal hunger and satiety cues that signal when and how much to eat.<sup>19</sup> Individuals that eat intuitively are not preoccupied with the dieting mentality and food, do not simply categorize food as “good” or “bad,” and their food choices are a reflection of preferred sensory property and a desire to assist the body’s functioning. In support of this conceptualization of IE, studies have shown that individuals who eat in response to internal hunger and satiety cues engage in less overeating in the absence of hunger, less eating in response to emotional or situational triggers, and less food preoccupation.<sup>20-23</sup> Moreover, IE also emphasizes promoting healthy PA behavior. Individuals who practice IE would pursue enjoyment and pleasure in exercise but not focus on burning more calories as another dieting method.<sup>24,25</sup>

Currently, there are only four studies that have assessed IE during adolescence.<sup>23,24,26,27</sup> These studies examined IE constructs in association with health indicators and psychological well-being among middle-school aged and high-school aged boys and girls. Together, these four studies confirmed that IE serves as an important and relevant concept for both adolescent boys and girls. However, considering the success of IE as promoting healthy dietary and PA behaviors, the research has been largely limited to examining adults only. The transition from adolescence to adulthood is a critical period because identities are being formed and a sense of autonomy is being developed.<sup>28,29</sup> Thus, the behaviors adolescents establish and the decisions they make during this period can have a long lasting impact in their life. Therefore, given the expected benefits of IE, it may be a promising avenue for encouraging the development of

healthy dietary and PA behaviors in the adolescent population, which may then promote life-long well-being and reduce the risk of obesity.

The goal of this study was to identify the differences in dietary and PA behaviors and perceptions between demographic variables (gender, grade, and ethnicity) before IE intervention implementation. Therefore, this study focused on answering the following research questions at baseline: (1) Will there be any differences in the adolescents' dietary behaviors?; (2) Will there be any differences in the adolescents' intention for FV consumption?; (3) Will there be any differences in the adolescents' attitude/perceived behavioral control/subject norm towards FV consumption?; (4) Will there be any differences in the adolescents' PA behaviors?; (5) Will there be any differences in the adolescents' intention for PA participation?; (6) Will there be any differences in the adolescents' attitude/perceived behavioral control/subject norm towards PA participation?; and (7) Will there be any differences in the adolescents' perceptions of IE? Individual perceptions include adolescents' attitude, perceived behavioral control, and subjective norm towards healthy eating and being physically active. Behavioral determinants include adolescents' breakfast consumption frequency, the frequency of consuming the recommended amount of FV over a typical week, and the frequency of meeting PA recommendation over a typical week. Furthermore, this study also described the proportion of adolescents that met breakfast intake recommendation, FV consumption recommendation, and PA recommendations to provide a broader picture of the overall characteristics of the population within the study.

## **Method**

This study was conducted as part of a five-year, tri-state community-based participatory research project entitled “Ignite: Spark Youth to Create Healthy Communities.” The Ignite project aimed to enhance healthy eating and PA participation in both rural and urban

communities in Kansas (KS), South Dakota (SD), and Ohio (OH), but the study described in this article focused on the rural community in KS. Research protocol and procedures were approved by the Institutional Review Board of Kansas State University, and child assent and parental consent were obtained prior to the study.<sup>32-34</sup>

### **Communities and Participants**

Communities met both the low-income and the minority criteria in KS, SD, and OH were considered and recruited for the Ignite project. The inclusion criterion for ethnicity was based on the minority (non-white) population either higher than state average or the majority population (> 51%) comprised by minority racial/ethnic groups.<sup>30,31</sup> The average state minority population is 21.4% ( $\pm 0.1\%$ ), 15.5% ( $\pm 0.1\%$ ), and 18.6% ( $\pm 0.1\%$ ), by which is dominated by Hispanic/Latino, Native American, and African American, respectively for KS, SD, and OH. Moreover, communities considered as low-income had met one of the four following criteria: the mean income of the county at or below 185.0% of poverty level; the poverty level of county is higher than the state average; the population of students who are qualified for free or reduced price school lunches is higher than the state average; or the majority (> 51%) students are qualified for free or reduced price school lunches.<sup>32-35</sup> Before the development of intervention programs, two communities were randomly selected from qualified communities in each state and further assigned as either the control or the intervention community at random.<sup>36-38</sup> For this study, enrolled 6<sup>th</sup> through 8<sup>th</sup> grade adolescents (N = 168) in selected intervention community in rural KS were recruited.

### **Measures**

Based on the TPB framework, the questionnaire for students contained 25 items that were designed to gather information on participating students' dietary and PA behaviors, perceptions

of healthy eating and being physically active, perceptions of IE, and demographics. Although questions used in the survey were adapted from previously validated instruments, the content validity was not established by a separate investigation. The survey questions were based on in-depth literature review and informed by experts' opinions. Three doctoral-level faculty members in the field of Nutrition or Health Communication with expertise in the areas of human nutrition, sensory analysis, communication, and middle school teachers reviewed the items regarding clarity, properness, and levels of understanding. The final survey was administered to assenting 6<sup>th</sup> through 8<sup>th</sup> grade adolescents.

### **Dietary behaviors and perceptions**

Survey questions specified two items for assessing participating adolescents' breakfast intake and FV consumption behaviors. These items include: (1) over a typical week, how often do you eat breakfast; and (2) over a typical week, how often do you eat at least 1 ½ cups of fruits and 2 cups of vegetables a day. Response category ranged from "*0 days*" to "*7 days*." Attitudes toward eating were assessed with one item that asked participants' levels of agreement with the following statement: having a healthy relationship with food and eating is important to me. The perceived behavioral control of healthy eating included two items that assessed participating students' confidence in making wise decisions about eating. These items include: (1) I am confident that I can make good food choices that support my health; and (2) I am confident that I can eat at least 1 ½ cups of fruits and 2 cups of vegetables a day ( $\alpha = .55$ ). The two items that assessed students' intent to make healthy food choices include: (1) I am planning to make good food choices that support my health; and (2) I am planning to eat at least 1 ½ cups of fruits and 2 cups of vegetables a day ( $\alpha = .54$ ). The subjective norm was assessed by one item that measure students' level of agreement with the following statement: my friends and family members are

supportive about me eating healthy.<sup>3</sup> Responses to the students' levels of agreement were measured on a 5-point Likert scale with 1 (*strongly disagree*) to 5 (*strongly agree*).

### **Physical activity behaviors and perceptions**

The item used to assess students' PA behavior was: over a typical week, how often did you do MVPA for at least 60 minutes a day. Possible responses ranged from "0 day" to "7 days." The two items that assessed students' attitudes toward PA were: (1) I enjoy being physically active; and (2) being physically active is important to me ( $\alpha = .82$ ). The perceived behavioral control of PA included one item that assessed students' confidence in being physically active for 60 minutes a day, every day of the week. The subjective norm was assessed by one item that asked if participating students' friends and family members support them being physically active. The item that assessed the intent to be physically active was: I am planning to be active for 60 minutes a day, every day of the week.

### **Intuitive Eating perceptions**

The perception of IE was assessed by a ten-item survey that examined three factors of IE: (1) Factor 1—Unconditional Permission to Eat (four items); (2) Factor 2—Eating for Physical Rather Than Emotional Reasons (two items); and (3) Factor 3—Reliance on Internal Hunger/Satiety Cues (four items). The scale was adapted from Tylka's IE (2006) scale and Dockendorff et al.'s (2012) IE for adolescent scale.<sup>20,23</sup> Participants responded using a 5-point Likert scale that ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher factor scores represent higher levels of IE on that factor.

### **Data analyses**

Descriptive statistics were used to characterize the sample. Chi-square analyses were performed on categorical data. Independent samples *t*-tests and one-way ANOVAs were used to



determine variable differences across demographic variables. Pearson correlations were used to assess the relationship between different variables. Multiple linear regressions were performed to examine the relationship of TPB variables and adolescents' dietary and PA behaviors. Significance level was set at  $P < .05$ . SPSS software, version 22.0 (IBM Corp, released 2013), was used for statistical analyses.

## Results

### Participant Characteristics

Table 3.1 displays participating students' demographic characteristics. Students' gender and grade level was evenly distributed, whereas Hispanic was identified as the predominant ethnic population (59%).

**Table 3.1 Demographic Characteristics of Participating Students**

<b>Characteristics</b>	<b>Frequency</b>	<b>Percentage</b>
<b><i>Gender</i></b>		
<b>Male</b>	79	51.3
<b>Female</b>	75	48.7
<b><i>Grade</i></b>		
<b>6<sup>th</sup></b>	55	35.7
<b>7<sup>th</sup></b>	41	26.6
<b>8<sup>th</sup></b>	58	37.7
<b><i>Race/Ethnicity</i></b>		
<b>Hispanic</b>	78	59.1
<b>White</b>	37	28.0
<b>Others</b>	17	12.9

## **Dietary Behaviors and Perceptions**

Students from different grade levels had similar FV consumption behavior ( $P > .05$ ). On average, the frequency of meeting FV consumption recommendation per week was 3.7 days. With regards to students' perceived behavioral control for healthy eating, intent to make healthy food choices, and subjective norm about family and peer influence, significant differences ( $P \leq .01$ ) across grade levels were also observed. Sixth graders (Mean = 4.3) were significantly more confident about making good choices about eating when compared with 7<sup>th</sup> graders (Mean = 3.6,  $P < .001$ ) and 8<sup>th</sup> graders (Mean = 3.7,  $P < .001$ ). In addition, 6<sup>th</sup> graders (Mean = 4.0) had high-intent about eating healthy when compared with 8<sup>th</sup> graders (Mean = 3.6,  $P = .001$ ). Besides, when compared with 7<sup>th</sup> graders (Mean = 3.5,  $P = .001$ ) and 8<sup>th</sup> graders (Mean = 3.7,  $P = .02$ ), 6<sup>th</sup> graders' family members and friends (Mean = 4.22) were more likely to be supportive about them eating healthy. However, all of the 6<sup>th</sup> through 8<sup>th</sup> graders demonstrated moderate attitude towards having a healthy relationship with food and eating (Mean = 3.6,  $P > .05$ ). No significant difference across genders and ethnicities was observed with regard to participating students' dietary behaviors and perceptions.

Moreover, descriptive statistics showed that only 11% of the participating students met the daily recommendation for FV consumption. Among them, 13% were boys and 9% were girls. *T*-tests and ANOVAs indicated no significant difference across genders, grade levels, and ethnicities.

On average, 31% of participating students indicated consuming breakfast every day of the week. However, the frequency of breakfast consumption per week was significantly different across grade levels ( $P < .001$ ). Seventh graders reported significantly lower breakfast

consumption frequency per week (3.5 days) when compared with 6<sup>th</sup> graders (5.3 days). No significant difference across gender and ethnicities was observed.

### **Physical Activity Behaviors and Perceptions**

Sixth through 8<sup>th</sup> graders had similar PA behaviors and reported engaging in MVPA for at least 60 minutes per day, 5.0 days of a week ( $P > .05$ ). To compare the perception differences across grade levels, ANOVA showed participating students' attitude towards PA, perceived behavioral control for PA, and subjective norm about family and peer influence were similar ( $P > .05$ ), whereas the intent to be physically active was significantly different ( $P = .03$ ). Students demonstrated relatively positive attitudes toward being physically active and they considered PA was important (Mean = 4.3); they were moderately to strongly confident about being active for at least 60 minutes per day (Mean = 4.3); and their friends and family members were moderately to strongly supportive of them being physically active (Mean = 4.2). On the contrary, 6<sup>th</sup> graders (Mean = 4.4) had significantly higher intent to be physically active for at least 60 minutes per day, every day of the week when compared to 8<sup>th</sup> graders (Mean = 3.8,  $P = .03$ ).

To test the behavioral and perception differences across genders, *t*-tests showed that over a typical week, boys (Mean = 5.3) spent more days doing MVPA for at least 60 minutes each day than girls (Mean = 4.6,  $P = .02$ ), and boys (Mean = 4.5) were slightly positive about being physically active than girls (Mean = 4.1,  $P = .01$ ). In particular, girls (Mean = 4.0) were less likely to consider being physically active was important to them when compared with boys (Mean = 4.4,  $P = .001$ ). Ethnicity did not contribute to the variance in PA behavioral and perception differences.

Twenty-four percent of the participating students met the PA guideline recommendations. However, *t*-test showed that compared with boys (35%), only 12% girls met the daily

recommendation ( $P = .001$ ). No significant difference was observed across grade levels and ethnicities.

## **The Theory of Planned Behavior Variables and Fruit and Vegetables Intake**

### **Intention and Behavior**

Association between participating students' attitudes, perceived behavioral control, and subjective norm of healthy eating were examined as predictors of their FV consumption intention. Multiple linear regressions revealed that demographic factors (model 1) did not produce a significant equation ( $P > .05$ ), despite grade variable by itself had a significant contribution ( $\beta = -0.19$ ,  $t = -2.13$ ,  $P = .04$ ). As stated earlier, ANOVA showed that there was a significant difference with regard to the students' intent to consume the recommended amount of FV daily across grades. Sixth graders (Mean = 4.0) had a higher intent about eating healthy when compared to 8<sup>th</sup> graders (Mean = 3.6,  $P = .001$ ). However, other factors such as attitudes, perceived behavioral control, and subjective norm of healthy eating produced a significant equation ( $P < .001$ ), and explained 44% of the model variance. As Table 3.2 shows, significant factors that contributed to higher intention for FV consumption in model 2 included the attitudes for healthy eating ( $\beta = 0.33$ ,  $t = 4.36$ ,  $P < .001$ ), confidence in making wise decisions about eating ( $\beta = 0.37$ ,  $t = 4.66$ ,  $P < .001$ ) and family and peer support for healthy eating ( $\beta = 0.17$ ,  $t = 2.13$ ,  $P = .04$ ). The gender ( $P = .02$ ) was also gained significant in the second model after adding other predicting factors.

Table 3.2 also shows that when the FV consumption behavior was regressed as the dependent variable and the TPB variables as independent variables, the model was significant and explained 23% of the model variance ( $P < .001$ ). The attitudes ( $\beta = 0.26$ ,  $t = 2.93$ ,  $P = .004$ )

and the perceived behavioral control ( $\beta = 0.30$ ,  $t = 3.18$ ,  $P = .002$ ) predicted the FV consumption behavior.

**Table 3.2 Multiple Linear Regressions for Fruit and Vegetable Consumption and Physical Activity Intentions and Behaviors**

Predictor Variables	Model 1 $\beta$ (t)	Model 2 $\beta$ (t)	Model 1 $\beta$ (t)	Model 2 $\beta$ (t)
<i>Fruit and Vegetable Consumption Intention and Behavior</i>				
<b>Gender</b>	0.13 (1.44)	0.16 (2.35) <sup>*</sup>	-0.03 (-0.34)	-0.03 (-0.36)
<b>Grade</b>	-0.19 (-2.13) <sup>*</sup>	-0.03 (-0.36)	-0.11 (-1.22)	-0.02 (-0.24)
<b>Ethnicity</b>	0.06 (0.62)	-0.01 (-0.10)	0.11 (1.20)	0.07 (0.86)
<b>Attitudes</b>		0.33 (4.36) <sup>***</sup>		0.26 (2.93) <sup>**</sup>
<b>Perceived Behavioral Control</b>		0.37 (4.66) <sup>***</sup>		0.30 (3.18) <sup>**</sup>
<b>Subjective Norm</b>		0.17 (2.13) <sup>*</sup>		0.03 (0.34)
<b>R<sup>2</sup></b>	0.06	0.44	0.03	0.23
<i>Physical Activity Intention and Behavior</i>				
<b>Gender</b>	-0.13 (-1.44)	-0.03 (-0.48)	-0.14 (-1.59)	-0.07 (-0.90)
<b>Grade</b>	-0.17 (-2.00)	-0.14 (-1.98)	-0.11 (-1.28)	-0.07 (-0.92)
<b>Ethnicity</b>	-0.17 (-1.90)	-0.14 (-1.93)	-0.07 (-0.78)	-0.04 (-0.45)
<b>Attitudes</b>		0.37 (3.54) <sup>**</sup>		0.21 (1.80)
<b>Perceived Behavioral Control</b>		0.26 (3.05) <sup>**</sup>		0.36 (3.75) <sup>***</sup>
<b>Subjective Norm</b>		0.09 (0.93)		0.03 (0.29)
<b>R<sup>2</sup></b>	0.07	0.45	0.04	0.31

*Note.*  $\beta$  values are standardized coefficients with t values in parentheses.

\*  $P < .05$ . \*\*  $P < .01$ . \*\*\*  $P < .001$

Furthermore, when demographic variables were controlled and the FV consumption behavior was regressed as the dependent variable with intention as the independent variable, the model was significant ( $P < .001$ ) and explained 31% of the model variance. The FV consumption intention significantly predicted FV consumption behavior ( $\beta = 0.56$ ,  $t = 7.50$ ,  $P < .001$ ).

### **The Theory of Planned Behavior Variables and Physical Activity Intention and Behavior**

Multiple linear regressions were performed to determine factors, which include participating students' demographic, attitudes, perceived behavioral control, and subjective norm toward PA that influence the intention to be physically active. Although model 1 produced a significant equation ( $P = .03$ ), none of the demographic variables contributed to the significance (Table 3.3). When other factors—attitudes towards PA, confidence in meeting the PA daily recommendation, and family and peer support—were included, the model was significant ( $P < .001$ ) and explained 45% of the variance. As shown in Table 3.2, significant factors in model 2 included the attitudes towards PA ( $\beta = 0.37$ ,  $t = 3.54$ ,  $P = .001$ ) and the perception of the perceived behavioral control ( $\beta = 0.26$ ,  $t = 3.05$ ,  $P = .003$ ).

When the PA behavior was regressed as the dependent variable and the TPB variables as independent variables, the model was significant ( $P < .001$ ) and explained 31% of the model variance. The perceived behavioral control ( $\beta = 0.36$ ,  $t = 3.75$ ,  $P < .001$ ) predicted PA behavior (Table 3.2).

Moreover, when the demographic variables were controlled, multiple linear regressions also showed that PA intention ( $\beta = 0.43$ ,  $t = 5.24$ ,  $P < .000$ ) significantly predicted PA behavior ( $P < .001$ ) and explained 21% of the model variance.

## **Intuitive Eating Factors in Association with Breakfast Intake, Fruit and Vegetable Consumption, and Physical Activity Behaviors**

The mean Factor 1—Unconditional Permission to Eat score was 12.5, and boys had a significantly higher score (Mean = 13.0) when compared with girls (Mean = 12.0,  $P = .005$ ). No significant difference across grades and ethnicities was observed. The mean score for Factor 2—Eating for Physical Rather Than Emotional Reasons was 6.7, and ANOVA showed 6<sup>th</sup> graders (Mean = 6.2) scored significantly lower than 7<sup>th</sup> graders (Mean = 7.0,  $P = .03$ ) and 8<sup>th</sup> graders (Mean = 6.9,  $P = .03$ ), and girls (Mean = 6.2) scored significantly lower than boys (Mean = 7.1,  $P = .001$ ). The mean score for Factor 3—Reliance on Internal Hunger/Satiety Cues was 15.3, and no significant difference across demographic variables was found.

Multiple linear regressions were performed to determine IE factors that influence breakfast intake and FV consumption behaviors among participating students. With regard to breakfast intake behavior, demographic factors (gender, grade level, and ethnicity) explained about 3% of the model variance but did not produce a significant model. None of the demographic factors played a significant role in determining breakfast intake behaviors among participating students. However, when all three IE factors were included, the model was significant [ $F(6, 126) = 2.30$ ,  $P = .04$ ] and the model explanatory power had been increased to about 10%. As Table 3.3 shows, a significant factor in the model included Factor 3—Reliance on Internal Hunger/Satiety Cues ( $\beta = 0.28$ ,  $t = 2.94$ ,  $P < .001$ ). Students who rely on their internal hunger or satiety cues indicated higher breakfast consumption frequency.

FV consumption was also predicted by IE factors. Similar to breakfast consumption, results from the multiple linear regression showed that demographics did not produce a significant model, but IE factors increased the model explanatory power and produced a

significant model equation [ $F(6, 126) = 2.27, P = .04$ ]. As shown in Table 3.3, the most significant determinant of FV consumption behavior after controlling for demographics was Factor 3—Reliance on Internal Hunger/Satiety Cues ( $\beta = 0.21, t = 2.28, P = .04$ ). Students who rely on their internal hunger or satiety cues showed higher FV consumption frequency.

Multiple linear regression was also performed to determine factors that influence the PA behavior, however, as shown in Table 3.3, none of the demographic or the IE factors had any significant contribution.

**Table 3.3 Multiple Linear Regressions for Breakfast Intake, Fruit and Vegetable Consumption and Physical Activity Behaviors**

Predictor Variables	Model 1 $\beta$ (t)	Model 2 $\beta$ (t)
<i>Breakfast Intake Behavior</i>		
Gender	-0.09 (-1.05)	-0.09 (-0.93)
Grade	-0.15 (-1.68)	-0.12 (-1.31)
Ethnicity	-0.04 (-0.49)	-0.09 (-0.98)
Factor 1		0.01 (0.02)
Factor 2		-0.03 (-0.35)
Factor 3		0.28 (2.94)**
R <sup>2</sup>	0.03	0.10*
<i>Fruit and Vegetable Consumption Behavior</i>		
Gender	-0.01(-0.04)	-0.05 (-0.47)
Grade	-1.00 (-1.07)	-0.04 (-0.46)
Ethnicity	0.94 (1.05)	0.07 (0.80)
Factor 1		-0.16 (-1.63)



<b>Factor 2</b>		-0.06 (-0.61)
<b>Factor 3</b>		0.21 (2.28)*
<b>R<sup>2</sup></b>	0.02	0.10*
<b><i>Physical Activity Behavior</i></b>		
<b>Gender</b>	-0.11(-1.24)	-0.05 (-0.51)
<b>Grade</b>	-0.12 (-1.37)	-0.15 (-1.64)
<b>Ethnicity</b>	-0.07 (-0.78)	-0.10 (-1.11)
<b>Factor 1</b>		0.07 (0.75)
<b>Factor 2</b>		0.13 (1.31)
<b>Factor 3</b>		0.17 (1.77)
<b>R<sup>2</sup></b>	0.03	0.07

*Note.*  $\beta$  values are standardized coefficients with t values in parentheses.

\*  $P < .05$ . \*\*  $P < .01$ .

## Discussion

This study examined adolescents' breakfast intake, FV consumption and PA behavior, as well as the percentage of participants that met the national FV and PA recommendations. TPB variables and IE factors that contributed to breakfast intake, FV consumption and PA behaviors were identified, and differences across demographics were described.

Compared with the estimated US adolescents' trends in FV intake (16% to 26% meet the FV intake guideline), only 11% of the participants in our study met the recommendation.<sup>2</sup> This lower rate may in part be because adolescents in this study were from a limited-resourced community, where the availability of nutritious opportunities was largely limited. The limited availability of healthy foods in low-socioeconomic status communities could also attribute to the

lower demand for healthy food options due to health literacy disparities.<sup>39</sup> Additionally, our results also showed that adolescent boys and girls had similar FV guideline adherence rate, which was in line with previous studies that have shown gender difference was not significant in FV guideline adherence among adolescents.

Although Siega-Riz et al.'s (1998) have shown that the breakfast consumption frequency in the US has declined over time and a gradually decline trend has been observed with the growing of ages, participants in our study had a much lower breakfast consumption frequency rate (31%) when compared with the US estimates (58%).<sup>40</sup> This discrepancy may also be because the adolescents in this study were from limited-resourced communities and had health literacy disparities.<sup>39</sup> Additionally, other reasons may include lack of time in the morning, did not feel hungry in the morning, or a desire to control weight.<sup>41,42</sup>

Approximately 24% of participating students in this study met PA recommendations, and this finding is similar to recent population-based estimates of PA guideline adherence in the US.<sup>10</sup> Boys in this study had a significantly higher rate of meeting PA recommendation and their attitudes toward being physically active were more positive when compared with girls. These findings confirm previous studies which have shown that boys were more active and more likely to engage in MVPA than girls,<sup>43,44</sup> whereas PA levels tend to drop dramatically for girls during adolescence.<sup>45</sup>

In this study, the TPB variables were found to be predictive factors affecting FV consumption intention, and the intention directly predicted participating adolescents' FV consumption behavior. Attitudes toward eating healthy, perceived behavioral control and perceived norm were found to be significant factors in adolescents' responses about FV consumption intention. Attitudes toward health are specifically important in predicting behavior,

and results show a significant correlation with the perceived behavioral control.<sup>46</sup> Moreover, gender was also found to be predictive factors of FV consumption intention. These results were in line with Lien et al.'s (2016) study, which had shown that the TPB explained adolescents' intention to eat FV and gender served as a mediator between intentions and behaviors.<sup>14</sup> Moreover, TPB variables, especially the perceived behavioral control served as significant predictors for adolescents' PA intention and behavior in our study. This result was consistent with Hagger et al.' (2002) meta-analysis of TPB variables.<sup>18</sup> In Hagger et al.'s (2002) study, TPB variables accounted for variance in PA intentions and behavior, and the perceived behavioral control explained unique variance in PA intention.

In the investigation of breakfast intake and FV consumption behaviors, IE factors were found to be predictive of factors that affected the frequency of breakfast intake and FV consumption. Consistent with Dockendorff et al.'s (2012) study, these results indicated that constructs of IE were viable and relevant for middle-school aged adolescents.<sup>23</sup> However, in this study, the IE factors were seemed to be irrelevant for PA behavior. Given the expected benefits of IE, it may be a promising avenue for future intervention to encourage the development of healthy dietary behaviors and attitudes in the adolescent population, but future studies are also needed to evaluate how IE interventions could encourage PA behavior change.

This study adds to the growing literature on IE interventions to promote healthy dietary and PA behavior change. The strength of this study includes addressing timely public health issues among adolescents—breakfast intake, FV consumption, and PA participation—within a low-income and ethnic setting. However, it must be understood within the context of potential limitations. The first limitation of this study was the reliance on self-reported data. The study is likely to have external validity issues due to self-reporting, especially as participants attempted to

recall their FV consumption and PA behaviors. In addition, using a 3-day dietary record may be more reliable and accurate estimates of the FV intake than using a survey, particularly in children.<sup>47</sup> Besides, participating students may also systematically alter their responses in the direction that they perceived to be socially desirable. Secondly, the survey tool used in the study had some 1- or 2-item measurements which may cause low reliability and validity issues. For self-assessment health surveys, it is not uncommon to find tools that have only one or two indicators to measure a particular variable due to the constraints of resource and survey time,<sup>48-53</sup> and we believe that the 1- and 2-item measurements used in this study captured the purpose and needs of the study. However, since having only one or two items to identify a construct has been recognized as problematic sometime,<sup>54,55</sup> we do prefer to add more items. Thirdly, in addition to the ethnic population, the rural setting of this study could affect the generalizability of findings to urban or suburban areas and other ethnicity or race. Fourthly, although the survey tool used for the study was based on in-depth literature review and informed by experts' opinion, it had not been previous validated or tested.

## **Conclusions and Implications for Research and Practice**

As a baseline assessment for a pilot study to test the effectiveness of an IE intervention for the adolescent population, the current study compared behavioral and perception differences, investigated the proportion of 6<sup>th</sup> through 8<sup>th</sup> grade adolescents meeting FV consumption and PA recommendations, and examined the influence of TPB variables on breakfast intake, FV consumption and PA participation. The findings from the study identified key determinants affecting FV consumption and PA participation in adolescents, which provided potential focuses for IE intervention development. In sum, future intervention should include strategies that target

enhancement of attitudes and perceived behavioral control for guidelines adherence to promote overall health in adolescents.

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# **Chapter 4 - Using Wise Eating Approach to Promote Healthy Dietary and Physical Activity Behaviors among Adolescents in a Low-income Racial Community in Kansas: A Pilot Study**

## **Abstract**

**Objective:** To promote healthy dietary and physical activity (PA) behaviors in adolescents using a six-module nutrition education resource—Wise Eating (WE)—which was designed specifically for the adolescent population based on the concept and principles of Intuitive Eating (IE).

**Study Design:** Repeated measures study with pre-assessment and post-assessment.

**Outcome Measures and Analysis:** This study assessed participating adolescents' breakfast intake, fruit and vegetable (FV) consumption, and PA behaviors; perceptions of IE factors; and perceptions of the Theory of Planned Behavior (TPB) variables. *T*-tests and ANOVAs were used to determine differences in demographic variables and differences between the control and the intervention group. Paired *t*-tests were performed to compare the behavioral and perception changes from the pre-assessment to the post-assessment. Multiple linear regressions were performed to examine the relationship between TPB variables and FV consumption and PA participation intent and behaviors.

**Results:** The total number of participants at the pre- and the post-assessment was 154 and 148, respectively. Hispanic was identified as the predominant ethnic population at both the pre- and the post-assessment. At post-assessment, participants in the intervention group reported significantly higher scores in their breakfast intake frequency, FV consumption frequency, and PA participation frequency compared with the control group ( $P < .05$ ). The TPB variables

significantly predicted FV consumption and PA intent and behaviors at both the pre- and the post-assessment, and the perceived behavioral control served as the most consistent predictor ( $P < .05$ ). For the intervention group, the IE total and Factor 1—Unconditional Permission to Eat scores were significantly increased at the post-assessment when compared with the control group ( $P \leq .001$ ).

**Conclusions:** These findings tested the effectiveness of WE education modules and further emphasized the needs for more interventions on IE to improve dietary and PA behaviors change in the adolescent population.

## Introduction

The prevalence of overweight and obesity has been considered as one of the most critical public health concerns in the United States. Healthy People 2020 identified ‘Nutrition, Physical Activity (PA), and Obesity’ as one of the twelve leading health concerns. According to the most recent national estimates of the prevalence of obesity and severe obesity among children and adolescents aged 2 to 19 years, the obesity rates had increased significantly from 1999 through 2014, despite considerable clinical and policy efforts to address the issue.<sup>1</sup> In particular, the severe obesity rate has significantly increased to 8.7% in adolescents and non-Hispanic black children.

As the prevalence of childhood and adolescent obesity increases, its health implications are becoming more evident.<sup>2</sup> Obesity in childhood and adolescence is associated with significant health problems in the pediatric age group and is an important early risk factor for much of the adult morbidity and mortality.<sup>2</sup> Childhood obesity frequently persists into adulthood, with up to 80% of obese children reported to become obese adults.<sup>3</sup> Studies have shown that many of the obesity-related health conditions once thought applicable only to adults are now being seen in

children and adolescents with increasing frequency. Examples include high blood pressure, early symptoms of hardening of the arteries, type 2 diabetes, nonalcoholic fatty liver disease, polycystic ovary disorder, and disordered breathing during sleep.<sup>2</sup> Furthermore, obesity in childhood and adolescence also increases psychological burden that could persist into adulthood. Studies on psychological correlates of obesity linked obesity with depression, and obesity is believed to increase depressive symptoms among children and adolescents.<sup>4-6</sup> In turn, depressed adolescents are at great risk for the development and persistence of obesity during adolescence.<sup>7</sup> Also, obesity has been shown to be a leading cause of lower self-esteem and negative body image among adolescents and young adults, especially Hispanic and non-Hispanic white females.<sup>8,9</sup>

Although dietary recommendations have been established for the adolescent population and the increased consumption of FVs have been linked to positive health indicators, only 16% to 26% of adolescents meet FV intake recommendations,<sup>10</sup> with obese adolescents showing even lower adherence rates.<sup>11</sup> Another population study also indicated adolescent girls significantly decreased their daily FV intake during the transition from early to middle adolescence.<sup>12</sup> Likewise, despite prior studies have shown that physically active adolescents have stronger cognitive and academic performance, higher self-esteem, and lower adiposity when compared to their less active peers,<sup>13</sup> only one-quarter of US adolescents aged 12-15 years met the PA recommendations according to the current estimated trends in PA.<sup>13</sup>

One reason that adolescents failed to meet these suggested guidelines may be due to low-intent of performing the behavior.<sup>14,15</sup> As emphasized in the theory of planned behavior (TPB), intention represents an individual's readiness to perform a given behavior and it is considered to be the best predictor of a certain behavior. Individuals' attitude towards a specific behavior, the

subjective norms and the perceived behavior control serve as three important determinants of intention, and the perceived behavioral control accounted for significant amounts of variance in intention and behavior.<sup>16</sup> The successful application of the TPB to dietary and PA behavior change interventions in adolescents has provided extensive support to show that attitudes, subjective norm and perceived behavioral control are all predictive factors of intentions to engage in the behavior.<sup>14,17,18</sup>

As first coined by Tribole and Resch, Intuitive Eating (IE) reflects a strong trust and connection with the internal hunger and satiety cues that signal when and how much to eat.<sup>19</sup> Individuals that eat intuitively are not preoccupied with the dieting mentality and food, do not simply categorize food as “good” or “bad,” and their food choices are a reflection of preferred sensory property and a desire to assist the body’s functioning. In support of this conceptualization of IE, studies have shown that individuals who eat in response to internal hunger and satiety cues engage in less overeating in the absence of hunger, less eating in response to emotional or situational triggers, less food preoccupation, and less restrictive eating behavior.<sup>20-22</sup> Moreover, a cross-sectional study also indicated that IE had a stronger impact on healthy weight management compared to dieting.<sup>23</sup>

In addition, IE also emphasizes promoting healthy PA behavior.<sup>24,25</sup> Individuals who practice IE would pursue enjoyment and pleasure in exercise but not focus on burning more calories as another dieting method. Bacon and Keim’s study (2005) indicated individual who trained with IE was able to maintain and increase their PA level significantly when compared with individuals who participated in a traditional restrictive eating program.<sup>24</sup> Also, another cross-sectional study that examined the motivation for eating and PA of female college students had shown that female students who demonstrated internal motivation related to eating were also

internally motivated to participate in regular PA, and female students who reported being internally motivated to eat were significantly more likely to engage in PA for pleasure.<sup>26</sup>

Currently, only four studies that have assessed IE in adolescence have been published in peer-reviewed journals.<sup>22,25,27,28</sup> These studies examined IE constructs in association with health indicators and psychological well-being among middle-school aged and high-school aged boys and girls, and showed IE was negatively associated with BMI, body dissatisfaction, restrictive eating behavior, pressure for thinness, and positively associated with satisfaction with life, acceptance of a broad variety of foods, and body appreciation. Together, these four studies confirmed that IE serves as an important and relevant concept for both adolescent boys and girls. However, considering the success of IE as promoting healthy dietary and PA behaviors, the research has been largely limited to examining adults only, and none of these studies examined the relationship between IE and dietary and PA guidelines adherence in adolescents.

The transition from adolescence to adulthood has been identified as an important stage for health promotion because during this period adolescents reach maturity, develop more sophisticated reasoning ability, and make important decision that will shape their future.<sup>29,30</sup> Therefore, these biological, cognitive, and psychosocial changes during this period create a need for more studies to target improving healthy behavior patterns for adolescents that contribute to the development of a healthy lifestyle. Given the expected benefits of IE, it may be a promising avenue for encouraging the development of healthy dietary and PA behaviors and attitudes in the adolescent population, which may then promote life-long well-being and reduce the risk of obesity.

The use of nutrition education programs and resources encourage individuals and their families to make healthier choices regarding the dietary and PA behaviors. It has been proven

that nutrition education is a key element to promoting lifelong healthy eating and exercise behaviors and should start from the early stages of life.<sup>31,32</sup> Compared with young children whose parents decide and prepare the food for them, adolescents progressively become more independent and have more autonomy about their food and PA choices. Hence, school, teachers, peers and other people at school, become more important to adolescents' dietary and PA decisions and have a major influence in shaping adolescents' habits and lifestyles.

Therefore, the purpose of this pilot study is to test the effectiveness of a six-module nutrition education resource—Wise Eating (WE)—which was designed specifically for the adolescent population based on the concept and principles of IE. Based on the TPB framework, this project focused on answering the following research questions: (1) Will there be an improvement in the adolescents' dietary and PA behaviors after they complete the WE modules?; (2) Will there be an increase in the adolescents' intent for FV consumption and PA participation after they complete the WE modules?; (3) Will there be an improvement in the adolescents' attitudes/perceived behavioral control/subjective norm towards eating healthy and being physically active after they complete the WE modules?; and (4) Will there be an increase in the adolescents' perceptions of IE after they complete the WE modules?

## **Method**

This study was conducted as part of a five-year, tri-state community-based participatory research project entitled “Ignite: Spark Youth to Create Healthy Communities.” The Ignite project aimed to enhance healthy eating and PA participation in both rural and urban communities in Kansas (KS), South Dakota (SD), and Ohio (OH), but the study described in this article focused on the rural community in KS. Research protocol and procedures were approved



by the Institutional Review Board of Kansas State University, and child assent and parental consent were obtained prior to the study.<sup>33-35</sup>

## **Communities and Participants**

Communities met both the low-income and the minority criteria in KS, SD, and OH were considered and recruited for the Ignite project. The inclusion criterion for ethnicity was based on the minority (non-white) population either higher than state average or the majority population (>51%) comprised by minority racial/ethnic groups.<sup>36,37</sup> The average state minority population is 21.4% ( $\pm 0.1\%$ ), 15.5% ( $\pm 0.1\%$ ), and 18.6% ( $\pm 0.1\%$ ), by which is dominated by Hispanic/Latino, Native American, and African American, respectively for KS, SD, and OH. Moreover, communities considered as low-income had met one of the four following criteria: the mean income of the county at or below 185.0% of poverty level; the poverty level of county is higher than the state average; the population of students who are qualified for free or reduced price school lunches is higher than the state average; or the majority (>51%) students are qualified for free or reduced price school lunches.<sup>38-41</sup>

For this pilot study, enrolled 6<sup>th</sup> through 8<sup>th</sup> grade adolescents in selected intervention community in rural KS were recruited. Forty-six 7<sup>th</sup> graders were chosen as the control group, and one hundred and twenty-two 6<sup>th</sup> and 8<sup>th</sup> graders were chosen as the intervention group by school administrator due to the reason that 6<sup>th</sup> and 8<sup>th</sup> graders had a more flexible school schedule compared with 7<sup>th</sup> graders. Three physical education (PE) teachers, one from each grade level, were recruited to teach the WE modules.

## **Instruments**

### **Wise Eating Modules Development**

Six WE education modules, modified for the adolescent population specifically, were developed based on the fundamental principles of IE and the Rose Capacities which outline what KS students should know and be able to do, and have informed by experts' opinions. These modules include: (1) Wise Eating Overview; (2) Respect Your Hunger; (3) Discover the Satisfaction Factor; (4) Take Charge of Your Emotions without Using Food; (5) Be Active! Feel the Difference; and (6) Pick the Right Fuel for Your Body. Each module included a Leaders' Guide with a PowerPoint slides for teachers to use in the classroom to lead discussion and activities; and a Workbook with resources and worksheet for students to use after the lecture to reinforce the knowledge they have learned.

### **Wise Eating Questionnaires for Teachers**

A 21-item retrospective survey was designed for teachers to gather their opinions about the overall effectiveness and the quality of the WE modules, and also for teachers to assess whether students have gained knowledge and skills with regard to each module's topic. The response category for the effectiveness and the quality of the WE modules (7-item) was measured on a 5-point Likert scale with *poor* (1) to *excellent* (5), and with *strongly disagree* (1) to *strongly agree* (5). The Cronbach's alpha for the module evaluation was 0.81. The assessment of students included a 14-item survey that required teachers to identify students' knowledge base and skills related to each module's topic before and after the modules were taught. The response category was also measured on a 5-point Likert scale with *very low* (1) to *very high* (5) and the Cronbach's alphas were 0.54 and 0.78, respectively for prior the intervention and after the intervention.

### **Wise Eating Questionnaires for Students**

Based on the TPB framework, the pre- and post-assessment survey for students contained 25 items that were designed to gather information on participating students' dietary and PA behaviors, perceptions of healthy eating and being physically active, perceptions of three IE domains that were included in the WE modules: (1) Factor 1—Unconditional Permission to Eat; (2) Factor 2 –Eating for Physical Rather Than Emotional Reasons; and (3) Factor 3—Reliance on Internal Hunger/Satiety, and demographics. Although questions used in the survey were adapted from previously validated instruments, the content validity was not established by a separate investigation. The survey questions were based on in-depth literature review and informed by experts' opinions. Three doctoral-level faculty members in the field of Nutrition or Health Communication with expertise in the areas of human nutrition, sensory analysis, communication, and one middle school teacher reviewed the items regarding clarity, properness, and levels of understanding.

### ***Dietary behaviors and perceptions***

Survey questions specified two items for assessing participating adolescents' FV intake and breakfast consumption behaviors. These items include: (1) over a typical week, how often do you eat at least 1 ½ cups of fruits and 2 cups of vegetables a day; and (2) over a typical week, how often do you eat breakfast. Response category ranged from “0 days” to “7 days.” Attitudes toward eating were assessed with one item that asked participants' levels of agreement with the following statement: having a healthy relationship with food and eating is important to me. The perceived behavioral control of healthy eating included two items that assessed participating students' confidence in making wise decisions about eating. These items include: (1) I am confident that I can make good food choices that support my health; and (2) I am confident that I can eat at least 1 ½ cups of fruits and 2 cups of vegetables a day ( $\alpha = 0.55$  and  $0.56$ , respectively

for the pre- and post-assessment). The two items that assessed students' intent for making healthy food choices include: (1) I am planning to make good food choices that support my health; and (2) I am planning to eat at least 1 ½ cups of fruits and 2 cups of vegetables a day ( $\alpha = 0.54$  and  $0.73$ ). The subjective norm was assessed by one item that measured students' level of agreement with the following statement: my friends and family members are supportive about me eating healthy. Responses to the students' levels of agreement were measured on a 5-point Likert scale with 1 (*strongly disagree*) to 5 (*strongly agree*).

### ***Physical activity behaviors and perceptions***

The item used to assess students' PA behavior was: over a typical week, how often do you do moderate to vigorous intensity PA for at least 60 minutes a day. Possible responses ranged from "0 day" to "7 days". The two items that assessed students' attitudes toward PA were: (1) I enjoy being physically active; and (2) being physically active is important to me ( $\alpha = 0.82$  and  $0.81$ ). The perceived behavioral control of PA included one item that assessed students' confidence in being physically active for 60 minutes a day, every day of the week. The subjective norm was assessed by one item that asking if participating students' friends and family members support them being physically active. The item that assessed the intent for being physically active was: I am planning to be active for 60 minutes a day, every day of the week.

### ***Intuitive Eating perceptions.***

The perception of IE was assessed by ten items that examined three domains of IE: (1) Factor 1: Unconditional Permission to Eat (four items); (2) Factor 2: Eating for Physical Rather Than Emotional Reasons (two items); and (3) Factor 3: Reliance on Internal Hunger/Satiety Cues (four items). The scale was adapted from Tylka's IE scale and Dockendorff et al.'s IE for

adolescent scale. Participants responded using a 5-point Likert scale that ranged from 1 (*strongly disagree*) to 5 (*strongly agree*).<sup>22,42</sup> Higher factor scores represent higher levels of IE on that domain.

### **Wise Eating Intervention Implementation**

WE questionnaire for students was first administered to assenting 6<sup>th</sup> through 8<sup>th</sup> grade adolescents before they had been trained with the WE modules as a pre-assessment. One module each week was then taught during PE classes by PE teachers. After students had completed the modules, the post-assessment WE questionnaire for students and WE questionnaire for teachers were administered to 6<sup>th</sup> through 8<sup>th</sup> graders and PE teachers, respectively.

### **Data analyses**

Descriptive statistics were used to characterize the sample. Chi-square analyses were performed on categorical data. Independent samples t-tests and one-way ANOVAs were used to determine differences across demographic variables. Paired t-tests were performed to compare the behavioral and perception changes from the pre-assessment to the post-assessment. Pearson correlations were used to assess the relationship between different variables. Multiple linear regressions were performed to examine the relationship between TPB variables and FV consumption and PA participation intention and behaviors. Significance level was set at  $P < .05$ . SPSS software, version 22.0 (IBM Corp, released 2013), was used for statistical analyses.

## **Results**

### **Participants Characteristics**

The total number of participants at the pre- and the post-assessment was 154 and 148, respectively. The retention rate for the study was high (96.1%). Table 4.1 displays participating

students' demographic characteristics over the period of study. Participants' gender and grade level were evenly distributed. Hispanic was identified as the predominant ethnic population

**Table 4.1 Demographic Characteristics of Participating Students at Pre- and Post-Assessment**

Characteristics	Frequency (%)	
	Pre	Post
<i><b>Gender</b></i>		
<b>Male</b>	79 (51.3)	71 (48.0)
<b>Female</b>	75 (48.7)	77 (52.0)
<i><b>Grade</b></i>		
<b>6<sup>th</sup></b>	55 (35.7)	53 (35.8)
<b>7<sup>th</sup></b>	41 (26.6)	40 (27.0)
<b>8<sup>th</sup></b>	58 (37.7)	55 (37.2)
<i><b>Ethnicity</b></i>		
<b>Hispanic</b>	78 (59.1)	85 (58.6)
<b>White</b>	37 (28.0)	41 (28.3)
<b>Others</b>	17 (12.9)	19 (13.1)

### **Dietary Behaviors and Perceptions**

As shown in Table 4.2, participating students in the intervention group indicated significant increases in their breakfast intake (Mean = 5.2,  $P = .001$ ) and FV consumption (Mean = 4.8,  $P = .04$ ) scores, as well as their attitude toward healthy eating (Mean = 4.1,  $P = .02$ ) and the intention to consume FV (Mean = 4.2,  $P = .01$ ) at the post-assessment when compared with the students in the control group. Furthermore, compared with the dietary behaviors and perceptions scores at baseline, significant increases were observed with regard to the frequency

of consuming recommended amount of FV daily (Mean = 4.8,  $P < .0001$ ), the attitudes toward healthy eating (Mean = 4.1,  $P < .001$ ), and the intent to consume sufficient amount of FV daily (Mean = 4.3,  $P < .001$ ) for the students in the intervention group (Table 4.3). Students in the control group showed a significant increase in the subjective norm at post-assessment ( $P = .03$ ).

The post-hoc paired contrasts showed significant differences across grade levels with regard to breakfast intake ( $P < .001$ ) and FV consumption ( $P = .03$ ) scores at post-assessment. Sixth graders (Mean = 5.9) had significantly higher breakfast intake frequency when compared with 7<sup>th</sup> (Mean = 3.6,  $P < .001$ ) and 8<sup>th</sup> graders (Mean = 4.7,  $P = .01$ ); and 8<sup>th</sup> graders had a significant higher breakfast intake frequency than 7<sup>th</sup> graders ( $P = .04$ ). Additionally, 6<sup>th</sup> graders (Mean = 4.9) also had significantly higher FV consumption frequency when compared with 7<sup>th</sup> graders (Mean = 4.1,  $P = .03$ ). No significant difference across genders and ethnicities were observed.

**Table 4.2 Differences of Behaviors and Perceptions between the Control and the Intervention Group at Post-Assessment**

Dietary Behaviors and Perceptions	Mean		P
	Control	Intervention	
<i>Behavior</i>			
Breakfast Intake	3.6	5.2	.001**
FV Consumption	4.1	4.8	.04*
<i>Perceptions</i>			
Attitude	3.7	4.1	.02*
Perceived Behavior Control	3.9	4.1	.21
Subjective Norm	4.0	4.2	.18
Intention	3.9	4.2	.01*

PA Behavior and Perceptions	Mean		P
	Control	Intervention	
<i>Behavior</i>			
PA	4.9	5.6	.002**
<i>Perceptions</i>			
Attitude	4.4	4.3	.80
Perceived Behavior Control	4.4	4.6	.09
Subjective Norm	4.1	4.1	.68
Intention	4.1	4.3	.16

Note. \* P < .05. \*\* P < .01.

### PA Behavior and Perceptions

Table 4.2 shows that at post-assessment, compared with the control group, students in the intervention group significantly increased their frequency of MVPA participation (Mean = 5.6, P = .002). Additionally, at post-assessment, students in the intervention group indicated significantly higher level of the perceived behavioral control towards PA (Mean = 4.6, P < .001) and intention to be physically active (Mean = 4.3, P = .002) when compared with the baseline assessment (Table 4.3).

The post-hoc paired contrasts showed significant differences across grade levels with regard to PA behavior (P = .002). Sixth graders (Mean = 5.8) indicated significantly higher frequency of engaging in MVPA for at least 60 minutes per day when compared with 7<sup>th</sup> graders (Mean = 4.9, P = .002). There was no significant difference across genders and ethnicities.

**Table 4.3 Differences of Behaviors and Perceptions between the Control and the Intervention Group at Pre- and Post-Assessment**



Dietary Behaviors and Perceptions	Control			Intervention		
	Pre	Post	P	Pre	Post	P
<i>Behavior</i>						
Breakfast Intake	3.8	3.7	.33	5.0	5.3	.11
FV Consumption	3.9	4.0	.71	3.7	4.8	.000***
<i>Perceptions</i>						
Attitude	3.7	3.6	.87	3.5	4.1	.000***
Perceived Behavior Control	3.7	3.9	.08	4.0	4.1	.39
Subjective Norm	3.5	4.0	.03*	4.0	4.2	.07
Intention	3.7	3.9	.27	3.7	4.3	.000***
PA Behavior and Perceptions	Control			Intervention		
	Pre	Post	P	Pre	Post	P
<i>Behavior</i>						
PA	5.1	5.0	.91	5.0	5.7	.000***
<i>Perceptions</i>						
Attitude	4.2	4.3	.28	4.3	4.4	.30
Perceived Behavior Control	4.3	4.3	.63	4.2	4.6	.000***
Subjective Norm	4.0	4.0	1.00	4.3	4.1	.21
Intention	3.9	3.9	.66	4.0	4.3	.002**

Note. \* P < .05. \*\* P < .01. \*\*\* P < .001

## Intervention Effect

### The Theory of Planned Behavior Variables and Fruit and Vegetables Consumption

Table 4.4 shows that when controlled for demographic variables (gender, grade, and ethnicity), multiple linear regression of FV consumption intent as the dependent variable and TPB constructs (attitude, perceived behavioral control and subjective norm) as independent variables showed that the attitude ( $\beta = 0.24$ ,  $t = 2.38$ ,  $P = .02$ ) and the perceived behavioral control ( $\beta = 0.27$ ,  $t = 2.63$ ,  $P = .01$ ) predicted 22% of the model variance and the TPB constructs produced a significant equation. Whereas when FV behavior was regressed with the TPB constructs as independent variables, the perceived behavioral control ( $\beta = 0.31$ ,  $t = 2.85$ ,  $P = .005$ ) served as significant predictor of the FV consumption behavior. Moreover, when demographic variables were controlled and the FV consumption behavior was regressed with intention as independent variable, the FV consumption intention ( $P < .001$ ) predicted FV consumption behavior and explained 17% of the model variance.

**Table 4.4 Multiple Linear Regressions for FV Consumption and PA Intentions and Behaviors**

Predictor Variables	Intention		Behavior	
	Model 1 $\beta$ (t)	Model 2 $\beta$ (t)	Model 1 $\beta$ (t)	Model 2 $\beta$ (t)
<i>FV Consumption</i>				
<b>Gender</b>	0.01 (0.07)	-0.03 (-0.30)	-0.10 (-1.00)	-0.15 (-1.51)
<b>Grade</b>	0.05 (0.51)	0.10 (1.02)	-0.08 (-0.84)	-0.11 (-1.09)
<b>Ethnicity</b>	-0.02 (-0.21)	-0.04 (-0.46)	0.001 (0.01)	-0.02 (-0.22)
<b>Attitude</b>		0.24 (2.38)*		0.09 (0.85)
<b>Perceived Behavioral Control</b>		0.27 (2.63)*		0.31 (2.85)**
<b>Subjective Norm</b>		0.10 (0.99)		-0.07 (-0.68)
<b>R<sup>2</sup></b>	0.00	0.22	0.01	0.12

<i>PA</i>				
<b>Gender</b>	-0.12 (-1.23)	-0.11 (-1.22)	-0.02 (-0.21)	-0.01 (-0.16)
<b>Grade</b>	-0.09 (-0.88)	-0.05 (-0.61)	-0.17 (-1.70)	-0.13 (-1.40)
<b>Ethnicity</b>	0.03 (0.31)	-0.01 (-0.11)	0.09 (0.95)	0.08 (0.84)
<b>Attitude</b>		0.17 (1.65)		0.30 (2.78)**
<b>Perceived Behavior Control</b>		0.31 (3.24)**		0.09 (0.85)
<b>Subjective Norm</b>		0.17 (1.68)		0.07 (0.62)
<b>R<sup>2</sup></b>	0.02	0.27	0.04	0.18

*Note.*  $\beta$  values are standardized coefficients with t values in parentheses.

\*  $P < .05$ . \*\*  $P < .01$ .

### **The Theory of Planned Behavior Variables and PA behavior**

With regard to PA behavior, multiple linear regression of intent as the dependent variable and TPB constructs as independent variables showed that the attitude ( $\beta = 0.31$ ,  $t = 3.24$ ,  $P = .002$ ) predicted 27% of the model variance and the TPB variables produced a significant equation when the demographic variables were controlled. When PA behavior was regressed as the dependent variable and the TPB constructs as the independent variables, the model was significant too, and the attitude for PA ( $\beta = 0.30$ ,  $t = 2.78$ ,  $P = .006$ ) predicted 18% of the model variance. Additionally, when the PA behavior was regressed with the intent as the independent variable, the PA intention ( $P < .001$ ) also predicted PA behaviors and explained 17% of the model variance when controlled for demographic variables.

### **Intuitive Eating Factors**

At post-assessment, the intervention group had significantly higher total IE score (Mean = 36.4) and Factor 1—Unconditional Permission to Eat score (13.2) when compared with the

control group (Mean = 34.2,  $P = .001$  and Mean = 11.7,  $P < .001$ ). As shown in Table 4.5, compared with the baseline assessment, significant differences were observed in the intervention group with regard to all of the three IE factors. Additionally, for Factor 1, 8<sup>th</sup> graders (Mean = 13.7) had significantly higher score when compared with 6<sup>th</sup> graders (Mean = 12.8,  $P = .005$ ). No significant difference across demographic variables was observed for Factor 2—Eating for Physical Rather Than Emotional Reasons and Factor 3—Reliance on Internal Hunger/Satiety Cues. Furthermore, in the intervention group, the total IE score was directly related to students' attitude towards healthy eating ( $R = 0.20$ ,  $P = .04$ ) and the perceived behavioral control for being physically active ( $R = 0.20$ ,  $P = .04$ ).

**Table 4.5 Differences of IE Factors Scores between the Control and the Intervention Group at Pre- and Post-Assessment**

IE Factors	Control			Intervention		
	Mean (%)			Mean (%)		
	Pre	Post	P	Pre	Post	P
<b>Factor 1</b>	12.4 (62%)	11.7 (78%)	.03*	12.3 (62%)	13.2 (66%)	.000***
<b>Factor 2</b>	7.0 (70%)	7.1 (71%)	.74	6.4 (64%)	7.2 (72%)	.000***
<b>Factor 3</b>	15.7 (79%)	15.7 (79%)	1.00	15.2 (76%)	16.0 (80%)	.009**

*Note.* \*  $P < .05$ . \*\*  $P < .01$ . \*\*\*  $P < .001$

### Teachers' Responses

At post-assessment, teachers who taught the WE modules rated the effectiveness of each module. The range of the ratings was from 3.7 to 4.3 on a 5-point Likert scale. Teachers also agreed (Mean = 4.0 on a 5-point Likert scale) that the WE modules developed students' abilities to think about the subject. More importantly, the teachers considered that students had significantly increased their knowledge and skills related to: (1) identifying body's hunger and

fullness signals ( $P = .02$ ); (2) eating the foods they like with moderation ( $P = .04$ ); and (3) making informed food choices that benefit their health ( $P = .04$ ). Furthermore, teachers indicated that they would probably (Mean = 4 on a 5-point Liker scale) recommend the WE modules to other teachers or students to use.

## **Discussion**

This study examined adolescents' breakfast intake, FV consumption, PA behaviors and the effectiveness of a nutrition education material—WE in a cross-sectional study. TPB variables that contributed to FV consumption and PA behaviors were identified, and differences across demographics were described.

The results indicated that by the end of the pilot study, participating students significantly increased their breakfast intake frequency, FV consumption frequency, and PA participation frequency after they completed the WE modules. Thus, the hypothesis that by the end of the study, participants in the intervention group will increase their breakfast intake, FV consumption, and PA participation than the control group was supported. Findings from Healy et al.'s (2015) study showed high school students who received an IE program showed a significant improvement in their overall healthy eating attitudes when compared with students in the comparison program.<sup>27</sup> Moreover, students who received the IE program also showed significantly increase in the Unconditional Permission to Eat factor score. Additionally, Bacon et al.'s (2005) IE study also showed that individuals who had been trained to eat intuitively were able to increase and maintain their PA levels.<sup>24</sup>

Furthermore, the theory of planned behavior variables were found to be predictive factors affecting FV consumption and PA intentions. Similar to previous studies which showed adolescents with a higher sense of behavioral control were more likely to make healthier food

choices and be more physically active,<sup>15,17</sup> the results in this study revealed the perceived behavioral control among participating students had the most consistency in determining FV consumption and PA intentions. These results supported the hypothesis that there will be an improvement in the adolescents' perceived behavioral control after they complete the WE modules. Also, the results indicated that the FV consumption and PA intentions significantly predicted the behaviors. Since the TPB is based on the concept that the stronger the intention to perform a given behavior, the greater the likelihood that the person will perform the certain behavior,<sup>16</sup> the results of this study further warrant that interventions focusing on promoting the TPB variables, especially the perceived behavioral control to increase FV consumption and PA participation are proven to be effective.

This study adds to the growing literature on the TPB and IE interventions to promote healthy dietary and PA behavior change. The findings that at post-assessment, participating students in the intervention group had significantly higher total IE score supported the hypothesis that by the end of the study there will be an increase in the adolescents' IE perceptions after they complete the WE modules. The results of this study proved that based on the TPB framework, IE intervention could serve as a promising avenue for encouraging the development of healthy dietary and PA behaviors and perceptions in the adolescent population, which may then promote life-long well-being and reduce the risk of obesity. However, it has to be noted that due to the nature of group setting nutrition education, the concepts of susceptibility to peer pressure and body image dissatisfaction have been regarded as barriers to healthy lifestyle,<sup>43,44</sup> thus some of the IE principles that focus on dieting and body image were not able to be included in the WE modules.

The strength of the study includes: (1) addresses timely public health issues among adolescents—breakfast intake, FV consumption, and PA participation—within a low-income and ethnic setting; and (2) provides some insight into the behavior determinants among limited-resource adolescents. However, it has some potential limitations that need to be addressed. The first limitation of this study was the reliance on self-reported data. The study is likely to have external validity issues due to self-reporting, especially as participants attempted to recall their FV consumption and PA behaviors. In addition, using a 3-day dietary record may be more reliable and accurate estimates of the FV intake than using a survey, particularly in children.<sup>45</sup> Besides, participating students may also systematically alter their responses in the direction that they perceived to be socially desirable. Secondly, the survey tool used in the study had some 1- or 2-item measurements which may cause low reliability and validity issues. For self-assessment health surveys, it is not uncommon to find tools that have only one or two indicators to measure a particular variable due to the constraints of resource and survey time,<sup>46-51</sup> and we believe that the 1- and 2-item measurements used in this study captured the purpose and needs of the study. However, since having only one or two items to identify a construct has been recognized as problematic sometime,<sup>52,53</sup> we do prefer to add more items. Thirdly, in addition to the ethnic population, the rural setting of this study could affect the generalizability of findings to urban or suburban areas and other ethnicity or race. Fourthly, although the survey tool used for the study was based on in-depth literature review and informed by experts' opinion, it had not been previous validated or tested.

### **Conclusions and Implications for Research and Practice**

The findings tested the effectiveness of WE education modules and further emphasized the need for more interventions on IE to improve healthy dietary and PA behaviors in the

adolescent population. Future studies could explore ways to increase breakfast intake, FV consumption, and PA participation in this age group to reduce their risk for obesity development. This could be achieved by improving TPB related variables as well as incorporate built environment factors such as the availability of nutritious opportunities and PA resources. Students' perceptions of the built environment for healthy eating and PA should be investigated to guide future interventions.



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## **Chapter 5 - Discussions, Conclusions and Recommendations for Future Research and Practice**

### **Discussions**

Overall, this study examined adolescents' breakfast intake, fruit and vegetables (FV) consumption, physical activity (PA) behaviors and the effectiveness of a nutrition education material—Wise Eating (WE) in a repeated measures study. The Theory of Planned Behavior (TPB) variables that contributed to FV consumption and PA behaviors were identified, Intuitive Eating (IE) factor scores were demonstrated, and differences across demographics were described at both the pre- and the post-assessment.

At baseline pre-assessment, compared with the estimated US adolescents' trends in FV intake (16% to 26% meet the FV intake guideline),<sup>1</sup> only 11% of the participants in this study met the FV consumption recommendation. This may be due to the reason that adolescents in this study were from a limited-resource community, where the availability of nutritious opportunities was largely lacking. The limited availability of healthy foods in low-socioeconomic status communities could also attribute to the lower demand for healthy food options due to health literacy disparities.<sup>2</sup> Additionally, the results also showed that adolescent boys and girls had similar rate of meeting FV recommendation, which were in line with previous studies that have shown gender difference was not significant in FV guideline adherence among adolescents.

Furthermore, 31% of the students at the pre-assessment study reported consuming breakfast everyday of the week, and younger students (6<sup>th</sup> graders) indicated significantly higher breakfast consumption frequency when compared with their older peers. Although previous studies have shown that breakfast consumption frequency in the US has declined over time and a gradually declining trend has been observed with the growing of ages, participants in this study

had a much lower breakfast consumption frequency rate (31%) when compared with the US estimates (58%).<sup>3,4</sup> This discrepancy may also be due to the reason that adolescents in this study were from limited-resource communities and had healthy literacy disparities.<sup>2</sup> Additionally, other reasons may include lack of time in the morning, do not feel hungry in the morning, and a desire to control weight.<sup>5,6</sup>

At pre-assessment, approximately 24% of participating students in our study met PA recommendations, and this finding is similar to recent population-based estimates of PA guideline adherence.<sup>7,8</sup> Boys in this study had a significantly higher rate of meeting PA recommendation and their attitudes toward being physically active were more positive when compared with girls. These findings confirm previous studies which have shown that boys were more active and more likely to engage in MVPA than girls,<sup>9,10</sup> whereas PA levels tend to drop dramatically for girls during adolescence.<sup>11</sup>

In the pre-assessment, the TPB variables were found to be predictive factors affecting FV consumption intent, and the intention directly predicted participating adolescents' FV consumption behavior. Attitudes toward eating healthy, perceived behavioral control and perceived norm were found to be significant factors in adolescents' responses about FV consumption intention. Attitudes toward health are specifically important in predicting behavior, and results show a significant correlation with the perceived behavioral control.<sup>12</sup> Moreover, gender was also found to be predictive factors of FV consumption intention. These results were in line with Lien et al.'s (2016) study, which had shown that the TPB explained adolescents' intention to eat FV and gender served as a mediator between intentions and behaviors.<sup>13</sup> Also, TPB variables, especially the perceived behavioral control served as significant predictors for adolescents' PA intention and behavior in our study. This result was consistent with Hagger et

al.' (2002) meta-analysis of TPB variables.<sup>14</sup> In Hagger et al.'s (2002) study, TPB variables were accounted for variance in PA intentions and behavior, and the perceived behavioral control explained unique variance in PA intention.

In the investigation of breakfast intake and FV consumption behaviors, IE factors were found to be predictive of factors affecting the frequency of breakfast intake and FV consumption. Consistent with Dockendorff et al.'s (2012) study, these results indicated that constructs of IE were viable and relevant for middle-school aged adolescents.<sup>15</sup> However, in this study, the IE factors were seemed to be irrelevant for PA behavior. Given the expected benefits of IE, it may be a promising avenue for future intervention to encourage the development of healthy dietary behaviors and attitudes in the adolescent population, but future studies are also needed to evaluate how IE interventions could encourage PA behavioral change.

At post-assessment, the results indicated that by the end of the study, participating students significantly increased their breakfast intake, FV consumption, and PA participation after they completed the WE modules. Thus, the hypothesis that by the end of the study, participants in the intervention group will increase their breakfast intake, FV consumption, and PA participation than the control group was supported. Findings from Healy et al.'s (2015) study showed high school students who received an IE program showed a significant improvement in their overall healthy eating attitudes when compared with students in the comparison program.<sup>16</sup> Moreover, students who received the IE program also showed significantly increase in the Unconditional Permission to Eat factor score.<sup>16</sup> Additionally, Bacon et al.'s (2002) IE study also showed that individuals who had been trained to eat intuitively were able to increase and maintain their PA levels.<sup>17</sup>



Furthermore, the TPB variables were found to be predictive factors affecting FV consumption and PA intentions at post-assessment as well. Similar to previous studies that had shown that adolescents with a higher sense of behavioral control were more likely to make healthier food choices and be more physically active, our results showed that the perceived behavioral control among participating students had the most consistency in determining FV consumption and PA intentions.<sup>13,14</sup> These results supported the hypothesis that there will be an improvement in the adolescents' perceived behavioral control after they completed the WE modules. Also, results from this study indicated that the FV consumption and PA intentions significantly predicted the behaviors. Since the TPB is based on the concept that the stronger the intention to perform a given behavior, the greater the likelihood that the person will perform the certain behavior,<sup>18</sup> this study's results further warrant that interventions focusing on promoting the TPB variables, especially the perceived behavioral control to increase FV consumption and PA participation are proven to be effective.

The findings that at post-assessment, participating students in the intervention group had significantly higher total IE score supported the hypothesis that by the end of the study there will be an increase in the adolescents' IE perceptions after they completed the WE modules. This study proved that based on the TPB framework, IE intervention could serve as a promising avenue for encouraging the development of healthy dietary and PA behaviors and perceptions in the adolescent population, which may then promote life-long well-being and reduce the risk of obesity. However, it has to be noted that due to the nature of group setting nutrition education, the concepts of susceptibility to peer pressure and body image dissatisfaction have been regarded as barriers to healthy lifestyle,<sup>19-21</sup> thus some of the IE principles that focuses on dieting and body image were not able to be included in the WE modules.

This study adds to the growing literature on IE interventions to promote healthy dietary and PA behavior change. The strength of our study includes: (1) addresses timely public health issues among adolescents—breakfast intake, FV consumption, and PA participation—within a low-income and ethnic setting; and (2) provides some insight into the behavior determinants among limited-resource adolescents. However, it has some potential limitations that need to be addressed. The first limitation of this study was the reliance on self-reported data. The study is likely to have external validity issues due to self-reporting, especially as participants attempted to recall their FV consumption and PA behaviors. In addition, using a 3-day dietary record may be more reliable and accurate estimates of the FV intake than using a survey, particularly in children.<sup>22</sup> Besides, participating students may also systematically alter their responses in the direction that they perceived to be socially desirable. Secondly, the survey tool used in the study had some 1- or 2-item measurements which may cause low reliability and validity issues. For self-assessment health surveys, it is not uncommon to find tools that have only one or two indicators to measure a particular variable due to the constraints of resource and survey time,<sup>23-28</sup> and we believe that the 1- and 2-item measurements used in this study captured the purpose and needs of the study. However, since having only one or two items to identify a construct has been recognized as problematic sometime,<sup>29,30</sup> we do prefer to add more items. Thirdly, in addition to the ethnic population, the rural setting of this study could affect the generalizability of findings to urban or suburban areas and other ethnicity or race. Fourthly, although the survey tool used for the study was based on in-depth literature review and informed by experts' opinion, it had not been previous validated or tested.

## **Conclusions and Implications for Research and Practice**

As a pilot study to test the effectiveness of WE education modules for the adolescent population, the aim of this study was to compare the behavioral and perception differences between the control and the intervention group at the pre- and the post-assessment, to examine the influence of TPB variables on FV consumption and PA participation prior and after the WE intervention. At pre-assessment, the results highlighted the key determinants affecting FV consumption and PA participation, as well as provided potential focus for IE intervention development such as targeting the enhancement of attitudes and perceived behavioral control for behaviors to promote the overall healthy lifestyle among adolescents. At post-assessment, the results tested effectiveness of the WE education resource and further emphasized the needs for more interventions on IE to improve healthy dietary and PA behaviors in the adolescent population. Future studies could explore ways to increase breakfast intake, FV consumption, and PA participation in this age group in order to reduce their risk for obesity development. This could be achieved by improving TPB related variables as well as incorporate built environment factors such as the availability of nutritious opportunities and PA resources. Students' perceptions of the built environment for healthy eating and PA should be investigated to guide future interventions.

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