ADOLESCENTS’ SELF-DETERMINATION TO REGULATE EATING BEHAVIORS:  
ADAPTATION AND VALIDATION OF A SELF-REPORT MEASURE

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Tessa N. Hamilton

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Committee:
Dr. Jessica Hoffman (Chair)
Dr. Amy Briesch
Dr. Rachel Rodgers
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Dedication

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Chapter 1

Adolescents’ Self-Determination to Regulate Eating Behaviors
Literature Review
Abstract

Assessment of an individual’s capacity to regulate his/her eating can aid our understanding of why some individuals are more or less successful in eating behaviors that promote biopsychosocial wellness. To date, prior work has not considered the strengths and weaknesses of existing measures of eating behavior regulation in adolescence, which would permit consideration for how to thoughtfully use extant measures and provide indications for future research. This chapter summarizes the results of a systematic literature review that aims to address this. Included studies were peer-reviewed, measured self-reported eating regulation with adolescents (ages 10 to 19), and were published between 2007-2016. The constructs assessed by the twelve extant measures identified in these articles fell into four broad categories: Affective and motivational influences on eating behaviors (n=5); environmental, home, and social influences (n=2); assessment of eating restraint (n=3); and eating disorder symptomology (n=2). Strengths, limitations, and directions for future research are discussed.
Adolescents’ Self-Determination to Regulate Eating Behaviors: Literature Review

The ability to monitor and regulate one’s own eating behaviors has important implications for physical and emotional wellness. Adolescence may be a period of particular significance in the establishment of sustained eating practices that will persist into adulthood. Importantly, existing research highlights concerning findings related to eating behaviors in the adolescent population. For example, Neumark-Sztainer, Wall, Larson, Eisenberg, and Loth (2011) found that the dieting and disordered eating behaviors of older and younger adolescents were consistent with behaviors observed a decade later, both at the group and individual level. Further, Verschueren (2018) and colleagues suggested disordered eating in adolescence can bi-directionally influence identity formation.

In light of these findings, the development of wellness enhancing eating behaviors is important for the promotion of overall physical and emotional health. Longitudinal assessments suggested that the majority of those surveyed experienced challenges in one more of the following areas at some point during adolescence or early adulthood: use of unhealthy weight control behavior (e.g., laxatives, purging); high body dissatisfaction; and/or excess weight (Neumark-Sztainer, Wall, Larson, Christoph, & Sherwood, 2018). Further, these challenges were pervasive at each five-year follow-up assessment period and well into middle adulthood (Neumark-Sztainer et al., 2018). Another study on adolescents ranging in age from 10 to 14 demonstrated that overweight status was associated with diagnostic criteria for an eating disorder; this was 13 times more likely among those participants with body dissatisfaction (Ceceon, Franceschini, Peluzio, Hermsdorff, & Priore, 2017).

These findings underscore two important factors related to eating and wellness in youth. First, the strong influence that eating patterns (as they relate to both weight and eating disorders)
developed during adolescence may have on practices carried through the life course. Second, eating disorders and overweight/obesity have been typically approached as independent research foci with the theories and approaches relating to their etiology, prevention, and intervention taking disparate approaches (Irving & Neumark-Sztainer, 2002). “Unhealthy” behaviors generally fall at opposite ends of the eating behavior continuum, with those that are indicative or promotive of excess weight and associated health challenges at one end, and those that are indicative of eating disorder pathology at the other (Schwartz & Henderson, 2009). Schwartz and Henderson (2009) describe the “tug of war” that has resulted among researchers whose foci are in the prevention of either overweight or eating disorders/body image. Eating behaviors can swing from one end of this continuum to the other at a rapid rate that is not yet quantified, established, or understood. Schwartz and Henderson (2009) also noted the propensity for traditional obesity prevention programs to increase body dissatisfaction. Relatedly, prospective findings indicate links between dieting—particularly caloric deprivation or restriction, bulimic symptoms, and weight gain among youth (Schwartz & Henderson, 2009).

Though potentially well intentioned, adults’ efforts to address the weight status of youth can inadvertently damage a child or adolescent’s body image, sense of self, and overall wellbeing. The perception of weight stigmatization is associated with higher levels of binge eating and increased food consumption (Puhl & Suh, 2015). Further, irrespective of weight status at the start of one longitudinal study, individuals who had been stigmatized due to their weight were between 2.5 to 3 times more likely to become or remain obese than those who had not (Puhl & Suh, 2015). This could partially explain the disconcerting findings that a man or woman classified as obese has a 1 in 8 (12.5%) or 1 in 7 (14.2%) chance, respectively, of achieving a 5% reduction in body weight, which medical professionals recommend as an annual target for body
size reduction (Fildes, Charlton, Rudisill, Littlejohns, Prevost, & Gulliford, 2015). Chances of achieving a “healthy” weight are near impossible; a 0.08% chance among obese women and 0.04% among obese men (Fildes et al., 2015). Thus, the “traditional” models to approach obesity prevention and intervention may not only contribute to body dissatisfaction, eating disorder pathology, and worsening overall health, they are likely an ineffectual approach altogether. This is yet a further reason for the unification of the approaches to the assessment, prevention, and early interventions related to dysregulated eating for a more encompassing, wellness-enhancing approach to the regulation of eating behavior (Irving & Neumark-Sztainer, 2002).

To date, beliefs surrounding “healthy” dietary practices have varied widely both within and across weight and eating disorder research. For example, some researchers and clinicians classify certain food groups as healthy, including those that are low in saturated fat and cholesterol, varieties of fruits and vegetables, whole grains (Croll, Neumark-Sztainer, & Story, 2001). Unhealthy foods are classified by a subset of researchers as items comprised predominantly of sugar, trans fats, or saturated fats, and with no nutritional value (Schwartz & Henderson, 2009). Others assert that there are no “healthy” or “unhealthy” foods and that all foods are healthy when consumed in moderation (Schwartz & Henderson, 2009). Thus, notions of “healthy” or “unhealthy” eating behaviors often encompasses the consumption of permitted foods and the abstention of forbidden ones (Schwartz & Henderson, 2009). Relatedly, notions surrounding dietary restraint suggest that “healthy eating” behaviors involve conscious control of one’s eating to refrain from excess consumption (Schwartz & Henderson, 2009). Of note, a study surveying American junior high and high school students’ perception of “healthy eating” suggested a range of perceptions that mirror those highlighted above; however, the authors noted that the identifying motivators and key reasons for healthy eating differed across genders: for
males, these were sports, and appetite; for females, appearance concerns were paramount (Croll et al., 2001).

With regard to unhealthy weight control, or disordered eating, researchers have classified the following behaviors as “unhealthy”: fasting, eating very little food, using food substitute powders, skipping meals, smoking cigarettes, taking diet pills, inducing vomiting, use of laxatives, and diuretics (Neumark-Sztainer, Wall, Story, & Standish, 2012). However, the use of some of these measures, such as intermittent fasting, meal replacement, and caloric restriction are also regarded by some researchers as effective means of promoting weight loss and reducing risk for coronary heart disease (Klempel, Kroeger, Bhutani, Trepanowski, & Varady, 2012). Thus, there is a need to consider situational and dispositional factors in the conceptualization of these behaviors as well. For some adolescents perceived to be overweight, engagement in these behaviors may be accompanied by excessive preoccupation and/or psychological distress, warranting consideration of potential eating disorder pathology. However, in the absence of excessive weight reduction or reaching a weight status that is regarded as unhealthy or concerning, this much less likely to raise alarm than among those perceived to be thin or of an “appropriate” weight.

Wade and O’Shea (2015) highlighted this phenomenon. They examined the experiences of individuals classified as having an Unspecified Feeding and Eating Disorder according to the Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition criteria (DSM-5; APA, 2013). Nearly one-third of their sample demonstrated a cluster of symptoms the authors termed “Restricting and Exercise Disorder,” which demonstrated similar clinical/sub-clinical thresholds for impairment and social/occupational dysfunction as other eating disorders (Wade & O’Shea, 2015). However, the authors noted that because (a) the behaviors associated with this diagnostic
profile can, in other capacities and behavioral clusters, be associated with health and wellness, and (b) the individuals meeting these diagnostic criteria are generally considered medically overweight, their activity was likely to “in fact be encouraged rather than highlighted as cause for concern” (Wade & O’Shea, 2015, p. 373).

Further, Rodgers (2016) proposed that the designation of weight status using the formerly biomedical classifications of a “Healthy Weight” has resulted in a sociocultural internalization of attitudes and beliefs about body size and social responsibility, which can lead to problematic body image and eating disorder concerns. Thus, this too requires thoughtful conceptualization. For the purposes of this chapter, an optimal weight is defined as a body mass at which an individual is able to achieve a maximal level of physiological and psychological wellness, at a level of functioning that allows them to prosper individually and in their socio-cultural environment.

Regardless of the target of an intervention relating to consumption patterns, eating behavior change requires adolescents to engage in a process of eating behavior regulation, which can be defined as exerting an influence on their nutritional patterns by means of engaging in processes of self-observation, self-judgment, and self-reaction (Schunk, 2008). Reconciling efforts across these areas requires a conceptualization of what it means to be “healthful” in one’s eating patterns and weight status that encompasses notions traditionally associated with eating disorder and weight/nutrition-related research. Thus, for the purposes of this chapter, healthy eating is conceptualized as dietary practices that are promotive or enhancing an individual’s biopsychosocial health, and are consistent with their physiological, cognitive, psychological, and sociocultural standards for nourishment and daily functioning (Levine et al., 2016; World Health Organization, 2018; Taylor, Evers, & McKenna, 2005).
Adapting one’s behaviors to achieve or sustain healthy eating practices is dependent, in part, on contextual factors, including economic factors, educational level, social determinants, and environmental factors (Taylor et al., 2005). While access and opportunity in these areas may be necessary, they alone do not produce lasting engagement over the long term (Pelletier, Dion, Slovenic-D’Angelo & Reid, 2004a; Taylor et al., 2005). For example, parental efforts to limit access to certain foods for children and adolescents can lead to excessive consumption of these foods when they are available or when the parent is not around (Birch, 1999; Taylor et al., 2005). As a result, an enhanced understanding of factors that contribute to how a person’s eating behavior is, individually and uniquely regulated, is warranted in order to enhance prevention and intervention efforts.

**Self-Determination Theory**

The study of motivation, as proposed by self-determination theory (SDT; Deci & Ryan, 1985, 2002; Ryan & Deci, 2000), is relevant to the study of eating and weight-based disorders in several ways. Ryan and Deci (2000) conceptualized motivation as an interest or investment to achieve a particular goal. SDT proposes a framework for the study of motivation and personality that considers an individual, both in terms of his/her innate characteristics as well as influencing social conditions and processes (Deci & Ryan, 1985, 2002; Ryan & Deci, 2000).

Research grounded in SDT led to the introduction of a sub-theory, Organismic Integration Theory (OIT), which identifies discrete types of motivation, based on environmental or cognitive features, that guide an individual’s behavior (Ryan & Deci, 2000). OIT stipulates that there are three general types of motivation that occur along a continuum of least-to-most self-determination. **Self-determination**, as conceptualized by Deci and Ryan (1985) is “the capacity to choose and to have those choices, rather than reinforcement contingencies, drives, or
any other forces or pressures, be the determinants of one’s actions” (p. 38). The continuum includes amotivation, extrinsic motivation, and intrinsic motivation (Ryan & Deci, 2000). *Intrinsic motivation* represents one end of the continuum and represents activities that some individual finds internally rewarding (Pelletier, Dion, & Levesque, 2004b; Ryan & Deci, 2000). Activities in this class are carried out *autonomously* and with a high degree of self-determination; as a result, the terms autonomous, self-determined, and intrinsic motivation are used relatively interchangeably in the SDT literature (Pelletier, et al., 2004a; Ryan & Deci, 2000). *Amotivation*, which lies at the other end of the spectrum, involves a complete lack of value or identification with the purpose of a behavior (Ryan & Deci, 2000). In between lies *extrinsic motivation*, in which the incentive to engage in a behavior is to “prompt agreeable consequences or to avoid disagreeable ones” (Pelletier et al., 2004a, p.248). However, OIT proposes that extrinsic motivation can be further differentiated based on the extent to which the regulation of a certain behavior is external versus internal (Ryan & Deci, 2000). In order from least-to-most autonomously motivated behavior, the four types of extrinsically motivated regulation are external regulation, introjected regulation, identified regulation, and integrated regulation (Ryan & Deci, 2000).

**Self-Determination and Eating Behavior Change**

Prior studies have demonstrated that intrinsic motivation is associated with a lower likelihood for excess weight. Examples of these factors include greater participation in leisure-time physical activities among adolescents (Gillison, Standage, & Skevington, 2006), as well as engagement in healthy eating behaviors, and weight-reduction that is sustained over a longer period (Mata et al., 2009). Additionally, eating behaviors driven by intrinsic motivation are less likely to be disordered (e.g. bulimic symptoms, extreme focus on the quantity of food consumed
or associations with weight gain) than externally motivated eating behaviors (Pelletier & Dion, 2007; Pelletier, et al., 2004a; Pelletier et al., 2004b).

Assessing self-determination to regulate one’s eating behaviors can enhance the ability to understand how consumption patterns relate to and/or are influenced by psychological processes and may better permit the prediction of eating behaviors indicative of biopsychosocial wellness (Pelletier et al., 2004a). Enhancing understanding in this area is critical in light of the high rates of drop out in programs that aim to influence eating behaviors. For example, within pediatric weight management programs dropout rates range from 27% to 73% in extant literature, with lack of/loss of motivation cited as one potential reason for treatment dropout (Skelton & Beech, 2011). Similarly, studies of adolescents and young adults undergoing treatment for eating disorders in both inpatient and outpatient settings, reported attrition rates ranged from 20.2% to 70.3%, again with motivation theorized to contribute to participant dropout (Fassino, Piero, Tomba, & Abbate-Daga, 2009). The participant dropout rates for tertiary treatment programs indicate there is room to better understand adolescents’ motivation to regulate their eating behaviors.

The tenets of SDT can be applied to consider participant dropouts from tertiary treatment programs. Individuals with lower levels of self-determination may be motivated by distal, extrinsic influences to engage in behavior change (e.g., at the urging of family or friends, societal pressure; Deci & Ryan, 2000). They are likely to require more consistent external reinforcement to sustain behavior change relative to those with higher levels of internalized self-determination (Deci & Ryan, 2000; Ryan & Deci, 2000). Next, extrinsically motivated individuals may be more likely to engage in disordered eating practices than individuals with higher levels of intrinsic motivation (Pelletier & Dion, 2007; Pelletier, et al., 2004a; Pelletier et al., 2004b). In
addition, individuals with lower levels of self-determination (or, stated differently, with higher levels of external regulation) are more likely to engage in processes of observation, judgment, and reaction influenced by external pressures (e.g., thinness ideal; familial expectations). The repeated receipt of these pressures in social environments may make it more difficult to replace body dissatisfaction beliefs and associated disordered eating practices with self-determined beliefs and associated healthy eating behaviors. In addition, prior work suggests that lower levels of self-determination are associated with lower levels of overall psychological adjustment (Pelletier & Dion, 2007).

Messages surrounding eating behaviors and their relation to a “Healthy Weight” are ingrained in sociocultural practices and can be congruous with a sense of social responsibility (Rodgers, 2016). As a result, the limited and/or variable external reinforcement provided in a short-term weight loss and/or eating disorder program are unlikely to address these in full; however, the process of addressing maladaptive practices or perceptions attached to eating behavior regulation cannot begin if practitioners do not have means to assess internal processes. As stated, individuals in eating disorder and weight reduction programs are working to influence their dietary patterns through processes of self-observation, self-evaluation, and behavioral reaction (Schunk, 2008). Importantly, individuals presenting with eating disorder symptoms, body image issues, and excess weight may display constellations of eating behaviors, which may or may not indicate alarm to those in their sociocultural environment.

For these reasons, the conceptualization and measurement of eating behavior according to the SDT motivational continuum may provide clinicians and researchers with better insight into factors that influence eating behaviors both within and outside of clinical samples. In addition, given that more autonomous forms of regulation are inversely associated with eating disorder
pathology (Pelletier & Dion, 2007; Pelletier, et al., 2004a; Pelletier et al., 2004b) and allow for the consideration of eating behaviors related to weight and eating disorders on the same spectrum, such a tool could represent one small step toward the unification of eating disorder and obesity prevention efforts.

**Existing Measures of Eating Behavior Regulation: Systematic Review of the Literature**

In order to identify extant self-report measures of eating behavior regulation that have been applied to research on adolescents and evaluate their strengths and weaknesses, a systematic review of the literature was conducted. The literature search was carried out in two phases. The first phase of the search reviewed studies that employed self-report measures of eating behavior in adolescents that were used in research over the last 20 years. The second phase of the search explored the development and psychometric properties of extant adolescent eating behavior measures. Finally, the strengths and limitations of the extant measures identified were examined.

**Methods**

The search was carried out using nine electronic databases: Ageline, Alt HealthWatch, CINAHL Complete, Health and Psychosocial Instruments, International Pharmaceutical Abstracts, MEDLINE, Mental Measurements Yearbook, Psychology and Behavioral Sciences Collection, and PsycINFO. Search parameters were set to include peer reviewed articles published between 1998-2018 and included the terms “eating behavior,” “regulation or motivation,” “measurement or assessment,” and “adolescents or adolescence or teen.” Eligible articles were those that included at least one self-reported assessment of eating behavior, whose primary sample was comprised of adolescents (i.e., youth between the ages of 10-19; Sacks, 2003), and for which the full-text could be accessed online. Articles were not limited based on
the type of research design and included both intervention and measurement validation studies. An initial search returned 133 articles, and 13 of these articles were duplicates.

Articles were excluded from the initial returned list if they: (1) did not feature at least one self-report measure (e.g., if assessments were purely anthropometric measurements, excluded \( n=27 \)); (2) if the measure was medical or nutritional in nature (e.g., asked participants to endorse gastrointestinal or diabetes-related symptoms or foods consumed and did not ask about associated emotions or behaviors, excluded \( n=30 \)); (3) if the mean/median age of the sample was college students or the study referred to the sample as “adults” or “young children;” excluded \( n=50 \) and (4) if the survey was developed by the researchers for the purpose of the study and did not have associated psychometric information (excluded \( n=0 \); no studies met this exclusion criteria that were not otherwise excluded by the prior criteria).

These exclusionary criteria were imposed as the focus was to consider measures of self-regulation of eating behaviors in adolescents; thus, measures of medical/nutritional variables and tools that used behavioral observations do not serve the same function as measures that ask an individual to report on their own thoughts, feelings, and actions surrounding their eating behaviors. Relatedly, restricting the age range allowed a consideration of measures that demonstrated prior utility in research with adolescents. Finally, many researchers will develop novel measures or surveys for the purposes of a study (e.g., to evaluate intervention effects) without evaluating the psychometric properties. If the reliability and validity of measures were not evaluated, they were not included in this review.

Article titles were examined to evaluate potential eligibility according to the inclusion and exclusion criteria stated above. Those that were clearly ineligible were removed at this stage. During this wave, 88 articles were excluded, and 43 articles remained. Abstracts of the
remaining 43 articles were examined to evaluate potential eligibility using the inclusion and exclusion criteria stated above. During this wave 23 articles were excluded, and 20 articles retained. Finally, the full text of the remaining 20 articles was examined to evaluate potential eligibility using the same criteria as in the prior stages. In the final wave, 9 articles were excluded, and 11 articles retained. A second researcher familiar with eating regulation literature reviewed all 133 articles generated in the initial search and independently coded the articles to determine eligibility. Agreement across the two raters was 92% and inconsistencies were resolved upon discussion of search procedures and inclusion criteria. See Table 1 for further characteristics of included studies.

The methods sections of the final 11 articles identified in Phase I were examined to identify those that used measures with established psychometric properties. An ancestral search was conducted using articles identified from reference lists in Phase I using the Scholar OneSearch and Google Scholar electronic databases. In other words, the measures included in this review were all used applied to study adolescents (ages 10-19) in empirical research in the last 20 years, even if they were not initially developed within that time period or for use with this age group. However, if a scale had been originally developed for use with adults but had been specifically adapted for use with children/adolescents, the adapted version was treated as the “original,” given the population of interest. Ten measures of eating behavior regulation that have been used with adolescents in empirical research in the last 20 years were identified in the systematic literature review. Ancestral searches resulted in the identification of two additional measures; in total, twelve measures were identified across eleven articles.
Results

The articles (N=11) that met eligibility criteria in Phase I were published between 2007 and 2017 (see Table 1). The studies were conducted in the United States (n=6), Belgium (n=3), Canada, China, Hong Kong, and Spain, and across Europe. Participants ranged in age from 7.5 to 18 years (see Table 1). The eligible articles were used to identify extant measures (n=12) in Phase II that were published, in their original form, between 1980 and 2014 (see Table 2). The psychometric reliability and validity of the measures was examined in 13 countries. The number of items on the instruments ranged from 10 to 123, and response options across the instruments were predominantly Likert-type ratings (n=9). Each of the articles, presented in the order in which they were published, are summarized below and in Table 2.

Revised Restraint Scale (RRS)

The RRS was created by Herman and Polivy (1980). Items were developed by the researchers to assess weight fluctuation and concern for dieting. Estimates of reliability (Cronbach’s alpha = .75) and validity (based on principal component analyses [PCA] results) suggested adequacy of the mixed-response format measure. The age and nationality of participants was not reported; however, the researchers were located in Germany.

Eating Attitudes Test, 26 item version (EAT-26)

The EAT-26 was created by Garner, Olmsted, Bohr, and Garfinkel (1982). Constructs assessed by the EAT-26 include bulimia, weight, body-image variables, and psychological symptoms. Estimates of reliability (Cronbach’s alpha = 0.83 and 0.90 across control and anorexia nervosa participant samples, respectively) and validity (based on exploratory factor analysis [EFA] results) suggested adequacy of the 6-point Likert scale in a Canadian sample that averaged age 20.5 among control participants 21.5 among clinical participants.
Three-Factor Eating Questionnaire (TFEQ)

The TFEQ was created by Stunkard and Messick (1985) by revising items from the RRS (Herman and Polivy, 1980), Purnell’s Latent Obesity Questionnaire, and through the addition of items based on the authors’ clinical experience (Stunkard & Messick, 1985). The primary subscales are cognitive restraint of eating, disinhibition, and hunger. Estimates of reliability (Cronbach’s alpha ranged from 0.85 to 0.92 across subscales) and validity (based on PCA) suggested adequacy of the mixed-response format measure in a U.S. sample of 17 to 77-year-olds.

Children’s Version of the EAT (ChEAT)

The ChEAT was developed by Maloney, McGuire, and Daniels (1988) by revising items from the adult version. Subscales are identical to the adult version. Estimates of reliability (Cronbach’s alpha = .77) and validity (based on PCA) suggested adequacy of 4-point Likert scale in a U.S. sample of 8 to 13-year-olds.

Regulation of Eating Behavior Scale (REBS)

The REBS was developed by Pelletier and colleagues (2004a). The REBS is designed to measure eating according to the six forms of regulation proposed by SDT: external regulation, introjected regulation, identified regulation, integrated regulation, intrinsic motivation, and amotivation. Researchers familiar with SDT developed eating-behavior items that were designed to assess the regulatory styles proposed by the theory. Estimates of reliability (Cronbach’s alpha ranged from .79 to .91 across subscales) and validity (based on EFA and confirmatory factor analysis [CFA]) suggested adequacy of the 7-point Likert scale in a Canadian sample that ranged in age from 17 to 50 years.

Food and Friends Questionnaire (2F)
The 2F was developed by Georgiou (2005). The primary subscales of the 2F are food attitudes transmitted by peers, approval by peers of new eating habits, and adaptation to the eating habits of peers. The methods used to develop items were not reported. Estimates of reliability (Cronbach’s alpha ranged from .70 to .78 across subscales) and validity (based on EFA) suggested adequacy of the 5-point Likert scale in a Greek sample that averaged 16.6 years.

**Intuitive Eating Scale (IES)**

The IES was developed by Tylka (2006); items were developed with the purpose of assessing intuitive eating, unrestrained eating, and adaptive eating by developing items from theoretical frameworks, a review of literature, and an expert/panel review. The primary subscales/areas assessed by the measure are unconditional permission to eat, eating for physical rather than emotional reasons, and reliance on internal hunger satiety cues. Estimates of reliability (Cronbach’s alpha ranged from .72 to .79 across subscales) and validity (based on EFA/CFA) suggested adequacy of the 5-point Likert scale in a U.S. sample that ranged in age from 17 to 61 years.

**Emotional Eating Scale Adapted for Children and Adolescents (EES)**

The EES was developed by Tanofsky-Kraff et al. (2007). The primary subscales of the EES are eating in response to anxiety, anger, frustration, depressive symptoms and feeling unsettled. The scale was developed through the adaptation and validation of an adult version of the scale. Estimates of reliability (Cronbach’s alpha ranged from .83 to .95) and validity (based on PCA) suggested adequacy of the 5-point Likert scale in a U.S. sample that ranged in age from 8-17 years.

**Eating in the Absence of Hunger Questionnaire for Children and Adolescents (EAHQ)**
The EAHQ was developed by Tanofsky-Kraff, Ranzenhofer, Yanovski, Schvey, Gustafson, and Yanovski (2008). Items were developed based on the clinical experience of the researchers to assess negative affect, external eating, fatigue/boredom. Estimates of reliability (Cronbach’s alpha ranged from .80 to .88 across subscales) and validity (based on PCA) suggested adequacy of the 5-point Likert scale in a U.S. sample that ranged in age from 6-19 years.

**Dutch Eating Behavior Questionnaire- Child Version (DEBQ)**

The DEBQ was developed by Van Strien and Oosterveld (2008). The primary subscales of the measure are restrained, emotional, and external eating. Items on this scale were developed by adapting them from the original, adult version of the DEBQ. Estimates of reliability (Cronbach’s alpha ranged from .73 to .82 across subscales) and validity (based on CFA and item analysis results) suggested adequacy of the 5-point Likert scale in a Belgian sample of 7-12-year-olds.

**Youth Form of the Motivators of and Barriers to Health-Smart Behaviors Inventory (MB-HBSI-Youth)**

The MB-HSBI–Youth was developed by Tucker, Rice, Desmond, Hou, Kaye, and Smith (2012) for the purposes of self-identified sources of motivation and barriers to health-promoting behaviors, including eating behaviors. The measure was developed through the use of focus groups who aided researchers in developing a pilot version of the measure that was subject to additional panel review. Estimates of reliability (Cronbach’s alpha ranged from 0.78 to 0.93 across subscales) and validity (based on EFA) suggested adequacy of the 4-point Likert scale in a U.S sample of 9-17-year-olds.

**Tempest Self-Regulation Questionnaire for Eating (TESQ-E)**
The TESQ-E was developed by De Vet, De Ridder, Stok, Brunso, Baban, and Gaspar (2014) for the purposes of assessing self-competence to regulate one’s eating behavior. Items were developed through the use of focus groups; responses from focus groups were then categorized prior to administering the measure to subjects. Estimates of reliability (Cronbach’s alpha = .70) and validity (based on CFA) suggested adequacy of the 7-point Likert scale in a U.S sample of 10-17-year-olds.

Discussion

The current review of 12 extant measures for adolescents highlights the breadth of components and factors related to eating behavior regulation that have been reliably measured using available instruments and applied in empirical research in geographically diverse settings. However, there are some areas of consideration to be noted. Some of the articles in which measures were piloted (Tucker et al., 2012; DeVet et al., 2014) described explicit efforts to ensure that the development and validation of their measure involved a process and/or sample that was culturally, ethnically, racially, and/or socioeconomically diverse. Notwithstanding these exceptions, the majority of studies were originally validated in homogenous samples and are reflective of an ever-present and longstanding need to diversify participants in psychological research (Graham, 1992). In addition, although the psychometric properties of some instruments designed for adults have since been examined in adolescent samples, some studies have used instruments designed for adults with younger samples without consideration of the reliability or validity of the measure with a different group of respondents. For example, the psychometric properties of the REBS (Pelletier et al., 2004a) have not been evaluated in adolescent populations, yet DeVet et al., (2014) applied subscales of the REBS in their study as a measure of concurrent validity.
It is of increasing clinical importance and scientific utility for health care providers to develop ways of measuring eating behavior regulation that does not singularly conceptualize weight status, consumption patterns, or food items as indicative of poor or good health, but instead identifies the potential affective and/or regulatory influences of eating behaviors.

Affective and/or emotional influences may play an important role in eating behaviors for some groups more than others; for example, one study suggested that among those receiving inpatient treatment for eating disorders 94% also experienced mood disorders, and 56% experienced anxiety disorders (Blinder, Cumella, & Sanathara, 2006). It is therefore reasonable to expect that affective influences may have a differential impact on eating behavior regulation for some subsets of the population. Further, prior studies indicate that women report negative emotional feelings more than men, so it is possible that measures that assess for affective influences on eating behaviors may be more sensitive in female adolescents than males (Simon & Nath, 2004).

Instruments to assess disordered eating behaviors are useful in clinical practice or empirical research, specifically, for the detection of diagnostic symptoms in an individual or population. The measures considered in this systematic review have good reliability and validity and have been applied to increase usability with younger populations (Maloney et al. 1988) or particular subsets of the population (Lynch & Eppers-Reynolds, 2005). Eating disorder pathology, while a form of eating behavior regulation and on the aforementioned spectrum of eating behaviors, may not have relevance to all subsets of the population.

Thus, the limitation to many of the instruments in this class is that they may have restricted applicability outside of the area of identification and/or diagnosis of eating disorder symptomology. In addition, these measures do not provide additional data surrounding potential
contributions or surrounding the factors that influence the disordered eating behaviors, or, in turn, those that may be likely to influence an individual’s likelihood to modify these behaviors. In other words, the results from the EAT or the ChEAT can indicate likelihood that an individual currently experiences a high level of body image dissatisfaction and/or disordered eating behaviors (Garner et al., 1982; Maloney et al., 1988). However, the measure does not supply a clinician or researcher with indications of the loci of this distress (e.g., self-imposed standards, peer standards, home/familial standards). Finally, social desirability response bias is of considerable concern (van de Mortel, 2008). This may be especially likely in the case of eating disorder questionnaires, a topic where adolescents may be able to detect a socially acquiescent response easily.

Instruments that assess eating restraint/control, such as the RRS and subscales of the DEBQ and TFEQ (Herman & Polivy, 1980; Stunkard & Messick, 1985; Van Strien & Oosterveld, 2008) have useful clinical and empirical utility in understanding adolescents’ perceptions surrounding how they limit their consumption patterns in accordance with stated goals/objectives. Assessment of this is beneficial as restraint is implicated in many dietary modification programs. For example, Schwartz and Henderson (2009) note that when clients are instructed to “limit portion sizes,” this involves numerous dietary restraint behaviors, including tracking/tallying caloric consumption, measuring food, planning meals, and/or reading labels. However, there are some limitations for use of measures of this construct. First, they may be especially problematic for assessing diverse eating regulation behaviors of adolescents. Restraint is generally conceptualized as a conscious refrain from excess consumption (Herman & Polivy 1980). There is a large subset of the population for which this experience may not be relevant. Some adolescents may be working to regulate eating behaviors to increase consumption, or to eat
more mindfully. This may be particularly salient for males, or for those adolescents who do not value a thin ideal. Thus, the instruments in this category may not capture all forms of regulation.

Instruments to assess sociocultural factors, such as the 2F or the MB-HSBI–Youth, have numerous applications in practice and research (Georgiou, 2005; Tucker et al., 2012). Namely, these tools are helpful in understanding the social and environmental factors that influence adolescents’ self-determination to regulate eating behavior. These tools can allow for the assessment of eating behavior regulation using an ecological approach and for considering potential areas of risk and resilience within a family, community, or within a particular subset of the population. The limitations to the instruments in these categories are that they may not fully capture the more individual, internal affective processes adolescents experience when regulating their eating.

For example, the 2F specifically asks adolescents to rate agreement on items about friends’ beliefs about food, approval of eating patterns, and how this impacts the respondent’s eating behavior. By contrast, the MB-HSBI-Youth asks respondents to rate agreement with items that are “motivators” (e.g., “It is a habit for me to have a healthy breakfast every day,” Tucker et al., 2012, p. 495) or “barriers” (e.g., “I cannot tell which cereals are the healthy ones,” Tucker et al., 2012, p. 495) to breakfast, snack, and water consumption. Items on both the 2F and MB-HSBI can enhance researchers and practitioners’ understanding as to the internal and external processes and factors that influence adolescents’ eating behaviors. However, several of these factors may also be conceptualized as facilitators of positive eating behaviors.

Finally, the instruments to assess regulation patterns, such as the REBS, IES, DEBQ, and the TESQ-E also possess strengths and weaknesses (DeVet et al.; Pelletier et al., 2004a; Tylka, 2006; Van Strien & Oosterveld, 2008). A strength of these measures is that they encompass
internal processes reflective of affective processing as well as perceptions about one’s own eating behaviors. For example, items on the IES assess affective or motivational influences on eating (e.g., loneliness); however, items also ask respondents to report about level of trust for their body’s hunger signals and/or rules for what/when to/not to eat (Tylka, 2006). Relatedly, the REBS, which asks respondents to indicate why they regulate what they eat, includes items surrounding health-related motivations, appearance motivations, as well as affective influences (Pelletier et al., 2004a). Thus, the measures in this category may be poised to capture a more comprehensive picture of adolescents’ self-determination to regulate their eating. However, an evident weakness of these measures is that they may not fully capture how these internal processes may vary or be dependent upon sociocultural factors.

The REBS is notable from other measures in this class in a couple of ways. First, the other tools primarily function to measure, classify, or distinguish classes of eating behavior or the intentions associated with them. However, the REBS attempts to assess the overarching values or guiding motivational processes that drive these behaviors and intentions. Second, with the exception of the REBS (Pelletier et al., 2004a), each of the regulation classification measures was either specifically developed or subsequently validated with an adolescent sample. The REBS was designed to measure regulation according to six styles proposed by SDT. As stated previously, the applications of SDT to eating behavior regulation in adolescence are significant; thus, expansion of this work is warranted.

The REBS was originally validated with female adults in Canada (Pelletier et al., 2004a; Otis & Pelletier, 2008). One recent study examining the psychometric properties of the REBS with an American sample suggested that the introjected regulation subscale, which was designed to measure regulation of one’s eating to avoid self-imposed consequences, had lower factor
loadings, internal consistency, and correlations with other factors than the other subscales of the measure and compared with the original all-female, adult Canadian sample (Hamilton et al., 2018). Therefore, adaptations of the measure, particularly with respect to introjected regulation, may be warranted prior to further use with mixed-gender, American, adolescents.

**Conclusion**

Adolescence is often an overlooked developmental stage for eating behavior changes that can have a long-lasting impact on individuals’ psychological and physical wellness into adulthood (Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008, p. 2205). An increased understanding of the internal factors that impact eating behavior at this developmental stage may better equip practitioners and researchers to support adolescents in developing eating behavior regulation strategies that enhance their biopsychosocial wellbeing. This type of understanding may also work towards the unification of weight and eating disorder prevention efforts. Existing instruments work to aid in this effort through the multifaceted assessment of eating behavior regulation; however, there is still room for improvement in future development of measures and in additional psychometric validation of existing measures for use with diverse adolescent populations.
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Psychiatry, 9*, 67-76.

Probability of an obese person attaining normal body weight: Cohort study using

dieting is related to rigid control and disinhibition in adolescents from the Québec Family

psychometric features and clinical correlates. *Psychological Medicine, 12*, 871-878.
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Table 1. Literature review: Identified articles

<table>
<thead>
<tr>
<th>Authors</th>
<th>Article Title</th>
<th>Self-Report Measure</th>
<th>Age</th>
<th>Theoretical Orientation if Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Boutelle et al. (2014)</td>
<td>“An intervention based on Schachter’s externality theory for overweight children: The Regulation of Cues pilot.”</td>
<td>The Eating in the Absence of Hunger Questionnaire for Children and Adolescents (Tanofsky-Kraff et al., 2008); Child Eating Behaviour Questionnaire (CEBQ Wardle, Guthrie, Sanderson, &amp; Rapoport, 2001)</td>
<td>8-12</td>
<td>Schachter’s externality theory</td>
</tr>
<tr>
<td>2. Loth et al. (2014)</td>
<td>“Are food restriction and pressure-to-eat parenting practices associated with adolescent disordered eating behaviors?”</td>
<td>Tempest Self-Regulation Questionnaire for Eating (Loth et al., 2014); REBS (Pelletier et al., 2014)</td>
<td>10-17</td>
<td>self-regulation theory</td>
</tr>
<tr>
<td>5. Senra et al. (2007)</td>
<td>“Comparison of 10- to 12-year-old boys and girls using a Spanish version of the children’s eating attitudes test. Personality and Individual Differences”</td>
<td>Children’s Eating Attitudes Test (CheAT; Maloney, McGuire, &amp; Daniels, 1988)</td>
<td>10-12</td>
<td>n/a</td>
</tr>
</tbody>
</table>
Table 1. Literature review: Identified articles (Continued)

<table>
<thead>
<tr>
<th>Authors</th>
<th>Article Title</th>
<th>Measure</th>
<th>Ages</th>
<th>Theoretical Orientation if applicable or reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Ledoux et al. (2011)</td>
<td>“Overeating styles and adiposity among multiethnic youth.”</td>
<td>DEBQ</td>
<td>9-10 and 17-18</td>
<td>psychosomatic theory; externality theory; restraint theory</td>
</tr>
<tr>
<td>9. DeDecker et al. (2017)</td>
<td>“Palatable food consumption in children: Interplay between (food) reward motivation and the home food environment.”</td>
<td>DEBQ</td>
<td>7.5-14</td>
<td>n/a</td>
</tr>
<tr>
<td>10. Gallant et al. (2012)</td>
<td>Past dieting is related to rigid control and disinhibition in adolescents from the Québec Family Study.</td>
<td>Three-Factor Eating Questionnaire (Stunkard, &amp; Messick, 1985)</td>
<td>M=15.0 years</td>
<td>restraint theory</td>
</tr>
<tr>
<td>11. Tucker et al. (2012)</td>
<td>“The Youth Form of the Motivators of and Barriers to Health-Smart Behaviors Inventory (MB-HSBI-Youth)”</td>
<td>MB-HSBI–Youth (Tucker et al., 2012)</td>
<td>9-17</td>
<td>social cognitive theory; health self-empowerment theory</td>
</tr>
</tbody>
</table>
Table 2. Review of measures of eating behavior regulation

<table>
<thead>
<tr>
<th>Measure Title</th>
<th>Authors</th>
<th>Primary Subscales/Areas Measured</th>
<th>Original Sample Age</th>
<th>n</th>
<th>Items</th>
<th>Response Options</th>
<th>Measure Development</th>
<th>Reliability (Cronbach's Alpha)</th>
<th>Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Revised Restraint Scale</td>
<td>Herman &amp; Polivy (1980).</td>
<td>dieting, weight, eating binge-eating and weight variation</td>
<td>Not reported</td>
<td>10</td>
<td>10 items</td>
<td>Items developed to assess weight fluctuation and concern for dieting</td>
<td>0.75</td>
<td>PCA</td>
<td></td>
</tr>
<tr>
<td>2. Eating Attitudes Test (EAT)-26</td>
<td>Garner, Olmsted, Bohr, &amp; Garfinkel, (1982).</td>
<td>bulimia, weight, body-image variables and psychological symptoms.</td>
<td>avg 21.5 AN group and 20.3 control group</td>
<td>26</td>
<td>6-point Likert</td>
<td>Factor analysis to extract items that loaded on relevant factors</td>
<td>0.83 for control participants, 0.90 for clinical participants</td>
<td>EFA</td>
<td></td>
</tr>
<tr>
<td>3. Three-Factor Eating Questionnaire</td>
<td>Stunkard &amp; Messick (1985).</td>
<td>cognitive restraint of eating, disinhibition, and hunger</td>
<td>17-77</td>
<td>51</td>
<td>Combined True/False &amp; 4-point Likert</td>
<td>Herman and Polivy's Revised Restraint Scale items, Pudel's Latent Obesity Questionnaire, items written based on clinical experience</td>
<td>Subscales ranged from 0.85 to 0.92</td>
<td>PCA</td>
<td></td>
</tr>
<tr>
<td>4. Children’s-EAT</td>
<td>Maloney, McGuire, &amp; Daniels, (1988);</td>
<td>bulimia, weight, body-image variables and psychological symptoms.</td>
<td>8-13 years</td>
<td>26</td>
<td>6-point Likert</td>
<td>Adaptation of adult EAT-26</td>
<td>0.77</td>
<td>PCA</td>
<td></td>
</tr>
<tr>
<td>5. Regulation of Eating Behavior Scale</td>
<td>Pelletier, Dion, Slovenic-D’Angelo &amp; Reid (2004)</td>
<td>intrinsic versus extrinsic motivation to regulate eating behaviors</td>
<td>17-50 years</td>
<td>24</td>
<td>7-point Likert</td>
<td>Items developed by researchers familiar with theoretical framework</td>
<td>Subscales ranged from 0.79 to 0.91</td>
<td>EFA/CFA</td>
<td></td>
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</tbody>
</table>

Note. EFA=exploratory factor analysis; CFA=confirmatory factor analysis; PCA=principal component analysis; AN=Anorexia Nervosa.
<table>
<thead>
<tr>
<th>Measure Title</th>
<th>Authors</th>
<th>Primary Subscales/Areas Measured</th>
<th>Original Sample Age</th>
<th>n</th>
<th>Items</th>
<th>Response Options</th>
<th>Measure Development</th>
<th>Reliability</th>
<th>Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Food &amp; Friends Questionnaire</td>
<td>Georgiou, &amp; Kalavana (2005)</td>
<td>social influence on eating behavior</td>
<td>avg 16.6</td>
<td>30</td>
<td></td>
<td>5-point Likert</td>
<td>Not reported</td>
<td></td>
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<tr>
<td>7. Intuitive Eating Scale</td>
<td>Tylka, (2006)</td>
<td>unconditional permission to eat, eating for physical rather than emotional reasons, and reliance on internal hunger/satiety cues;</td>
<td>17-61 years</td>
<td>21</td>
<td></td>
<td>5-point Likert</td>
<td>Items developed to assess aspects of intuitive eating, unrestrained eating, and adaptive eating from theory and literature; expert/panel review</td>
<td></td>
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<tr>
<td>Measure Title</td>
<td>Authors</td>
<td>Primary Subscales/Areas Measured</td>
<td>Original Sample Age</td>
<td>n of items</td>
<td>Response Options</td>
<td>Measure Development</td>
<td>Reliability (Cronbach’s Alpha)</td>
<td>Validity</td>
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<tr>
<td>9. EAHQ-Child &amp; Adolescent Version</td>
<td>Tanofsky-Kraff, Yanovski, Ranzenhofer, Yanovski, Schvey,, Faith, Gustafson, Yanovski (2008)</td>
<td>Negative Affect, External Eating, and Fatigue/Boredom</td>
<td>6-19</td>
<td>14 items</td>
<td>5-point Likert</td>
<td>Based on clinical experience of researchers</td>
<td>Subscales ranged from 0.80 to 0.88</td>
<td>PCA</td>
<td></td>
</tr>
<tr>
<td>10. DEBQ-Child Version</td>
<td>Van Strien, &amp; Oosterveld (2008).</td>
<td>restrained, emotional, and external eating</td>
<td>7-12</td>
<td>33 items</td>
<td>5-point Likert</td>
<td>Validation of Adult DEBQ with child sample</td>
<td>Subscales ranged from 0.73 to 0.82</td>
<td>CFA/Item Analysis</td>
<td></td>
</tr>
<tr>
<td>11. YFMBHSI</td>
<td>Tucker, et al. (2012).</td>
<td>Motivators and barriers to eating a healthy breakfast, eating healthy foods and snacks, drinking healthy drinks, and engaging in physical activity</td>
<td>9-17</td>
<td>19 subscales, 123 total items</td>
<td>4-point Likert</td>
<td>Focus groups used to develop pilot version prior to initial administration; expert/panel review</td>
<td>Subscales ranged from 0.78 to 0.93</td>
<td>EFA</td>
<td></td>
</tr>
<tr>
<td>12. Tempest Self-Regulation Questionnaire for Eating</td>
<td>De Vet, De Ridder,, Stok, Brunso,, Banan,, &amp; Gaspar, (2014).</td>
<td>self-regulatory competence in relation to eating behaviors</td>
<td>10-17</td>
<td>24 items</td>
<td>7-point Likert</td>
<td>Focus groups were used to generate items which were categorized by researchers prior to validation</td>
<td>0.70</td>
<td>CFA</td>
<td></td>
</tr>
</tbody>
</table>

*Note. EFA=exploratory factor analysis; CFA=confirmatory factor analysis; PCA=principal component analysis; AN=Anorexia Nervosa.*
Figure 1. Self-determination model, modified from Ryan & Deci (2000).
Figure 2. Flowchart of selected studies

**Initial Electronic Database Search**
Limits: Participant Ages 10-19, English, 1998-2018  
\( n = 133 \)

**Excluded:**
Duplicates \( (n=13) \); articles not featuring self-report measures \( (n=27) \); self-report measures that were medical or nutritional in nature \( (n=30) \); if primary sample/focus of study was outside adolescence \( (n=50) \)

**Title Review for Eligibility**  
\( n = 131 \)

**Abstract Review for Eligibility**  
\( n = 43 \)

**Full Text Review for Eligibility**  
\( n = 20 \)

**Reference List Search**  
\( n = 6 \)

**Excluded Search Return:** Duplicates, articles not featuring self-report measure; medical/dietary foci; non-adolescent sample  
\( n = 120 \)

**Ancestral Search:**  
\( n = 5 \)

**Articles Meeting Eligibility Criteria:** \( n = 11 \)
I. emotion-related constructs and eating behaviors \( (n=6) \)
II. environmental/social influences \( (n=2) \)
III. measure development/validation \( (n=3) \)
Chapter 2

Assessment of Eating Behavior Regulation: Validation of a Self-Report Measure
Abstract

The aim of this study was to adapt a measure of eating behavior regulation developed for use with adult females, the Regulation of Eating Behavior Scale (REBS), for use with mixed-gender, adolescent. The study aimed to evaluate the psychometric properties of the adapted measure and to evaluate how responses differed across races/ethnicities and genders. Responses were examined in a sample of 261 adolescents across the United States. The factor structure was examined using exploratory (n=150) and confirmatory factor analyses (n=100). A two-factor model was identified as the best fit for the data in both analyses and using multiple fit indices. The revised measure demonstrated good internal consistency and validity. Subscale scores did not differ across gender or ethnicity for more intrinsic forms of eating behavior regulation, but they were significantly different across extrinsic forms of eating behavior regulation. The measure can be applied for use in future research to better understand properties of adolescent eating behavior regulation. Conclusions, implications, and future directions are discussed.
Assessment of Eating Behavior Regulation in Adolescence

In the fall of 2018, Huffington Post journalist Michael Hobbes published an article entitled “Everything You Know about Obesity is Wrong.” The article was debated widely in subsequent opinion-editorial articles and on social media in weeks and months following (e.g., Markey, 2018). One of the most prominently displayed quotes in the article speaks to Hobbes’ (2018) experience in writing the piece:

*I have never written a story where so many of my sources cried during interviews, where they shook with anger, describing their interactions with doctors and strangers and their own families* (para. 7).

Hobbes’ quote highlights the need for enhancing researchers’ and clinicians’ capacity to more effectively support the social and emotional processes that are associated with eating and weight regulation. Longitudinal assessments suggested that the majority of adolescents had experience in one more of the following areas at some point by the time they reached adulthood:

- Employing unhealthy weight control mechanisms; high levels of body dissatisfaction; or classification according to medical standards as being overweight (Neumark-Sztainer, Wall, Chen, Larson, Christoph, & Sherwood, 2018). Eating disorders and body dissatisfaction have generally been regarded as areas of research and intervention that are separate from the study of excess weight; however, these findings highlight the potential benefits of efforts that marry these (Irving & Neumark-Sztainer, 2002).

In light of these findings, the assessment of affective and motivational processes that govern eating behavior regulation may better support researchers in accounting for internal, affective processes that support health-promoting behaviors. *Eating behavior regulation (EBR)* can be characterized as the adjustment or influence of nutrient consumption patterns by engaging in processes of self-observation, self-judgment, and self-reaction (Schunk, 2008). Understanding
the factors that influence EBR may better equip researcher and clinicians to address conditions that can both positively and negatively impact the biopsychosocial functioning of adolescents.

Unification of weight and eating disorder efforts will require that researchers develop novel definitions that encompass notions across both bodies of research. Thus, for the purposes of this work, healthy eating is conceptualized as dietary practices that promote or enhance an individual’s biopsychosocial wellness, and are consistent with their unique cognitive, psychological, physiological needs and support sociocultural standards for nourishment and daily living (Levine et al., 2016; Taylor, Evers, & McKenna, 2005; World Health Organization, 2018). In addition, classification of healthy weight status may also require reconsideration. Rodgers (2016) suggests that formerly biomedical classifications of a “Healthy Weight” have resulted in a sociocultural internalization of attitudes and beliefs about body size, which can be accompanied with problematic body image and eating disorder concerns. For the purposes of this study, a healthy weight is considered a self-determined construct—the body mass at which a person is able to achieve a maximal level of physiological and psychological health and at a level of functioning consistent with their individual and sociocultural functioning.

**Self-Determination Theory, Motivation, and Adolescent Eating Behavior Regulation**

An understanding of the regulatory patterns proposed by self-determination theory (Deci & Ryan, 1985, 2002; Ryan & Deci, 2000) has relevance to the study of adolescent EBR. Self-determination, as conceptualized by Deci and Ryan (1985) is “the capacity to choose and to have those choices, rather than reinforcement contingencies, drives, or any other forces or pressures, be the determinants of one’s actions” (p. 38). In this regard, higher levels of self-determination are regarded as more intrinsic, autonomously driven behaviors (Deci & Ryan, 1985; 2002; Ryan & Deci, 2000). By contrast, controlled regulation involves management of behaviors, that are
not perceived as being selected or chosen by an individual, through the use of external consequences, pressure/influence, or contingencies (Deci & Ryan, 2002; Ryan & 2000; Pelletier, Dion, Slovenic-D’Angelo, & Reid, 2004).

In prior studies, level of self-determination to modify eating behaviors was assessed among adult Canadian individuals, identified as at-risk for coronary artery disease and enrolled in a weight reduction intervention program (Pelletier et al., 2004). At the conclusion of the 26-week intervention, higher levels of self-determination to change eating behaviors were associated with a greater reduction in saturated fat/total fat consumption, body weight (among individuals for whom this was an identified goal) and reductions in blood lipid parameters (Pelletier et al., 2004).

Pelletier et al. (2004) observed similar relationships between self-determination and numerous constructs within adult Canadian undergraduate women; for example, participants with higher self-determination to regulate their eating were more likely to care about the quality of their food ($r=.43$) as opposed to quantity ($r=.18$). The opposite relationship was observed among participants with more controlled eating regulation where the concern for quantity ($r=.41$) was more strongly and positively correlated than the concern for quality ($r=.21$; Pelletier et al., 2004a). Importantly, lower levels of self-determination were positively correlated with bulimic symptomology ($r=.68$) and depressive symptomology ($r=.43$; Pelletier et al., 2004a). In addition, some research has demonstrated a motivational “spill over” effect across eating and exercise behaviors, such that interventions targeting exercise motivation also led to increases in self-determined EBR (Mata et al., 2009).

Finally, adolescence often marks the emergence of awareness, interest, and motivation to alter one’s food consumption or weight status, especially among females (Rolls, Fedoroff, &
Guthrie, 1991). However, the regulatory patterns associated with adolescents’ eating behaviors have not been sufficiently explored. Taken together, these findings highlight the important role assessing affective processes can play in adolescent wellness promotion.

Prior research related to eating behavior change among adolescents has generally examined treatment outcomes without regard for the affective or motivational processes that underlie these results. For example, Austin, Field, and Wiecha (2012) found that female adolescents enrolled in the Planet Health interdisciplinary obesity prevention program were less than half as likely to engage in purging or to use diet pills as adolescents in a comparison group. The Planet Health intervention also reduced the odds for being classified as overweight according to medical standards over two subsequent school years. Despite overlooking the motivational components, the findings from Planet Health may be the first evidence of the efficacy of the integration of overweight and eating disorder prevention (Austin et al., 2012).

However, Austin et al. (2012) also noted that it was unknown what specific components of the program were responsible for these changes, and many questions remain about the mechanisms that resulted in a shift in adolescents’ EBR. Thus, assessment of motivational properties can provide supplemental information about the key components of interventions, environments, or subcultures that are wellness-enhancing.

The Regulation of Eating Behavior Scale (REBS)

Pelletier et al. (2004) applied the tenets of SDT and notions of internal versus external regulators of eating behavior to develop the REBS. Respondents rated the extent to which each item corresponded to their motives for regulating their eating on a 7-point scale (Pelletier et al., 2004; see Appendix A). This measure could provide an opportunity for researchers and clinicians to better understand affective and motivational properties of EBR. In addition, the REBS allows
for conceptualization of EBR across the SDT spectrum of motivation; that is, it allows for an assessment of self-determination to regulate eating behavior ranging from least-to-most autonomously regulated. As stated, assessing self-determination and the degree to which it is intrinsic versus extrinsic may allow researchers and clinicians to better understand why interventions are or are not effective and how to differentially support individuals depending upon their regulatory needs.

Despite the potential utility of the measure, it has some existing limitations, especially with use in a diverse adolescent population. The studies examining the validity of the REBS were both conducted with female, Canadian students at one university (Pelletier et al., 2004). Beyond age and body mass index, additional demographic characteristics of the sample (e.g., race/ethnicity) were not provided (Pelletier et al., 2004) and measures of reliability (e.g. test-retest reliability) beyond internal consistency were not examined.

**Study Purpose**

The demographic characteristics of the sample used to validate the REBS posed significant limitations for the interpretation of scores in heterogeneous American samples. Although the REBS has been applied to the study of adolescent EBR, its psychometric reliability and validity have not been evaluated with this age group (De Vet, De Ridder, Stok, Brunso, Baban, & Gaspar, 2014). The language used in the REBS may not be appropriate for use with diverse adolescent populations, and this is difficult to estimate given that specific demographic information (e.g., race/ethnicity) of the sample used to validate the measure was not provided (Pelletier et al., 2004). For example, one item on the scale asks respondents to indicate how well the statement, “Because I must absolutely be thin” corresponds with their own reasons for regulating their eating behaviors (Pelletier et al., 2004). Subgroups of adolescents, such as Black
females (Wilson, Sargent, & Dias, 1994) and males (Morrison, Kalin, & Morrison, 2004) may not view thinness as an ideal body type but may still be otherwise motivated to regulate their eating behaviors.

According to the Flesch-Kincaid readability test, the REBS has a 7th grade reading level. This may be too advanced for many adolescents, given that the average reading level of texts selected by American high school students according to the Advantage-TASA Open Standard Readability formula is 5th Grade, Second Month (Renaissance Learning, 2016). In addition, the wording of many REBS items does not follow modern guidelines generally recommended for Likert formats. Crocker and Algina (2006) suggest that items be comprised of clearly worded, short, non-complex, positively stated sentences that are free of indefinite qualifiers or statements open to many interpretations. However, the REBS features several items that deviate from these guidelines; this includes items with compound sentences (e.g. “I don’t really know; I truly have the impression that I’m wasting my time trying to regulate my eating behaviors.”) and negative wording (e.g. “Because I would feel ashamed of myself if I was not eating healthy.”).

Finally, some items on the REBS include indefinite qualifiers and multiple potential interpretations. For example, the statement, “Because I believe that it will eventually allow me to feel better,” not only features an indefinite qualifier, but also could be interpreted as referring to feeling better about one’s appearance, physical strength, or the reduction of existing adverse symptoms/experiences. Additionally, several statements on the REBS are embedded with assumptions that are questionable within adolescent populations, including that they possess a universal understanding of what “eating behavior regulation,” “healthy eating,” and “unhealthy eating” means.
The REBS was developed for use with autonomous, adult populations. Therefore, several items refer to independent cooking activities that likely influence adults’ EBR (e.g. “… I take pleasure in fixing healthy meals,”). Adolescents have comparatively less autonomy in the types of foods offered to them at meals and may instead regulate their eating behaviors primarily through the types of foods selected, purchased (e.g. in school lunches, from vending machines, from convenience stores), or the amount of food consumed. It is worthwhile to consider these limitations in the adaptation of the measure for use in adolescent populations.

The present study aimed to adapt the REBS to address the limitations outlined above and to examine the adapted version’s reliability and validity in a gender diverse adolescent sample. The following hypotheses were tested in this study.

**Research Questions and Hypotheses**

(1) Does the revised REBS measure demonstrate the same factor structure in a diverse adolescent sample as observed in adult samples?

   a. As a six-factor structure was observed by Pelletier et al. (2004) with an adult sample, it was predicted that a six-factor structure would be replicated in the current sample.

(2) Does the revised REBS measure demonstrate adequate test-retest and internal consistency reliability?

   a. As the original measure demonstrated adequate internal consistency, it was predicted that this would be observed in the present sample (Pelletier et al., 2004). Though test-retest reliability was not examined in the original measure, subsequent research suggested that response scores were correlated across administrations.
separated by several months (Hamilton et al., 2018). It was predicted that the adapted measure would be temporally stable.

(3) Does the revised REBS measure demonstrate adequate convergent, divergent, and concurrent validity?

a. As a measure of convergent validity, scores from the revised measure were correlated with a subscale from an existing measure of intuitive eating. Given that high levels of self-determination are understood to reflect intrinsic satisfaction obtained from healthy eating behaviors (Pelletier et al., 2004), it was predicted that the intrinsic motivation subscale would positively correlate with an existing measure that assesses intuitive eating and that this measure would negatively correlate with amotivation, introjected regulation, and external regulation.

b. As a measure of divergent validity, it was hypothesized that scores from the revised measure would be weakly correlated with measures of psychosocial functioning and self-esteem, as an indication that the constructs assessed by the revised measure were unique from overall psychosocial adjustment and self-esteem of participants. Given that prior research (e.g., Pelletier et al., 2004; Deci & Ryan, 2000) have suggested associations between psychosocial functioning/self-esteem with higher levels of autonomous regulation, it was expected that some relationship between these constructs would be observed. However, in indication that the revised measure assesses unique constructs, the strength of these predictions was expected to be weak or non-significant.

c. As a measure of concurrent validity, the revised measure scores were correlated with eating disorder symptoms. Prior research has suggested that higher levels of
extrinsic motivation to regulate eating are associated with eating disorder symptoms; conversely, it has been observed that intrinsic motivation is negatively associated with eating disorder symptoms (Pelletier et al., 2004). Given these findings, it was predicted that the more internal forms of regulation (i.e., intrinsic motivation, integrated regulation) would negatively correlate with the eating disorder subscale scores and that these scores would positively correlate with the more external forms of regulation (i.e., amotivation, introjected regulation).

d. As a measure of concurrent validity, the revised measure was used in a linear regression analysis to predict reported nutrition and physical activity behaviors. As higher levels of intrinsic motivation have been associated with increased exercise and healthier food consumption, was predicted that more internal forms of regulation would be associated with higher levels of fruit/vegetable and breakfast consumption as well as physical activity (Mata et al., 2009). Given that reports of health behaviors, such as exercise engagement, may be subject to acquiescent responding, it was also beneficial to assess behaviors that influence and/or relate to the health behaviors of interest. In light of this, screen time was also assessed; given that screen time use is associated with lower levels of physical activity, it was also predicted that higher internal forms of regulation would be associated with lower levels of screen time use (Melkevik, Torsheim, Iannotti, & Wold, 2010).

e. As an additional measure of concurrent validity, the revised measure was used in a linear regression to predict Body Mass Index. Given prior findings that higher levels of internal forms of motivation were associated with increased/sustained weight reduction (e.g., Leon, Madden, Gray & Horwath, 2012; Pelletier et al.,
2004), it was predicted that higher levels of internal regulation would be associated with lower BMI $z$-scores.

(4) How does EBR vary across genders and races/ethnicities?

a. Prior studies indicated significant differences across genders on some, but not all subscales of the revised measure, but effect sizes were small (Hamilton et al., 2018). Given the small effect sizes and that the prior study used a sample comprised primarily of females, it was hypothesized that subscale scores would be similar across groups.

(5) Do the responses of adolescents on a measure of EBR demonstrate the spectrum of motivation proposed by SDT?

a. Given prior findings (e.g., Hamilton et al., 2018; Pelletier et al., 2004) in which EBR was observed to occur in a spectrum consistent with the SDT continuum of motivation, it was expected that the correlational pattern among latent factors observed in the current study would reflect the SDT continuum with factors possessing the strongest, positive relationships to factors closest to them, progressively weaker towards the middle and a negative relationship with those at the opposite end of the spectrum.

**Methods**

**Phase I**

The first component of the project involved the adaptation of the REBS for use with adolescents, utilizing input from prior studies (e.g., Hamilton et al., 2018) and through the integration of feedback from a panel of adolescents and experts.

**Participants.** Male and female adolescents between the ages of 13 and 18 years ($N=12$; $M = 14.58$ years; $SD = 1.62$) were identified through convenience sampling. All of the adolescents
were participants at a community recreation center in the Northeastern U.S. All of the adolescents identified through this convenience sample were Black. A pool of experts (N=15) were contacted to obtain systematic feedback; these included researchers and clinicians familiar with SDT, eating behavior research, and nutrition sciences, eating disorders, weight reduction programs, and measurement theory. Respondents (N=4) included a professor of psychology and experienced statistician who had worked with the REBS in research previously, a professor of psychology with expertise in SDT and the original author of the REBS, a professor of nutrition who had previously utilized SDT in research and clinical practice, and a dietician and eating disorder specialist.

**Procedures.** Approval was obtained from the Northeastern University (NEU) Institutional Review Board (IRB). The REBS (Pelletier et al., 2004) in its existing form was first assessed for readability for an adolescent population and the item content was evaluated for developmental appropriateness. Utilizing feedback from previous studies (e.g., Hamilton et al., 2018) and addressing the aforementioned concerns (e.g., readability, ability for items to apply to a mixed-gender adolescent population), the REBS items were revised. The intent of these revisions was to retain as much of the original content as possible while ensuring appropriateness for the intended population. In addition to revision to the items, the directions were revised to address concerns related to the generalizability to a general population. Specifically, given the wide interpretation of what “healthy” eating means for individuals and families, it felt important for this to be operationally defined in the revised directions. Specifically, the directions were revised to instruct respondents to consider “what healthy eating means to you and how true each sentence is for why you might make choices about how you eat.” According to the Flesch-Kincaid readability test, the readability of the revised measure was a 5th grade reading level.
The revised measure (the Adolescent Scale of Eating Behavior Regulation [ASEBR]) was then presented to the adolescent panel in individual interviews. After the adolescents read through the questionnaire directions and items, the researcher asked the respondents to explain what they thought the directions were asking the reader to do, to identify any words that were difficult, and to explain any points of confusion or difficulties the reader had in understanding the directions. The researcher then asked the adolescents to identify items they believed were not relevant to their experience as an adolescent (e.g., “Are there any questions on this survey that were difficult for you to respond to based on how you live your daily life?”) and the researcher solicited suggestions for how the item could be reworded to better encompass their experience. Finally, the researcher asked the adolescents to select a question, to identify an answer in their minds, and to discuss the cognitive process that they used to obtain the answer. Interviews followed an informal, semi-structured format. Cognitive probes in each of the categories developed by Collins (2003; i.e., comprehension, retrieval, concrete judgment) were used to guide questions (see Appendix B).

The researcher took written notes during the interview. Each interview lasted 10-15 minutes and was conducted in a private office inside the community center within view of the teen director during the teen’s regularly scheduled activities. This area was deemed by the community partner to be convenient and comfortable for the adolescents. The results of these interviews demonstrated that all of the teens found the revised instructions easy to understand. The majority of the teens (n=8) indicated that one item that referred to meal/snack preparation did not feel relevant to their experience and suggested rewording the item to reflect food selection (e.g., purchasing food items at/after school). Teens’ explanation of their cognitive processes suggested a reflection of the affective/emotional processes that influenced their eating.
For example, a seventeen-year-old member of the teen panel discussed having received a football scholarship for college and that his athletic performance was closely tied with his identity. He explained that he identified food as healthy or unhealthy depending upon how he perceived it impacted his athletic performance. He provided feedback to improve the wording of an item intended to measure integrated regulation. The item read, “I pick the food I eat because getting all of the food groups is part of my lifestyle.” The panel member explained that he did not associate how healthy a food was with particular food groups or nutritional content, but rather with how they gave him energy to perform as an athlete. He gave the specific example of needing to eat bread with butter and his mother’s rice before games because it provided enough energy to sustain his activity. This panel member’s feedback was underscored by other teen members who described intent to avoid consuming too much of one type of food, but did not consider food groups when doing so. Based on this feedback, this item was revised to “I pick the food I eat because making sure I eat a balanced diet is part of my lifestyle.” The teen panel’s feedback was used to further revise and improve the measure before further assessing its content validity.

**Assessment of content validity.** The updated revised survey was presented to an interdisciplinary panel of experts to assess the content validity. Experts were informed as to which items were designed to measure which SDT constructs. The intent was to calculate a content validity index following procedures outlined in Polit, Beck, and Owen (2007) by asking respondents to rate the degree to which each item is relevant for the particular construct on a scale from 1 (not relevant) to 4 (highly relevant). Feedback was solicited using a Qualtrics survey. Consistent with Polit et al. (2007) procedures, the item level content validity index (I-CVI) would have been calculated by counting the number of experts that rated a given item as 3
or 4 divided by the total number of experts in the sample \( (n=5) \). However, only four (out of the 15 contacted) experts responded to the queries for feedback. Of these, only two provided ratings. The original author of the REBS and an additional researcher with expertise in psychometrics and previous experience applying the REBS in research provided these ratings. Given the substantial expertise of these researchers, this was considered to be sufficient in improving the scale; however, it did not provide sufficient ratings to calculate an I-CVI. Ratings on items that were less than 4 or 5 were revised and sent back to the experts. Only one expert provided revised ratings, and that expert indicated that the revised items were adequate. The feedback from the reviewers was incorporated to further improve the content validity and this form of the revised REBS, the ASEBR, was administered to the full study sample in Phase II (see Appendix I).

**Phase II**

**Participants**

English-speaking adolescents between the ages of 12 and 19 years \( (N= 261) \) were recruited from three sites: (a) a summer program for high-achieving high school students with interests in the sciences located in a suburban region in Southwestern U.S. (comprising 25% of the total sample); (b) a community recreation program that served predominantly under resourced children and families located in an urban metropolitan region in Northeastern U.S., (comprising 7% of the total sample); and (c) through Facebook advertisements to parents across the U.S. who provided consent and referrals for their adolescent children (comprising 68% of the total sample).

Participants were from 34 states across the U.S. and ranged in age from 12 to 19. A chi-square test of independence was performed to examine demographic differences across the three data collection sites. There were significant differences across the three sites in terms of gender, \( \chi^2 (8, N=255) = 25.05, p<.01 \), age \( \chi^2 (14, N=255) = 119.72, p<.01 \), and ethnicity, \( \chi^2 (26, \ldots) \).
The suburban science program sub-sample ranged in age from 15 to 19, was predominantly female, and Caucasian and/or Hispanic. The urban recreation program sub-sample ranged in age from 14 to 19, was equal in males/females and was entirely Black or Hispanic. The online sample ranged in age from 12 to 18 and was predominantly male and Caucasian. Participants completed the surveys in the summer, between school years; the grade level they were to enter in the following year spanned from 6th grade to sophomore year of college. The sample was comprised of 60% males (n = 156), 37% females (n = 96), 1.2% (n = 3) non-binary individuals, and 2.3% (n = 6) transgender individuals. With regard to weight classification, 93.4% of the sample fell within the healthy weight range according to Body Mass Index (BMI) z-score. A higher percentage of females were in the overweight or obese category (25.58%) than males. Approximately 32% of transgender and 66% of non-binary individuals within the sample were either overweight or obese; however, these subsets of the sample were significantly smaller than males or females. Additional demographic characteristics of the full sample are detailed in Table 1a and Table 1b.

A randomly selected subset of participants were contacted two-weeks following the completion of the study to re-complete the revised measure. Participants who responded to the request completed it on a first-come, first-served basis until the study was closed. The subset of the sample at Time 2 was comprised of 22 of the adolescents who participated at Time 1. This subset ranged in age from 12 to 16 and entering grades 6 through 11. The sample was 34% female, 40% male, 4% non-binary and 22% transgender. All participants at Time 2 were Caucasian, Hispanic, or Black/African American.
Measures

A methodological aim of this study was to replicate procedures carried out by Pelletier et al. (2004) insofar as possible, in a manner that was appropriate for the new sample. Thus, the measures were selected based on the constructs assessed in the original study, using instruments validated for use with adolescent populations with consideration for completion fatigue and timing constraints at the partner sites.

Demographic questionnaire. Participants were administered a survey that asked for general demographic information including their age, gender, grade, race/ethnicity, geographic location, estimated height and weight (see Appendix C). Height, weight, and gender were used in order to calculate BMI \( z \)-score.

ASEBR. Participants were administered the ASEBR. Akin to the REBS, the 24 items were designed to measure six subscales corresponding to the six regulatory styles proposed by SDT (i.e., intrinsic motivation, amotivation, integrated motivation, identified motivation, external motivation, and introjected motivation). Two weeks following the initial administration, the ASEBR was re-administered to a subset of the sample (\( n=22, 8\% \) of the total sample) to assess test-retest reliability. As stated previously, one data collection site was not willing to participate in a second administration. At the other data collection site, all participants were offered the opportunity to re-take the survey. A subset of online participants was randomly selected and offered to complete the survey a second time.

Eating Attitudes Test, 26-item version (EAT-26). Participants were administered the five-item Food Pre-Occupation (FPO) subscale of the EAT-26 (Garner, Olmsted, Bohr & Garfinkel, 1982; see Appendix D). Constructs assessed were psychological symptoms associated with disordered eating. Estimates of reliability (Cronbach’s alpha ranged from .83 to .90 across
control and anorexia nervosa participant samples, respectively) and validity (based on exploratory factor analysis) suggested adequacy of the 6-point Likert scale in a Canadian young adult sample (Garner et al., 1982; Lynch & Eppers-Reynolds, 2005). The EAT-26 was also validated for use with adolescents (Jones, Bennett, Olmsted, Lawson, & Rodin, 2001). The EAT-FPO subscale had acceptable internal consistency among males (α=.71) and females (α=.79) in the present sample.

**Intuitive Eating Scale, Unconditional Permission to Eat Subscale (IES).** Participants were administered the IES, Unconditional Permission to Eat six-item subscale (Tylka, 2006; see Appendix E). Similar to the REBS, the IES assesses affective and or motivational influences that shape regulation of eating behaviors. For these reasons, the IES was selected as measure of convergent validity. The survey was developed to assess unconditional permission to eat, eating for physical rather than emotional reasons, and reliance on hunger/satiety cues and had adequate reliability and validity. Higher levels of intuitive eating were associated with positive coping skills, life satisfaction, lower BMI, optimism, positive self-esteem, body satisfaction, and tendency to reject societally imposed standards for thinness in adults (Dockendorff, Petrie, Greenleaf, & Martin, 2012; Tylka, 2006). Dockendorff et al. (2012) examined the validity of the measure with adolescents and found similar associations. As a measure of EBR, the IES has demonstrated positive correlations with constructs that share these relationships with the REBS (Pelletier et al., 2004).

It is worth noting that the version of the IES-Unconditional Permission to Eat subscale was modified (i.e., wording; number of items in the subscale) consistent with the modifications reported Dockendorff et al. (2012) in their assessment of the psychometric properties of the IES with in a child/adolescent population. Specifically, “I have forbidden foods that I don’t allow
myself to eat” was changed to “I have forbidden or ‘bad’ foods that I don’t allow myself to eat,” and “I think of a certain food as ‘good’ or ‘bad’ depending on its nutritional content” was changed to “. . . depending on how much fat or how many calories it has.” In addition, the original IES featured nine items on the Unconditional Permission to Eat subscale. The Dockendorff et al. (2012) study identified that three of these items had low factor loadings or high residuals and they elected to exclude these. In accordance with this, these items were excluded in the present study as well. Higher scores on the IES-Unconditional Permission to Eat subscale are associated with lower levels of intuitive eating (i.e., more externally regulated eating). The IES-Unconditional Permission to Eat subscale had adequate internal consistency in the current sample across males (α=.70), and females (α=.77).

**Outcome Rating Scale (ORS).** As an assessment of divergent validity, the ORS (Miller, Duncan, Brown, Sparks & Claud, 2003; see Appendix F) was administered. This 4-item scale was designed to globally assess interpersonal, social, individual, and overall functioning for the purpose of progress monitoring with therapeutic interventions. The measure asks respondents to rate their impressions of their functioning across these four broad domains using a visual analogue scale (Miller et al., 2003). The placement of their mark is then measured in standardized units and translated to a numerical score. Each of the scores was totaled to create a total ORS score. Prior studies utilizing the ORS demonstrated moderate to high reliability and concurrent validity with more extensive assessments of emotional functioning and therapeutic progress (Bringhurst, Watson, Miller & Duncan, 2006). The ORS had adequate internal consistency in males (α=.73) and strong internal consistency in females (α=.86) in the present sample.
Single Item Self Esteem Scale (SISE). As an assessment of concurrent validity, the SISE was administered (Robins, Hendin & Trzeniewski, 2001; see Appendix G). The SISE is a one-item, self-report measure of self-esteem, and has demonstrated concurrent validity with more extensive measures of self-esteem (Robins et al, 2001). The SISE has been used with individuals between the ages of 9 to 90 years.

Youth Risk Behavior Survey (YRBS). Finally, as additional assessments of concurrent validity, items selected from two subscales of the YRBS were administered. These items asked participants to rate frequency of fruit/vegetable and breakfast consumption as well as engagement in physical activity for 60 or more minutes over the past seven days. Additionally, an item asked participants to estimate the amount of time spent using screens on an average school day. Centers for Disease Control and Prevention [CDC], 2018; see Appendix H). These items were developed for use with adolescents and are administered every two years to youth in schools across the United States (CDC, 2018). The validity (e.g., internal consistency, factor structure) of the full YRBS has not been examined in prior research; however, numerous prior studies have similarly selected relevant items from the YRBS; in addition, the reliability of discrete items has been examined in prior studies (e.g., Howard et al., 2009; Levin et al., 1999; Vagi et al., 2015) The CDC (2014) released a guide for the administration of the YRBS by independent researchers, which recommends the consideration of completion fatigue, cultural appropriateness, and relevance to areas of inquiry when selecting items to administer from the measure.

Procedures

In-person administration. Data collection was carried out with two community partners, in the Southwestern and Northeastern regions of the United States. Approval from NEU’s IRB
was obtained; permission was also obtained from the program directors at each of the community sites. In exchange for their assistance in recruiting participants, the programs were remunerated in different ways: one program requested the researcher provide a “career talk” and the other was provided a $250 stipend to support ongoing health programming efforts. The discrepancy in these forms of remuneration was commensurate with the forms of compensation that were deemed of value to the programs.

Parents of youth in community programs were informed through letters about the research project and were provided the consent form and study information. A “passive-consent” procedure was used; parents were provided the opportunity to opt-out of participation through an array of means (e.g., calling the researcher, emailing the researcher, alerting the program director, or returning the consent form). The researcher visited each community program to conduct data collection. Surveys were administered using Qualtrics software, which participants accessed through any web-enabled device. Paper-and-pencil administration was also offered for participants who preferred this method. At the start of the survey, participants were presented with an assent statement that explained the purpose, risks, and benefits associated with participation. One partner site did not wish to participate in a second survey administration; however, at the other site participants were asked at the end of the survey if they wished to be contacted via text/e-mail to complete the ASEBR two weeks later. Participants were offered their choice of a $5 gift card in exchange for completing the survey on each occasion. Data from paper-and-pencil surveys was manually entered into the database; once entered, all responses were crosschecked with the original hard copies to ensure there were no errors in data entry.

**Online administration.** Given the challenges associated with recruiting a sufficient sample size via community partners, an alternative method for recruiting participants using
online advertisements was selected after the in-person administrations had taken place. This approach involved advertising to parents of teens in the target age range, permitting them to read about the study, and providing consent before providing contact information for their child who could also assent to participate or decline participation. A graphic was developed (see Figure 1 and circulated on Facebook using the platform’s paid, targeted advertising feature. This feature permitted adults between the ages of 35-60 within the United States who identified interests in “motherhood,” “fatherhood,” “academia,” “adolescence,” “child development,” “family,” or “research” to be targeted by the ads.

Parents were offered a $5 gift card if they referred their child and their child participated; however, adolescents were free to assent to completing the survey themselves. Adolescents were also offered a $5 gift card if they did choose to participate. Parents who clicked on the Facebook ad were directed to a Qualtrics landing page that provided them with the study overview and consent form. If they provided consent, they detailed their child’s contact information (i.e., phone number or email address) so that a survey link could be sent to the adolescent.

In order to run the Facebook ad, a “business” profile was created for the study using the name Teen Food Study for the account; this is required to run paid promotions and also permitted parents to ask questions or indicate interest using the Facebook messaging platform. A brief description of the study was provided on the profile. The Facebook ad ran for 10 days and had a total cost of $7.82 to publish. According to the data provided through Facebook analytics, 1472 users were reached by the Facebook ads; 765 of these occurred “organically” (e.g., through “likes” and “shares” from one user to another) 707 of these occurred due to the paid promotion. Users who viewed the ad were located in 47 states across the United States and were primarily female (96.6%). The majority of users (99.9%) viewed the ad on their mobile devices. In total,
583 parent forms were received, providing consent/indicating interest for a teen to participate in the study.

Parents were informed that adolescents would be admitted to the study on a first-come, first-served basis until funds for gift cards were exhausted. It was noted that six individuals submitted applications repeatedly from the same IP address numerous times in rapid succession, suggesting that, in these cases, the submissions were not reflective of true, separate entries. As a result, when this was indicated, these participants were not admitted to the study. In total, 177 adolescents from the online recruitment strategy went on to complete the study before the study was closed. At the end of the survey, adolescents were asked if they would like to be contacted in two weeks to complete the ASEBR a second time. A random subset of the online sample was contacted using the preferred contact method indicated by the adolescent 2-weeks following the date that they completed the first survey. Participants were offered an additional gift card for doing so.

Data Analysis

All identifying participant information was removed prior to data analysis, were stored under password protection, and analyzed using SPSS (Version 25 for Mac) and Stata (IC Version 16.0 for Mac). The data were examined for missing data; a Little’s Missing Completely At Random (MCAR) test was conducted to assess if the missing data displayed any pattern. The results of this test suggested that there was no identifiable pattern to the data, $\chi^2 = 61.91$ (df=48, $p=.08$). No more than three participants missed any one item. The majority of items had no missing data. Given the small portion of missing data relative to the large sample size and because Stata is capable of tolerating missing cases, missing cases were not deleted or imputed before conducting the analyses.
Exploratory factor analysis. An Exploratory Factor Analysis (EFA) was used to identify a facture structure in the current sample. A random subset of the sample (n=150) was selected for this analysis. The data were evaluated to ensure they were fit to carry out an EFA. EFAs are dependent on independence of observation (Tabachnick & Fidell, 2013). As data were collected at separate sites, a possible nesting effect could have occurred and this represents a potential weakness in the study design; however, given that the data were collected across a geographically, racially, and gender diverse sample, it is possible that any nesting effects are representative of true population-based differences (e.g., cultural differences, economic differences).

The distribution of each item was assessed for normality, which was observed in the visual distribution, inspection of Quartile-Quartile plots, and examination of skewness/kurtosis values. Data were examined for influential outliers (e.g., Mahalanobis’ distances examination for multivariate outliers; consideration of Cook’s distances to assess level of influence).

The sample size exceeded the minimum suggested sample size of 100 participants (Hair et al., 1995). Next, inspection of the inter-item correlation matrix revealed several correlations above threshold value of .3, thereby supporting the factorability of the correlation matrix (Tabachnik & Fidell, 2013). Communalities below .3 were observed on three items (“The way I eat is not in my control,” intended to measure introjected regulation, “Other people pressure me to eat the foods that I do,” intended to measure external regulation, and “I eat healthy because of the way I want to look,” intended to measure amotivation) As a result these items were removed before proceeding with further analyses. While communalities below .3 were observed on some other items, these items possessed relationships with the majority of other items above the threshold. Thus, these items were retained. The assumption of linearity was evaluated by
examining scatter plots displaying relationships between pairs of variables (Tabachnik & Fidell, 2013). Linearity was observed in the majority of these relationships. Absence of multicollinearity was confirmed as no correlation coefficients exceeded 0.85 (Pelletier et al., 2004).

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy value of 0.88 confirmed that it exceeded Tabachnik and Fidell’s (2013) criteria of 0.60 or higher. Bartlett’s Test of Sphericity was statistically significant (p<.001). Taken together, these values indicate that the sample size was large enough in relation to the number of items in the measure and that the correlations in the matrix were significantly different than 0 (Tabachnik & Fidell, 2013). In sum, the data were deemed appropriate to carry out an EFA.

The EFA was performed using principal axis factoring (PAF) with an oblique rotation. PAF was selected as it is durable against deviations from a normal distribution and has a higher likelihood of convergence (Coughlin, 2013). The six regulatory styles assessed on the ASEBR occur on a spectrum, such that regulatory styles on either end of the spectrum are expected to correlate higher than those on opposite ends (Pelletier et al., 2004). This suggests that factors within the model should be permitted to correlate, warranting an oblique rotation versus an orthogonal rotation (Tabachnik & Fidell, 2013). Direct Oblimin rotation was selected as the appropriate oblique rotation method as it can tolerate a wide range of correlations among factors and is a widely used oblique rotation approach (Tabachnik & Fidell, 2013).

Decisions regarding the number of factors to extract were guided by consideration of several factors, including scree test, Kaiser criterion, and parallel analysis. Parallel analysis was selected as the factor extraction method, given the propensity for traditional methods (e.g., Kaiser criterion, scree test) to over factor (Hayton, Allen, & Scarpello, 2004). A parallel analysis generates correlation matrices derived from randomly generated values that are equivalent in
terms of sample size and number of variables as those in the study data set (Hayton et al., 2004). Eigenvalues are derived, which indicate the eigenvalues anticipated by chance alone (Hayton et al., 2004). The mean and 95th percentile of these randomly-generated eigenvalues were calculated and compared with the eigenvalues observed in the study data set using PAF. Eigenvalues of factors derived through the PAF should exceed the randomly generated eigenvalue (at the 95th percentile; Hayton et al., 2004). Factors possessing eigenvalues less than the randomly generated eigenvalues were not retained (Hayton et al., 2004).

**Confirmatory factor analysis.** A confirmatory factor analysis (CFA) was used to confirm the factor structure identified through the EFA. The data were evaluated to ensure they were fit to carry out a CFA. Although this sample size is not ideal, Tabachnik and Fidell (2013) postulate that samples sizes ranging from 100 to 200 can be acceptable in instances in which communalities are greater than .50. This was observed in the majority of cases. In addition, CFAs are dependent on independence of observation (Tabachnick & Fidell, 2013). As data were collected at separate sites, a possible nesting effect could have occurred and this represents a potential weakness in the study design; however, given that the data were collected across a geographically, racially, and gender diverse sample, it is possible that any nesting effects are representative of true population-based differences (e.g., cultural differences, economic differences).

The distribution of each item was assessed for normality, which was observed in the visual distribution, inspection of Quartile-Quartile plots, and examination of skewness/kurtosis values. Data were examined for influential outliers (e.g., Mahalanobis’ distances examination for multivariate outliers; consideration of Cook’s distances to assess level of influence).
In order to confirm the absence of multicollinearity, correlations between items and subscales were examined. Item correlations did not suggest multicollinearity across individual items.

Consistent with Kline’s (2016) recommendations, multiple fit indices were examined in order to evaluate the model fit. Fit indices of the unconstrained model were compared with indices of the model produced by Pelletier et al. (2014). Fit indices that were used to evaluate model fit included: (1) minimum fit function chi-square test (CMIN; significance indicates an inadequate fit; Kline, 2016); (2) Root Mean Square Error of Approximation (RMSEA) adequate fit indicated above .05; Kline, 2016); (3) Bentler’s Comparative Fit Index (CFI) values approaching 1.0 are generally considered to represent an adequate fit; (Kline, 2016) (4) Tucker Lewis Index (TLI;; adequate fit is indicated by values above .95; Cangur & Ercan, 2015); and (5) Standardized Root Mean Square Residual (SRMSR; values of less than .10 are indicative of an acceptable fit; Cangur & Ercan, 2015).

Estimates of internal consistency were calculated using the Cronbach’s alpha statistic. Test-retest reliability was measured by calculating Pearson correlation coefficients between subtest scores and total scores at Time 1 and Time 2. Convergent, divergent, and concurrent validity were assessed using Pearson correlation coefficients between subscale scores on the ASEBR and scores on the accompanying measures. Pearson correlations were selected given their use in prior research with similar constructs (Pelletier et al., 2004); in addition, Murray (2003) suggests that when using Likert data, Pearson and Spearman correlations lead to similar conclusions. The IES total score was calculated and correlated with subscale scores on the ASEBR. As stated previously, higher scores on the IES subscale are indicative of lower levels of intuitive eating.
Divergent validity was assessed by analyzing correlational relationships between ASEBR subscales identified through the factor analyses and total scores on the ORS and the SISE. Scores from the EAT-26 FPO subscale were used to assess the relationship between the ASEBR and the presence of psychological symptoms associated with disordered eating as a measure of concurrent validity. In addition, concurrent validity was assessed by comparing ASEBR subscale scores with items on the YRBS and BMI z-scores using linear regression analysis. Prior to conducting these analyses and in order to assess model fit, the assumptions underlying regression (i.e., normality, linearity, independence of observations, and homoscedasticity) were evaluated and the data were deemed fit.

Between-group differences were conducted using multivariate analysis of variance (MANOVA) to examine differences ASEBR subscale scores between gender and race/ethnicity. Assumptions underlying MANOVA were evaluated and the data were deemed fit (Nimon, 2012; Tabachnik & Fidell, 2013). MANOVA assumes multivariate normality of outcome variables (i.e., ASEBR subscale scores; Nimon, 2012; Tabachink & Fidell, 2013). This was assessed through inspection of histograms, quartile-quartile (Q-Q) plots, skew, and kurtosis (Tabachink & Fidell, 2013). Next, sufficient sample size in each group was confirmed. Data were examined and determined to be free of influential outliers. MANOVA assumes homogeneity of the variance-covariance matrices, which was evaluated using Box’s test of equality of covariance matrices; significance values exceeded the threshold value of $p=.01$ which indicated that this assumption was met (Nimon, 2012; Tabachink & Fidell, 2013). Homogeneity of variance across groups was examined using Levene’s test of equality of error variances. Levene’s test indicated unequal variance across groups; given this violation, the Pillai-Bartlett Trace statistic was used, as this test is the most robust to violations to assumptions (Olson, 1976).
Results

Factor Structure

EFA. PAF of the 18 items yielded four factors with eigenvalues greater than 1 (7.41, 3.2, 1.44, 1.11). These factors explained 35%, 15%, 6%, and 5% of the variance, respectively.

Parallel analysis suggested that the third and fourth factor (with eigenvalues 1.44 and 1.11) were less than those that would occur by chance. This contrasted the Kaiser criterion and scree test, which both suggested four factors; however, use of these methods can result in over-factoring (Hayton et al., 2004). As a result, only two factors were retained (with eigenvalues 7.41 and 3.2). Collectively, these two factors explained 50% of total variance. Each of the factor loadings (see Table 2) met the Tabachnik and Fidell (2013) threshold for interpretation of .32 or higher. Five factor loadings exceeded .63, which suggests a 40% overlap in variance and is considered very good (Tabachnik & Fidell, 2013). One factor loading exceeded .70, which suggests a 70% overlap in variance and is considered excellent (Tabachnik & Fidell, 2013). With the exception of the three remaining items intended to assess amotivation (“Eating healthy is a waste of my time,” “eating healthy doesn’t seem to affect my health,” and “I have no idea why I choose the foods that I eat”), items were divided into one factor that measured more internal, autonomous eating regulation versus one factor that measured more external, controlled eating regulation.

The three amotivation items loaded, unexpectedly, onto the former factor. As a result, they were removed and the model was generated again. This resulted in an improvement in the factor loadings. In this model, all factor loadings, with the exception of one, were very good or excellent. It was determined that Factor 1 (possessing all items intended to measure intrinsic, identified, and integrated regulation) was representative of “intrinsic EBR” and Factor 2 (possessing all items intended to measure introjected and external regulation) was representative
of “extrinsic EBR.” The correlations between each item and a given factor were examined (see Table 2). Each item had a moderate or strong relationship with its intended factor.

**Internal consistency.** Estimates of the internal consistency of each subscale were calculated using Cronbach’s alpha in order to evaluate the suitability of remaining items. The alpha coefficient for the intrinsic EBR subscale suggested excellent internal consistency (α = .92). Coefficients for the subscale were calculated if each item were deleted but did not suggest that the deletion of any items would improve the internal consistency of the subscale. The alpha coefficient for the extrinsic EBR subscale suggested strong internal consistency (α = .84). Given that this scale possessed half the items of the intrinsic EBR scale, the discrepancy in reliability coefficients is not unexpected. Coefficients for the extrinsic EBR subscale were calculated but did not suggest that the deletion of any items would improve the consistency of the subscale. This suggested that all items identified through the EFA should be retained in the model.

**CFA.** A CFA was conducted to confirm the factor structure identified through the EFA. To start, a structural model (see Figure 2a) was created, which included two latent variables corresponding to two ASEBR subscales (intrinsic and extrinsic EBR) and the number of observed variables corresponding to each of the 18 remaining items on the survey; 12 items previously on the intrinsic, identified and integrated subscales loaded onto one factor, and items previously on the external and introjected subscales—with the deletion of two problematic items—loaded onto another. Factors were permitted to correlate. All genders were included in the same model. In this initial model, all factor loadings were statistically significant (at the \(p<.001\) level) and covariances between factors were also statistically significant (at the \(p<.001\) level). Fit indices suggested that the model adequately fit the data (Model 1; CMIN= \(p<.001\); RMSEA=0.12; CFI=0.84; TLI=0.82; SRMR=0.08).
Modification indices (MI) were reviewed to identify potential ways to improve the model fit. Pathways were added between the factors with the highest MI. These were between the error terms between five pairs of items, three on the extrinsic EBR factor and two on the intrinsic EBR subscale (see Figure 2b). This further improved the fit of the model (Model 2; CMIN= p<.001; RMSEA=0.1; CFI=0.90; TLI=0.86; SRMR=0.07). MIs were further examined, but were not consistent with theoretical understanding of the data. As a result, Model 2 was determined to be the best fit for the data. Factor loadings from the CFA are provided in Table 3.

**Test-retest reliability.** Across the two administrations, the intrinsic EBR regulation subscale demonstrated poor test-retest reliability (r=.49, p=.02). The extrinsic EBR subscale demonstrated modest test-retest reliability (r=.66, p<.001). An item-by-item test retest reliability analysis suggested that five items on the intrinsic EBR subscale (“When I have the opportunity, I enjoy picking foods that are healthy,” “Eating healthy is a big part of my life,” “I eat healthy because it feels good,” “I pick the food I eat because making sure I eat a balanced diet is part of my lifestyle”) and three items on the extrinsic EBR subscale (“I eat healthy because people important to me get upset if I eat differently,” “I eat healthy because I would be embarrassed if other people thought my eating was out of control,” “I pick healthy foods because it makes me feel better about myself”) had lower correlations across administrations than other items on each subscale.

**Validity**

**Convergent validity: Intuitive Eating Scale (IES; Tylka, 2006).** Estimates of convergent validity were considered by assessing the correlations between IES scores and ASEBR subscale scores (see Table 4). Higher scores on the IES subscales suggested endorsement of items not indicative of intuitive eating. In other words, a lower score was better
on the IES subscale. Contrary to predictions, the intrinsic EBR subscale had a moderate, positive correlation with the IES subscale ($r=.43, p<.001$). This indicated that higher scores on internally regulated eating behavior items on the ASEBR were associated with lower levels of intuitive eating. Consistent with predictions, the extrinsic EBR had a moderate, positive correlation with the IES subscale ($r=.67, p<.001$); in addition, the strength of this correlations exceeded the intrinsic EBR subscale. In sum, the relationship between the responses on the IES, an established measure of EBR, and ASEBR, provided some evidence of convergent validity.

**Divergent validity: self-esteem and psychosocial functioning.** Estimates of divergent validity were calculated using Pearson correlation coefficients, which assessed the strength of the relationship between the ASEBR subscales and the SISE and ORS scores, respectively (see Table 4). A moderate, positive correlation was observed between SISE scores and the intrinsic EBR subscale ($r=.36, p<.001$). This suggested a positive relationship between internal forms of regulation assessed by the ASEBR and self-esteem as assessed by the SISE. The SISE was weakly, positively correlated with the extrinsic EBR subscale ($r=.14, p<.001$). In sum, higher scores on more intrinsic, or self-determined forms of EBR on the ASEBR were positively associated with scores on the SISE. However, more extrinsic scores possessed a weak relationship. This suggests that the constructs assessed by the ASEBR and SISE were not closely correlated with one another and provides some support for divergent validity.

A moderate, positive relationship between ORS total score and the ASEBR intrinsic EBR subscale scores was observed (see Table 4; $r=.48, p<.001$). Extrinsic EBR did not have a significant relationship with the ORS subscales ($r=.02, p=.81$). Overall, this suggests that more self-determined, internal forms of eating reported on the ASEBR were positively associated with higher scores on the ORS. Eating regulation patterns that are less-self determined were not
significantly correlated with measures of psychosocial adjustment suggesting that these measures were assessing different constructs. Further, the observed correlational patterns were consistent with relationships observed between similar constructs in adult populations using the original REBS measure (Pelletier et al., 2004). This was consistent with expectations and provided support for divergent validity.

**Concurrent validity: Eating disorder symptomology.** To examine evidence of concurrent validity, ASEBR subscale scores were correlated with the EAT FPO subscale score. Higher scores on the EAT FPO are indicative of higher levels of eating disorder-related distress and lower scores are indicative of a higher level of functioning. Scores on the extrinsic EBR ($r=.53, p<.001$) subscales were moderately, positively correlated with EAT FPO scores. This was consistent with expectations. The relationship between the intrinsic EBR subscale and the EAT FPO subscale score total was non-significant ($r=.004, p=.95$). It was expected that intrinsic EBR subscale scores would be negatively correlated with the EAT FPO; however this was not observed. More external forms of EBR were associated with higher levels of food-preoccupation symptoms; internally-regulated eating behaviors did not possess a relationship. In sum, this provides some support for concurrent validity.

**Concurrent validity: Health behaviors.** As an additional measure of concurrent validity, a series of multiple regression analyses were conducted to examine the relationships between ASEBR scores and health behaviors/outcomes, namely consumption of fruits, vegetables, and breakfast, physical activity engagement, screen-time use, and BMI z-score (see Table 5).

**Fruit consumption.** First, the relationship between the ASEBR subscales and fruit consumption was assessed. The initial model demonstrated that intrinsic EBR was a significant
predictor of fruit consumption; higher intrinsic EBR—or internally regulated eating behavior—was associated with higher fruit consumption. Extrinsic EBR was not a significant predictor (see Table 5).

**Breakfast consumption.** Next, participant scores reflecting number of days they consumed breakfast were compared with ASEBR subscale scores. Extrinsic EBR was not a significant predictor. Intrinsic EBR was positively associated with breakfast consumption (see Table 5).

**Vegetable consumption.** Next, the relationship between the ASEBR subscale scores and vegetable consumption was assessed. Both intrinsic and extrinsic EBR were significant at the .05 level. Higher levels of intrinsic EBR were associated with higher rates of vegetable consumption over the past seven days; higher levels of extrinsic EBR were also associated with higher levels of vegetable consumption over the past seven days, but this was a weaker predictor than intrinsic EBR (see Table 5).

**Physical activity.** Next, the relationship between the ASEBR subscale scores and reported levels of physical activity was assessed. Higher levels of intrinsic EBR were associated with more frequent reports of physical activity in the past 7 days. Higher levels of extrinsic EBR were associated with lower levels of physical activity (see Table 5).

**Screen time.** Next, the relationship between the ASEBR and reported screen time on a typical day were assessed. Both intrinsic and extrinsic EBR were significant predictors of screen time. Higher levels of intrinsic EBR were associated with lower levels of screen time use. This was consistent with predictions. However, higher level of extrinsic EBR was also associated with lower levels of screen time use, contrary to expectations. Intrinsic EBR regulation was the stronger predictor.
**Body Mass Index (BMI).** Finally, a multiple regression analysis was used to assess the relationship between ASEBR subscale scores and BMI z-scores. The initial model demonstrated that extrinsic EBR was not a significant predictor of BMI z-score (see Table 5). Higher levels of intrinsic EBR were associated with lower BMI z-scores.

Taken together, the results of the validity analyses suggested some support for each type of validity. However, deviations from expectations suggests room for improvement of the measure.

**Group Differences on Subscale Scores**

A two-way MANOVA was conducted to assess how intrinsic and extrinsic EBR subscale scores differed between males and females and across race/ethnicity. A significant main effect was detected for gender across subscale scores, $F(2, 251)= 4.12, p<.01$, Partial $\eta^2=.03$. Effect size was small-medium. With regard to subscales, score differences were not significant across genders for intrinsic EBR, $F(2, 252) = 2.33, p=1$, Partial $\eta^2=.05$, but were significant across extrinsic EBR subscale scores, $F(2, 252) = 6.74, p<.001$, Partial $\eta^2=.05$. Effect size was medium. Post-hoc analysis (Fisher’s LSD) suggested that extrinsic EBR was highest among transgender participants and lowest among non-binary participants. It is important to note that individuals with these gender identities only comprised 3% of the total sample. Male participants had higher extrinsic EBR scores than females.

A significant main effect was detected for race/ethnicity across ASEBR subscale scores, $F(6, 462)= 8.56, p<.001$, Partial $\eta^2=.09$. The effect size was medium-large. With regard to individual subscales, subscale score differences were significant across ethnicities for the extrinsic EBR subscale, $F(3, 231)= 17.27, p<.001$, Partial $\eta^2=.18$. Effect size was large. Score differences were not significant for the intrinsic EBR subscale, $F(3, 231)= 1.03, p=.4$, Partial
\( \eta^2 = .01 \). A series of post-hoc analyses (Fisher’s LSD) were conducted to assess mean differences across ethnicities for extrinsic EBR. Extrinsic EBR was lowest among Asian participants and highest among Caucasian. Results of the MANOVA main effects are provided in Tables 6-8.

**Correlations among Factors**

The relationship between the latent factors in the ASEBR measure was examined using the unconstrained model (see Figure 2). Given that the model yielded two factors, comparisons across the SDT spectrum were not possible. However, the two factors were moderately correlated \((r = .49)\).

**Discussion**

The impetus for this work was a longstanding call from researchers to unify the investigation of eating disorders and weight disorders (Irving, & Neumark-Sztainer, 2002). The lack of attention to the affective states impacted by eating behaviors has resulted in devastating psychological consequences for some individuals who have approached practitioners seeking help with their eating habits (Hobbes, 2018). Prior research in the areas of eating disorder and weight reduction interventions have demonstrated a need for a more comprehensive understanding of the affective/motivational factors that enhance eating behavior change as well as those that hinder them (Austin et al., 2012; Fassino et al., 2009; Skelton & Beech, 2011). Relatedly, polarized approaches to investigating and treating disordered eating and obesity have failed to recognize similar processes of self-regulation that occur among individuals affected by one or both of these challenges (Schwartz & Henderson, 2009).

This study contributes to existing literature on EBR in two important and distinct ways. First, it provides support for the usability of a measure of affective and motivational influences of eating behaviors in an adolescent population. In the adaptation of the REBS and refinement of
the ASEBR, a more systematic assessment of regulatory processes that govern eating behaviors can be conducted with adolescents in research and practice settings. For practitioners, assessment of these constructs can permit the provision of more individualized supports to foster self-determination. Further, these constructs may be useful in providing indications for psychosocial supports of interest to adolescents that may not be directly evident through adolescents’ observed eating behaviors alone. For researchers, this can be an added research tool to study adolescent eating behaviors and can further understanding of factors that are influenced by the affective and motivational constructs assessed by the measure.

Secondly, this work represented further inquiry into patterns and correlates of EBR across a geographically and gender diverse sample of adolescents. Prioritizing the recruitment of a diverse sample with respect to gender, race/ethnicity, and geography is important in improving the knowledge base on EBR. The majority of research on eating disorders has been carried out with Caucasian females (Le Grange Telch, & Argas, 1998). The sample recruited for this study is consistent with the ethnic/racial diversity of the United States (United States Census, 2018). In addition, the majority of individuals recruited for the study were male. Conducting survey administration online allowed for participant recruitment across a wider geographic span than would have been possible through in-person administration. The successes and strengths of this work allow for the identification of important conclusions related to: (1) the development of the ASEBR; (2) gender and ethnic differences observed in self-reports of EBR; and (3) the scale’s contribution to theoretical knowledge base related to SDT.

**Development of the ASEBR**

The chief purpose of this study was to adapt the REBS with specific consideration of the needs of a diverse adolescent population. The processes and procedures carried out in Phase
I allowed for systematic consideration of how the measure could be adapted in a manner that retained the core concepts of the REBS but was relevant to American adolescents. The original studies examining the psychometric structure of the REBS were carried out with an all-female, adult, Canadian university sample ranging in age from 17 to 50. In addition, the authors did not report the racial/ethnic demographics of the sample. Thus, it is difficult to generalize these findings to an adolescent population that is diverse with respect to gender and race/ethnicity. Subsequent work examining the REBS (e.g., Hamilton et al., 2018) suggested that factor structure observed in the original sample was consistent in a sample of male and female college students in the Southeastern U.S. However, this sample was predominantly Caucasian and female. The current sample differed not only in age (ranging from 12-19), but also in that over half of the participants were male and approximately half were Caucasian. The data collected and analyzed in Phase II permitted the measure to be evaluated to assess its goodness-of-fit in a sample of diverse adolescents.

Contrary to expectations, there was not support for the same six-factor structure with the adolescent sample with the ASEBR as observed in prior work conducted with adults using the REBS (e.g., Pelletier et al., 2004; Hamilton et al., 2018). In the current study, a two-factor model provided the best fit for the data and resulted in the combination of the three most internally-driven forms of EBR, and the two most externally-driven forms of EBR. Typically-developing adults have autonomy and independence in most aspects of their behavior, and may differentiate these aspects of their eating behavior, accordingly. By contrast, adolescents have markedly less autonomy and independence in their daily lives; thus, they may perceive less gradation in the amount of self-determination that governs their eating behaviors. This may be reflected in the two-factor structure observed in the present study.
In adolescence, there may be less heterogeneity in self-determined eating behaviors. Internally driven behaviors may not yet be differentiated to the same degree that they are in adulthood. Adolescence is often a period of emerging interest in regulation of eating patterns or weight status modification, especially among female-identifying adolescents (Rolls et al., 1991). Given this developmental stage, there may not yet be stable enough integration of ideals to differentiate the intrinsic versus extrinsic forms of EBR into six subscales proposed the REBS or the ASEBR. Though a two-factor structure has not previously been identified, the use of intrinsic and extrinsic “composites” is in line with prior work with the REBS as well as other empirical work that has applied SDT to the study of adolescents. For example, prior work utilizing the REBS (e.g., Gropper et al., 2014; Kopp & Zimmer, 2011; Pelletier et al., 2004;) have used aggregate scores of individual subscales to comprise autonomous or controlled regulation scores. Gillison, Stantage and Skevington (2006) assessed adolescents exercise motivation using the Behavioral Regulation in Exercise Questionnaire (Markland & Tobin, 2004), a behavioral regulation scale grounded in SDT. Though the scale has six subscales corresponding to the six types of regulation proposed by SDT, in their work with adolescents, Gillison and colleagues (2006) developed a composite score representing “self-determined motivation.” Higher scores, as is the case on the intrinsic EBR composite in the present study, represented higher levels of internally driven motivation and was a good fit for their structural equation model. Additional studies (e.g., Koestner, Otis, Powers, Pelletier, and Gagnon, 2008) differentiated autonomous versus controlled regulation in assessing how forms of regulation influence goal progress.

The items designed to assess Amotivation (or a lack of motivation to regulate eating behavior) were not retained in the model because they loaded onto an unexpected factor and possessed low factor loadings. This warrants further investigation to assess areas of improvement
in these items. For example, it is possible that these findings were due to socially acquiescent responding or an effort to avoid socially undesirable responses; for example, adolescents may have felt that stating that they do not feel in control of their eating behaviors or see the value in healthy eating were inconsistent with societal/social expectations. Therefore, they may have rated these items in a manner that they felt was more consistent with desirable responses. In sum, the ASEBR demonstrated a two-factor model with intrinsic, or internally regulated items on one subscale, and extrinsic, or externally regulated items on the other. This was inconsistent with expectations and with findings from prior work involving adults and suggests that the spectrum of EBR may be different in adolescents.

The measure demonstrated adequate internal consistency; participants responded to similar items similarly. This was consistent with study predictions. By contrast, the scale did not demonstrate adequate test-retest reliability. The test-retest reliability of the REBS was not reported in the original work conducted by Pelletier and colleagues (2004), so comparison of the revised measure’s temporal stability with that of the original measure is not possible. However, the test re-test correlation coefficients are comparable with other measures of affective influences on eating behaviors used with children and adolescents (e.g., Tanoffsky-Kraff et al., 2007) and with prior studies examining the REBS (e.g., Hamilton et al., 2018). The subset of the sample that participated at Time 2 was not representative of the original sample with respect to age, gender, or ethnicity. This may have influenced the consistency of the scores across the two time periods.

In addition, scores five items on the intrinsic EBR subscale and four items on the extrinsic EBR subscale were weakly correlated across administrations; these coefficients were weaker than other items on each subscale. This may suggest that these items are interpreted differently at different time periods and may warrant additional content validity analysis of these
particular items. While this finding warrants additional investigation, it is also possible that these findings reflect that EBR varies significantly across time. It may therefore suggest that an assessment of EBR is reflective of how the adolescent is functioning at that moment in time, and more frequent assessment of EBR may be required in order to support adolescents in treatment programs over the long-term.

Contrary to expectations, lower levels of intuitive eating were associated with higher levels of intrinsic EBR. Consistent with expectations, more external forms of EBR were associated with lower levels intuitive eating. This provided some support for convergent validity, but suggested that the measure deviates from the constructs assessed by the Intuitive Eating Scale (Tylka, 2006). Also consistent with expectations, the ASEBR subscales possessed weak or non-significant correlations with a measure of self-esteem; this suggested that the measure assessed constructs independent from overall self-esteem.

Consistent with study hypotheses self-reported ratings of psychosocial functioning possessed weak relationships with external forms of eating behavior, suggesting that these measures assessed different constructs. Inconsistent with expectations, significant, moderate correlations were observed between the intrinsic EBR subscales and the psychosocial functioning measure. More self-determined eating regulation was associated with higher psychosocial functioning. These relationships suggest an association between the constructs, suggesting a significant overlap in variance. However, the strength of the relationships does not appear to suggest such a high degree of overlap that the measures appear to be assessing the same constructs entirely. In addition, prior work (e.g., Pelletier et al., 2004) has demonstrated positive associations between self-determined eating behavior and positive psychosocial functioning.
Consistent with expectations, external forms of EBR were moderately, positively correlated with food preoccupation symptoms of disordered eating. Eating disorder symptoms did not possess a significant relationship with internal, self-directed forms of eating behavior. This suggests that self-determined eating behaviors may play a protective role against eating disorder symptomology and is consistent with findings from prior studies (e.g., Pelletier et al., 2004). However, these findings—in particular the absence of a negative association between intrinsic EBR and eating disorder symptoms—suggest that self-determined forms of eating may not prevent food preoccupation in the absence of low levels of externally regulated eating behaviors. Taken together, these results suggested that the ASEBR demonstrates some evidence of convergent, divergent, and concurrent validity and was consistent with findings from prior research conducted with adult participants.

As an additional measure of concurrent validity, a series of multiple regression analyses were conducted which examined the relationship between ASEBR subscale scores and health behaviors. Higher levels of self-determined eating behavior were associated with more frequent fruit, vegetable, and breakfast consumption, as well as physical activity. This was consistent with expectations, and in line with prior research. For example, Pelletier and colleagues (2004) found that autonomous forms of EBR were positively associated with healthy eating behaviors.

Contrary to predictions, higher levels of extrinsic EBR, or externally regulated eating, were also associated with higher levels of vegetable consumption. However, this was a markedly weaker predictor than intrinsic EBR. Given that this could be spurious finding, it warrants further investigation before meaningful interpretations can be made. Adolescents who reported higher levels of externally-regulated eating behaviors engaged in less frequent physical activity. With regard to use of screens, adolescents with more internally regulated eating engaged in lower
levels of screen time use; however, contrary predictions, this relationship was also observed between extrinsic EBR and screen time use. It is worth noting that intrinsic EBR was a markedly stronger predictor. Mata et al. (2009) reported a motivational “spill over” that occurred with higher levels of physical activity intrinsic motivation “spilling over” into increased levels of EBR. It is possible that with more self-determined eating behaviors, adolescents were additionally motivated to modify other health behaviors. Given that few, if any, studies have examined the relationships between EBR and screen time in adolescents, further investigation of these relationships is warranted.

Higher levels of intrinsic EBR were associated with lower BMI z-scores. These findings mirror those resulting from empirical studies with adult samples. For example, Leong, Madden, Gray, and Horwath (2012) administered the REBS to a sample of 2,500 adult women in New Zealand and found that BMI was significantly lower by 2% for every 10-unit increase in intrinsic EBR and BMI was statistically higher among those with higher levels of extrinsic EBR (i.e., a 1.4% increase in BMI for every 10 unit increase in extrinsic EBR eating scores; Leong et al., 2012). The current work suggests that the overall trends in the relationships observed by Leong and colleagues (2012) among adult women are consistent in a diverse adolescent sample. Extrinsic EBR did not significantly predict BMI z-scores, which contrasts findings from prior work, such as the aforementioned results obtained by Leong et al. (2012).

Taken together, these results suggest that prior findings related to correlates of intrinsic motivation and extrinsic motivation in adult samples were observed similarly in an adolescent sample. This indicates that adolescents who view themselves as possessing low levels of regulatory control over their eating were less likely to engage in health promoting behaviors and to have a higher BMI. It is important to note that this did not necessarily suggest that they were
more likely to have a BMI traditionally in the overweight or obese category, but rather reflects general trends in unit increases across these variables. In sum, the study demonstrated that adolescents’ reports of EBR predicted a significant portion of variance in a variety of health-related outcomes; this provided some support for concurrent validity of the ASEBR.

However, deviations from expected relationships among variables (e.g., the positive relationship observed between intrinsic regulation and low intuitive eating; positive relationship between extrinsic regulation and higher levels of screen time; significant relationships between self-esteem/psychosocial functioning and the ASEBR subscale scores) suggest the need for further inquiry. These unexpected findings may be due to the nature of the sample recruited for this type of study; that is, the two summer programs in which participants were recruited had health emphases. In addition, individuals who elect to complete a study about eating regulation and food behaviors online may have heightened interest in this area. This assertion is supported when considering the health behaviors/outcomes of the current sample in comparison to national samples, which suggests the sample may have more positive health behaviors/outcomes than expected in a representative adolescent sample (see Table 9). In this sense, the sample was not likely representative of American adolescents, with respect to weight status, nutritional consumption patterns, or physical activity engagement. The prevalence of binge eating was higher in the current sample than national samples. This further supports the need for further investigation of these constructs in diverse adolescent samples.

**Differences in Eating Behavior Regulation across Gender and Ethnicity**

A second aim of the study was to explore how EBR differed across genders and ethnicities. The ASEBR extrinsic EBR subscale differed significantly across genders; extrinsic EBR was highest among transgender participants and lowest among non-binary participants. No
known work has examined EBR in among transgender or non-binary adolescents. In addition, there were relatively few transgender and non-binary participants within the given sample; thus, it is difficult to draw conclusions related to this finding. With regard to male and female participants, males’ extrinsic EBR was, on average, higher than females’. This finding mirrors prior work (e.g., Gropper et al, 2014), which suggested that extrinsic forms of EBR was higher among college-aged males. In addition, prior work has suggested that male and female adolescents demonstrate different eating behaviors, including dieting behaviors or disordered eating behaviors (e.g., Rolls et al., 1991; Taber & Utz, 2015).

In terms of ethnicity, extrinsic EBR significantly differed across participants of different racial/ethnic backgrounds; Asian adolescents had the lowest levels of extrinsic EBR and Caucasian adolescents had the highest levels. With regard to intrinsic EBR, there was not a significant difference in scores across race/ethnicity. This variability may be reflective of disparate findings in prior research conducted on ethnically diverse samples. For example, prior work conducted by Baugh, Mullis, Mullis, Hicks, and Peterson (2010) examined body image satisfaction among Black and White college students. Their findings suggested that there was not an association between ethnic identity and level of body dissatisfaction. However, across both Black and White college females, women who were more dissatisfied with their bodies were also more likely to aspire to be thin. By contrast, Wilson, Sargent, and Dias, (1994) found that Black adolescent females tended to prefer a significantly larger body size than White females when asked to identify the ‘ideal’ body shape.

Adolescence is also a period of ethnic and racial identity formation, which may influence adolescent’s perception of desired body type/shape and may influence their regulation of eating behaviors (Hudley & Irving, 2012). It is possible that these disparate findings reflected the
surveyed participants differing stages in racial-ethnic identity formation. These findings underscore the need for more focused research on ethnic minority adolescent samples to better understand factors that contribute to EBR and in order to draw meaningful conclusions in the general population.

**Limitations and Future Directions**

The limitations to this study provide several useful directions for future inquiry. As stated, the measure did not demonstrate adequate test-retest reliability. Although a larger subset would have been preferable for this portion of the analysis, the ability to secure more responses was limited to budgetary constraints. Future work should attempt to further assess the stability of self-reported EBR using a diverse sample. In addition, assessment of the temporal stability across multiple periods spanning several years would significantly enhance the knowledge base by providing a longitudinal assessment of how eating behavior constructs change over time in the adolescent population.

The current study utilized single subscales or selected items from measures. This may fail to capture the full variability in participant’s responses. For example, while food preoccupation is an important symptom in eating disorder symptomology, this symptom does not reflect the presence of an eating disorder alone; likewise, there are other symptoms that may not have been accounted for in this subscale. Relatedly, the reliability and validity of select items from some of these measures—such as those from the YRBS—have not been examined independent of the entire measure (CDC, 2018). Future work should include more encompassing measures of intuitive eating, eating disorder symptomology, and health behaviors. In addition, this study relied on self-report data, which subject to biased response patterns (Paulhus & Vazire, 2007). Future scale validation work should prioritize a multi-source, multi-method approach to scale...
validation by using behavioral observations or parent reports, and more objective health
information (e.g., formal weigh-ins to calculate BMI $z$-score as opposed to self-reported height
and weight). A significant portion of the study sample was recruited online; this had many
benefits, including the ability to recruit a large sample in a short period, and soliciting responses
from a far more geographically diverse sample than would have been possible with in-person
data collection. However, online data collection prevents the researcher from verifying the
identity of individuals prior to their completion of the study. A focus of future work should the
development and piloting of online recruitment strategies that allow researchers to recruit to a
large number of individuals while retaining the quality of screening procedures. In addition, as
stated, the sample was not representative of adolescents with respect to health behaviors and
outcomes, in comparison to nationwide statistics. Likely, this is due to the sampling method and
the tendency for individuals with heightened interest or awareness of the topic to be motivated to
participate in the study.

Although the sample was comprised of 60% males and was diverse with respect to
geography and age, the majority of the sample was still Caucasian. This limits the ability to draw
meaningful conclusions specific to racial/ethnic identities. For example, the factor structure of
the measure could not be specifically assessed using Black adolescent participants in the current
sample. As such, future work should prioritize the recruitment of ethnically diverse samples to
better understand how the constructs assessed in this study, such as the factor structure, differs
across racial/ethnic groups.

Additionally, priority of future research should be the recruitment of a socio-
economically diverse sample. The present study did not solicit information about participants’
linguistic background or socioeconomic status, as factors such as acculturation and income may
impact adolescents’ EBR. In addition, future work should assess if environmental factors, such as socioeconomic status or level of acculturation moderates the relationship between EBR and reported eating/health behaviors. Future work should prioritize a more encompassing understanding of how these factors may impact EBR. Relatedly, future work should consider how the eating behavior constructs assessed in this study are impacted by ecological factors such as proximity to grocery stores, access to free/reduced-price lunch, and engagement in family meals.

Findings with respect to the amotivation subscale suggest weak associations with other subscales and unexpected association with some validity measures. Taken together, this suggests that future assessment of the validity of this subscale is warranted to aid in its improvement for use in adolescent samples. Finally, and perhaps most importantly, future work should prioritize the replication of these findings in other samples of American adolescents and adolescents of other nationalities to allow conclusions to be more meaningfully extracted (Maxwell, Lau, & Howard, 2015).

**Conclusion**

The eating and weight patterns that emerge in adolescents are likely to prevail into adulthood without intervention (Neumark-Sztainer et al., 2018). This leaves the majority of adolescents vulnerable to facing challenges related to disordered eating, weight management, and/or body image concerns by the time they reach adulthood (Neumark-Sztainer et al., 2018). The developmental cascades in EBR that occur in adolescence warrant greater attention and prioritization of samples that are representative of the general population. The ASEBR is a self-report measure of adolescents’ EBR. The ASEBR is grounded in SDT and was adapted from the REBS, an established measure that was designed for use with adults. Findings from this study
suggest that the ASEBR demonstrated adequate internal consistency and validity in use with a mixed-gender, American sample of adolescents. Analyses supported a two-factor model, which was in contrast to the six-factor model that has been observed using the REBS with adults.
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**Table 1a**

**Demographic Characteristics of Sample (N=261)**

<table>
<thead>
<tr>
<th></th>
<th>Total Sample</th>
<th>Female</th>
<th>Male</th>
<th>Non-Binary</th>
<th>Transgender</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>96 (37)</td>
<td>156 (60)</td>
<td>3 (1.2)</td>
<td>6 (2.3)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Binary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transgender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age M (SD)</strong></td>
<td>15.41 (1.6)</td>
<td>15.8 (1.6)</td>
<td>15.2 (1.6)</td>
<td>15.8 (.98)</td>
<td>15.6 (.98)</td>
</tr>
<tr>
<td><strong>Race &amp; Ethnicity n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>142 (54.4)</td>
<td>41 (42.7)</td>
<td>93 (59.6)</td>
<td>3 (100)</td>
<td>6 (86)</td>
</tr>
<tr>
<td>Black</td>
<td>24 (9.2)</td>
<td>11 (11.5)</td>
<td>13 (8.3)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Hispanic</td>
<td>53 (20.3)</td>
<td>15 (15.6)</td>
<td>38 (24.4)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Asian</td>
<td>16 (6.0)</td>
<td>10 (10.4)</td>
<td>6 (3.8)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Multi-Racial</td>
<td>23 (8.9)</td>
<td>17 (17.7)</td>
<td>6 (3.8)</td>
<td>N/A</td>
<td>1 (14)</td>
</tr>
<tr>
<td>Other</td>
<td>3 (1.2)</td>
<td>3 (3)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Note. Participants were presented with the following responses to select as many options as relevant from on the demographic questionnaire: White or European; Hispanic, Latino or Spanish, Black or African American; Native American, American Indian, or Alaskan Native; Asian; Middle Eastern or North African; Native Hawaiian or other Pacific Islander; Another Race or Ethnicity Not Listed. Given the low frequency of some multi-selected demographic categories, participants who fell into these categories were compiled into the “Multi-Racial” and “Other” categories reflected above. It is important to note that this does not reflect the full diversity or variability of the individual identities of participants within the sample.*
Table 1b

Demographic Characteristics of Sample Continued (*N*=261)

<table>
<thead>
<tr>
<th></th>
<th>Total Sample</th>
<th>Female</th>
<th>Male</th>
<th>Non-Binary</th>
<th>Transgender</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grade M (SD):</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>range: 6-14</td>
<td>10.36 (1.84)</td>
<td>11(1.5)</td>
<td>10(1.9)</td>
<td>10.5(1.5)</td>
<td>10.0 (1.5)</td>
</tr>
<tr>
<td>Grades 6-8 n(%)</td>
<td>41(18)</td>
<td>10(10.4)</td>
<td>36(23.1)</td>
<td>0(0)</td>
<td>1(14.3)</td>
</tr>
<tr>
<td>Grades 9-12 n (%)</td>
<td>191 (73)</td>
<td>77(80)</td>
<td>106(68)</td>
<td>3(100)</td>
<td>6 (87)</td>
</tr>
<tr>
<td>College Freshman &amp; Sophomores n (%)</td>
<td>23 (8)</td>
<td>9(.09)</td>
<td>14 (.08)</td>
<td>0(0)</td>
<td>0(0)</td>
</tr>
<tr>
<td><strong>Body Mass Index (BMI)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>z-score median</td>
<td>-.05</td>
<td>-.32</td>
<td>-.01</td>
<td>1.85</td>
<td>-.75</td>
</tr>
<tr>
<td>range: -1.6 – 6.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Weight Category (%):</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Based on BMI z-Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;85&lt;sup&gt;th&lt;/sup&gt; Percentile</td>
<td>93.48</td>
<td>87.4</td>
<td>97.4</td>
<td>66.6</td>
<td>83.33</td>
</tr>
<tr>
<td>85&lt;sup&gt;th&lt;/sup&gt;-95&lt;sup&gt;th&lt;/sup&gt; Percentile</td>
<td>3.12</td>
<td>7.4</td>
<td>.06</td>
<td>33.3</td>
<td>0</td>
</tr>
<tr>
<td>&gt;95&lt;sup&gt;th&lt;/sup&gt; Percentile</td>
<td>3.40</td>
<td>5.2</td>
<td>1.92</td>
<td>0</td>
<td>16.67</td>
</tr>
</tbody>
</table>
Table 2
*Adolescent Scale of Eating Behavior Regulation (EBR): Path Coefficients through Exploratory Factor with Oblique Rotation (n=150)*

<table>
<thead>
<tr>
<th>Items</th>
<th>Intrinsic EBR</th>
<th>Extrinsic EBR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intrinsic EBR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Intrinsic Motivation:</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) When I have the opportunity,</td>
<td>0.65</td>
<td></td>
</tr>
<tr>
<td>I enjoy picking foods that are healthy.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) I enjoy finding new ways to eat healthy foods.</td>
<td>0.73</td>
<td></td>
</tr>
<tr>
<td>(3) I eat healthy because it feels good.</td>
<td>0.78</td>
<td></td>
</tr>
<tr>
<td>(4) It is fun to eat healthy foods.</td>
<td>0.66</td>
<td></td>
</tr>
<tr>
<td><strong>Integrated Regulation:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Eating healthy is a big part of my life.</td>
<td>0.73</td>
<td></td>
</tr>
<tr>
<td>(6) Making sure I eat healthy is part of how I have chosen to live my life</td>
<td>0.79</td>
<td></td>
</tr>
<tr>
<td>(7) I pick the food I eat because making sure I eat a balanced diet is part of my lifestyle.</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>(8) Eating healthy is important because it fits in with other areas of my life.</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td><strong>Identified Regulation:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(9) I choose the food I eat because I know it will help me live a long and healthy life.</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>(10) It is probably a good idea for me to pick the foods I eat carefully.</td>
<td>0.44</td>
<td></td>
</tr>
<tr>
<td>(11) I eat healthy because with time it will help me feel better.</td>
<td>0.74</td>
<td></td>
</tr>
<tr>
<td>(12) I pick healthy foods because it helps me feel better about myself.</td>
<td>0.65</td>
<td></td>
</tr>
<tr>
<td><strong>Extrinsic EBR (α=.78)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Introjected Regulation:</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(13) I eat healthy because I don’t want to be embarrassed about how I look.</td>
<td>0.46</td>
<td></td>
</tr>
<tr>
<td>(14) I eat healthy because I feel guilty if I don’t.</td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>(15) I eat healthy because I would be embarrassed if other people thought my eating was out of control.</td>
<td>0.72</td>
<td></td>
</tr>
<tr>
<td><strong>External Regulation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(16) I eat healthy because other people expect me to.</td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td>(17) I eat healthy because people important to me get upset when I eat differently.</td>
<td>0.81</td>
<td></td>
</tr>
<tr>
<td>(28) I eat healthy because people around me tell me I should.</td>
<td>0.73</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* The following items were removed through the EFA: “I eat healthy because of how I want to look” (intended to assess introjected regulation), “Other people pressure me to eat the foods that I do” (intended to assess external regulation), and the following items, each intended to assess amotivation: “I have no idea why I choose the foods that I eat,” “Eating healthy doesn’t seem to affect my health,” “The way I eat is not in my control,” and “Eating healthy is a waste of my time.”
Table 3
Adolescent Scale of Eating Behavior Regulation (EBR): Path Coefficients Confirmatory Factor Analysis (n=100)

<table>
<thead>
<tr>
<th></th>
<th>Intrinsic EBR</th>
<th>Extrinsic EBR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intrinsic EBR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intrinsic Motivation:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) When I have the opportunity, I enjoy picking foods that are healthy.</td>
<td>0.74</td>
<td></td>
</tr>
<tr>
<td>(2) I enjoy finding new ways to eat healthy foods.</td>
<td>0.69</td>
<td></td>
</tr>
<tr>
<td>(3) I eat healthy because it feels good.</td>
<td>0.79</td>
<td></td>
</tr>
<tr>
<td>(4) It is fun to eat healthy foods.</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td><strong>Integrated Regulation:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Eating healthy is a big part of my life.</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>(6) Making sure I eat healthy is part of how I have chosen to live my life</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td>(7) I pick the food I eat because making sure I eat a balanced diet is part of my lifestyle.</td>
<td>0.78</td>
<td></td>
</tr>
<tr>
<td>(8) Eating healthy is important because it fits in with other areas of my life.</td>
<td>0.68</td>
<td></td>
</tr>
<tr>
<td><strong>Identified Regulation:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(9) I choose the food I eat because I know it will help me live a long and healthy life.</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>(10) It is probably a good idea for me to pick the foods I eat carefully.</td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>(11) I eat healthy because with time it will help me feel better.</td>
<td>0.81</td>
<td></td>
</tr>
<tr>
<td>(12) I pick healthy foods because it helps me feel better about myself.</td>
<td>0.61</td>
<td></td>
</tr>
<tr>
<td><strong>Extrinsic EBR (α=.78)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Introjected Regulation:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(13) I eat healthy because I don’t want to be embarrassed about how I look.</td>
<td>0.78</td>
<td></td>
</tr>
<tr>
<td>(14) I eat healthy because I feel guilty if I don’t.</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>(15) I eat healthy because I would be embarrassed if other people thought my eating was out of control.</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td><strong>External Regulation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(16) I eat healthy because other people expect me to.</td>
<td>0.77</td>
<td></td>
</tr>
<tr>
<td>(17) I eat healthy because people important to me get upset when I eat differently.</td>
<td>0.66</td>
<td></td>
</tr>
<tr>
<td>(18) I eat healthy because people around me tell me I should.</td>
<td>0.67</td>
<td></td>
</tr>
</tbody>
</table>

Note. The following items were removed through the EFA: “I eat healthy because of how I want to look” (intended to assess introjected regulation), “Other people pressure me to eat the foods that I do” (intended to assess external regulation), and the following items, each intended to assess amotivation: “I have no idea why I choose the foods that I eat,” “Eating healthy doesn’t seem to affect my health,” “The way I eat is not in my control,” and “Eating healthy is a waste of my time.”
<table>
<thead>
<tr>
<th>Type of Validity</th>
<th>Statistical Method</th>
<th>Comparative Measures Used</th>
<th>ASEBR Subscales or Items Used</th>
<th>Findings</th>
<th>Validity Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convergent</td>
<td>Pearson Correlation</td>
<td>Intuitive Eating Scale (IES; Tylka, 2006) Unconditional Permission to Eat Subscale Score</td>
<td>Intrinsic Extrinsic</td>
<td>$r = .43, p &lt; .001$ $r = .67, p &lt; .001$</td>
<td>Some support</td>
</tr>
<tr>
<td>Divergent</td>
<td>Pearson Correlation</td>
<td>Single Item Self Esteem Scale (SISE; Robbins et al., 1999)</td>
<td>Intrinsic Extrinsic</td>
<td>$r = .36, p &lt; .001$ $r = .14, p &lt; .001$</td>
<td>Some support</td>
</tr>
<tr>
<td>Divergent</td>
<td>Pearson Correlation</td>
<td>Outcome Rating Scale (ORS: Miller et al., 1993)</td>
<td>Intrinsic Extrinsic</td>
<td>$r = .48, p &lt; .001$ $r = -.07, p = .2$</td>
<td>Some support</td>
</tr>
<tr>
<td>Concurrent</td>
<td>Pearson Correlation</td>
<td>Eating Attitudes Test Food Preoccupation Subscale Score Total (EAT-FPO; Garner et al., 1982)</td>
<td>Intrinsic Extrinsic</td>
<td>$r = .004, p = .95$ $r = .53, p &lt; .001$</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table 5
Multiple Linear Regression Analyses Predicting Health Outcomes Using Adolescent Eating Behavior Survey (ASEBR) Subscale Scores (n=261)

<table>
<thead>
<tr>
<th>Outcome Variables</th>
<th>Predictors</th>
<th>Resulting Model</th>
<th>Standardized Beta</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit Consumption</td>
<td>Intrinsic*</td>
<td>p&lt;.001, R²=.15, F(1, 234) = 47.72, p&lt;.001</td>
<td>Intrinsic (Std. Beta: 39, p&lt;.001)</td>
<td>Higher levels of intrinsic regulation were associated with higher rates of fruit consumption over the past seven days.</td>
</tr>
<tr>
<td>Breakfast Consumption</td>
<td>Intrinsic*</td>
<td>R²=.18, F(1, 234) = 49.99, p&lt;.001</td>
<td>Intrinsic (Std. Beta: .42, p&lt;.001)</td>
<td>Higher levels of self-directed regulation were associated with higher levels of breakfast consumption.</td>
</tr>
<tr>
<td>Vegetable Consumption</td>
<td>Intrinsic*</td>
<td>R²=.24, F(1, 234) = 73.84, p&lt;.001</td>
<td>Intrinsic (Std. Beta: .49, p&lt;.001) Extrinsic (Std. Beta: .17, p&lt;.04)</td>
<td>Higher levels of intrinsic regulation were associated with higher levels of vegetable consumption over the past seven days. Extrinsic regulation was also associated with higher vegetable consumption but was a weaker predictor.</td>
</tr>
</tbody>
</table>

Note. (*) indicates that the subscale was a significant predictor in the model.
Table 5
Multiple Linear Regression Analyses Predicting Health Outcomes Using Adolescent Eating Behavior Survey (ASEBR) Subscale Scores (Continued)

<table>
<thead>
<tr>
<th>Outcome Variables</th>
<th>Predictors</th>
<th>Resulting Model</th>
<th>Standardized Beta</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Activity</td>
<td>Intrinsic*</td>
<td>$R^2 = .12, F(2, 233) = 15.81$ p &lt; .001</td>
<td>Intrinsic Eating Behavior Regulation (Std Beta: Std. Beta: - .20, p &lt; .001)</td>
<td>Higher levels of intrinsic eating regulation were associated with higher levels of physical activity. Higher levels of extrinsic regulation were associated with lower levels of physical activity.</td>
</tr>
<tr>
<td></td>
<td>Extrinsic*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screen Time</td>
<td>Intrinsic*</td>
<td>$R^2 = .14, F(2, 233) = 18.04$ p &lt; .001</td>
<td>Intrinsic Regulation (Std Beta: -.37, p &lt; .001)</td>
<td>Higher levels of intrinsic and extrinsic regulation were associated with lower levels of screen time use.</td>
</tr>
<tr>
<td></td>
<td>Extrinsic*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI z-Score</td>
<td>Intrinsic*</td>
<td>$R^2 = .15, F(1, 230) = 39.98$ p &lt; .001</td>
<td>Intrinsic Regulation Std. Beta: -.40</td>
<td>Higher levels of intrinsic regulation were associated with lower BMI z-scores.</td>
</tr>
<tr>
<td></td>
<td>Extrinsic</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. (*) indicates predictor was significant and retained in final model*
Table 6

Two-Way MANOVA for Gender and Ethnicity Differences in ASEBR Composite Scores: Main Effects (n=227)

<table>
<thead>
<tr>
<th>Effect</th>
<th>Pillai’s Trace</th>
<th>df</th>
<th>Error df</th>
<th>F</th>
<th>p</th>
<th>Partial η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>.86</td>
<td>2</td>
<td>224</td>
<td>672.98</td>
<td>&lt;.001</td>
<td>.86</td>
</tr>
<tr>
<td>Gender</td>
<td>.08</td>
<td>6</td>
<td>450</td>
<td>2.94</td>
<td>.008</td>
<td>.04</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>.17</td>
<td>6</td>
<td>450</td>
<td>7.06</td>
<td>&lt;.001</td>
<td>.09</td>
</tr>
</tbody>
</table>
Table 7

Two-Way MANOVA for Ethnicity Differences in ASEBR Composite Scores: Between-Subjects Effects (n=227)

<table>
<thead>
<tr>
<th>Measure</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>p</th>
<th>Partial η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic</td>
<td>3</td>
<td>178.76</td>
<td>1.42</td>
<td>.24</td>
<td>0.02</td>
</tr>
<tr>
<td>Extrinsic</td>
<td>3</td>
<td>630.71</td>
<td>14.77</td>
<td>&lt;.001</td>
<td>0.17</td>
</tr>
</tbody>
</table>
Table 8

Two-Way MANOVA for Gender Differences in ASEBR Composite Scores: Between-Subjects Effects (n=227)

<table>
<thead>
<tr>
<th>Measure</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>p</th>
<th>Partial η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic</td>
<td>3</td>
<td>316.99</td>
<td>2.53</td>
<td>&lt;.001</td>
<td>0.02</td>
</tr>
<tr>
<td>Extrinsic</td>
<td>3</td>
<td>193.31</td>
<td>14.77</td>
<td>&lt;.001</td>
<td>0.17</td>
</tr>
</tbody>
</table>
Table 9

*Comparison of Nationwide Health Outcome Statistics with Study Sample*

<table>
<thead>
<tr>
<th>Health Outcome</th>
<th>Study Sample</th>
<th>Nationwide Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence</td>
<td>Overweight or Obesity Status</td>
<td>6.52%</td>
</tr>
<tr>
<td>Fruit Consumption&lt;sup&gt;b&lt;/sup&gt;</td>
<td>None over past 7 days: 4.5%</td>
<td>5.6%</td>
</tr>
<tr>
<td></td>
<td>3 or more servings: 76%</td>
<td>18%</td>
</tr>
<tr>
<td>Vegetable Consumption&lt;sup&gt;b&lt;/sup&gt;</td>
<td>None over past 7 days: 3%</td>
<td>7.2%</td>
</tr>
<tr>
<td></td>
<td>3 or more servings: 80%</td>
<td>13.9%</td>
</tr>
<tr>
<td>Physical Activity (PA)</td>
<td>No PA over past 7 days: 3%</td>
<td>15.4%</td>
</tr>
<tr>
<td>Engagement</td>
<td>PA on all 5 days: 23.7%</td>
<td>46.5%</td>
</tr>
<tr>
<td>Screen Time&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3 or more hrs. on avg. school day: 76%</td>
<td>43%</td>
</tr>
<tr>
<td>Binge Eating&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Regular engagement in Binge Eating: 29.5%</td>
<td>22.2%</td>
</tr>
</tbody>
</table>

*Note.* Nationwide statistics on these outcomes retrieved via: <sup>a</sup>National Institute of Diabetes and Digestive Kidney Diseases (2017) <sup>b</sup>CDC (2017) <sup>c</sup>Hei, Cai, & Fan (2017).
Figure 1. Graphics used to recruit participants via Facebook. Flyers were approved by Northeastern University’s IRB prior to distribution.
Figure 2a. Path diagram displaying 18 observed variables as modeled using a confirmatory factor analysis (CFA; model 1).
Figure 2a. Path diagram displaying the standardized coefficients of four latent variables and 18 observed variables as modeled using a confirmatory factor analysis (CFA; model 2, final model)
### Appendix A

**Regulation of Eating Behavior Scale (Pelletier et al. 2004)**

**WHY ARE YOU TRYING TO REGULATE YOUR EATING BEHAVIORS?**

Listed below are several statements concerning possible reasons why people might try to regulate their eating behaviors. Using the scale from 1-7 below, please indicate the degree to which the proposed reasons correspond to your reasons for regulating your eating behaviors. Circle the appropriate number.

<table>
<thead>
<tr>
<th>Possible Reason</th>
<th>Does not correspond at all</th>
<th>Correlates moderately</th>
<th>Correlates exactly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I don’t know why I bother.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>2. Because I take pleasure in fixing healthy meals.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>3. Because it is expected of me.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>4. Because I like to find new ways to create meals that are healthy.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>5. Because eating healthy is a way to ensure long-term health benefits.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>6. I don’t know. I can’t see how my efforts to eat healthy are helping my health situation.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>7. Because I feel I must absolutely be thin.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>8. Because I don’t want to be ashamed of how I look.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>9. Because other people insist that I do.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>10. Because eating healthy is an integral part of my lifestyle.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>11. For the satisfaction of eating healthy.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>12. Because I would feel ashamed of myself if I was not eating healthy.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>13. Because other people close to me (e.g. partner or parents) will be upset if I don’t.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>14. Honestly, I don’t know. I can’t see what I’m getting out of it.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>15. Because people around me nag me to do it.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>16. Because I think it’s a good idea to try and regulate my eating behaviors.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td>17. Because eating healthy is part of the way I’ve chosen to live my life.</td>
<td>1</td>
<td>2</td>
<td>3  4  5  6</td>
</tr>
<tr>
<td></td>
<td>Does not correspond at all</td>
<td>Corresponds moderately</td>
<td>Corresponds exactly</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------------------</td>
<td>------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>18. Because I would be humiliated if people thought I wasn’t in control of my eating behaviors.</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. I don’t really know; I truly have the impression that I’m wasting my time trying to regulate my eating behaviors.</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Because regulating my eating behaviors has become a fundamental part of who I am.</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Because eating healthy is congruent with other aspects of myself.</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Because I believe that eventually it will allow me to feel better.</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Because I believe it’s a good thing I can do to feel better about myself in general.</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Because it’s fun to create meals that are good for my health.</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Intrinsic Motivation: 2, 4, 11, 24
Integrated Regulation: 10, 17, 20, 21
Identified Regulation: 5, 16, 22, 23
Introjected Regulation: 7, 8, 12, 18
External Regulation: 3, 9, 13, 15
Amotivation: 1, 6, 14, 19
Appendix B

Examples of Cognitive Probes (Collins, 2003)

<table>
<thead>
<tr>
<th>Type</th>
<th>Sample Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Think-aloud/general</td>
<td>How did you go about answering that question?</td>
</tr>
<tr>
<td></td>
<td>Tell me what you are thinking?</td>
</tr>
<tr>
<td></td>
<td>I noticed you hesitated before you answered – what were you thinking about?</td>
</tr>
<tr>
<td></td>
<td>How easy or difficult did you find this question to answer?</td>
</tr>
<tr>
<td></td>
<td>Why do you say that?</td>
</tr>
<tr>
<td>Comprehension</td>
<td>What does the term X mean to you? What did you understand by X?</td>
</tr>
<tr>
<td>Retrieval</td>
<td>How did you remember that? Did you have a particular time period in mind?</td>
</tr>
<tr>
<td></td>
<td>How did you calculate your answer?</td>
</tr>
<tr>
<td>Confidence judgment</td>
<td>How well do you remember this? How sure of your answer are you?</td>
</tr>
<tr>
<td>Response</td>
<td>How did you feel about answering this question?</td>
</tr>
<tr>
<td></td>
<td>Were you able to find your first answer to the question from the response option shown?</td>
</tr>
</tbody>
</table>
Appendix C

Demographic Questionnaire

What is your first name? ______________________________

What is the name of the program/site where you are completing this survey?

____________________________________________________________________

What is today’s date? _________________________________

How old are you? _________________________________

What grade will you enter next year in school? ______________

Please check those that best fit your racial/ethnic identity. You may select all that apply to you:

_____ White or European
_____ Hispanic, Latino, or Spanish
_____ Black or African American
_____ Native American, American Indian, or Alaskan Native
_____ Asian
_____ Middle Eastern or North African
_____ Native Hawaiian or other Pacific Islander
_____ Another Race or Ethnicity Not Listed

If Another Race Not Listed, Please Specify: ______________________________

What is your gender identity?

_____ Male
_____ Female
_____ Transgender
_____ Non-Binary
_____ Gender Not Listed

What is your height?

Feet: ________
Inches: ________

How much do you think you weigh (if you're not sure it is okay to guess)?

Weight (in pounds): ______________
Eating Attitudes Test-Food Preoccupation Subscale (Garner et al., 1982)
Please choose the best answer:

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Very often</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>I give too much time and thought to food.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think about food a lot of the time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think that food controls my life.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have gone on eating binges where I feel that I might not be able to stop.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel that others pressure me to eat.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Appendix E

Selected Items from the Intuitive Eating Scale (21-Item; Tylka, 2006)

**Unconditional Permission to Eat Subscale**

For each item, please choose the answer that best characterizes (or fits) your attitudes or behaviors.

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I try to avoid certain foods high in fat, carbohydrates or calories.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I follow eating rules or dieting plans that dictate what, when, and/or how much to eat.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have forbidden or 'bad' foods that I don’t allow myself to eat.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel guilty if I eat a certain food that is high in calories, fat, or carbohydrates.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think of a certain food as “good” or “bad” depending on how much fat or calories it has.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I don’t trust myself around fattening foods.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Changes to the wording of questionnaire items were consistent with Dockendorf et al. (2012) who administered the scale to a child and adolescent sample. The original scale was developed with an adult sample.*
Appendix F

Outcome Rating Scale (Miller et al., 2003)

Outcome Rating Scale (ORS)

Name ___________________ Age (Yrs): ___
ID# ____________________ Sex: M / F
Session # ___ Date: ________________

Looking back over the last week, including today, help us understand how you have been feeling by rating how well you have been doing in the following areas of your life, where marks to the left represent low levels and marks to the right indicate high levels.

Overall:
(General sense of well-being)

Individually:
(Personal well-being)

Interpersonally:
(Family, close relationships)

Socially:
(Work, School, Friendships)

Institute for the Study of Therapeutic Change
Appendix G

Single Item Self-Esteem Scale (Robbins et al., 1999)

Please choose the answer that best fits for you.

<table>
<thead>
<tr>
<th>1 (Not very true of me)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 (Very true of me)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have high self-esteem.</td>
<td></td>
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</tr>
</tbody>
</table>
Selected Questions from the Youth Risk Behavior Survey  
(Centers for Disease Control and Prevention, 2018)

The next six questions ask about food you ate during the past seven days. Think about all the meals and snacks you had from the time you got up until the time you went to bed. Be sure to include food you ate at home, at school, at restaurants, or anywhere else.

During the past 7 days, how many times did you eat fruit? (Do not count fruit juice.)
A. I did not eat fruit during the past 7 days
B. 1 to 3 times during the past 7 days
C. 4 to 6 times during the past 7 days
D. 1 time per day
E. 2 times per day
F. 3 times per day
G. 4 or more times per day

During the past 7 days, how many times did you eat vegetables? (Do not count potatoes.)
A. I did not eat other vegetables during the past 7 days
B. 1 to 3 times during the past 7 days
C. 4 to 6 times during the past 7 days
D. 1 time per day
E. 2 times per day
F. 3 times per day
G. 4 or more times per day

During the past 7 days, on how many days did you eat breakfast?
A. 0 days
B. 1 day
C. 2 days
D. 3 days
E. 4 days
F. 5 days
G. 6 days
H. 7 days

The next 5 questions ask about physical activity.

During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? (Add up all the time you spent in any kind of physical activity that increased your heart rate and made you breathe hard some of the time.)
A. 0 days
B. 1 day
C. 2 days
D. 3 days
E. 4 days
F. 5 days
G. 6 days
H. 7 days

On an average school day, how many hours do you watch TV?
A. I do not watch TV on an average school day
B. Less than 1 hour per day
C. 1 hour per day
D. 2 hours per day
E. 3 hours per day
F. 4 hours per day
G. 5 or more hours per day

On an average school day, how many hours do you use screens to play video or computer games or use a computer for something that is not school work? (Count time spent playing games, watching videos, texting, or using social media on your smartphone, computer, Xbox, PlayStation, iPad, or other tablet.)
A. I do not use screens on an average school day
B. Less than 1 hour per day
C. 1 hour per day
D. 2 hours per day
E. 3 hours per day
F. 4 hours per day
G. 5 or more hours per day
Appendix I

Adolescent Scale of Eating Behavior Regulation (ASEBR)
(Adapted from the Regulation of Eating Behavior Scale, Pelletier et al., 2004)

Each day we make choices about the food we eat, such as what, where, what time of day, and how much or who we eat with. Listed on the next few pages are reasons why someone might make these choices. We'd like you to think about what eating healthy means to you and how true each sentence is for why YOU might make choices about how you eat.

<table>
<thead>
<tr>
<th>When I have the opportunity, I enjoy picking foods that are healthy.</th>
<th>1 (never true for me)</th>
<th>2 (rarely true for me)</th>
<th>3 (sometimes, but not usually true for me)</th>
<th>4 (neutral)</th>
<th>5 (sometimes true for me)</th>
<th>6 (usually true for me)</th>
<th>7 (always true for me)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eating healthy is a big part of my life.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I choose the food I eat because I know it will help me live a long and healthy life.</td>
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<tr>
<td>I eat healthy because of how I want to look.</td>
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<tr>
<td>I eat healthy because other people expect me to.</td>
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</tr>
<tr>
<td>I have no idea why I choose the foods that I eat.</td>
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<tr>
<td>I enjoy finding new ways to eat healthy foods.</td>
<td>1 (never true for me)</td>
<td>2 (rarely true for me)</td>
<td>3 (sometimes, but not usually true for me)</td>
<td>4 (neutral)</td>
<td>5 (sometimes true for me)</td>
<td>6 (usually true for me)</td>
<td>7 (always true for me)</td>
</tr>
<tr>
<td>Making sure I eat healthy is part of how I've chosen to live my life.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>It’s probably a good idea for me to pick the foods I eat carefully.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>I eat healthy because I don’t want to be embarrassed about how I look.</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>Other people pressure me to eat the foods I do.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>Eating healthy doesn’t seem to affect my health.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td></td>
<td>1 (never true for me)</td>
<td>2 (rarely true for me)</td>
<td>3 (sometimes, but not usually true for me)</td>
<td>4 (neutral)</td>
<td>5 (sometimes true for me)</td>
<td>6 (usually true for me)</td>
<td>7 (always true for me)</td>
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<tr>
<td>I eat healthy because it feels good.</td>
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<tr>
<td>I pick the food I eat because making sure I eat a balanced diet is part of my lifestyle.</td>
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<tr>
<td>I eat healthy foods because with time, it will help me feel better.</td>
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<tr>
<td>I eat healthy because I feel guilty if I don’t.</td>
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<tr>
<td>I eat healthy because people important to me get upset when I eat differently.</td>
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<tr>
<td>The way I eat is not in my control.</td>
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</tr>
</tbody>
</table>

*Note.* Italicized items are those that were identified as problematic through Exploratory Factor Analysis and Confirmatory Factor Analysis and were removed in the finalized version of the measure.
<table>
<thead>
<tr>
<th>It is fun to eat healthy food.</th>
<th>1 (never true for me)</th>
<th>2 (rarely true for me)</th>
<th>3 (sometimes, but not usually true for me)</th>
<th>4 (neutral)</th>
<th>5 (sometimes true for me)</th>
<th>6 (usually true for me)</th>
<th>7 (Always true for me)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eating healthy is important because it fits in with other areas of my life.</td>
<td>1 (never true for me)</td>
<td>2 (rarely true for me)</td>
<td>3 (sometimes, but not usually true for me)</td>
<td>4 (neutral)</td>
<td>5 (sometimes true for me)</td>
<td>6 (usually true for me)</td>
<td>7 (Always true for me)</td>
</tr>
<tr>
<td>I pick healthy foods because it makes me feel better about myself.</td>
<td>1 (never true for me)</td>
<td>2 (rarely true for me)</td>
<td>3 (sometimes, but not usually true for me)</td>
<td>4 (neutral)</td>
<td>5 (sometimes true for me)</td>
<td>6 (usually true for me)</td>
<td>7 (Always true for me)</td>
</tr>
<tr>
<td>I eat healthy because I would be embarrassed if other people thought my eating was out of control.</td>
<td>1 (never true for me)</td>
<td>2 (rarely true for me)</td>
<td>3 (sometimes, but not usually true for me)</td>
<td>4 (neutral)</td>
<td>5 (sometimes true for me)</td>
<td>6 (usually true for me)</td>
<td>7 (Always true for me)</td>
</tr>
<tr>
<td>I eat healthy because people around me tell me I should.</td>
<td>1 (never true for me)</td>
<td>2 (rarely true for me)</td>
<td>3 (sometimes, but not usually true for me)</td>
<td>4 (neutral)</td>
<td>5 (sometimes true for me)</td>
<td>6 (usually true for me)</td>
<td>7 (Always true for me)</td>
</tr>
<tr>
<td>Eating healthy is a waste of my time.</td>
<td>1 (never true for me)</td>
<td>2 (rarely true for me)</td>
<td>3 (sometimes, but not usually true for me)</td>
<td>4 (neutral)</td>
<td>5 (sometimes true for me)</td>
<td>6 (usually true for me)</td>
<td>7 (Always true for me)</td>
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