



## APPROVAL SHEET

Title of Thesis: The Mediating Role of Self-Regulation in The Association Between Parental Autonomy Support and Dysfunctional Eating Habits in Emerging Adults

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## ABSTRACT

Title of Document: THE MEDIATING ROLE OF SELF-REGULATION IN THE ASSOCIATION BETWEEN PARENTAL AUTONOMY SUPPORT AND DYSFUNCTIONAL EATING HABITS IN EMERGING ADULTS  
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Emerging adulthood (18 to 25 years) is a critical developmental period for examining eating-related processes and self-regulation. Autonomy supportive parenting is a predictor of more positive self-regulation and adaptive outcomes in children. The overall purpose of the present study was to examine the relations between 365 emerging adults' perceptions of their parents' promotion of volitional functioning (PVF) and their reported dysfunctional eating habits (i.e., cognitive restraint, emotional eating and uncontrolled eating). In addition, the mediating roles of global and eating-specific (i.e., controlled and autonomous regulation of eating) self-regulation in these associations were explored. PVF was positively associated with global self-regulation and autonomous regulation of eating, and negatively associated with controlled regulation of eating, cognitive restraint, emotional eating and uncontrolled eating. Findings indicated that global and eating-specific self-regulation were differently associated with specific types of dysfunctional eating habits. Specifically, controlled regulation and autonomous regulation mediated the association between PVF and cognitive restraint, whereas global self-regulation mediated the association between PVF and emotional eating. Finally, global self-regulation, controlled regulation, and autonomous regulation mediated the association between PVF and uncontrolled eating. This level of specificity in the processes revealed in the present study has important

implications for future studies and the design of intervention programs to promote the positive eating-related and health outcomes of emerging adults.

THE MEDIATING ROLE OF SELF-REGULATION IN THE ASSOCIATION BETWEEN  
PARENTAL AUTONOMY SUPPORT AND DYSFUNCTIONAL EATING HABITS IN  
EMERGING ADULTS

By

Salih Barman

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## **Introduction**

Obesity and overweight are prevalent medical conditions that can lead to significant health problems in the United States, with 35.1% of individuals categorized as obese or overweight between 2015 and 2016 (Fryar et al., 2018). In a longitudinal study, Gordon-Larsen et al. (2004) found that prevalence of overweight has increased from 10.9% during adolescence to 22.1% during emerging adulthood between 1996 and 2001. During the period of emerging adulthood (18 to 25 years; Arnett, 2000), long-term weight-related behavioral patterns, such as eating habits, are established and there is an increased risk for engaging in adverse health behaviors, including dysfunctional eating behaviors and eating disorders (American Psychiatric Association, 2013; Nelson et al., 2008; Racette et al., 2008; Sussman & Arnett, 2014; Verstuyf et al., 2013). Therefore, emerging adulthood is a critical developmental period for examining eating-related processes.

Self-regulatory skill is an important predictor of healthy eating habits (Hofmann et al., 2007; Kalavana et al., 2010) and is also related to higher levels of success in health-related behavior change, such as in obesity interventions (Teixeira et al., 2015). In addition, self-regulation ability continues to develop in emerging adulthood (Albert & Steinberg, 2011). Thus, the examination of self-regulation is important in order to understand potential processes underlying unhealthy eating habits during this period of development. Studying the factors that promote self-regulation is also crucial in improving eating habits. According to Self Determination Theory, the development of self-regulation ability can be influenced by parenting practices (Ryan & Deci, 2017) such that parenting that supports children's autonomy can promote intrinsic motivation and better autonomous self-regulation; in contrast, controlling parenting practices undermine children's self-regulation abilities (Gorin et al., 2014).

The overall purpose of the present study was to examine the concurrent relations between emerging adults' perceptions of their parents' autonomy supportive parenting practices (i.e., promotion of volitional functioning) and their reported dysfunctional eating habits (i.e., cognitive restraint, emotional eating and uncontrolled eating). Cognitive restraint, emotional eating and uncontrolled eating are three dimensions of unhealthy eating habits, which reflect the cognitive, emotional and behavioral aspects of dysfunctional eating, respectively. Cognitive restraint is defined as the conscious effort to restrict food intake (Stunkard & Messick, 1985). Emotional eating is an unhealthy eating habit that occurs after experiencing negative emotions (Evers et al., 2018). Finally, uncontrolled eating is defined as an overall difficulty in the regulation of eating (Karlsson et al., 2000). In addition, the mediating roles of emerging adults' global and eating-specific (i.e., controlled and autonomous regulation of eating) self-regulation in the relation between parental autonomy support and dysfunctional eating habits were explored.

## **Emerging Adulthood**

The present study focused on examining these regulatory and eating-related processes during emerging adulthood, which is a developmental period between the ages of 18 and 25 years, characterized by increased autonomy and independent decision-making (Arnett, 2000). Exploration of and experimentation with different life directions and behaviors occur more frequently and substantially during emerging adulthood compared to the other periods of life (Arnett, 2000; Sussman & Arnett, 2014), which is proposed to be adaptive for emerging adults' identity development (Shulman et al., 2009). However, the changes in the behaviors and life-style factors together with increased level of independence may also pose a risk for emerging adults' health, as individuals may feel invulnerable to negative life consequences and act hedonistic during this period (Sussman & Arnett, 2014), including with regard to eating.

Emerging adulthood is a high-risk period for weight gain (Racette et al., 2005, 2008). Health-related behaviors and eating habits, such as physical activity and dietary intake, are likely to change during emerging adulthood (Nelson et al., 2008). For example, overall diet quality may decline during this period (Larson et al., 2008; Lipsky et al., 2015; Nelson et al., 2008; Niemeier et al., 2006). Moving out of the parental home, one of the developmental markers of emerging adulthood (Cohen et al., 2003), is also associated with changes in eating habits (Gram et al., 2015). Moreover, a meta-analysis study concluded that almost two thirds of the first-year college students gained weight within their first year in college and those students' weight gain rates were higher than in the general population (Vadeboncoeur et al., 2015).

Several studies found that self-regulation is related to weight-control and eating behaviors in emerging adults. Qualitative studies reported that college students believe that their limited self-regulation ability was leading to overeating and weight gain (P. H. Johnson & Annesi, 2018; LaCaille et al., 2011). Moreover, lower levels of effortful control were associated with higher risk for eating disorders in emerging adults (N. M. Burt et al., 2015), and autonomous regulation of eating behaviors was negatively associated with body fat percentage in college students (Morgan et al., 2012). Therefore, self-regulation can be a protective factor against dysfunctional eating habits in emerging adulthood.

Importantly, self-regulation and self-control abilities show a significant increase during adolescence and continue to develop in emerging adulthood (Albert & Steinberg, 2011; C. H. Burt et al., 2014; Hagler et al., 2016). Neurological studies also indicate that the development and maturation of the prefrontal cortex, which is related to executive functioning and self-regulation, continue throughout adolescence and emerging adulthood (Smith et al., 2013; White, 2009). Therefore, relatively limited capacity in self-regulation can also contribute to the elevated risk for

negative health outcomes during emerging adulthood. The increase in autonomy and independent decision-making during emerging adulthood can also increase the frequency of situations in which emerging adults need to self-regulate. This may, in turn, lead to greater risk for adverse health outcomes including dysfunctional eating and weight gain during this period, especially when coupled with relatively limited capacity in self-regulation. As emerging adulthood is a high-risk period for engaging in unhealthy eating habits and a critical period for the development of self-regulation, it is important to examine the associations between regulatory processes and eating habits during emerging adulthood.

### **Self-determination Theory**

Self-determination theory (SDT) was used as the theoretical framework of the present study. SDT maintains that there are three basic psychological needs: autonomy, relatedness, and competence (Ryan & Deci, 2000). The satisfaction of these needs is essential for various aspects of individuals' positive adjustment, including their psychological well-being, intrinsic motivation, self-regulation of behaviors, and the establishment of an autonomous self (Milyavskaya & Koestner, 2011; Wilson & Rogers, 2008). In contrast, the frustration of these basic needs can lead to maladaptive outcomes, such as depressive symptoms (B. Chen et al., 2015), disordered eating (Froreich et al., 2017; Verstuyf et al., 2013) and lower levels of life satisfaction (Leversen et al., 2012). SDT proposes that the satisfaction of all three needs is essential for psychological integration and optimal human functioning, such that satisfaction of one or two of the basic needs is not sufficient for psychological well-being (Ryan & Deci, 2017). Importantly, the degree of value given to each of the basic needs may vary on both individual- and cultural-levels; however, these basic psychological needs are still proposed to be universal

and essential for optimal psychological functioning regardless of the cultural context (B. Chen et al., 2015; Sheldon & Schöler, 2011).

Ryan and Deci (2017) stated that social environmental factors, including parenting, can support or hinder the development and meeting of one's basic psychological need satisfaction, motivation, behavioral regulation, and well-being. In this study, I focused on the need for autonomy, and the role of parents. Parents are important figures in children's social environment in the early stages, and continue to be key social influences on children's psychological need satisfaction during emerging adulthood (Gitelson & McDermott, 2006). For instance, parental autonomy supportive practices are associated with higher levels of basic psychological need satisfaction in adolescents and emerging adults which, in turn, are associated with positive developmental outcomes such as autonomous regulation of behaviors (Inguglia et al., 2015).

### **Self-Regulation**

Global self-regulation is the ability to suppress one's impulses toward a lower-level goal in order to achieve a higher-level goal (Carey et al., 2004; F. Johnson et al., 2012). Self-regulation involves inhibition of immediate desires and delayed gratification, which require one to exert control over automatic processes (Muraven & Baumeister, 2000). Self-regulatory skills are associated with fewer externalizing and internalizing problems (Eisenberg et al., 2004), and positive long-term outcomes in several domains including psychological well-being, academic achievement, health related behaviors and weight management (Bandura, 2005; Kitsantas, 2000; Liew et al., 2014; Niemiec et al., 2006).

Self-regulation is a broad construct that includes both conscious and unconscious processes that regulate one's behaviors, emotions and physiological systems (F. Chen et al., 2018). There are various terms used in the literature, and throughout this proposal, that may refer

to different aspects or components of self-regulation. Self-control and effortful control are two common terms that are used either interchangeably with self-regulation or as subdimensions of it. Similar to self-regulation, both self-control and effortful control are generally defined as the ability to inhibit dominant responses and alter them with responses that are in line with long-term goals (Baumeister et al., 2007; Eisenberg et al., 2004). Executive functioning is another term that is commonly used in self-regulation literature, which refers to the cognitive processes (e.g., working memory, inhibitory control and shifting) that allow individuals to control and regulate thoughts, emotions and behaviors (Müller & Kerns, 2015). Executive functions support the important mechanisms required for self-regulation (Hofmann et al., 2012).

Organismic Integration Theory (OIT), one of the six mini theories of SDT, focuses on the development of self-regulation through the process of internalization. Internalization is defined as “the process of taking in values, beliefs, or behavioral regulations from external sources and transforming them into one’s own” (Ryan & Deci, 2017, p. 180). OIT describes the internalization of extrinsic motivation and types of regulation in a continuum spanning from relatively controlled regulation to more autonomous or self-determined regulation (Grolnick & Ryan, 1989; Ryan & Deci, 2017). Accordingly, there are two main types (i.e., controlled and autonomous) and five subtypes (i.e., external, introjected, internal, integrated, and intrinsic) of regulatory styles specified in OIT. These regulatory styles vary in their perceived locus of causality (i.e., external or internal) and level of autonomy experienced in self-regulation. External regulation and introjected regulation are the external or controlled regulatory styles. Identified regulation, integrated regulation and intrinsic regulation are the internal or autonomous types of regulation. Controlled regulation of behaviors is contingent on external rewards or punishment, or an internal sense of conditional pride. On the other hand, autonomous regulation of behaviors

is driven by internalized values and regulations that were consciously endorsed or integrated into one's self. Previous studies showed that autonomous regulation is associated with positive outcomes such as academic adjustment (Ratelle et al., 2007), whereas controlled regulation is usually associated with negative outcomes such as lower levels of self-esteem and psychological well-being (Carraça et al., 2011; Schultz & Ryan, 2015).

Controlled and autonomous regulatory styles are applied to eating domain as well. Pelletier et al.'s (2004) examples for controlled regulation of eating include regulating eating to obtain approval from others, to avoid criticism from others, and to avoid an internalized sense of shame associated with unhealthy eating behaviors; and examples for autonomous regulation of eating include eating healthy because of one's own values and goals such as believing that eating healthy is a good thing, and regulating eating to help improve one's overall physical health and well-being which can allow the individual to prioritize engaging in other activities one enjoys or values. Many studies have found that controlled regulation of eating is usually ineffective, and is associated with dysfunctional eating behaviors, body dissatisfaction and psychological adjustment problems (Carraça et al., 2011; L. L. Kopp & Zimmer-Gembeck, 2011; Pelletier et al., 2004; Pelletier & Dion, 2007). In contrast, autonomous regulation of eating is found to be more effective, and is associated with healthy eating behaviors, lower BMI and psychological well-being (L. L. Kopp & Zimmer-Gembeck, 2011; Leong et al., 2012; Pelletier et al., 2004; Pelletier & Dion, 2007). Moreover, controlled regulation of eating behaviors was associated with avoidance orientation towards planning of eating and dysfunctional eating behaviors, whereas autonomous regulation was related to approach orientation toward planning of eating and healthy eating habits (Otis & Pelletier, 2008).

Motivation is one of the key components of successful self-regulation (Baumeister & Heatherton, 1996). Self-regulation is a domain-general construct (Rivers et al., 2016). However, despite having the adequate global self-regulatory skills, individuals can fail at self-regulation in certain domains (e.g., eating behaviors and academic achievement) due to a lack of motivation to regulate domain-specific behaviors (Geldhof et al., 2012; Hofmann et al., 2012). Thus, it is important to investigate the regulation of eating behaviors within a motivational framework, such as SDT, which can be helpful in understanding the role of social and motivational factors on the development of self-regulation and the regulation of eating behaviors. Moreover, examining and contrasting the roles of global and eating-specific self-regulation together would allow an understanding of the unique contributions of both forms to unhealthy eating habits. These unique contributions can inform future prevention and intervention efforts in focusing on the more important form of self-regulation (global versus eating-specific) to reduce unhealthy eating habits. Therefore, in the present study, the mediating roles of both global self-regulation and eating-specific regulation were examined together.

The effectiveness of the internalization process depends on the individual's perceived level of autonomy (Ryan & Deci, 2017). An autonomy supportive socialization environment would promote more effective internalization of values, beliefs, or behaviors promoted within the environment, which, in turn, is more likely to promote autonomous regulation of behaviors and consequently healthy functioning (L. L. Kopp & Zimmer-Gembeck, 2011; Pelletier et al., 2001).

### ***Parental Autonomy Support and Self-regulation Development***

Self-regulation requires children to be aware of the socially approved behaviors and to be able to adjust their own behaviors accordingly (C. B. Kopp, 1982). Thus, socialization processes and contextual demands play a key role in the development of self-regulation. Socialization

agents, especially caregivers, reinforce or discourage certain behaviors and provide rules and expectations to their children, which serve as external motivators or control mechanisms (Bornstein & Lansford, 2010). These control mechanisms are antecedents of children's self-initiated control as they let children learn which behaviors are approved and which are expected to be suppressed (C. B. Kopp, 1982).

OIT also emphasizes the role of socialization agents in the self-regulation development and proposes that humans are inclined to internalize extrinsic motivations endorsed by significant others. Children engage in many practices because socialization agents (e.g., parents or peers) expect, promote or compel those practices. Although parental reinforcement is an external source of motivation for children, parental values and beliefs are gradually internalized by children as they grow (Ryan & Deci, 2017). Importantly, parental practices can influence whether children will internalize the values in an effective or ineffective way. An autonomy supportive environment provided by parents would allow children to make self-directed, personally meaningful choices, which would promote intrinsic motivation and better autonomous self-regulation (Gorin et al., 2014). Alternatively, in less autonomy granting environments, children's behaviors are usually regulated by external agents (e.g., through parental rewards or punishments), which do not allow children to learn and practice self-mediated regulatory strategies. Thus, in this latter example, parental values would not be internalized effectively and would continue to serve as external or introjected regulators.

Parental promotion of volitional functioning (PVF) is an autonomy supportive parenting practice, which entails the parental encouragement of autonomous behaviors in their children. Specifically, parental PVF is characterized as being empathetic to children's perspectives, providing children with choices, minimizing the use of control and promoting children's

exploration of and acting upon their personal values and interests (Soenens et al., 2007). Soenens et al. (2007) found that PVF was positively associated with emerging adults' self-determination, which, in turn, is associated with better psychological functioning.

Perceived parental autonomy support is related to better autonomous self-regulation (Grolnick & Ryan, 1989). Parents can enhance their children's self-regulation of food intake by providing an environment in which they give healthy food choices to their children and grant children autonomy on their food intake (S. L. Johnson & Birch, 1994). In contrast less autonomy promotive parenting can undermine learning and internalization of self-regulation of behaviors (Costanzo & Woody, 1985). For example, parents' controlling child-feeding practices can undermine children's self-regulation of eating (Birch & Fisher, 1998). Internalized parental restrictions can help children regulate their behaviors in certain situations. However, if children lack self-mediated control skills, counter-regulatory processes can disrupt internalized parental restrictions when the child is faced with tempting situations or disinhibitory experiences (e.g., negative emotions). For example, young adults may have internalized their parents' concerns about weight gain and deliberately restrict their eating; however, this restrictions can be disrupted by desirable stimuli (e.g., palatable foods) if the emerging adults' self-regulatory capacity is limited (Costanzo & Woody, 1985). Controlled regulation may pose a particular risk for emerging adults who are living separately from their parents for the first time, in terms of being able to regulate their impulses without the "help" of an external source of control.

Wong (2008) found that parental autonomy support is associated with better effortful control, autonomous self-regulation and academic achievement in adolescents. Research on the association between parenting practices and emerging adults' self-regulation is limited. However, the existing literature indicates that parental autonomy support is positively associated with self-

regulation in emerging adulthood. For example, parental autonomy support was associated with academic self-regulation (Litalien et al., 2019) and autonomous regulation of sexual-risk behaviors in college students (Riley & McDermott, 2018). Moreover, emerging adults' perception of parental autonomy support was positively associated with autonomous regulation of residential status, and negatively associated with controlled regulation. Less autonomy supportive parenting practices were also found to be negatively associated with emerging adults' self-regulation. For instance, helicopter parenting, a parenting style characterized by excessive limiting of child's autonomy (Padilla-Walker & Nelson, 2012), is associated with poorer academic and emotional functioning, and endorsement of less adaptive decision-making styles (e.g., avoidant decision-making) in emerging adults (Luebke et al., 2018). In addition, emerging adults' self-regulation ability and psychological well-being are negatively associated with authoritarian parenting and positively associated with authoritative parenting (Shen et al., 2018). Parental psychological control was also a negative predictor of emerging adults' self-regulation (Moilanen & Manuel, 2017).

### **Dysfunctional Eating Habits as Outcomes**

Overall, limited self-regulatory ability is predictive of dysfunctional eating habits (Pelletier et al., 2004). For example, cognitive restraint is negatively associated with self-regulation (Logue & King, 1991). Although cognitive restraint, an active effort to restrain food intake, might seem like an effective strategy for regulation of eating, restrained eating practices (e.g. dieting) are related to disturbances in the control of food intake (Wardle, 1988). Since restrained eaters rely on cognitive control, instead of physiological cues, to regulate their eating, cognitive restraint is thought to become ineffective during states of disinhibition that disrupt cognitive functioning, such as after alcohol ingestion or when experiencing dysphoric emotions

(F. Johnson et al., 2012). For example, a meta-analysis concluded that, in laboratory settings, restrained eaters tend to eat more than unrestrained eaters following negative mood induction (Cardi et al., 2015). This process is called counter-regulation, in which restrained eaters fail to commit to their (long-term) goal of limiting food intake during states of disinhibition (F. Johnson et al., 2012). Counter-regulatory processes can lead to loss of control over eating and binge eating episodes in restrained eaters due to limited levels of self-regulation (Goldschmidt et al., 2016).

Emotional eating is another dysfunctional eating habit, which is associated with health problems including higher risk for obesity and diabetes (Evers et al., 2018). Emotional eating is proposed to be learned from early experiences through associating certain emotions with food intake, especially if food intake is followed by positive feelings or reduction of negative emotions (Alzheimer & Urry, 2019). Powell et al. (2017) suggested that such experiences can socialize children to use eating as a coping strategy to alleviate the effects of negative emotions and found that lower self-regulation partially mediated the relation between parental use of food as reward and increased emotional eating in children. In other words, emotional eating can be characterized by failure in emotion regulation. In addition, lower capacity in regulation of eating was found to mediate the relation between stress and higher emotional eating behavior in university students (Tan & Chow, 2014). Similarly, lower levels of self-control mediated the relation between negative emotional states and emotional eating in adolescents (Zhu et al., 2014). Therefore, low self-regulation is a risk factor for emotional eating.

Finally, uncontrolled eating is a dysfunctional eating habit characterized by loss of control over food intake and overeating (Anglé et al., 2009; Karlsson et al., 2000). Various studies have found that uncontrolled eating is related to low levels of self-regulation. Uncontrolled eating is positively associated with trait impulsivity and BMI, and negatively associated with executive

functioning, cognitive control and self-control (Booth et al., 2018; Calvo et al., 2014; Konttinen et al., 2009; Leitch et al., 2013; Vainik et al., 2019). Constructs that are closely related to, and sometimes used interchangeably with uncontrolled eating include binge eating, disinhibited or impulsive eating and loss of control over eating, which have also been found to be inversely correlated with cognitive control (Vainik et al., 2019).

## **The Present Study**

The overall aim of this study was to examine whether autonomy supportive parenting practices are related to emerging adults' dysfunctional eating habits through emerging adults' self-regulation abilities. Two types of SR were examined as mediators: global self-regulation and self-regulation of eating behaviors. This was the first study to examine the mediating roles of both global and eating-specific self-regulation in the association between perception of parenting practices and dysfunctional eating habits in emerging adulthood, to help tease out potential mediating mechanisms that could help explain the association between parenting and dysfunctional eating outcomes during emerging adulthood, which is a risk period for weight gain. The specific aims and hypotheses of the present study are as follows.

### ***Specific Aims and Hypotheses***

*Aim 1:* To assess the associations between parental promotion of volitional functioning (PVF) and the three dimensions of dysfunctional eating habits; cognitive restraint, emotional eating and uncontrolled eating. *Hypothesis 1:* Parental PVF would be negatively associated with cognitive restraint, emotional eating and uncontrolled eating.

*Aim 2:* To assess the association between parental autonomy support and global self-regulation and two types of self-regulation more specific to eating-related processes (autonomous and controlled regulation of eating behaviors). *Hypothesis 2.1:* Parental PVF would be positively

associated with global self-regulation and autonomous regulation of eating behaviors. *Hypothesis 2.2:* Parental PVF would be negatively associated with controlled regulation of eating behaviors.

*Aim 3.1:* To examine the mediating roles of global self-regulation and two types of eating-specific self-regulation in the relation between parental autonomy support and dysfunctional eating habits. *Hypothesis 3.1:* Global self-regulation, autonomous regulation of eating and controlled regulation of eating would mediate the association between PVF and dysfunctional eating habits (cognitive restraint, emotional eating and uncontrolled eating). Specifically, global self-regulation and autonomous regulation of eating would be negatively associated with dysfunctional eating habits, whereas controlled regulation of eating would be positively associated with dysfunctional eating habits. *Aim 3.2:* To examine and contrast the unique indirect effects through global-self-regulation, autonomous regulation of eating and controlled regulation of eating. *Hypothesis 3.2:* Since the mediating roles of global self-regulation and eating-specific self-regulation have not been examined together in the literature before, no hypothesis is defined regarding the contrasts between unique indirect effects.

### ***Covariates***

Participants' age, body mass index (BMI), gender, ethnicity and living situation were controlled for in the primary analyses. Both longitudinal (C. H. Burt et al., 2014; Friedman et al., 2016) and cross-sectional studies (Hagler et al., 2016) showed that self-regulation ability tends to change with age during emerging adulthood. In order to account for the potential effect of age on self-regulation and other study variables, participants' age was controlled for in the primary analyses. Previous studies also indicated that BMI is associated with eating behaviors. Specifically, BMI is found to be positively associated with restrained eating, emotional eating and uncontrolled eating (Anglé et al., 2009; Banna et al., 2018; Gallant et al., 2010; Snoek et al.,

2008, 2013). Participants' BMI was also controlled for in the primary analyses to account for its potential effect on the proposed model.

The existing literature shows that there may be group-level gender differences in dysfunctional eating behaviors, where women are more likely to engage in unhealthy eating behaviors and demonstrate higher levels of eating pathology (Lewinsohn et al., 2002; Opwis et al., 2017; Striegel-Moore et al., 2009; Zayas et al., 2018). Studies also showed that there might be cultural or ethnic group differences in mean levels of perceived parental autonomy support (Chirkov & Ryan, 2001; Ferguson et al., 2011; Lekes et al., 2010), self-regulation (Shen et al., 2018; Weis et al., 2016), and dysfunctional eating behaviors (Rodgers et al., 2017; Story et al., 1995). Despite these potential mean-level group differences, the processes underlying the associations between parental autonomy support, self-regulation and eating habits are expected to be similar across ethnic groups as suggested by SDT (Ryan & Deci, 2017). For example, in line with this expectation, Shen et al. (2018) found that the associations between parenting styles and self-regulation were similar across Asian American and European American emerging adults despite mean-level differences in self-regulation and parenting styles across these two groups.

As mentioned above, moving out of the parental home is associated with changes in eating habits and diet quality. Gram et al. (2015) describe moving away from the parental home as “a period of intense (re)construction of food consumption habits and skills.” Overall diet quality may decline during this reconstruction period (Nelson et al., 2008). Moreover, the frequency of fast food consumption, which is associated with greater weight gain (Duffey et al., 2007), increased from adolescence to young adulthood (Larson et al., 2008; Niemeier et al., 2006). Conversely, frequency of healthy food (e.g., fruits, vegetables and whole grains) intake showed a decreasing trend from adolescence to young adulthood (Lipsky et al., 2015). Therefore,

there might be group differences in dysfunctional eating habits across participants with different living situations.

Since the present study aims to examine the processes rather than the mean-level group differences, the main hypotheses of the study were examined with the whole sample together. In order to control for the effects of gender, ethnicity, and living situation on the proposed model, these variables were dummy coded and treated as covariates in the primary analyses.

## **Method**

### **Participants**

Participants were 362 emerging adults (73% Cis females) between 18 and 25 years old ( $M = 20.18$ ,  $SD = 1.71$ ) who participated in a larger study examining the psychological (e.g. mental health, body dissatisfaction), social (e.g., parenting) and cultural (e.g., acculturation, ethnic identity, discrimination experiences) processes that contribute to young adults' healthy development. Participants were students attending a mid-size state university in the mid-Atlantic U.S.A. The specific demographic characteristics of the sample are presented in Table 1.

### **Procedure**

Data collection and participant recruitment started in the Fall of 2018 and ended in the Spring of 2020. Participants were recruited through a psychology department participant pool (SONA) and by posting flyers around campus. Participants provided online informed consent and responded to an online survey on Qualtrics. As compensation for completing the survey, participants were offered either one extra credit in a psychology class (if recruited from the Psychology Department participant pool), or (b) one entry into a lucky drawing to win one of five \$20, \$50 cash prizes and a \$100 grand prize. Procedures of this study were approved by the

Institutional Review Board of University of Maryland, Baltimore County (Understanding Healthy Development in Young Adults, protocol #: Y19CC20012).

## **Measures**

***Demographics.*** Participants responded to demographic questions regarding their age, gender, self-identified ethnicity, major, class standing, living situation, weight and height. Body mass index (BMI) was calculated by dividing weight in kilograms by height in meters squared ( $\text{Kg/m}^2$ ) (Centers for Disease Control and Prevention, 2017).

***Promotion of Volitional Functioning.*** Emerging adults' perceptions of their parents' promotion of volitional functioning was measured with 6 items (e.g., "My parents let me make my own plans for things I want to do"; see Appendix A.1.) adapted from autonomy support subscale of Perception of Parents Scale (Grolnick et al., 1991) and Psychological Autonomy Granting Scale (Silk et al., 2003) by Soenens et al. (2007). Participants responded to the items on a 5-point Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). This measure has demonstrated adequate reliability in previous studies among emerging adults in U.S. (Cronbach's  $\alpha = .70-.88$ ; Inguglia et al., 2016; Zong et al., 2019). It demonstrated good reliability in the present study (Cronbach's  $\alpha = .90$ ). Mean score of the 6 items was created for the analyses.

***Regulation of Eating Behavior Scale.*** Participants' behavioral and motivational regulatory styles regarding eating behaviors was assessed with Regulation of Eating Behavior Scale (REBS; Pelletier et al., 2004; see Appendix A.2.). REBS instructs participants to indicate to what extent they agree with items that tap into different reasons for regulating eating behaviors. Participants responded to the items on a 7-point Likert scale ranging from 1 (Strongly disagree) to 7 (Strongly agree). REBS follows the motivational model of regulation proposed by SDT and it measures five forms of regulation; external regulation (4 items; e.g., "Other people close to me

insist that I do”), introjected regulation (4 items; e.g., “I don’t want to be ashamed of how I look”), identified regulation (4 items; e.g., “I believe it will eventually allow me to feel better”), integrated regulation (4 items; e.g., “Eating healthy is part of the way I have chosen to live my life”) and intrinsic motivation (4 items; e.g., “I take pleasure in fixing healthy meals”). REBS also has an amotivation subscale, however it was not be used in this study. Scores for controlled regulation of eating were calculated by averaging the scores of 8 items from external regulation and introjected regulation subscales. Scores for autonomous regulation of eating were calculated by averaging the scores of 12 items from identified regulation, integrated regulation and intrinsic motivation subscales. REBS subscales demonstrated adequate test-retest reliability ( $r = .49-.76$ ; Hamilton et al., 2018) and internal consistency (Cronbach's  $\alpha = .71-.93$ ) in the previous studies among Canadian and U.S. emerging adults (Bégin et al., 2018; Hamilton et al., 2018; Pelletier et al., 2004). In the present study, both autonomous regulation (Cronbach's  $\alpha = .91$ ) and controlled regulation (Cronbach's  $\alpha = .83$ ) demonstrated good reliability.

***Short Self-Regulation Questionnaire.*** Global self-regulation of emerging adults was assessed with Short Self-Regulation Questionnaire (SSRQ; Carey et al., 2004; see Appendix A.3.). SSRQ consists of 31 items (e.g., “I am able to accomplish goals for myself.”). Participants responded to the items on a 5-point Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). SSRQ showed good reliability in previous studies among U.S. emerging adults (Cronbach's  $\alpha = .92-.93$ ; Carey et al., 2004; Shen et al., 2018). The SSRQ also demonstrated good reliability in the present study (Cronbach's  $\alpha = .92$ ). Mean score of the items was created for the analyses.

***Three Factor Eating Questionnaire.*** Participants’ unhealthy eating habits were measured with the revised version of the Three Factor Eating Questionnaire (TFEQ-R18; Karlsson et al.,

2000). TFEQ-R18 involves 18 items (see Appendix A.4.). Thirteen items of TFEQ-R18 instruct participants to indicate to what extent the items are true for them on a 4-point Likert scale ranging from 1 (Definitely false) to 4 (Definitely true). Three items instruct participants to indicate how often the situation described in each item occurs on a 4-point Likert scale ranging from 1 (Almost never/Never) to 4 (Almost always/At least once a week). One item instructs participants to indicate the likelihood of the situation described in the item happening for them on a 4-point Likert scale ranging from 1 (Unlikely) to 4 (Very likely). Lastly, one item instructs participants to indicate to what extent they restrain their eating on an 8-point Likert scale ranging from 1 (No restraint) to 8 (Total restraint).

TFEQ-R18 consists of three subscales; cognitive restraint (6 items; e.g., “I deliberately take small helpings as a means of controlling my weight.”), emotional eating (3 items; e.g., “When I feel lonely, I console myself by eating.”) and uncontrolled eating (9 items; e.g., “Sometimes when I start eating, I just can’t seem to stop.”). TFEQ subscales demonstrated good reliability in previous studies among U.S. emerging adults (Cronbach's  $\alpha = .82-.87$ ; Hodgins et al., 2016; Quick et al., 2016). In the present study, cognitive restraint (Cronbach's  $\alpha = .78$ ) and emotional eating (Cronbach's  $\alpha = .79$ ) showed adequate reliability, and uncontrolled eating showed good reliability (Cronbach's  $\alpha = .88$ ). Subscale scores were converted to a scale ranging from 0 to 100 using the following equation:  $[(\text{raw score} - \text{lowest possible raw score}) / \text{possible raw score range}] \times 100$ .

### **Data Analytic Plan**

In the preliminary analyses, the associations between covariates and the study variables were examined. Correlation analyses were conducted to examine the relations between participants' BMI, age and the study variables. A series of t-tests was conducted to examine

gender differences in the study variables among cis females and cis males, and a series of ANOVAs was conducted to examine the mean differences in the study variables among ethnic groups with a sample size of 30 or larger. Similarly, ANOVAs were conducted to examine the mean differences in the study variables among participants living on campus, living off campus with their families, and living off campus without their families

Participants' self-reported BMI, age, ethnicity, gender, and living situation were controlled for in the following analyses. To test hypothesis 1, three multiple linear regression analyses were conducted. PVF was entered as the predictor variable, and cognitive restraint, uncontrolled eating, and emotional eating were entered as outcome variables in each analysis separately. To test hypotheses 2.1 and 2.2, three multiple linear regression analyses were conducted. PVF was entered as the predictor variable, and global self-regulation, autonomous regulation and controlled regulation were entered as outcome variables in each analysis separately.

Three parallel mediation analyses were conducted to test hypothesis 3.1 using PROCESS macro (Hayes, 2017) for SPSS. PVF was entered as the predictor variable and self-regulation, autonomous regulation of eating, and controlled regulation of eating were entered as mediator variables at the same time. Cognitive restraint, uncontrolled eating, and emotional eating were entered as outcome variables in each analysis separately. To test hypothesis 3.2, pairwise comparisons between specific indirect effects were conducted using PROCESS, which allowed us to bootstrap the contrasts between the absolute values of specific indirect effects.

## Results

### Preliminary Analyses

In the preliminary analyses, the associations between study variables (promotion of volitional functioning, global self-regulation, autonomous regulation, controlled regulation, cognitive restraint, emotional eating, and uncontrolled eating) and covariates (BMI, age, ethnicity, gender, and living situation) were explored. BMI was positively associated with cognitive restraint, emotional eating, and uncontrolled eating, whereas it was not significantly associated with promotion of volitional functioning, global self-regulation, autonomous regulation, and controlled regulation (see Table 2 for correlations). Participants' age was not significantly related to any of the study variables (see Table 2).

I conducted one-way ANOVAs to examine whether the mean levels of study variables differed across ethnic groups with a sample size of 30 or larger, which included White, Black/African American, Asian/Asian American, and Latinx participants. There were no significant differences between the groups in autonomous regulation,  $F(3, 331) = 2.04, p = .109$ ; controlled regulation,  $F(3, 331) = 2.57, p = .054$ ; cognitive restraint,  $F(3, 331) = 0.62, p = .603$ ; and emotional eating,  $F(3, 331) = 2.13, p = .097$ . Significant ethnic group differences were found in emerging adults' promotion of volitional functioning,  $F(3, 331) = 9.42, p < .001$ . Post-hoc pairwise comparisons with Bonferroni correction showed that White ( $M = 3.98, SD = 0.74$ ) participants reported higher levels of perceived promotion of volitional functioning than Black/African American ( $M = 3.51, SD = 0.92$ ), Asian/Asian American ( $M = 3.50, SD = 0.82$ ), and Latinx ( $M = 3.54, SD = 0.64$ ) participants,  $p = .003, p < .001, p = .038$ , respectively.

In addition, there were significant ethnic group differences in global self-regulation,  $F(3, 331) = 4.08, p = .007$ . Post-hoc pairwise comparisons indicated that Latinx ( $M = 3.16, SD = 0.46$ )

participants scored significantly lower than White ( $M = 3.46$ ,  $SD = 0.57$ ) and Black/African American ( $M = 3.51$ ,  $SD = 0.57$ ) participants,  $p = .039$ ,  $p = .037$ , respectively. Moreover, there were significant ethnic group differences in uncontrolled eating,  $F(3, 331) = 2.85$ ,  $p = .038$ . Post-hoc pairwise comparisons showed that Latinx ( $M = 34.54$ ,  $SD = 19.42$ ) participants scored significantly higher on uncontrolled eating than Black/African American ( $M = 24.28$ ,  $SD = 16.38$ ) participants,  $p = .036$ .

I conducted independent samples  $t$ -tests to examine the gender differences in the study variables among cis females and cis males. Participants did not show any significant differences in promotion of volitional functioning,  $t(360) = 0.39$ ,  $p = .697$ ; global self-regulation,  $t(360) = 1.17$ ,  $p = .242$ ; autonomous regulation,  $t(360) = 1.31$ ,  $p = .192$ ; controlled regulation,  $t(360) = 0.36$ ,  $p = .718$ ; cognitive restraint,  $t(360) < -0.01$ ,  $p = .998$ ; and uncontrolled eating,  $t(360) = 0.80$ ,  $p = .425$ . However, females ( $M = 34.22$ ,  $SD = 21.14$ ) scored significantly higher than males ( $M = 27.78$ ,  $SD = 19.96$ ) on emotional eating,  $t(360) = 2.62$ ,  $p = .009$ .

Next, one-way ANOVAs were conducted to examine whether the mean levels of study variables differed among participants living on-campus, off-campus with their family, and off-campus without their family. The results revealed that participants' promotion of volitional functioning,  $F(2, 359) = 0.75$ ,  $p = .475$ ; autonomous regulation,  $F(2, 359) = 0.55$ ,  $p = .580$ ; controlled regulation,  $F(2, 359) = 1.14$ ,  $p = .320$ ; cognitive restraint,  $F(2, 359) = 1.22$ ,  $p = .297$ ; emotional eating,  $F(2, 359) = 1.43$ ,  $p = .241$ ; and uncontrolled eating,  $F(2, 359) = 2.34$ ,  $p = .098$ , did not differ for those with different living situations. However, there were significant group differences in global self-regulation,  $F(2, 359) = 3.25$ ,  $p = .040$ . Post-hoc pairwise comparisons indicated that participants living off-campus without their families ( $M = 3.61$ ,  $SD = 0.56$ ) scored

higher on global self-regulation than those who were living on-campus ( $M = 3.36$ ,  $SD = 0.49$ ),  $p = .034$ .

## **Primary Analyses**

### ***Promotion of volitional functioning and Dysfunctional Eating Habits (c paths)***

I conducted three multiple regression analyses to examine whether promotion of volitional functioning was associated with each dysfunctional eating habit, controlling for BMI, age, ethnicity, gender, and living situation. As expected, PVF was significantly and negatively associated with cognitive restraint,  $c_1 = -2.40$ ,  $t(350) = -2.43$ ,  $p = .016$ ; emotional eating  $c_2 = -3.66$ ,  $t(350) = -2.71$ ,  $p = .007$ ; and uncontrolled eating  $c_3 = -4.61$ ,  $t(350) = -4.41$ ,  $p < .001$ .

### ***Promotion of volitional functioning and Self-regulation (a paths)***

Next, I conducted three multiple regression analyses to examine whether promotion of volitional functioning was associated with each form of self-regulation, controlling for BMI, age, ethnicity, gender, and living situation. As expected, PVF was positively associated with global self-regulation,  $a_1 = 0.25$ ,  $t(350) = 7.42$ ,  $p < .001$ , and autonomous regulation,  $a_2 = 0.23$ ,  $t(350) = 3.28$ ,  $p = .001$ ; and negatively associated with controlled regulation,  $a_3 = -0.35$ ,  $t(350) = -4.59$ ,  $p < .001$ .

### ***Mediating Role of Self-regulation in the Association between Parental Promotion of Volitional Functioning and Dysfunctional Eating Habits (b and ab paths)***

To examine the mediating roles of global self-regulation, autonomous regulation of eating and controlled regulation of eating in the associations between promotion of volitional functioning and each dysfunctional eating habit, I conducted three parallel mediation analyses. Participants' BMI, age, ethnicity, gender, and living situation were controlled for in these analyses.

### *Cognitive Restraint*

The overall model regressed on cognitive restraint was significant,  $R^2 = .24$ ,  $F(14, 347) = 7.84$ ,  $p < .001$ . Controlled regulation of eating,  $ab_3 = -1.56$ , 95% Bootstrap CI = [-2.64, -0.72], and autonomous regulation of eating,  $ab_2 = 0.41$ , 95% Bootstrap CI = [0.03, 0.96], significantly mediated the association between PVF and cognitive restraint, whereas global self-regulation was not a significant mediator,  $ab_1 = -0.49$ , 95% Bootstrap CI = [-1.41, 0.32] (see Figure 1).

Specifically, PVF was positively associated with autonomous regulation, which in turn, was positively associated with cognitive restraint,  $b_2 = 1.73$ ,  $t(347) = 2.29$ ,  $p = .023$ . On the other hand, PVF was negatively associated with controlled regulation, which in turn, was positively associated with cognitive restraint,  $b_3 = 4.40$ ,  $t(347) = 6.42$ ,  $p < .001$ . PVF was also positively associated with global self-regulation, however global self-regulation was not associated with cognitive restraint,  $b_1 = -1.95$ ,  $t(347) = -1.25$ ,  $p = .213$ . PVF was not significantly associated with cognitive restraint, when controlling for the mediators in addition to the covariates,  $c' = -0.75$ ,  $t(347) = -0.76$ ,  $p = .450$ . Bootstrapped contrast between the unique indirect effects of PVF through the significant mediators revealed that unique indirect effect of PVF through controlled regulation was larger in magnitude than that through autonomous regulation,  $|ab_3| - |ab_2| = 1.15$ , 95% Bootstrap CI = [0.06, 0.96].

### *Emotional Eating*

The overall model regressed on emotional eating was significant,  $R^2 = .15$ ,  $F(14, 347) = 4.31$ ,  $p < .001$ . Global self-regulation significantly mediated the association between PVF and emotional eating,  $ab_1 = -1.94$ , 95% Bootstrap CI = [-3.45, -0.68]; however neither autonomous regulation,  $ab_2 = -0.17$ , 95% Bootstrap CI = [-0.82, 0.38]; nor controlled regulation was significant mediators,  $ab_3 = -0.47$ , 95% Bootstrap CI = [-1.40, 0.26] (see Figure 2). Specifically,

PVF was positively associated with global self-regulation, which in turn, was negatively associated with emotional eating,  $b_1 = -7.68$ ,  $t(347) = -3.37$ ,  $p = .001$ . Neither autonomous regulation,  $b_2 = -0.71$ ,  $t(347) = -0.64$ ,  $p = .524$ , nor controlled regulation,  $b_3 = 1.32$ ,  $t(347) = 1.32$ ,  $p = .187$ , was significantly associated with emotional eating. PVF was not significantly associated with emotional eating, when controlling for the mediators in addition to the covariates,  $c' = -1.08$ ,  $t(347) = -0.75$ ,  $p = .456$ . Since there was only one significant mediator associated with emotional eating, contrasts between the unique indirect effects were not explored.

### *Uncontrolled eating*

The overall model regressed on emotional eating was significant,  $R^2 = .22$ ,  $F(14, 347) = 6.82$ ,  $p < .001$ . Global self-regulation,  $ab_1 = -1.59$ , 95% Bootstrap CI = [-2.60, -0.67]; autonomous regulation,  $ab_2 = -0.45$ , 95% Bootstrap CI = [-1.07, -0.05]; and controlled regulation,  $ab_3 = -1.09$ , 95% Bootstrap CI = [-1.94, -0.43], significantly mediated the association between PVF and uncontrolled eating (see Figure 3). Specifically, PVF was positively associated with both global self-regulation and autonomous regulation, which in turn, were negatively associated with uncontrolled eating,  $b_1 = -6.26$ ,  $t(347) = -3.71$ ,  $p < .001$ ;  $b_2 = -1.94$ ,  $t(347) = -2.36$ ,  $p = .019$ , respectively. Additionally, PVF was negatively associated with controlled regulation, which in turn, was positively associated with uncontrolled eating,  $b_3 = 3.07$ ,  $t(347) = 4.14$ ,  $p < .001$ . PVF was not significantly associated with uncontrolled eating, when controlling for the mediators in addition to the covariates,  $c' = -1.48$ ,  $t(347) = -1.38$ ,  $p = .169$ . Bootstrapped contrasts between the unique indirect effects of PVF revealed that neither of the unique indirect effects meaningfully differed from each other in magnitude,  $|ab_1| - |ab_2| = 1.13$ , 95% Bootstrap CI = [-0.07, 2.31];  $|ab_1| - |ab_3| = 0.50$ , 95% Bootstrap CI = [-0.76, 1.75];  $|ab_3| - |ab_2| = 0.63$ , 95% Bootstrap CI = [-0.33, 1.64].

## **Post-hoc Power Analysis**

Power analysis was not conducted a priori for the following reason: power analysis methods (e.g., Monte Carlo simulation approach) for a 3-mediator mediation model require path coefficients to calculate power (Zhang, 2014). For an a priori power analysis, the path coefficients should be obtained from either a pilot study or other studies in the literature. However, this premise was not met because there were no existing studies in the literature which produced the indirect effect coefficients for the variables proposed in the present thesis. Therefore, I conducted a post-hoc power analysis for my model after the mediation analyses are conducted.

A Monte Carlo simulation-based method was used to estimate the power of the indirect effects. Power was estimated with a fixed sample size of 362 and fixed effect sizes derived from the present study. Steps described by Thoemmes et al. (2010) and Zhang (2014) were followed when estimating power. First, a simulated dataset with 10000 samples was generated based on the intercorrelations in the present study. Second, samples of 362 were randomly drawn from the simulated dataset. Third, mediation models proposed in the presents study were run with each randomly selected sample and the significance of indirect effects were tested. The second and third steps were replicated 5000 times. Finally, the power was estimated for each indirect effect by calculating the proportion of the number of significant results to the total number of replications.

Power estimates for indirect effects through global self-regulation, autonomous regulation and controlled regulation in the models regressed on cognitive restraint are .33, .46 and 1, respectively. In the models regressed on emotional eating, power estimates for indirect effects through global self-regulation, autonomous regulation and controlled regulation are .92, .04 and

.33, respectively. Power estimates for indirect effects through global self-regulation, autonomous regulation and controlled regulation in the models regressed on uncontrolled eating are 1, .46 and 1, respectively. The observed power estimates for nonsignificant indirect effects were low (ranging from .04 to .33), as would be expected (O’Keefe, 2007). The observed power for significant indirect effects through global self-regulation and controlled regulation was high (ranging from .92 to 1). However, the observed power for the significant indirect effects through autonomous regulation was low (.46), which may indicate that the results concerning the indirect effects of PVF on cognitive restraint and uncontrolled eating through autonomous regulation could represent false positive results. Therefore, the findings related to autonomous regulation should be accepted with caution, and future studies should consider recruiting larger samples to increase statistical power if autonomous regulation is of interest.

## **Discussion**

The present study aimed to examine the concurrent associations between parental autonomy support and dysfunctional eating habits in emerging adulthood through emerging adults’ global and eating-specific self-regulation. First, I discuss the associations between covariates (BMI, age, gender, ethnicity, and living situation) and the study variables (parental promotion of volitional functioning, global self-regulation, eating-specific self-regulation, and dysfunctional eating habits). Then I discuss the associations between promotion of volitional functioning, dysfunctional eating habits and self-regulation. Finally, I discuss the mediating roles of both global and eating-specific self-regulation (autonomous regulation and controlled regulation) in the association between promotion of volitional functioning and dysfunctional eating habits. Overall, we found that self-regulation mediated the association between parental autonomy support and dysfunctional eating habits. Moreover, specific types of self-regulation

differentially associated with specific types of dysfunctional eating habits among emerging adults.

### **Preliminary Findings**

Emerging adults' BMI was associated with higher levels of dysfunctional eating habits, which support previous studies where restrained eating, emotional eating and uncontrolled eating were positively correlated with BMI (Anglé et al., 2009; Banna et al., 2018; Lang et al., 2019). Cognitive restraint, emotional eating and uncontrolled eating are associated with unhealthy food consumption and higher energy intake, and therefore with greater BMI (Bennett et al., 2013; Cornelis et al., 2014; Konttinen et al., 2010).

Ethnic-racial group differences were examined, and we found that White emerging adults reported higher levels of perceived parental promotion of volitional functioning than Black/African American, Asian/Asian American and Latinx emerging adults. These results are consistent with previous literature which suggests that White parents may demonstrate more autonomy support as autonomy and independence in child is valued more in European American culture, whereas interdependence and hierarchy between parent and child are more valued in African American, Latinx and Asian American cultures (see Benito-Gomez et al., 2020 for a review).

Latinx emerging adults scored lower on global self-regulation than White and Black/African American emerging adults. The research findings on ethnic group differences in emerging adults are limited and inconsistent (Bembenuddy, 2007; Pintrich & Zusho, 2002; Shen et al., 2018). However, early childhood studies reported no mean differences in self-regulation across different ethnic/racial groups (see Li-Grining, 2012 for a review). Moreover, cultural groups may perceive and evaluate their abilities differently, which can lead to biased scores in

self-reports (Gregorich, 2006). Latinx emerging adults might have underestimated their self-regulatory skills and reported lower scores than White and Black/African American emerging adults. Our results might also be unreliable due to small sample size of the Latinx group ( $N = 30$ ). Future studies should explore the ethnic/racial group differences in self-regulation since the knowledge in this area, especially in emerging adults, is very limited.

Latinx emerging adults reported higher levels of uncontrolled eating than Black/African American emerging adults. There is no previous research on ethnic/cultural differences in uncontrolled eating, although there are studies that examined cross-ethnic differences in binge eating, which is a severe form of uncontrolled eating (Vainik et al., 2015). A review study reported that there are mixed findings regarding ethnic group differences in binge eating behaviors with more than half of the studies reporting null findings (Crago & Shisslak, 2003).

Our examination of gender differences in the variables revealed that females reported higher levels of emotional eating than males, which is in line with previous research (de Lauzon-Guillain et al., 2009; Halliwell & Dittmar, 2006; Tanofsky et al., 1997). Emotional eating is positively associated with depressive symptoms in both males and females (Konttinen et al., 2010). Tanofsky-Kraff et al. (2007) suggested that gender differences in depressive symptoms (Salk et al., 2017) may explain why women are more likely to engage in emotional eating. That is, women may be more likely to experience depressive symptoms and negative mood than men, which can ultimately lead to emotional eating episodes (van Strien et al., 2016).

We also compared participants with different living situations and found that emerging adults living off-campus without their families reported higher global self-regulation compared to emerging adults living on-campus. Individuals with higher self-regulation skills might be more likely to live independently from their families. Alternatively, moving away from the family

home may lead emerging adults to develop greater self-regulatory skills during emerging adulthood (Arnett, 2015). When living together, parents may be likely to attempt to regulate their emerging adult children's behaviors, potentially undermining emerging adults' development of self-regulation (Arnett, 2015). Living in on-campus housing may also restrict the full development of regulation in emerging adults through institutional rules and controlled environments (e.g., curfew). Thus, emerging adults living off-campus without their families might be more likely to make independent decisions and regulate their own behaviors compared to those living on-campus, which can support the development of their self-regulatory skills.

We found that the demographic variables above (BMI, ethnicity, gender, and living situation) were related to the study variables. Therefore, these variables were treated as covariates and controlled for in the primary analyses. The results of the primary analyses are discussed in the following sections.

### **Parental Autonomy Support, Self-regulation and Dysfunctional Eating Habits**

The first aim of the present study was to examine the association between parental promotion of volitional functioning and emerging adults' cognitive restraint, emotional eating, and uncontrolled eating. In line with hypothesis 1, emerging adults' perceptions of their parents' engagement in autonomy supportive practices (i.e., promotion of volitional functioning) was negatively associated with their level of cognitive restraint, emotional eating, and uncontrolled eating. However, the direct associations between parental promotion of volitional functioning and the dysfunctional eating habits were not significant when controlling for the mediators in all three mediation models. Therefore, in order to understand how and why promotion of volitional functioning and eating habits are related, it is important to focus on the indirect relations between

promotion of volitional functioning and dysfunctional eating habits through global and eating-specific self-regulation, which were discussed below.

The second aim of the present study was to assess the associations between parental promotion of volitional functioning and emerging adults' global self-regulation, autonomous regulation of eating, and controlled regulation of eating. In line with hypothesis 2.1, parents' promotion of volitional functioning was positively associated with emerging adults' global self-regulation and autonomous regulation of eating. Moreover, as expected in hypothesis 2.2, parents' promotion of volitional functioning was negatively associated with emerging adults' controlled regulation of eating. These findings are consistent with previous literature (L. L. Kopp & Zimmer-Gembeck, 2011; Shen et al., 2018) and indicate that parental autonomy support can promote children's global self-regulation and better autonomous regulation of eating and can decrease children's controlled regulation of eating behaviors even during emerging adulthood.

Parents' external regulation of their children's behaviors through autonomy supportive parenting practices may help children develop self-regulatory strategies and skills by allowing children to make their own decisions, which can help children practice and refine their global self-regulatory skills (Gorin et al., 2014). In contrast, autonomy restrictive parenting can make children more vulnerable towards engaging in controlled regulation. Limited autonomy support from parents can prevent emerging adults from developing the skills necessary for goalsetting based on their own values and needs (Ryan & Deci, 2017). These emerging adults may seek external motivators (e.g. seeking assurance or avoiding criticism from other) to regulate their behaviors including eating, or they can be more susceptible to introject external regulators which can shape their goals related to eating behaviors. On the other hand, autonomy supportive parenting may encourage emerging adults to make their decisions and set their goals more

intrinsically. Thus, these emerging adults can develop better autonomous regulation of behaviors and would be more likely to be successful in their goals related to regulation of eating behaviors.

### **The Mediating Role of Self-regulation**

The third aim of the present study was to examine the mediating roles of global self-regulation, autonomous regulation of eating, and controlled regulation of eating in the associations between parental promotion of volitional functioning and the dysfunctional eating habits of cognitive restraint, emotional eating and uncontrolled eating. The findings for each dysfunctional eating habit (cognitive restraint, emotional eating, and uncontrolled eating) are discussed separately in the following sections.

#### ***Mediational Model Regressed on Cognitive Restraint***

Our findings revealed that promotion of volitional functioning was negatively associated with cognitive restraint indirectly through controlled regulation, as expected. In other words, lower levels of parental promotion of volitional functioning was associated with greater controlled regulation in emerging adults, which ultimately predicted their higher levels of cognitive restraint. Controlled regulation entails external or internalized extrinsic motivations to regulate eating behaviors, which may lead individuals to employ cognitive restraint as an eating regulation strategy. Thus, individuals who are more likely to act upon perceived pressures from others or an internalized sense of shame when regulating their eating behaviors can make active efforts to limit their food intake. Our finding is in line with the previous literature. For example, drive for thinness (Lang et al., 2019), and sociocultural pressures about appearance and internalization of these sociocultural attitudes (Griffiths et al., 2000) were found to be predictive of restrained eating. As mentioned above, cognitive restraint is not an effective strategy to regulate food intake, and can lead to other unhealthy eating behaviors such as binge eating

(Tuschl, 1990). Therefore, future studies should consider strategies that can decrease the use of individuals' cognitive restraint in eating. Promoting parents' engagement in autonomy supportive parenting practices may help emerging adults decrease their engagement in the controlled regulatory style, which, in turn, can decrease their use of cognitive restraint.

Contrary to our expectations, however, emerging adults' perceptions of their parents' promotion of volitional functioning was positively and indirectly associated with emerging adults' cognitive restraint through their autonomous regulation. Thus, emerging adults who are motivated to regulate their eating because they find eating healthy important or satisfying are likely to consciously attempt to restrict their food intake. Although unexpected, our findings were similar to some previous findings reported in the literature. For example, both autonomous and controlled regulation were positively associated with avoidance food planning (e.g. avoiding high-calorie foods) among female university students (Otis & Pelletier, 2008). Another study found that both autonomous and controlled regulation were positively associated with dieting, a weight control behavior characterized with restrained food intake (L. L. Kopp & Zimmer-Gembeck, 2011). The authors of both studies stated that their findings regarding autonomous regulation were unexpected and suggested that motivations underlying dieting and food planning behaviors might differ. Similarly, cognitive restraint may be driven by both autonomous and controlled regulation of eating. Individuals who are motivated to regulate their eating due to their personal values or enjoyment may consider cognitive restraint to be an effective or useful strategy to regulate eating behaviors. Future studies can explore whether emerging adults' underlying motivations moderate the effectiveness of their use of cognitive restraint in regulating food intake. Future prevention studies can consider educating emerging adults that cognitive restraint is likely to be an ineffective strategy. One important caveat regarding this finding is that

the post-hoc power analysis indicated that mediation effect of promotion of volitional functioning on cognitive restraint through autonomous regulation had low statistical power (.46); thus, this finding should be interpreted cautiously.

Unexpectedly, emerging adults' global self-regulation abilities was not a significant mediator in the relation between perceptions of their parents' promotion of volitional functioning and emerging adults' cognitive restraint. Although the bivariate correlations indicated that global self-regulation was negatively and significantly related to cognitive restraint, it was not related to cognitive restraint when controlling for the other eating-related regulation mediators. Cognitive restraint may reflect one's intention to regulate food intake but not necessarily the success or failure in dietary restraint. Therefore, global or overall self-regulation may not be predictive of emerging adults' cognitive restraint after accounting for their motivations to regulate their eating behaviors. Although some studies suggest that cognitive restraint is negatively related with self-regulation (Ebner et al., 2012; Logue & King, 1991), other studies indicate that self-regulation can interact with cognitive restraint to distinguish between successful and unsuccessful restrained eaters (Papies et al., 2008; Sin & Vartanian, 2012). In other words, individuals can be motivated to restrain their food intake for varying reasons regardless of their global self-regulatory skills. Thus, global self-regulation skills may not be related to cognitive restraint as individuals with either higher or lower levels of global self-regulation can have goals to restrict food intake, which should be explored in future studies.

### ***Mediational Model Regressed on Emotional Eating***

Unlike for cognitive restraint, emerging adults' perceptions of their parents' promotion of volitional functioning was indirectly and negatively associated with their emotional eating through their global self-regulation skills but not their autonomous regulation and controlled

regulation of eating. Specifically, when their parents were perceived to be more autonomy supportive, emerging adults reported higher overall self-regulation skills across various domains, which was ultimately associated with their engagement in less emotional eating. These results are consistent with previous literature indicating that poor self-control skills are predictive of emotional eating (Elfhag & Morey, 2008; Zhu et al., 2014). Moreover, individuals with higher levels of impulsivity and lower levels of inhibitory control are more likely to engage in emotional eating after experiencing negative affect (Bekker et al., 2004; Jasinska et al., 2012). Global self-regulation is a broad construct that also includes the regulation of one's emotions (Diamond & Aspinwall, 2003). Thus, individuals with higher capacity in regulating their emotions may be less likely to engage in emotional eating to compensate for negative emotions. For example, lower levels of emotion regulation were found to mediate the association between low self-control and emotional eating (Sanchez-Ruiz et al., 2019).

In contrast to our expectations, however, neither emerging adults' autonomous regulation nor controlled regulation mediated the relation between parental autonomy support and emotional eating after controlling for global self-regulation. Emerging adults' motivations for regulating their eating behaviors were not related to their tendency to overeat during or after experiencing negative emotions. Previous literature on the relation between motivation for eating regulation and emotional eating is very limited and inconsistent. For example, Waller and Osman (1998) reported that drive for thinness was not significantly related to emotional eating, whereas Lang et al. (2019) found a significant and positive correlation between these constructs. Moreover, controlled motivation for exercise was not related to emotional eating, whereas autonomous motivation for exercise was negatively related to emotional eating (Mata et al., 2009). Our results indicated that regardless of emerging adults' motivations to regulate their eating behaviors,

emerging adults with poorer global self-regulatory skills tend to overeat in reaction to negative emotions.

### ***Mediational Model Regressed on Uncontrolled Eating***

Finally, emerging adults' perceptions of their parents' promotion of volitional functioning was indirectly associated with their uncontrolled eating through their global-self regulation, autonomous regulation and controlled regulation. Therefore, both global self-regulation and eating-specific self-regulation significantly mediated the relation between parental autonomy support and uncontrolled eating.

Individuals who scored higher on global self-regulation and autonomous regulation of eating are less likely to lose control over their eating behaviors and overeat. Thus, both emerging adults' general ability to adjust their behaviors and their autonomous motivation to regulate their eating behaviors may be protective factors against uncontrolled eating. Uncontrolled eating, or loss of control over eating, is associated with hedonic hunger which is characterized by a desire to eat palatable food when one is not hungry (Lowe & Butryn, 2007). Thus, uncontrolled eating is an impulsive and hedonic reaction to palatable food cues. As inhibitory control over impulses is an important aspect of global self-regulation (Nigg, 2017; Rueda et al., 2005), individuals who have higher global self-regulatory abilities may be less likely to lose control over their eating behaviors (Van Malderen et al., 2018), and thus more likely to be successful at regulating their eating behaviors. Previous studies also showed that higher levels of impulsivity and lower levels of inhibitory control were predictive of loss of control over eating in young adults (Espel et al., 2017; Jasinska et al., 2012).

Individuals who scored higher on controlled regulation were more likely to experience loss of control over their eating, which indicates that regulating eating behaviors due to extrinsic

motivators or internalization of the extrinsic motivators may be a risk factor for uncontrolled eating. Individuals who have controlled regulation may not be likely to actualize their goal of regulating their eating behaviors, perhaps because controlled regulation of eating is extrinsically motivated, which means that the regulation of eating is either dependent on external motivators or introjection of external motivators such as actual or perceived disapproval from others.

Individuals who are motivated to regulate their eating behaviors because of external factors or an internalized sense of shame or guilt may lose control over their eating behaviors when the external motivators are not present. Indeed, binge eaters tend to engage in binge eating when they are alone or in secrecy because of the sense of shame associated with this behavior (Duarte et al., 2017). Moreover, Verstuyf et al. (2012) suggest that controlled regulation of eating can lead to an increase in thoughts about foods that should be avoided and eventually the actual eating of those foods. In other words, preoccupation with rewarding foods due to controlled regulation can lead one to lose control over food consumption.

In contrast, since autonomous regulation is less extrinsically and more intrinsically motivated, it can result in successful regulation of eating in terms of lower levels of uncontrolled eating. Thus, individuals who are intrinsically or internally motivated to regulate their eating behaviors might be more successful at controlling their eating behaviors. These individuals tend to regulate their eating behaviors because they find eating healthy enjoyable or an important aspect of their life. Thus, controlling their behaviors might be an easier and more automatic process for autonomous regulators than controlled regulators (Ryan & Deci, 2017) leading them to be less likely to lose control over their eating behaviors.

Interestingly, only the behavioral aspect of dysfunctional eating habits (i.e., uncontrolled eating) was associated with both global and eating-specific self-regulation. In contrast, the

cognitive aspect of eating habits (i.e. cognitive restraint) was associated only with eating-specific regulation, and the emotional aspect (i.e. emotional eating) was only associated with global self-regulation. These findings indicate different types of regulatory processes may be uniquely associated with specific aspects or types of dysfunctional eating habits.

### **Implications of Study Findings**

The current findings can inform the design of intervention and prevention programs designed to improve self-regulatory skills or decrease dysfunctional eating habits. Specifically, we found that autonomy supportive parental practices may support the development of self-regulation and, in turn, may decrease the risk for unhealthy eating during the critical period of emerging adulthood. Prevention efforts may focus on increasing autonomy supportive parenting practices in order to promote the development of self-regulation during this developmental period where emerging adults are seeking more independence. Improving the self-regulation abilities of emerging adults may, in turn, help decrease their engagement in dysfunctional eating behaviors.

Health educational programs can also be designed to change weight-related behaviors in adolescents transitioning into college. The transition from adolescence to emerging adulthood is a critical period for changes in eating habits and weight status (Nelson et al., 2008; Wengreen & Moncur, 2009). Moreover, eating habits and weight status during emerging adulthood tend to persist over time (Nelson et al., 2008). Thus, effective changes in the regulation of eating behaviors during adolescence and emerging adulthood can promote health-related outcomes in later years.

In addition, health interventions may focus on improving the ability to self-regulate eating behavior among emerging adults who are at risk for unhealthy eating behaviors. Since executive functions are related to self-regulation of eating behaviors (Dohle et al., 2018), executive function

training may be an effective tool for interventions. For example, improving working memory capacity, one of the facets of executive functions, can increase self-regulation of food intake and decrease dysfunctional eating behaviors (e.g., emotional eating). Working memory can help emerging adults cognitively represent health-related long-term goals in tempting situations (e.g., food craving), which in turn can allow them to redirect their attention from attractive food stimuli to long-term goals (Hofmann et al., 2008; Houben et al., 2016) and the initiation of more healthy food choices (Allom & Mullan, 2014). Enhancing inhibitory control, which is another aspect of executive functioning, can also influence self-regulation of eating behaviors through the inhibition of impulsive responses (e.g., approach bias, overeating and emotional eating) towards the intake of unhealthy and high-calorie foods (Dohle et al., 2018; Hofmann et al., 2009).

Our results showed that different types of self-regulation are associated with different aspects of dysfunctional eating habits. For example, cognitive aspect of dysfunctional eating habits was only associated with eating-specific self-regulation, whereas emotional aspect of dysfunctional eating was only associated with global self-regulation. Behavioral aspect of dysfunctional eating habits, on the other hand, was predicted by both global and eating-specific self-regulation. Future interventions aiming to prevent specific types or aspects of dysfunctional eating habits can focus on the specific types of self-regulation associated with the eating habit of interest in order to maximize the efficacy of these efforts.

### **Limitations and Future Directions**

Several important limitations of the current study must be noted. The present study is cross-sectional and correlational in design. Therefore, these data and findings cannot inform us about the causal relations between parental autonomy support and the development of self-regulation and eating-related processes in emerging adults. Indeed, poorer self-regulatory skills in

emerging adults may evoke less autonomy-promoting parenting. Experimental and longitudinal study designs are needed to lend more evidence for the causal associations between parenting practices, self-regulation and eating behaviors, and to test the temporal precedence among the variables and processes that we have proposed here.

In the present study, all the constructs were measured through participants' self-reports. Thus, the results of our study reflect emerging adults' perceptions of their parents' parenting instead of actual parenting practices and behaviors. Although children's appraisals (i.e. perceptions and interpretations) of parenting practices are not perfectly associated with actual parental behaviors, their relations with outcome variables tend to be very similar (Soenens et al., 2015). In addition, the self-reported self-regulation scores might have been overestimated, and dysfunctional eating habits might have been under-reported by participants, which may threaten the validity of the present study. For example, Carey et al. (2004) found that social desirability scores were correlated with self-reported self-regulation scores. Similarly, self-reported eating disorder symptoms and body weight was associated with social desirability scores (Ambwani & Chmielewski, 2013). Therefore, to measure self-regulation and eating behaviors more accurately, future studies should consider controlling for social desirability. In addition, measuring self-regulation directly, for example, with executive functioning tasks can help increase the objectivity of the results in future research.

Another limitation of the present study is that it focused on only two groups of potential predictors (parenting practices and emerging adults' self-regulation) of unhealthy eating behaviors. There are potential extraneous variables that have been found to contribute substantial variance in eating behaviors including, but not limited to, biological and physiological factors (Ravussin & Swinburn, 1993), gender (Striegel-Moore et al., 2009), social comparison processes

(in real life and/or through social media; Polivy, 2017), body image (Tylka, 2004), parents' earlier feeding practices (Carnell et al., 2014) and emerging adults' living situation (Small et al., 2013). Each of these variables and their interactions should be explored more systematically in future research to obtain a more comprehensive understanding of the various factors that contribute to dysfunctional eating during emerging adulthood.

## **Conclusion**

Despite the limitations, the present study demonstrated that low levels of parental autonomy support can be a risk factor for emerging adults' unhealthy eating habits through its associations with self-regulatory processes. Importantly, the present study contributed to the literature by being the first to examine the mediating roles of both global and eating-specific self-regulation in the association between parental autonomy support and dysfunctional eating habits. These findings indicated that global and eating-specific self-regulation were differently associated with specific types of dysfunctional eating habits. This level of specificity in the processes revealed in the present study has important implications for future studies and the design of intervention programs to promote the positive eating-related and health outcomes of emerging adults.

## Tables

**Table 1.** Demographic characteristics of the sample

	<i>N (%)</i>	<i>M (SD; Min - Max)</i>
Total <i>N</i>	362	
Cis Female	263 (73)	
Cis Male	199 (27)	
Race/Ethnicity		
White	137 (38)	
Asian/Asian American	120 (33)	
Black/African American	48 (13)	
Hispanic/Latinx	30 (8)	
Bi/Multicultural	17 (5)	
Middle Eastern	10 (3)	
Living Situation		
On Campus	165 (45)	
Off Campus with Family	158 (44)	
Off Campus without Family	39 (11)	
Major		
CAHSS	199 (54)	
CNMS	110 (31)	
CEIT	38 (11)	
Other	15 (4)	
Class Standing		
Freshman	97 (27)	
Sophomore	82 (23)	
Junior	91 (25)	
Senior	92 (25)	
BMI		23.91 (4.54; 15.81 – 46.34)
Underweight (BMI < 18.5)	21 (6)	
Normal weight (18.5 < BMI < 25)	228 (63)	
Overweight (25 < BMI < 30)	71 (20)	
Obese (30 < BMI)	42 (11)	
Weight in Kg		67.09 (15.65; 38 - 129)
Height in cm		167.09 (10.55; 147 - 198)
Age		20.18 (1.71; 18 - 25)

CAHSS: College of Arts, Humanities and Social Sciences; CNMS: College of Natural and Mathematical Sciences; CEIT; College of Engineering and Information Technology

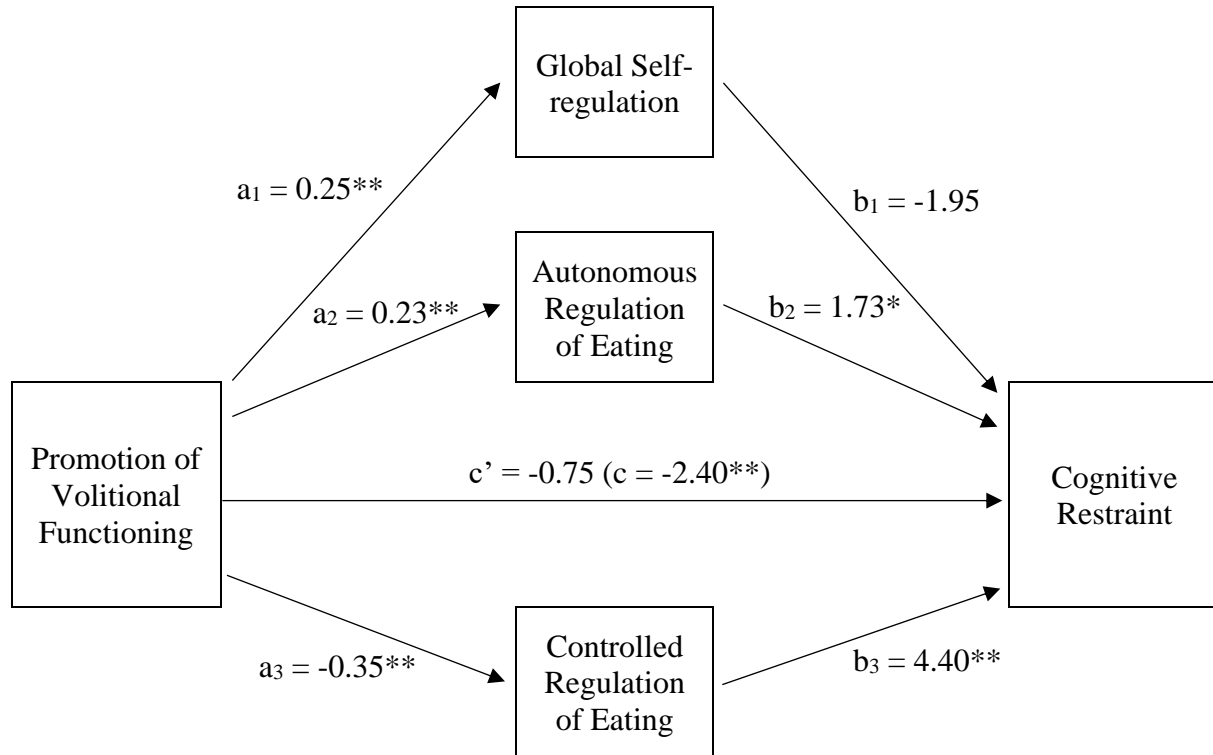
**Table 2.** Correlations between the study variables

	Mean	SD	1	2	3	4	5	6	7	8
1. Promotion of volitional functioning	3.70	0.83								
2. Autonomous regulation of eating	4.70	1.09	.20**							
3. Controlled regulation of eating	3.28	1.19	-.23**	.22**						
4. Global self-regulation	3.41	0.56	.38**	.35**	-.28**					
5. Cognitive restraint	30.47	15.24	-.12*	.19**	.41**	-.13*				
6. Uncontrolled eating	28.34	16.22	-.22**	-.15**	.27**	-.34**	.36**			
7. Emotional eating	32.46	20.99	-.11*	-.06	.14**	-.23**	.35**	.65**		
8. BMI	23.91	4.54	.08	.10	.02	.02	.23**	.12*	.17**	
9. Age	20.18	1.71	.08	.05	-.08	.04	-.04	.05	.02	.12*

N = 362.

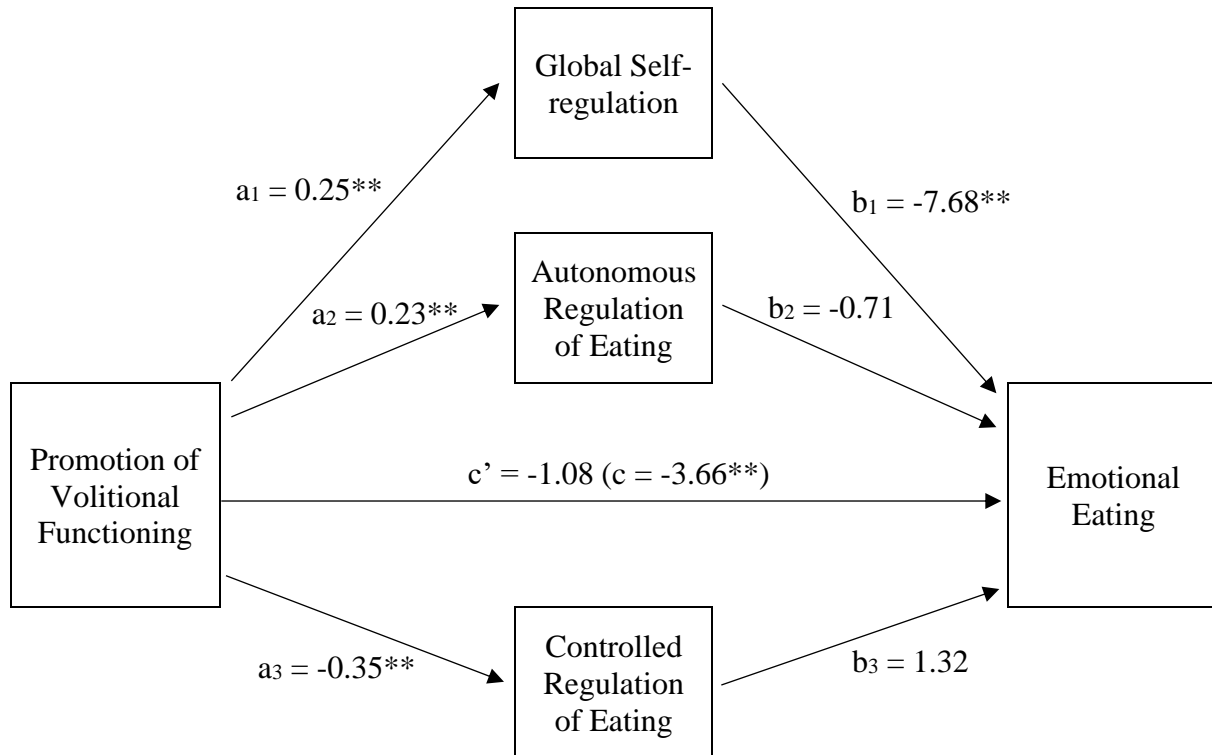
## Figures

**Figure 1.** Mediation model regressed on cognitive restraint



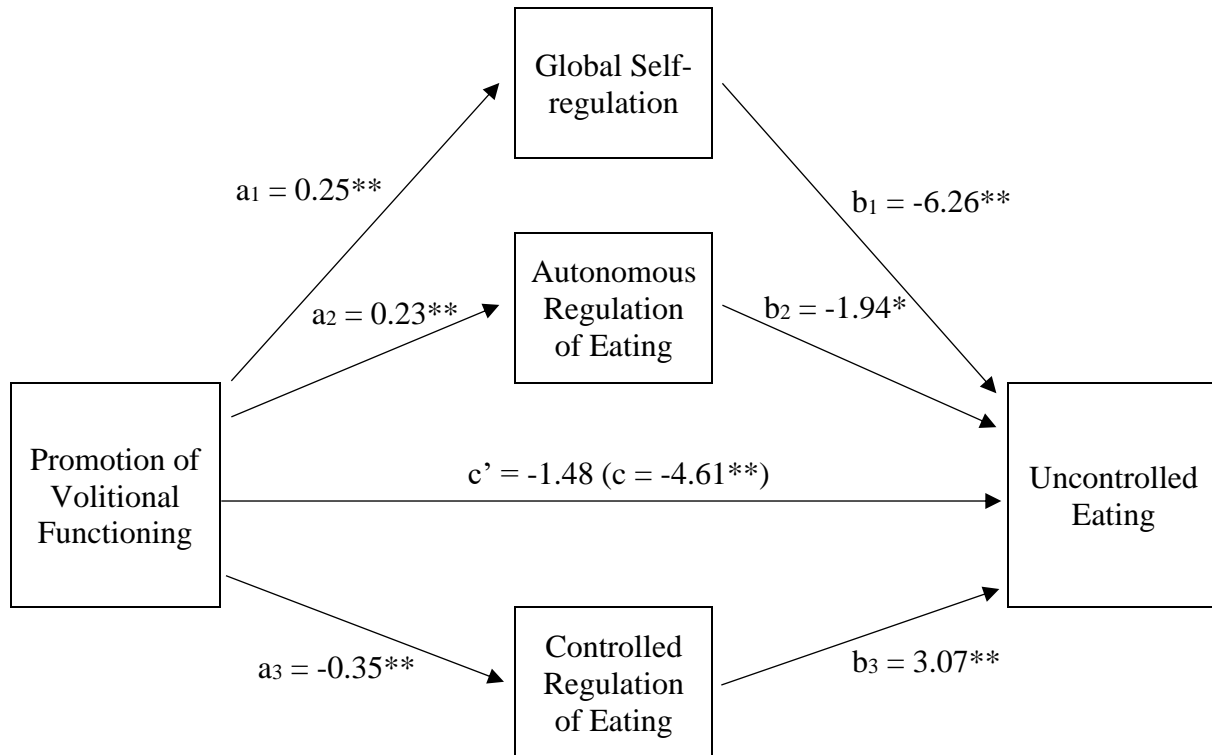
*Note.*  $N = 362$ .  $*p < .05$ ,  $**p < 0.01$

**Figure 2.** Mediation model regressed on emotional eating



*Note.*  $N = 362$ .  $*p < .05$ ,  $**p < 0.01$

**Figure 3.** Mediation model regressed on uncontrolled eating



Note.  $N = 362$ .  $*p < .05$ ,  $**p < 0.01$

### Appendix A.1. Promotion of Volitional Functioning (PVF)

*Instructions: Please read each of the following items carefully and indicate the number that best reflects your agreement with the statement.*

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

1. My parents let me make my own plans for things I want to do	1 2 3 4 5
2. My parents are usually willing to consider things from my point of view	1 2 3 4 5
3. My parents whenever possible, allow me to choose what to do	1 2 3 4 5
4. My parents allow me to decide things for myself	1 2 3 4 5
5. My parents allow me to choose my own direction in life	1 2 3 4 5
6. My parents insist upon doing things their way.	1 2 3 4 5

## Appendix A.2. Regulation of Eating Behaviors Scale (REBS)

*Instructions: Why are you regulating your eating behaviors?*

Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

1. Other people close to me will be upset if I don't	1 2 3 4 5 6 7
2. I take pleasure in fixing healthy meals	1 2 3 4 5 6 7
3. Eating healthy is an integral part of my life	1 2 3 4 5 6 7
4. I believe it will eventually allow me to feel better	1 2 3 4 5 6 7
5. I believe it's a good thing I can do to feel better about myself in general	1 2 3 4 5 6 7
6. Is a way to ensure long-term health benefits	1 2 3 4 5 6 7
7. I would be humiliated if I was not in control of my eating behaviors	1 2 3 4 5 6 7
8. It is expected of me	1 2 3 4 5 6 7
9. I don't know why I bother	1 2 3 4 5 6 7
10. I like to find new ways to create meals that are good for my health	1 2 3 4 5 6 7
11. For the satisfaction of eating healthy	1 2 3 4 5 6 7
12. It is a good idea to try to regulate my eating behaviors	1 2 3 4 5 6 7
13. I feel I must absolutely be thin	1 2 3 4 5 6 7
14. Other people close to me insist that I do	1 2 3 4 5 6 7
15. I can't really see what I'm getting out of it	1 2 3 4 5 6 7
16. Regulating my eating behaviors has become a fundamental part of who I am	1 2 3 4 5 6 7
17. I don't really know. I truly have the impression that I'm wasting my time trying to regulate my eating behaviors	1 2 3 4 5 6 7
18. People around me nag me to do it	1 2 3 4 5 6 7
19. Eating healthy is congruent with other important aspects of my life	1 2 3 4 5 6 7
20. I would feel ashamed of myself if I was not eating healthy	1 2 3 4 5 6 7
21. I don't want to be ashamed of how I look	1 2 3 4 5 6 7
22. I don't know. I can't see how my efforts to eat healthy are helping my health situation	1 2 3 4 5 6 7
23. It is fun to create meals that are good for my health	1 2 3 4 5 6 7
24. Eating healthy is part of the way I have chosen to live my life	1 2 3 4 5 6 7

### Appendix A.3. Short Self-Regulation Questionnaire (SSRQ)

*Instructions: Please read each of the following items carefully and indicate the number that best reflects your agreement with the statement.*

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

1. I don't notice the effects of my actions until it's too late	1	2	3	4	5
2. I put off making decisions.	1	2	3	4	5
3. It's hard for me to notice when I've 'had enough' (alcohol, food, sweets).	1	2	3	4	5
4. I have trouble following through with things once I've made up my mind to do something.	1	2	3	4	5
5. I don't seem to learn from my mistakes	1	2	3	4	5
6. I usually only have to make a mistake one time in order to learn from it.	1	2	3	4	5
7. I can usually find several different possibilities when I want to change something.	1	2	3	4	5
8. Often I don't notice what I'm doing until someone calls it to my attention.	1	2	3	4	5
9. I usually think before I act	1	2	3	4	5
10. I learn from my mistakes.	1	2	3	4	5
11. I give up quickly.	1	2	3	4	5
12. I usually keep track of my progress toward my goals.	1	2	3	4	5
13. I am able to accomplish goals for myself.	1	2	3	4	5
14. I have personal standards and try to live up to them.	1	2	3	4	5
15. As soon as I see a problem or challenge, I start looking for possible solutions.	1	2	3	4	5
16. I have a hard time setting goals for myself.	1	2	3	4	5
17. When I'm trying to change something, I pay a lot of attention to how I'm doing.	1	2	3	4	5
18. I have trouble making plans to help me reach my goals	1	2	3	4	5
19. I set goals for myself and keep track of my progress	1	2	3	4	5
20. If I make a resolution to change something, I pay a lot of attention to how I'm doing	1	2	3	4	5
21. I know how I want to be.	1	2	3	4	5
22. I have trouble making up my mind about things	1	2	3	4	5
23. I get easily distracted from my plans.	1	2	3	4	5
24. When it comes to deciding about a change, I feel overwhelmed by the choices.	1	2	3	4	5
25. Most of the time I don't pay attention to what I'm doing.	1	2	3	4	5

26. I tend to keep doing the same thing, even when it doesn't work.	1 2 3 4 5
27. Once I have a goal, I can usually plan how to reach it.	1 2 3 4 5
28. If I wanted to change, I am confident that I could do it.	1 2 3 4 5
29. I can stick to a plan that's working well.	1 2 3 4 5
30. I have a lot of willpower.	1 2 3 4 5
31. I am able to resist temptation.	1 2 3 4 5

#### Appendix A.4. Three-Factor Eating Questionnaire (TFEQ-R18)

*Instructions: Please read each statement and select from the multiple choice options the answer that indicates the frequency with which you find yourself feeling or experiencing what is being described in the statements below.*

Definitely false	Mostly False	Mostly True	Definitely True
1	2	3	4

1. When I smell a delicious food, I find it very difficult to keep from eating, even if I have just finished a meal.	1	2	3	4
2. I deliberately take small helpings as a means of controlling my weight.	1	2	3	4
3. When I feel anxious, I find myself eating.	1	2	3	4
4. Sometimes when I start eating, I just can't seem to stop.	1	2	3	4
5. Being with someone who is eating often makes me hungry enough to eat also.	1	2	3	4
6. When I feel blue, I often overeat.	1	2	3	4
7. When I see a real delicacy, I often get so hungry that I have to eat right away.	1	2	3	4
8. I get so hungry that my stomach often seems like a bottomless pit.	1	2	3	4
9. I am always hungry, so it is hard for me to stop eating before I finish the food on my plate.	1	2	3	4
10. When I feel lonely, I console myself by eating.	1	2	3	4
11. I consciously hold back at meals in order not to weight gain.	1	2	3	4
12. I do not eat some foods because they make me fat.	1	2	3	4
13. I am always hungry enough to eat at any time.	1	2	3	4

*Instructions: Please indicate your response to the questions below using the following scale*

Only at meal times	Sometimes between meals	Often between meals	Almost always
1	2	3	4

14. How often do you feel hungry?	1	2	3	4
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*Instructions: Please indicate your response to the questions below using the following scale*

Almost Never	Seldom	Moderately Likely	Almost Always
1	2	3	4

15. How frequently do you avoid "stocking up" on tempting foods?	1	2	3	4
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*Instructions: Please indicate your response to the questions below using the following scale*

Unlikely	Slightly likely	Moderately Likely	Very Likely
1	2	3	4

16. How likely are you to consciously eat less than you want?	1 2 3 4
---	---------

*Instructions: Please indicate your response to the questions below using the following scale.*

Never	Rarely	Sometimes	At least one a week
1	2	3	4

17. Do you go on eating binges though you are not hungry?	1 2 3 4
---	---------

*Instructions: Please indicate your response to the questions below using the following scale.*

No Restraint							Total Restraint
1	2	3	4	5	6	7	8

18. On a scale of 1 to 8 where 1 means no restraint in eating (eating whatever you want whenever you want it) and 8 means total restraint (constantly limiting food intake and never “giving in”) what number would you give yourself?	1 2 3 4 5 6 7 8
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