Self-regulatory predictors of eating disorder symptoms: Understanding the contributions of action control and willpower beliefs

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Abstract

Action orientation, or the ability to regulate both positive and negative affect to perform goal-directed action, has been associated with eating behavior in previous research. Additionally, differences in beliefs about self-control have been shown to influence behavior, but it is unclear how these beliefs impact disordered eating behavior or how they may interact with other self-regulatory mechanisms to predict eating outcomes. In this study, 1128 participants were recruited online via Amazon Mechanical Turk to answer questions about self-regulation constructs and eating behavior. A three-way moderated regression analysis was used to assess relationships between two subtypes of action orientation (failure-related action orientation, or AOF, which describes an ability to up-regulate positive affect, and decision-related action orientation, or AOD, which describes an ability to down-regulate negative affect), willpower beliefs, and binge eating. Results revealed a significant three-way interaction between AOD, AOF, and willpower beliefs such that the interaction between AOF and willpower beliefs was only significant for those with low AOD. These findings suggest an ability to down-regulate negative affect (*high* AOF) is a protective factor against increased disordered eating, though this may not be the case for individuals with an inability to up-regulate positive affect (*low* AOD) and simultaneously ascribe to beliefs that willpower is a limited resource.

Keywords: willpower beliefs; self-control; action-orientation; eating disorder

Introduction

Binge eating disorder (BED), a relatively new diagnosable eating disorder as of the publication of the DSM-5 (American Psychiatric Association, 2013), is defined by two key features: (1) the consumption of a large amount of food in a short amount of time and (2) a sense of loss of control over eating behavior. In the United States, BED has a 12-month prevalence rate of 1.7% in women, which is higher than both Bulimia Nervosa (1-1.5%) and Anorexia Nervosa (0.4%) (Smink, van Hoeken, & Hoek, 2013). Beyond diagnosis, more than 29% of college students reported recent bingeing behavior (Kelly-Weeder, Jennings, & Wolfe, 2012), and binge eating is associated with decreased physical health-related quality of life, increased body weight, higher prevalence of obesity and diabetes, and poor social functioning (Wilfley, Wilson, & Agras, 2003) as well as the onset of depressive symptoms and substance use in adolescent populations (Sonneville et al., 2013). In short, binge eating is a serious health-related issue.

A key feature of binge eating disorder is the sense of loss of control that occurs during a binge episode, which is similar to the loss of control that characterizes substance use disorders. This commonality has aided in recent conceptualizations of BED as an addictive-spectrum disorder (Gearhardt, White, & Potenza, 2011; Schreiber, Odlaug, & Grant, 2013; see also Smith & Robbins, 2013). Many attempts have been made to understand the self-control difficulties that characterize various addictive behaviors, resulting in multiple theories pertaining specifically to self-regulation. One theory thought to capture individual differences in self-control behavior is the Action Control Theory (Kuhl 1992, 1994a, 1994b). This theory describes the degree to which an individual can successfully plan, initiate, and carry out intended actions. Accordingly, people fall along a continuum of self-regulatory ability, with those highly capable of goal-driven action residing on one end of the spectrum, labeled “action-oriented.” These individuals are highly

successful at initiating goal-directed action (decision-related action orientation: AOD), which requires the up-regulation, or effortful increase, of positive affect in order to initiate goal-directed behavior. Action oriented individuals are also adept at carrying out intended actions even after experiencing failure (failure-related action orientation: AOF), requiring successful down-regulation, or effortful decrease, of negative affect associated with previously adverse experiences (Kuhl, 1992). Individuals with difficulty regulating positive or negative affect in order to accomplish goals are said to be "state-oriented," meaning that they have greater difficulty up-regulating positive affect and thus cannot translate intentions into action in order to initiate behavior (i.e., low AOD) and are often distracted by negative experiences and previous failures (i.e., low AOF). Thus, state-oriented individuals are less able to self-regulate in order to accomplish goals (Kuhl, 1992), a feature that is highly relevant to addictive behaviors (Quinn & Fromme, 2010; Tibbetts & Whittimore, 2002; Wills, Walker, Mendoza, & Ainette, 2006), as well as binge eating (Fischer & Munsch, 2012; Jasinska et al., 2012; Schag et al., 2013). Indeed, action orientation has been studied in the context of several behavioral outcomes. Difficulties with up-regulation of positive affect in order to initiate action (i.e., low AOD) predicted increased alcohol-related negative consequences in a sample of binge-drinking college students (Palfai, McNally, and Roy, 2002) and increased eating dysfunction in undergraduate females (Palfai 2002). This suggests that the ability to self-regulate (i.e., up-regulate positive affect as well as down-regulate negative affect) in order to initiate and carry-out goal-directed behavior is an important predictor of health-related behaviors.

Aside from understanding individual differences in self-control tendencies, many researchers have focused their attention on understanding the underlying nature of self-control. In the 1990's, Baumeister and colleagues introduced a well-accepted hypothesis describing self-

control as a force akin to strength or energy (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Baumeister & Heatherton, 1996). According to this model, the use of self-control over time leaves an individual in a depleted state, with less ability to utilize self-control in a subsequent situations (i.e. ego-depletion). However, work by Job and colleagues (Job, Dweck, & Walton, 2010; Job, Walton, Bernecker, & Dweck, 2015) suggests that ego depletion effects can be accounted for simply by an individual's beliefs about the fundamental nature of willpower. In multiple studies, these researchers demonstrate that those who believe willpower to be a limited resource evidence increased ego-depletion in subsequently demanding tasks, while those who believe that willpower is unlimited do not show ego-depletion effects (Job et al., 2010). Recently, this work has been extended to multiple self-regulatory domains including time management, dietary choices, and monetary spending (Job et al., 2015). In particular, those with beliefs in unlimited willpower showed less procrastination and higher grades in academic settings, decreased unhealthy eating, and less impulsive spending than those with limited willpower beliefs. Thus, even in highly demanding everyday situations, beliefs about the nature of willpower seem to play an important role in self-regulatory ability, a notion with significant implications for addictive behavioral outcomes and binge eating behavior.

Recent theories suggest that several mechanisms, including inhibitory control, personal beliefs about self-control and willpower, motivation, and goal-orientation, contribute to self-regulation success and may interact in specific situations to predict self-regulatory ability (Fujita, 2011). In this study, we aim to understand how separable aspects of self-control (i.e., action control and willpower beliefs) contribute specifically to binge eating behavior and additionally wish to investigate how these self-control factors interact to predict binge-eating outcomes. As such, we have several hypotheses: (1) Action-oriented individuals, or those who are more adept

at both up-regulating positive affect (high AOD) and down-regulating negative affect (high AOF) in order to initiate and follow through with goal-directed behavior will evidence decreased binge eating behavior. (2) Beliefs that willpower is an unlimited resource will be associated with decreased binge eating behavior, and (3) these self-regulatory factors, namely action orientation and willpower beliefs, will interact to predict lower rates of binge eating behavior than either factor could alone. In other words, we hypothesize action-oriented individuals who additionally believe willpower to be an unlimited resource will evidence the least binge eating behavior.

Methods

Participants and Procedure

The current research was reviewed and approved by the Institutional Review Board at a mid-South university in the United States. Participants were recruited online via Amazon Mechanical Turk (mTurk), a website that pays "workers" small amounts of money to complete tasks online, including surveys and psychological studies. In total, 1128 individuals residing in the United States provided informed consent and completed a set of individual difference measures assessing personality, self-control, emotion regulation, and eating-related behaviors for $3.

Measures

Action Control Scale (ACS; Kuhl, 1994a). The ACS is a 36-item scale containing three subscales that measure the degree of action control for decision-related action orientation (e.g., up-regulation of positive affect), failure-related action orientation (e.g., down-regulation of negative affect), and action orientation during successful performance of activities. In the current study, only the decision-related orientation scale ($\alpha = .88$) and the failure-related orientation scale ($\alpha = .72$) were used. Each item has a question stem and two alternative answers, one of

which is indicative of action orientation and the other of state orientation. A decision-related action orientation question may begin with a question stem such as "when I have to take care of something important but which is also unpleasant" and will present an action-oriented answer (e.g., "I can do it and get it over with") and a state-oriented answer (e.g., "It can take a while before I can bring myself to do it"). Alternatively, a failure-related action orientation question may begin with a question stem such as "when I am in a competition and have lost every time" followed by an action-oriented answer (e.g., "I can soon put losing out of my mind") and a state-oriented answer (e.g., "the thought that I lost keeps running through my mind").

Eating Disorders Diagnostic Scale (EDDS; Stice et al., 2000). The EDDS is a 22-item scale that assesses eating habits and attitudes toward eating that are associated with eating pathology (e.g., "During the past six months have there been times when you felt you have eaten what other people would regard as an unusually large amount of food given the circumstances?"). The scale was designed to diagnose anorexia nervosa, bulimia nervosa and binge eating disorder per the DSM-IV and demonstrated good reliability and validity in comparison to standard interviews (Stice et al., 2000). For the current study, a total score was used to index eating pathology. Because of the propensity of items on the scale assessing binge-related constructs (e.g., days and incidences of binge eating, symptoms associated with loss of control eating), the composite measure can be construed as primarily a measure of binge-eating behavior.[1]

[1] To confirm that the EDDS composite score indexes primarily binge behavior, we examined the correlation between the EDDS composite and an index of only the binge items (items 5 through 14), and found that the binge index correlated at .80 with the EDDS total composite score. We also ran the analyses in the current paper with the binge index as the outcome rather than the total EDDS composite and found no differences in the outcome. Thus, we report the total composite as this is the measure described in the literature (Stice et al., 2000).

Implicit Beliefs in Willpower (Job et al., 2010). Implicit Beliefs in Willpower is a 10-item scale measuring the degree to which a person believes in the limited resource theory of self-control (e.g., "After a strenuous mental activity, your energy is depleted and you must rest to get it refueled again"). Items are given on a 6-point Likert-type scale ranging from 1 (*Strongly Agree*) to 6 (*Strongly Disagree*), where higher scores indicate greater belief in the limited resource theory. In the current study, the scale demonstrated good reliability ($\alpha = .85$).

Data Analytic Strategy

To assess the hypothesized relationship between action control and self-reported binge eating, we conducted a three-way moderated regression using the PROCESS macro in SPSS (Hayes, 2013). Failure-related action orientation, decision-related action orientation, and willpower beliefs were entered as predictor variables. Body Mass Index (BMI) was included as a covariate to control for weight. Gender was also included as a covariate (Males coded as 0, Females as 1) due to prior research suggesting greater eating disorder symptoms in women (Kelly-Weeder, Jennings, & Wolfe, 2012; Agh et al., 2015). All variables were mean-centered prior to analysis. Per PROCESS procedures, all reported regression coefficients are unstandardized. Significant interactions between predictor variables were evaluated at one standard deviation above and below the mean. Within the description of results concerning action orientation, low scores on the action orientation scale (i.e., one standard deviation below the mean) are labeled as "state oriented" while high scores (i.e., one standard deviation above the mean) are labeled as "action oriented" for ease of interpretation.

Results

Descriptive Statistics

The sample (N = 1128) was over half women (n = 662, 59.9%) with an average age of 34.39 (SD = 12.04). Participants were largely Caucasian (n = 876, 77.7%), followed by African American (n = 98, 8.7%), and the remainder were Hispanic (5.9%), Asian American (4.3%), Native American (.6%), or other (2.7%). Participants had an average BMI of 27.44 (SD = 7.12), with no significant differences between men (M_{bmi} = 27.42, SD = 6.49) and women (M_{bmi} = 27.48, SD = 7.55), $t(1116) = -.14$, $p = .89$.

Moderated Regressions

The overall model predicted a significant amount variance in eating disorder symptoms, $R^2 = .27$, $F(9,1108) = 46.19$, $p < .001$. As expected, female gender and higher BMI significantly predicted greater binge eating (all coefficients are presented in Table 1). There was a main effect of willpower beliefs, where increased beliefs that willpower is an unlimited resource predicted decreased binge eating. There were also main effects of both AOF and AOD, with more action orientation on both subscales predicting fewer binge eating symptoms.

None of the two-way interactions were significant, but we found a significant three-way interaction between AOF, AOD, and willpower beliefs. Specifically, the interaction between willpower beliefs and failure-related action orientation was only significant for those with less ability to up-regulate positive affect (i.e., low AOD; see Figure 1 for graphs). In other words, for individuals with difficulties self-motivating or up-regulating positive affect (e.g., low AOD) there was an interaction between willpower beliefs and failure-related action orientation such that those ascribing to the limited theory of willpower evidenced consistently high rates of binge eating behavior regardless of whether they were high or low on the failure-related subscale (i.e., regardless of their ability to down-regulate negative affect). Alternatively, for those who ascribed

to the unlimited theory of willpower, increased AOF (e.g., increased abilities to down-regulate negative affect) was associated with decreased binge eating symptoms.

Discussion

Past research has found low overall self-control predictive of increased unhealthy behavior (Baumeister & Heatherton, 1996) and specifically decreased action control to be associated with problematic behavioral outcomes such as alcohol consumption (Palfai et al., 2002) and binge eating (Palfai, 2002). In addition, differences in beliefs concerning the fundamental nature of self-control have been shown to influence behavior (Job, Dweck, & Walton, 2010) especially in highly demanding self-regulatory situations (Job, Walton, Bernecker, & Dweck, 2015). Overall through this study, we support previous findings concerning relationships between self-regulatory predictors (i.e., action control and self-control beliefs) and unhealthy behavioral outcomes (specifically binge eating symptomology). In addition, we add to the current literature by examining how these self-regulatory factors may interact to predict eating outcomes.

As predicted, we found that action orientation, both the ability to up-regulate positive affect in order to initiate goal driven action (decision-related action orientation) as well as the ability to down-regulate negative affect accompanying previous failure experiences (failure-related action orientation), was associated with decreased binge eating. Both negative affective states as well as self-motivation ability have been directly linked to binge eating behavior in past research (Telch & Agras, 1996; Nauta et al., 2000; Mansour et al., 2012), and thus it appears that emotion regulation plays an important role in disordered eating behavior (Whiteside et al., 2007; Danner et al., 2012). Here we see that the ability to control both positive and negative affect to initiate and complete goal-directed actions may be highly beneficial for those with increased

binge eating symptoms. Additionally, in line with hypotheses, we found beliefs that willpower is an unlimited resource also predicted decreased binge eating behavior. These results support previous findings linking the unlimited resource theory of willpower to less procrastination in academic situations and increased self-regulation in goal striving (Job, Dweck, & Walton, 2010; Job, Walton, Bernecker, & Dweck, 2015). Thus, while past research as focused on willpower beliefs in various everyday situations, we provide evidence that willpower beliefs may contribute to the course of maladaptive behavioral processes like disordered eating behavior.

Furthermore, we found that for individuals who were adept at up-regulating positive affect (i.e., had high decision related action orientation), the ability to down-regulate negative affect (i.e., high failure-related action orientation) predicted decreased eating disorder symptoms, regardless of willpower beliefs. However, for individuals who struggle to up-regulate positive affect (i.e., low decision-related action orientation), high failure-related action orientation predicted decreased eating disorder symptoms only for those who tend to believe that willpower is an unlimited resource. In other words, those who believe that willpower is limited did not evidence lower binge-eating behavior, even if they were adept at regulating negative-affect (i.e., high in failure-related action orientation). Thus, an ability to regulate negative affective states (i.e., high failure-related action orientation) seems to be a particularly important protective factor for eating outcomes, but may not be as protective if an individual is low in decision-related action orientation (i.e., less skilled at up-regulating positive affect) and believes in the limited theory of willpower. Current models of self-control acknowledge that multiple facets contribute to overall self-control success, including impulse control, goal-orientation, personality and temperamental factors, and even lay beliefs about the nature of willpower (Fujita, 2011). In the current study, we support this notion with evidence that multiple factors, namely action

orientation and willpower beliefs, do indeed influence self-regulation in the context of disordered eating behavior. In addition, we support the notion that these self-regulatory factors interact in specific ways that are highly relevant to disordered eating symptoms and, by extension, may be important when evaluating disordered eating outcomes.

Findings from this study have direct implications for binge eating treatment practices. As self-regulation in a key component to successful weight management (Kitsantas, 2000), diet maintenance (Konttinen et al., 2009), and overall health achievement (Mann, de Ridder, & Fujita, 2013), attempts have been made to address self-regulatory ability in treatment for those with eating spectrum disorders (for review, see Fischer & Munsch, 2012) and weight management concerns (Forman & Butryn, 2015; Wing et al., 2006). Separately, cognitive intervention techniques such as cognitive behavioral therapy (CBT; Murphy, Straebler, & Fairburn, 2010; Wilson & Fairburn, 1993) are commonly used to address maladaptive beliefs and cognitions that commonly accompany eating pathology and show promising results for decreasing disordered eating symptomology. Recent work even suggests CBT is more effective than medication alone at addressing affective symptoms accompanying binge eating disorder (Grilo, Masheb, & Crosby, 2012). Our results are in line with this form of treatment, as we provide evidence that an individual's beliefs concerning the nature of willpower (i.e., whether it is a limited or unlimited resource) significantly predict eating disorder symptoms. Thus it seems that individuals who view self-control as a limited resource would benefit from therapeutic techniques that specifically address this perspective. However, because our results indicated an interaction between multiple self-regulatory factors, it may be that a combined treatment approach, including self-regulation practice and cognitive therapy techniques, may be most beneficial for addressing the multiple self-regulatory factors that accompany binge eating

behavior, specifically emotion-related self-regulation (i.e., action-orientation) and self-control beliefs. Nevertheless, additional studies are needed that address these self-regulatory factors in relation to treatment outcomes before treatment implications can be seriously considered in the context of eating symptomology and specifically binge eating.

The current study has numerous strengths and several limitations worth mentioning. First, by using on-line convenience sampling techniques such as Amazon Mechanical Turk (MTurk), our sample includes not only both men and women from a wide range of ages, but also people with varying degrees of eating pathology. Though our data is self-report based, MTurk is considered a reliable option for large data collection of this nature (Buhrmester, Kwang, & Gosling, 2011). Second, the average BMI of participants in our sample falls in the "overweight" range. Past research has demonstrated that the majority of US adults fall into this category (Schoenborn, Adams, & Peregoy, 2013), and that high BMI is linked to various health-related problems (see Ul-Haq, Mackay, Fenwick, and Pell, 2013). Thus, incorporating BMI as a control variable in our study adds strength to our overall statistical model, as the relationships between variables were significant even after accounting for the variance associated with BMI. Finally, the cross sectional nature of this data limits the ability to make causal connections between variables examined, though the moderation analyses we used (Hayes, 2013) lay a solid foundation for controlled causal studies. For example, willpower beliefs manipulations have been successful in previous studies (see Job, Dweck, & Walton, 2010). Thus, it is plausible to manipulate willpower beliefs while simultaneously assessing action control tendencies and binge eating behavior as a result of belief manipulation. Evaluations of binge eating behavior have been collected both in laboratory settings (e.g., Goldschmidt, Tanofsky-Kraff, & Wilfley, 2011) and in vivo using methods such as ecological momentary assessment (Heron, Scott, Sliwinski, &

Smyth, 2014; but see also Smyth et al., 2001) and would both be plausible methods for future studies interested in examining the variables examined here.

Future studies should not only investigate action-control and willpower beliefs in samples of those diagnosed with eating disorders, but should also in association with other behaviors indicative of self-regulatory failure, such as alcohol dependence and substance use. Much research has focused on the overlap between eating and substance use disorders, including etiology, underlying mechanisms, clinical characteristics, and treatment efficacy (Schreiber et al., 2013; Smith & Robbins, 2013). In particular, self-control deficits characterize both substance-related and addictive disorders as well as feeding and eating disorders, prompting recent investigations into the neurobiological and biobehavioral similarities underlying them (DiLeone, Taylor, & Picciotto, 2012; Gearhardt, White, & Potenza, 2011; Hebebrand et al., 2014,). However, the loss of control characterizing binge eating disorder differs from that of substance-related disorders, specifically based on definitional time constraints and onset (Gearhardt, White, & Potenza, 2011; Hebebrand et al, 2014). Thus, it will be important to understand how self-regulatory factors interact to predict outcomes similarly as well as differentially in addiction spectrum and eating disorders. This may be important for future studies aiming to develop optimal treatment practices that are generalizable to individuals with eating, drug, and alcohol addictions.

Overall, this study provides a novel investigation of the relationships between multiple self-control factors and binge eating behavior. We specifically highlight the importance of action-orientation and willpower beliefs in predicting binge eating symptom severity. Importantly, we find that the combination of high action-control and unlimited willpower beliefs

predicts the best outcomes in the context of binge eating behavior beyond what either action orientation or willpower beliefs are able to predict individually.

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Table 1. Overall model of action orientation and willpower beliefs predicting binge eating symptoms.

	B	*SE*	*t*
Gender	4.44	.84	5.32**
BMI	.84	.06	14.42**
Willpower Beliefs	2.09	.68	3.05**
Decision-related Action Orientation (AOD)	-.39	.15	-2.61**
Failure-related Action Orientation (AOF)	-1.15	.19	-6.14**
AOD x Willpower Beliefs	.18	.18	.99
AOF x Willpower Beliefs	.31	.23	1.34
AOD x AOF	.03	.04	.56
AOD x AOF x Willpower Beliefs	-.15	.05	-3.19**

*$p < .05$, **$p < .01$

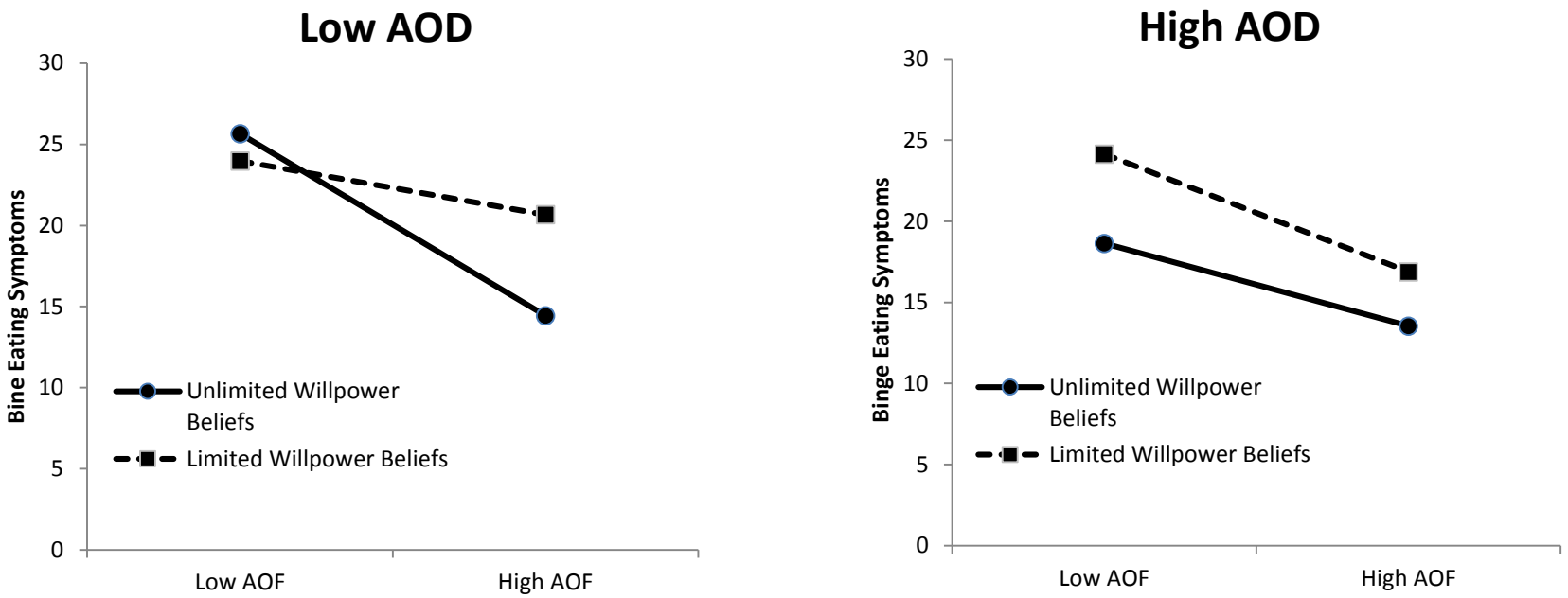

Figure 1. Failure-related orientation (e.g., AOF; down-regulation of negative affect) and willpower beliefs predicting binge eating symptoms. Interactions are displayed separately for low decision-related orientation (left) and high decision-related orientation (right).