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## Could the resource depletion model of self-control help the field to better understand momentary processes that lead to binge eating?

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Binge eating, characterized by overeating while experiencing a sense of loss of control, affects 5–10% of people and is associated with adverse health outcomes, including excess weight gain and the development of full-syndrome eating disorders. There is emerging interest in interventions targeting momentary antecedents of binge eating. Such interventions are promising, but their refinement could be informed by an improved understanding of momentary processes that promote binge eating.

Currently there are several overarching models that seek to explain binge eating. Restraint theory (which posits that binge eating results from lapses in ongoing attempts to reduce energy intake for weight control purposes) and affect regulation theories (which suggest that binge eating is a maladaptive strategy for coping with negative affect) comprise the most well-known contemporary theories of binge eating. Independent tests of these theories using experimental and ecological momentary assessment (EMA) methodologies indicate that both restraint and negative affect often act as momentary antecedents to binge eating. One theory involving affect regulation processes, escape theory, more specifically proposes that binge eating represents a motivated attempt to escape from self-awareness. In this framework, an individual who becomes overwhelmed by awareness of his/her perceived shortcomings (e.g. failure to achieve thin ideal, comply with diet goals) and subsequently experiences negative affect (e.g. anxiety or depression) seeks to escape to a lower level of self-awareness. This state thought to include a narrowed cognitive focus which is associated with several features that may promote binge eating, including decreased inhibitions and a

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focus on immediate, concrete experiences (e.g., taste of food) versus long-term consequences (e.g., weight gain).

Although independent tests of these models have produced promising results, our understanding of *how* and *why* restraint- and affect-related factors elicit binge eating is incomplete. Further, there is not a comprehensive framework that provides a clear understanding of why engaging in restraint or experiencing negative affect do not invariably result in binge eating. We propose a theoretical framework that may be used to understand the momentary occurrence of binge eating behavior, namely the resource depletion model.<sup>i</sup> This model complements existing theories of binge eating and has proved useful in explaining eating behavior in normative samples, yet its applicability to binge eating has not been studied. Future research testing whether and how resource depletion may predict binge eating behavior could transform the field's understanding of binge eating onset, maintenance, and treatment. The intent of this paper is to describe the resource depletion model of behavior, provide evidence to support the use of this model to explain binge eating, and stimulate conversation among researchers and clinicians as to how to optimally examine this model in relation to binge eating within population-based and clinically-relevant samples.

## The resource depletion model of behavior

The resource depletion model, originally applied to the study of dysregulated eating behavior by Vohs and Heatherton, proposes that self-control is a limited resource that may become depleted after repeated use.<sup>ii</sup> As a consequence, after engaging in acts of self-control (e.g. dietary restraint, emotion regulation), one's capacity to exercise further self-control becomes exhausted, leading to diminished performance on subsequent acts requiring self-control. Importantly, once self-control resources have been depleted, the resulting state of depletion can be resolved by restoring the resource through rest, relaxation, or by eating.

Research on resource depletion has typically utilized a dual-task paradigm, in which participants engage in two consecutive tasks, with either both tasks involving self-control (depletion condition) or only the latter task involving self-control (neutral condition).<sup>iii</sup> For example, one study required those in the depletion condition to suppress their emotions when watching an evocative video; controls were informed they could freely express their emotions. Participants were then required to hold a spring-loaded handgrip to exhaustion. Compared with the control group, participants who suppressed their emotions had significantly impaired performance on the handgrip task.

Depletion has been found to consistently lead to increased energy intake.<sup>iv</sup> Further, this depletion effect appears to be elevated among individuals who engage in dietary restraint. Together, these findings suggest that 1) increased eating behavior may be one relatively normative response to resource depletion; and 2) engaging in extended bouts of self-control via dieting or affect regulation may enhance the impact of resource depletion on eating behavior. Taken together, evidence suggests that the depletion model has specific relevance to binge eating via its core focus on self-control, its demonstrated application to eating

behavior, and relevant underlying deficits in self-regulation observed in individuals who binge eat; thus this model warrants testing in a binge eating population.

## Resource depletion and binge eating

Despite its theoretical relevance, the resource depletion model has not been examined in relation to binge eating. Of note, this model is highly complementary to, yet distinct from, restraint and affect regulation theories of binge eating (including escape theory). The resource depletion model suggests a common mechanism by which both dietary restraint and affect regulation exert their effects on binge eating behavior. Viewed through the lens of depletion, engaging in dietary restraint, and experiencing and regulating emotional states, may both be viewed as cognitively taxing processes by which individuals who are vulnerable to binge eating may become depleted. Indeed, restrained eaters consume more snack food following taxing versus non-taxing self-regulatory tasks, an effect that is comparatively attenuated in non-restrained controls. Additionally, individuals who engage in binge eating tend to be more likely to utilize maladaptive emotion regulation strategies, including emotion suppression, which predicts increased desires to binge eat and, in some studies, energy intake.

Importantly, restraint and affect regulation theories view binge eating as a direct response to dietary restraint or negative affect, whereas depletion theory conceptualizes dietary restraint, negative affect, and/or attempts to reduce negative affect as experiences that produce a state of diminished self-control that impedes subsequent attempts to control one's behavior, including eating. As such, resource depletion represents a mechanism by which dietary restraint and affect regulation lead to binge eating; depletion is conceptualized as a consequence of both restraint and affect regulation, given that both of these require self-control. Thus, we propose that both dietary restraint and affect regulation impact binge eating indirectly by depleting self-control resources. Further, if the depletion model is found to explain binge eating behavior, the impact of depletion might also serve to explain other disinhibited behaviors often demonstrated by individuals vulnerable to binge eating (e.g., substance use, self-injurious behaviors).

The depletion model is compatible with escape theory. Indeed, while escape theory posits that binge eating arises out of a heightened self-awareness and subsequent inability to cope appropriately with self-directed cognitions and emotions, the depletion model would suggest that the self-control utilized to cope with the aversive self-directed cognitions and emotions could result in ego-depletion, thus diminishing capacity to engage in subsequent tasks requiring self-control. The depletion model also aligns with trait-based risk factors for binge eating. Preliminary research suggests that sensitivity to self-control depletion (i.e., a tendency to exhaust one's self-control resources relatively rapidly) predicts poorer self-control in response to tasks requiring self-regulation, including making healthy choices about eating. Individuals who binge eat may be vulnerable to becoming depleted rapidly due to underlying deficits in self-regulation,<sup>v</sup> and this vulnerability may interact with a tendency to experience eating as highly reinforcing. These factors, set against a backdrop of chronic dieting and/or poor affect regulation, may foster the development of binge eating as a

consequence of momentary factors promoting depletion (e.g., dietary lapses, aversive affective states; see Figure 1).

## **A multi-method approach to testing the resource depletion model within a binge eating sample**

There is a clear need to better characterize momentary factors involved in the onset and maintenance of binge eating, given its association with multiple adverse health outcomes. The resource depletion model of behavior, which has been validated with respect to multiple behaviors involving self-control, has yet to be tested in binge eating samples. However, its relevance to binge eating marks this as an area in need of further inquiry. Investigating the model in individuals with binge eating has the potential to significantly impact prevention and treatment interventions in the following ways: 1) Data from this type of investigation would support the development of a theoretical framework that will guide the development of secondary prevention and early intervention studies. Such interventions would focus on helping at-risk individuals develop skills to minimize maladaptive factors that promote self-control depletion (e.g., dietary restraint), and recognize early signs that they are in a depleted state so they may generate and utilize adaptive strategies to replenish self-control reserves before they engage in a maladaptive behavior. 2) Results could improve the acceptability of existing treatments (e.g., cognitive-behavioral interventions) targeting depletion-related constructs (e.g., dietary restraint) by enhancing their rationale for patients (e.g., framing dietary restraint as a source of depletion that ultimately leaves one more vulnerable for losing control over eating), and by incorporating relevant foci that may not be adequately addressed in current approaches (e.g., sleep hygiene).

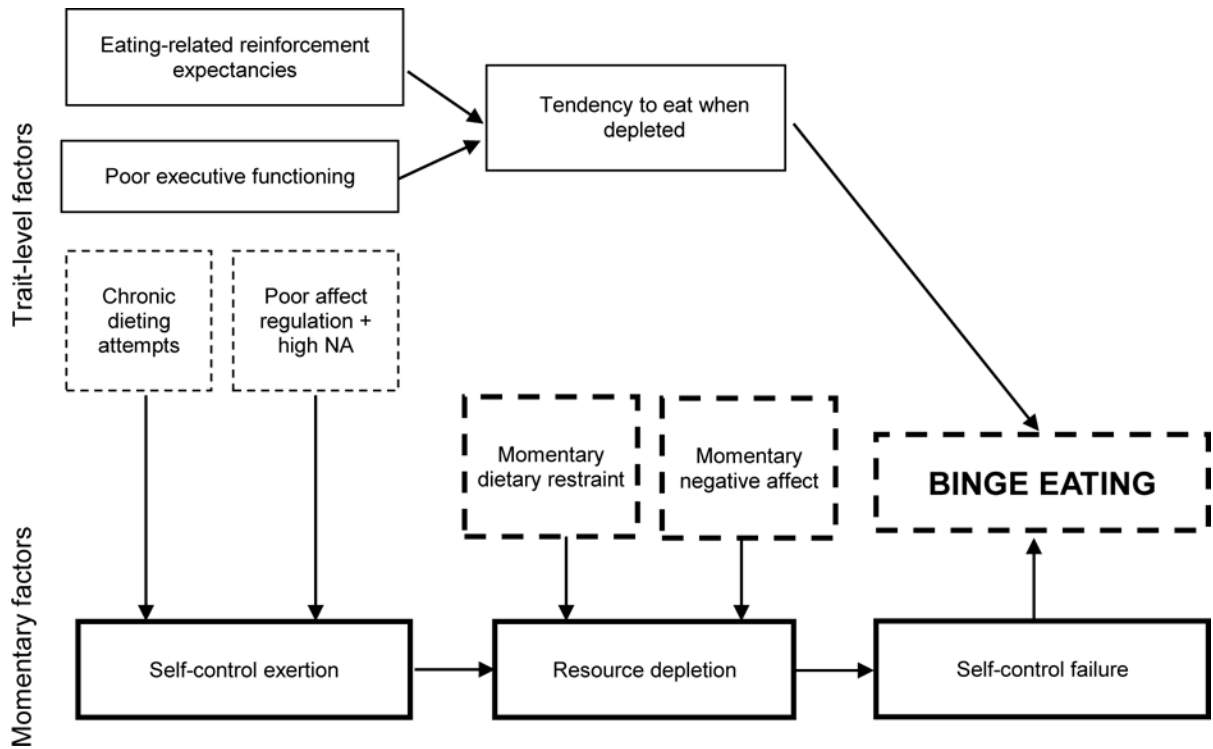
Future research should consider the use of multiple innovative methods to test the depletion model within samples of individuals known to engage in recurrent binge eating, relative to healthy controls. For example, in-vivo laboratory methods, using the dual task paradigm, should be considered as a means of testing the specificity of this model in relation to binge eating; previous research has demonstrated success at inducing depletion utilizing the dual-task paradigm with a variety of initial tasks requiring self-control, including affect regulation and dietary restraint. Further, EMA methods could be utilized to evaluate the association between resource depletion and binge eating in a naturalistic setting; examination of resource depletion in real-time in a real-world setting offers many potential benefits that are not afforded by lab-based paradigms, including the opportunity to understand momentary experiences and activities of daily living that lead to depletion over time, as well as to observe depletion as it unfolds over time (including in the time frame preceding binge eating). Thus, examination of resource depletion within a real-world setting might reduce some of the heterogeneity in observed effect sizes. Finally, potential underlying physiological (e.g., cortisol, blood glucose) and neurobiological (e.g., inferior frontal gyrus activation) mechanisms should be explored.

The intent of this manuscript is to inspire scholarly discussion of the resource depletion model within individuals who binge eat. High priority questions for this line of inquiry include identifying the most relevant tasks to employ within the dual-task paradigm to

induce depletion within this population; developing optimal measures of loss of control eating within a laboratory setting; exploring potential alternatives to the dual-task paradigm for successfully observing depletion within binge eaters; understanding how the resource depletion model can be assessed within naturalistic settings (i.e. via EMA); and elucidating physiological and neurobiological mechanisms underlying resource depletion. Ultimately, we believe that this “Idea Worth Researching” has the potential to inform prevention efforts and clinical practice, including assessment and treatment, leading to a decrease in the prevalence and morbidity of binge eating.

## Footnotes

- i. Baumeister RF, Bratslavsky E, Muraven M, Tice DM. Ego depletion: is the active self a limited resource? *J Pers Soc Psychol.* 1998; 74(5):1252. [PubMed: 9599441]
- ii. Vohs KD, Heatherton TF. Self-regulatory failure: A resource depletion approach. *Psychological Science.* 2000; 11(3):249–254. [PubMed: 11273412]
- iii. Hagger MS, Wood C, Stiff C, Chatzisarantis NL. Ego depletion and the strength model of self-control: a meta-analysis. *Psychol Bull.* 2010; 136(4):495. [PubMed: 20565167]
- iv. Hofmann W, Rauch W, Gawronski B. And deplete us not into temptation: Automatic attitudes, dietary restraint, and self-regulatory resources as determinants of eating behavior. *J Exp Soc Psychol.* 2007; 43(3):497–504.
- v. Manasse SM, Juarascio AS, Forman EM, Berner LA, Butryn ML, Ruocco AC. Executive Functioning in Overweight Individuals with and without Loss-of-Control Eating. *Eur Eat Disord Rev.* 2014; 22(5):373–377. [PubMed: 24962637]



**Figure 1.**  
Proposed theoretical model

Notes:

- 1) Boxes with a solid bold outline depict the primary components of the Resource Depletion Model,
- 2) Boxes with a dashed bold outline include examples of how the resource depletion model functions in relation to binge eating,
- 3) Boxes with a dashed outline include trait-level factors theorized to influence self-control exertion,
- 4) Boxes with a solid outline include trait-level factors theorized to lead to binge eating behavior