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# Respiratory sinus arrhythmia as a predictor of eating disorder symptoms in college students: Moderation by responses to stress and parent psychological control

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ABSTRACT

This longitudinal study examined the prospective contribution of respiratory sinus arrhythmia (RSA), a key physiological indicator of self-regulation, to eating disorder symptoms in college students, and whether this link was moderated by maladaptive responses to stress and parent psychological control. At Wave 1, college students' RSA was measured at rest. At Waves 1 and 2 (six-month follow-up), students reported on their eating disorder symptoms, coping and involuntary responses to stress, and perceptions of their parents' use of psychological control. Significant three-way interactions indicated that the link between RSA and subsequent eating disorder symptoms was contingent on responses to stress and parent psychological control. In the context of maladaptive responses to stress and high psychological control, RSA predicted increased eating disorder symptoms over time. In the absence of parent psychological control, high RSA was beneficial in most cases, even when individuals reported maladaptive responses to stress. This study presents novel evidence that high RSA contributes to risk for or resilience to eating disorder symptoms over time. RSA can be protective against eating disorder symptoms, but in some contexts, the self-regulation resources that high RSA provides may be inappropriately applied to eating cognitions and behaviors. This research highlights the importance of examining physiological functioning conjointly with other risk factors as precursors to eating disorder symptoms over time.



## 1. Introduction

### 1.1. RSA and disordered eating

Self-regulation is central to the development and maintenance of eating disorder symptoms (Ball & Lee, 2000; Heatherton, Striepe, & Wittenberg, 1998; Stice, Nemeroff, & Shaw, 1996). Autonomic physiology provides a potential window into the process through which self-regulation contributes to psychopathology (Calkins, Propper, & Mills-Koonce, 2013; Obradović, 2012). A key component of autonomic functioning is respiratory sinus arrhythmia (RSA), the cyclical fluctuations in heart rate corresponding with respiration (Porges, 2007), which represents a noninvasive way to measure parasympathetic nervous system (PNS) activation. According to Polyvagal theory (Porges, 2007), RSA is indicative of an individual's ability to self-regulate one's emotional and behavioral responses to challenging environmental circumstances. RSA activity at rest is thought to reflect one's capacity for self-regulatory processes. High resting RSA acts as a cardiac brake and inhibits activation of the sympathetic nervous system (SNS), which is responsible for a "fight or flight" stress response; in this way, higher levels of resting RSA indicate greater capacity for flexible physiological responses to environmental demands Thus, RSA is viewed as a physiological indicator of effective self-regulation and a buffer against psychopathology (Beauchaine, 2001; Grossman & Taylor, 2007; Porges, 2007; Thayer & Lane, 2009); for instance, high resting RSA is associated with lower levels of depression and anxiety (e.g., Brosschot, Van Dijk, & Thayer, 2007; Chang et al., 2012; Sanders & Abaied, 2015) and better emotion regulation (Hastings et al., 2008; Vasilev, Crowell, Beauchaine, Mead, & Gatzke-Kopp, 2009).

Research on RSA and eating disorder symptoms (EDS) is limited and has yielded mixed results. Two cross-sectional studies of community samples have found high RSA to buffer against disordered eating: high RSA is associated with less restrained eating (i.e., concern for dieting and weight fluctuations) in emerging adults (Meule, Vögele, & Kübler, 2012), and chocolate cravers with low RSA demonstrate higher EDS than cravers with high RSA (Rodríguez-Ruiz et al., 2009). However, compared to controls, patients with bulimia nervosa (BN; Cong et al., 2004; Vögele, Hilbert, & Tuschen-Caffier, 2009) and anorexia nervosa (AN) demonstrate higher RSA (Mazurak, Enck, Muth, Teufel, & Zipfel, 2011), and RSA levels decrease after treatment for AN (Mont et al., 2003). Unfortunately, the cross-sectional designs of these studies prevent us from drawing conclusions about direction of effect between

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RSA and EDS. Thus, this study sought to build upon prior research by examining prospective effects between RSA and EDS in emerging adults in college, a population at heightened risk for EDS (Liechty & Lee, 2013; Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008), as well as the moderating roles of other factors relevant to both EDS and self-regulation.

### 1.2. Responses to stress

One potential moderator of the link between RSA and EDS is individuals' typical patterns of emotional, cognitive, and behavioral responses to stress. In this study, we drew from Compas and colleagues' framework (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000), which conceptualizes four types of responses to stress: (1) *engagement coping* includes purposeful attempts to change the stressor or negative emotions (e.g., problem solving, purposeful emotion expression, emotion regulation) or to adapt to stressful conditions (e.g., cognitive restructuring, positive thinking), (2) *disengagement coping* includes purposeful avoidance or denial of stress or negative emotions, (3) *involuntary engagement* includes uncontrolled involvement in stressors and negative emotions (e.g., rumination, intrusive thoughts), and (4) *involuntary disengagement* includes uncontrolled avoidance of stress or negative emotions (e.g., emotional numbing, involuntary escape). This factor structure has been validated in samples of children, adolescents, and emerging adults (e.g., Connor-Smith et al., 2000; Connor-Smith & Compas, 2002; Wadsworth, Raviv, Compas, & Connor-Smith, 2005). It should be noted that research using this framework typically assesses individuals' general tendencies to respond to stress in these ways.

In children and adolescents, frequent use of engagement coping is associated with fewer internalizing and externalizing symptoms (Flynn & Rudolph, 2007, 2011, 2014; Jaser et al., 2005, 2007, 2008), whereas frequent use of disengagement coping and involuntary responses are associated with heightened symptoms and other adjustment difficulties (Flynn & Rudolph, 2007, 2011, 2014; Jaser et al., 2005; Wadsworth et al., 2005). Thus, researchers typically view engagement coping as adaptive and disengagement coping and involuntary responses as maladaptive. A similar pattern has emerged in research on coping and EDS. Correlational studies support concurrent links between disengagement coping and EDS in adolescents and college students (Hasking, 2006; Ward & Hay, 2015), and individuals with symptoms of EDS report higher disengagement coping and more involuntary responses compared to those without symptoms (Ball & Lee, 2000, 2002; VanBoven & Espelage, 2006).

EDS may result when efforts to self-regulate are inappropriately applied to eating-related cognitions and behaviors (Haedt-Matt et al., 2014; Kitsantas, Gilligan, & Kamata, 2003; Verstuyf, Patrick, Vansteenkiste, & Teixeira, 2012). Considering RSA and responses to stress together should help us understand these processes. High levels of RSA at rest indicate parasympathetic activation, which provides physiological resources for regulating responses to environmental demands (Porges, 2007; Thayer & Lane, 2009). Individuals with high RSA who typically respond to stress in adaptive ways (with voluntary engagement coping rather than disengagement coping or involuntary responses) should be able to apply their physiological resources effectively and demonstrate lower risk for EDS. In contrast, individuals with high RSA who respond to stress in avoidant, dysregulated ways may instead apply these resources in maladaptive ways and demonstrate heightened risk for EDS.

### 1.3. Parent psychological control

The impact of RSA on EDS may also be contingent upon the context in which self-regulation takes place. To explore this idea, we examined emerging adults' perceptions of parent psychological control, which involves manipulation of thoughts and feeling by making affection contingent upon compliance, inducing guilt or shame, or constraining independence (Barber, 1996; Soenens & Vansteenkiste, 2008).

Psychological control undermines social and emotional adjustment among adolescents (Soenens & Vansteenkiste, 2008) and emerging adults (Abaied & Emond, 2013; Nelson, Padilla-Walker, Christensen, Evans, & Carroll, 2011; Urry, Nelson, & Padilla-Walker, 2011). Furthermore, psychological control represents an environmental constraint on autonomy, which may be a critical pathway to EDS (Verstuyf et al., 2012; Waller, 1998). Verstuyf et al. (2012) suggest that either the rigid, restrictive eating characteristics of AN or the excessive, uncontrolled eating of BN may emerge as a means of compensating for unmet psychological needs such as autonomy. Cross-sectional group comparison studies indicate that patients with EDS perceive their parents as more controlling and/or overprotective compared to controls (Canetti, Kanyas, Lerer, Latzer, & Bachar, 2008; Deas, Power, Collin, Yellowlees, & Grierson, 2010; Lobera, Bolaños, & Garrido, 2011). Correlational research with adolescents and emerging adults also supports positive associations between parent psychological control and EDS in clinical (Goddard et al., 2013; Soenens et al., 2008) and community samples (Berge et al., 2014); similar associations have emerged for generalized parent control in community samples (Kluck, 2008; McEwen & Flouri, 2009).

Broader measures of harsh, controlling parenting moderate the links between RSA and internalizing and externalizing problems (Gordis, Feres, Olezeski, Rabkin, & Trickett, 2010; Hastings et al., 2008), providing some precedent for a moderational process. However, no research has tested whether psychological control prospectively contributes to EDS over time, or whether it moderates the effects of responses to stress or physiology on EDS.

### 1.4. Hypotheses

We expected parent psychological control, responses to stress, and RSA to jointly predict (i.e., a three-way interaction) EDS over time. First, we expected that both high parent psychological control and maladaptive responses to stress (low engagement coping, high disengagement coping, or high involuntary responses) would predict more EDS over time. However, we also expected that a combination of these two risk factors (high psychological control and maladaptive responses to stress) would create a context in which the self-regulation resources provided by high RSA would be applied in maladaptive ways. Thus, in the context of high psychological control and maladaptive responses to stress, high RSA was expected to predict heightened risk for EDS over time. In the absence of psychological control, we expected that RSA would buffer risk for EDS over time, but to a greater extent among those with adaptive responses to stress (high engagement coping, low disengagement coping, or low involuntary responses), who are best equipped for effective self-regulation.

## 2. Method

### 2.1. Participants

Participants were drawn from a sample of 180 college students at a public university in the northeastern United States. Of the 180 Wave 1 participants, 66 opted to participate in a six-month follow-up assessment (18–22 years, $M_{age} = 19.37$, $SD_{age} = .75$, 56 females). Participants were predominately White (84.8% White, 3.0% Hispanic, 1.5% Asian, 10.6% did not report race) and 65.2% reported receiving financial aid to attend the university. Students with and without data at Wave 2 did not differ on any study variables at Wave 1 except involuntary disengagement: students without data at Wave 2 reported slightly less involuntary disengagement responses than those with data, $t(178) = -2.12$, $p = .04$.