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Research report

Bidirectional associations between binge eating and restriction in anorexia nervosa. An ecological momentary assessment study ☆

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ABSTRACT

This study examined the association between restrictive eating behaviors and binge eating in anorexia nervosa (AN) using data collected in the natural environment. Women ($N = 118$) with DSM-IV full or sub-threshold AN reported eating disorder behaviors, including binge eating episodes, going ≥ 8 waking hours without eating, and skipping meals, during 2 weeks of ecological momentary assessment (EMA). Time-lagged generalized estimating equations tested the following hypotheses: 1) dietary restriction would predict binge eating while controlling for binge eating the previous day; 2) binge eating would predict restriction the subsequent day while controlling for restriction the previous day. After controlling for relevant covariates, the hypotheses were not supported; however, there appeared to be a cumulative effect of repeatedly going 8 consecutive hours without eating (i.e. fasting) on the risk of binge eating among individuals who recently engaged in binge eating. In addition, skipping meals was associated with a lower risk of same day binge eating. The relationship between binge eating and dietary restriction appears to be complex and may vary by type of restrictive eating behavior. Future research should aim to further clarify the nature of the interaction of binge eating and restrictive eating among individuals with AN in order to effectively eliminate these behaviors in treatment.

Introduction

The eating behaviors that characterize eating disorders are generally restrictive, appetitive, or purgative (American Psychiatric Association, 2013). Restrictive and purgative eating behaviors can be further described as compensatory when an individual engages in them in response to an eating episode (e.g., binge eating), although these behaviors also may occur independently of specific eating episodes (e.g., a day of fasting). Multiple converging sources of evidence suggest that restrictive eating behaviors (e.g., fasting, avoiding certain types of foods, and limiting the amount of foods eaten) may promote binge eating. For instance, prospective studies in adolescents demonstrate that restrictive eating predicts the onset of binge eating during the high school years (e.g., Stice, Killen, Hayward, & Taylor, 1998; Stice, Presnell, & Spangler, 2002); in animal studies, acute caloric restriction precipitates binge-like eating behavior (e.g., Mathes, Brownley, Mo, & Bulik, 2009); and in a naturalistic study of women with bulimia nervosa, restrictive eating behaviors predicted the next day occurrence of binge eating episodes (Zunker et al., 2011). However, an opposing line of research suggests that dietary restriction may actually reduce binge eating. Studies of weight loss interventions in overweight individuals have found that caloric restriction results in decreases in binge eating frequency (e.g., Goodrick, Poston, Kimball, Reeves, & Foreyt, 1998). Similarly, a weight maintenance intervention that included caloric restriction resulted in decreased binge eating in adolescent girls (Stice, Presnell, Groesz, & Shaw, 2005), and a 6-week weight loss diet in normal-weight women produced decreased binge eating (Presnell & Stice, 2003). Thus, findings regarding the relationship between restrictive eating behaviors and binge eating are mixed and may differ across populations.

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Some of these inconsistencies may stem from confusion regarding two related but distinct constructs: dietary restriction and dietary restraint. Dietary restriction is the behavior of limiting caloric intake below energy requirements, and dietary restraint is the cognitive intent to do so (Stice, Fisher, & Lowe, 2004). Individuals may engage in dietary restriction through the cognitively mediated process of dietary restraint. In other words, individuals may restrict their intake below their needs purposely by attempting to (and succeeding at) restraining themselves from eating as much as they otherwise would. However, there are also other reasons individuals may engage in dietary restriction. For instance, forgetting to eat, experiencing an illness that interferes with appetite, poor planning leading to the unavailability of food, or economic limitations that impinge upon the ability to purchase food may each lead to dietary restriction. At the same time, dietary restraint need not lead to dietary restriction, and indeed dietary restraint does not predict short-term dietary restriction as measured by the actual amount of calories consumed (Stice et al., 2004). This may result from the difficulty of executing the intention to limit intake in the context of the modern environment in which food is generally plentiful and highly palatable (Lowe, 2003). Further, dietary restraint itself may actually increase the risk of binge eating by enhancing disinhibition around food after violations of the intention to limit intake (Johnson, Pratt, & Wardle, 2012). Some individuals, particularly those with eating psychopathology (Stice, Presnell, & Shaw, 2012), often aspire to unrealistic goals when it comes to limiting their intake; aspirations that they inevitably fail to accomplish. In the context of such failures, individuals may experience increased negative affect, disinhibition, and all-or-nothing thinking that lead to a binge eating episode, after which they recommit to their unrealistic goals and set the stage for the process to repeat (e.g., Herman & Mack, 1975). Thus, the intention to limit intake (i.e., dietary restraint) appears to be an important construct for understanding eating psychopathology but a poor proxy for dietary restriction. To avoid introducing further confusion to the literature, research on the relationship between binge eating and restrictive eating behaviors must be careful to ensure that measures of dietary restriction are not actually measures of restraint.

The risk for binge eating that is theoretically potentiated by restrictive eating is generally conceptualized as occurring over shorter (e.g., hours or days) versus longer (e.g., weeks, months, years) intervals, although other mechanisms function in long term appetite regulation (e.g., fat mass and leptin concentrations; Gil-Campos, Aguilera, Cañete, & Gil, 2006). Restrictive eating behaviors may lead to a state of acute caloric/nutrient deprivation that induces physiological hunger and results in a homeostatic drive to eat (Gil-Campos et al., 2006). Thus, consistent with the nature of the hypothesized bi-directional relationship between restriction and binge eating in eating disorder maintenance models (e.g., Fairburn, Cooper, & Shafran, 2003), restrictive eating behaviors may have dual functions, both precipitating the occurrence of binge eating episodes and compensating for their occurrence.

Prospective, momentary research is well-suited to examine the relationship between behaviors that occur within close proximity, including restrictive eating and binge eating. Ecological momentary assessment (EMA) is one such data collection strategy in which individuals monitor and report on experiences in their natural environment in real-time. Data collected via EMA have a number of benefits over data collected using more traditional methods of assessment, which include reduced error attributable to bias in retrospective recall and increased generalizability of findings to the natural environment (Wheeler & Reis, 1991). Recently, Zunker et al. (2011) reported results from an EMA study of restrictive eating behaviors and binge eating in women with bulimia nervosa, in which restrictive eating behaviors predicted binge eating both on the same day and on the subsequent day. Restrictive eating behaviors two days prior did not improve the prediction of binge eating, indicating that acute restrictive eating behaviors (≈24 hours or less) were specifically predictive of binge eating. These results support contemporary models of the maintenance of bulimic pathology (e.g., Fairburn, 2008; Fairburn et al., 2003).

In the present study, we aimed to examine the temporal nature of the relationships between restrictive eating behaviors and binge eating in individuals with anorexia nervosa (AN) using data collected via EMA. No studies to our knowledge have examined this relationship in AN, which is characterized by restrictive eating behaviors associated with chronic caloric intake that is below energy needs (American Psychiatric Association, 2013). Although recent evidence suggests that restrictive eating behaviors and binge eating episodes do not appear to be significantly associated when examined as summed frequencies over a two-week period in AN (De Young et al., 2013), the extent to which there may be bidirectional relationships between these behaviors, including possible cumulative effects of repeated restrictive eating behaviors, remains unclear. Consistent with treatment models that target binge eating and the findings of Zunker et al. (2011), we hypothesized that restrictive eating would function in a compensatory fashion, such that the presence of binge eating on a given day (controlling for the presence of restrictive eating that day) would predict restrictive eating behavior on the subsequent day. Second, consistent with evidence suggesting that restrictive eating may potentiate the risk of binge eating, we hypothesized that restrictive eating on a given day (controlling for the presence of binge eating that day) would predict binge eating the subsequent day. In addition, we conducted an exploratory analysis to examine the cumulative effect of restrictive eating over multiple days on the risk of binge eating, which would be consistent with the chronic caloric deprivation characterizing AN.

Method

Participants

A total of 118 women who were at least 18 years old with full ($n = 59$) or sub-threshold ($n = 59$) AN participated in this study. Individuals with full AN met all DSM-IV (American Psychiatric Association, 1994) criteria; individuals with sub-threshold AN met all DSM-IV criteria except one of the following: (1) body mass index (BMI) of 17.6–18.5 kg/m^2, (2) no amenorrhea, or (3) no body image disturbance and intense fear of fatness. Research generally supports the clinical significance of an AN syndrome that presents without fear of fatness (Becker, Thomas, & Pike, 2009; Wildes, Forbush, & Markon, 2013). Only three of the 118 individuals in this sample met criteria for sub-threshold AN in this way. A study examining differences between the full and sub-threshold AN samples noted no difference across measures of anxiety, depression, personality, eating pathology, or comorbid psychopathology. The only differences were more frequent binge eating and purging in the full-threshold and more frequent checking of the thighs and joints in the sub-threshold sample when assessed via EMA (Le Grange et al., 2013). Participants were recruited through referrals from treatment providers and advertisements in the community, treatment centers, and college campuses in three locations in the Midwestern U.S. (Fargo, Minneapolis, and Chicago). Demographics can be found in Table 1.

Measures

Baseline interviews

AN diagnosis was established using the Structured Clinical Interview for DSM-IV Axis I Disorders, Patient Edition (SCID-I/P; First, Spitzer, Gibbon, & Williams, 1995). An independent assessor rated a random sample of 30 of these audiotaped interviews to gauge the