



## Research report

# Testing the original and the extended dual-pathway model of lack of control over eating in adolescent girls. A two-year longitudinal study



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## ABSTRACT

Stice's (1994, 2001) dual pathway model proposed a mediational sequence that links body dissatisfaction to lack of control over eating through dieting and negative affect. Van Strien et al. (2005) extended the negative affect pathway of the original dual pathway model by adding two additional intervening variables: interoceptive deficits and emotional eating. The purpose of this study was to test and compare the original and extended model using prospective data. Both types of loss of control over eating (i.e., subjective and objective binge eating) were evaluated. Data collected from 361 adolescent girls, who were interviewed and completed self-report measures annually over a 2-year period, were analysed using structural equation modeling. Although both models provided a good fit to the data, the extended model fit the adolescent girls' sample data better and accounted for a greater proportion of variance in binge eating than the original model. All proposed mediational pathways of both models were supported and all indirect effects examined through bootstrap procedure were significant. Although our results confirmed the validity of both models and extended previous findings to an early- to middle adolescent group, the bi-directional relationship between dietary restriction and negative affect suggests that the association between these key risk factors for binge eating are more complex than outlined in both the original and extended dual-pathway models.

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## Introduction

Binge eating, wherein one consumes a large amount of food whilst experiencing a sense of loss of control over eating (American Psychiatric Association [APA], 2013), is prevalent in adolescents (Goldschmidt & Wilfley, 2009; Le Grange & Lock, 2011; Sonnevile et al., 2013; Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011). Approximately 3%–16.1% of females report overeating with loss of control (Field et al., 2008; Goldschmidt & Wilfley, 2009; Goossens, Soenens, & Braet, 2009; Neumark-Sztainer, Wall, Larson, Eisenberg, & Loth, 2011; Tanofsky-Kraff, 2008) some time during adolescence. Research indicates that binge eating is strongly associated with greater obesity severity and increased risk for obesity-related chronic illnesses, poor outcome from weight loss treatment, greater prevalence of psychiatric disorders, as well as poorer psy-

chosocial functioning (Goossens et al., 2009; Sonnevile et al., 2013; Swanson et al., 2011; Tanofsky-Kraff, 2008; Tanofsky-Kraff et al., 2004, 2009). The physical and psychological stressors of adolescence combined with the age of onset of clinical and subclinical levels of eating disorders (including binge eating) in early/middle adolescence onwards makes the investigation of factors associated with the onset of binge eating during this developmental period essential for the development of targeted prevention and intervention programs (Goldschmidt et al., 2008; Goldschmidt & Wilfley, 2009; Kjelsas, Bjornstrom, & Gotestam, 2004; Le Grange & Lock, 2011; Riva, Gaggioli, & Dakanalis, 2013; Stice & Bohon, 2013; Swanson et al., 2011).

Binge eating is multi-determined (Goldschmidt & Wilfley, 2009; Hilbert, 2005; Mathes, Brownley, Mo, & Bulik, 2009; Stice, 2002; Tanofsky-Kraff, 2008); body dissatisfaction as a result of the internalisation of the body shape ideals portrayed in the media is theorised to play a primary role in its aetiology among adolescent girls (Stice, Ng, & Shaw, 2010; Stice, Schupak-Neuberg, Shaw, & Stein, 1994; Stice & Shaw, 1994, 2002). Although over 80% of adolescent

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girls are dissatisfied with their body shape and weight (see Cash, 2012; Dakanalis & Riva, 2013), it is clear that not all girls engage in binge eating (Faravelli et al., 2006; Kjelsas et al., 2004). Therefore additional variables may serve as mediators and/or moderators for explaining the body dissatisfaction–binge eating relationship (Dakanalis & Riva, 2013; Dakanalis, Zanetti, Riva, & Clerici, 2013; Juarascio, Perone, & Timko, 2011; Ricciardelli & McCabe, 2001; Riva et al., 2013). The dual-pathway model proposed by Stice (1994, 2001) appears to be a key framework for explaining the underlying mechanism by which female concerns about shape and weight<sup>1</sup> are translated into emotional and behavioural risk factors potentially promoting binge eating (Allen, Byrne, & McLean, 2012).

According to Stice's (1994, 2001) model, body concerns are indirectly linked to binge eating through two distinct pathways. In the first pathway, "body dissatisfaction leads to dieting because of the commonly accepted belief that this is an effective weight control technique" (Stice & Shaw, 2002, p. 987) for altering the body's shape to more closely approximate the thin ideal stereotype (Cash, 2012; Dakanalis et al., 2014). Dieting, in turn, is an important risk factor for eating pathology and leads to overeating through a variety of physiological and psychological mechanisms (see Fairburn, Cooper, & Shafran, 2003; Mathes et al., 2009; Stice, 2002; Zunker et al., 2011). The second pathway is via negative affect. Since physical appearance is central to one's self-evaluation (Cash, 2012; Dakanalis & Riva, 2013), body dissatisfaction may result in general negative affect (i.e., sadness/depression, anxiety, shame) leading to binge eating as a means of coping with aversive feelings (see Fairburn et al., 2003; Garner, 2004, 2008; Ranzenhofer et al., 2013; Stice, 2002; Tanofsky-Kraff et al., 2009).

Support was found for the dieting pathway in several studies employing samples of children (Allen et al., 2012) and late adolescent girls (Stice, 2001; Stice & Agras, 1998; Stice, Akutagawa, Gaggari, & Agras, 2000; Stice, Presnell, & Sprangler, 2002; Stice, Shaw, & Nemeroff, 1998). However, the hypothesised dieting–binge eating relationship has not been found in other prospective studies focused on late adolescent girls and employing a shorter follow-up period (1 year or less) with two measurement points (Spoor et al., 2006; Stice, 1998). The inconsistent findings might depend on several factors, including study design (Stice, 2002; Stice & Shaw, 2002) and the confusion and assumed equivalency of the terms *dieting* and *dietary restraint* and their subsequent assessment and measurement (Howard & Porzelius, 1999; Stice & Presnell, 2010; Stice, Sysko, Roberto, & Allison, 2010).

Historically, the terms *dieting* and *dietary restraint* have been assumed to be synonymous (Howard & Porzelius, 1999) and have frequently been used interchangeably in the most of the available literature (Stice & Presnell, 2010). The assumption of equivalency between these terms is due, in part, to the assumption that cognitive or "dietary restraint is similar to, but a less extreme version of the caloric restriction" (Stice et al., 2010, p. 520) and the postulated role of both cognitive and concrete efforts to restrict food intake in the onset or/maintenance of binge eating (e.g., Fairburn et al., 2003; Howard & Porzelius, 1999; Mathes et al., 2009; Stice, 2002; White, Masheb, & Grilo, 2009; Zunker et al., 2011). Nevertheless, as noted by Stice (2001), "dieting is not synonymous to dietary restraint" (p. 124). While the former term, which refers to the "intentional efforts to achieve a desired weight by effecting a negative energy balance between caloric intake and expenditure . . . corresponds to the theoretical construct invoked in the dual-pathway model" (Stice, 2001, p. 124; see also Stice, Marti, & Durant, 2011;

Stice & Presnell, 2010), the latter term describes the intent to diet and attempts to follow dietary rules or control intake (regardless as to whether or not it is successful) (Hilbert, 2005; Howard & Porzelius, 1999). Thus, caloric *restriction* more accurately and clearly captures the function of the terms "dieting" and "restraint" in the dual pathway model (Stice et al., 2011). Yet, all prior studies that tested the validity of the model in adolescents (see above) have used measures of dietary restraint [i.e., the Dutch Eating Behavior Questionnaire – Restraint Scale (Van Strien, Frijters, Bergers, & Defares, 1986), the Eating Inventory–Cognitive Restraint Scale (Stunkard & Messick, 1985), the Dietary Intent Scale (Stice, 1998)] to assess the theoretical construct. The use of these measures is understandable and is also problematic as they do not appear to be valid methods for assessing caloric restriction (see Stice, Fisher, & Lowe, 2004; Stice & Presnell, 2010; Stice et al., 2010) and their use could have contributed to conflicting findings (Hilbert, 2005).

It remains unclear whether or not self-reported dieting translates to reduced calories or to reductions of certain macronutrients without an overall reduction in calories (Timko, Juarascio, & Chowansky, 2012). Frequent self-reported dieting (e.g., "How often have you gone on a diet during the last year?") has been reported as precursor to binge eating in adolescents (Field et al., 2008; Neumark-Sztainer et al., 2011). Weight loss (or failure to gain weight with growth) plays an etiological role in the development of eating disorders in adolescents (Le Grange & Lock, 2011; Stice & Bohon, 2013). However, there is evidence that not all adolescents who binge eat report that it preceded restrictive eating patterns (e.g., Tanofsky-Kraff, Faden, Yanovski, Wilfey, & Yanovski, 2005); this opens the possibility that factors other than dieting may play a key role in the onset and/or persistence of binge eating (Garner, 2008; Ouwens, van Strien, van Leeuwe, & van der Staak, 2009; Stice, 2002; Van Strien, Engels, van Leeuwe, & Snoek, 2005). Nonetheless, the impact of dietary restriction<sup>2</sup> on binge eating warrants further elucidation (Stice, 2002; Stice & Shaw, 2002; Zunker et al., 2011). In fact, researchers have argued that further studies are needed to investigate whether or not there are critical periods during which restriction may (not) be a necessary precondition for binge eating (Hilbert, 2005; Stice et al., 2010; Zunker et al., 2011). One step towards answering this question is to use more than two measurement points, longer follow-up periods (which may increase the power to detect changes in binge eating; Stice, 2002; Stice & Shaw, 2002), and methods of data collection other than self-report that can reliably and validly assess dietary restriction (Anderson, Lundgren, Shapiro, & Paulosky, 2004; Spoor et al., 2006; Stice, 1998, 2002; Stice & Shaw, 2002; Zunker et al., 2011).

The pathway involving negative affect as mediator between body dissatisfaction and binge eating has been extensively evaluated in children and samples of female high school and college students and supported using cross-sectional (Ricciardelli & McCabe, 2001; Shepherd & Ricciardelli, 1998; Stice, Nemeroff, & Shaw, 1996; Stice, Ziemba, Margolis, & Flick, 1996; Van Strien et al., 2005) and prospective (Allen et al., 2012; Spoor et al., 2006; Stice, 2001; Stice & Agras, 1998; Stice et al., 2000, 2002; Stice et al., 1998) data. Van Strien

<sup>1</sup> We use the terms body dissatisfaction, dissatisfaction with one's shape and weight, body concerns, and concerns about shape and weight interchangeably based on the practice of other investigators in the literature (e.g., Allen et al., 2012; Cash, 2012; Dakanalis & Riva, 2013; Stice & Shaw, 2002).

<sup>2</sup> We opted to use the term *restriction* throughout the manuscript not only to separate out this behaviour from research on dietary restraint, but also to be clear that some degree of caloric or macronutrient restriction (whether it be intermittent or chronic) is the defining characteristic of the behaviour linking body dissatisfaction to binge eating in the dual-pathway model. This is important given that before Stice's (2001) clarification that dieting is not synonymous to dietary restraint (see above), Stice and colleagues used both terms interchangeably (Stice et al., 1996, 1998). Our focus on dietary restriction may be at odds with some authors' conceptualisation or interpretation of "dieting" and "restraint." Given the existing confusion in the literature (see above), we feel that "restriction" is more theoretically consistent and is also in-line with our theoretical stance and body of research on this topic (e.g., Stice et al., 2011; Stice, Martinez, Presnell, & Groesz, 2006; Zunker et al., 2011).

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