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Research report

Are dietary restraint scales valid measures of dietary restriction? Additional objective behavioral and biological data suggest not

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ABSTRACT

Prospective studies find that individuals with elevated dietary restraint scores are at increased risk for bulimic symptom onset, yet experiments find that assignment to energy-deficit diet interventions reduce bulimic symptoms. One explanation for the conflicting findings is that the dietary restraint scales used in the former studies do not actually identify individuals who are restraining their caloric intake. Thus, we tested whether dietary restraint scales showed inverse relations to objectively measured caloric intake in three studies. Four dietary restraint scales did not correlate with doubly labeled water estimates of caloric intake over a 2-week period (*M*, $r = .01$). One scale showed a significant inverse correlation with objectively measured caloric intake during a regular meal ordered from an ecologically valid menu (*M*, $r = -.30$), but a significant positive relation that was qualified by a significant quadratic effect, to objectively measured caloric intake during multiple eating episodes in the lab (*M*, $r = .32$). In balance, results suggest that dietary restraint scales are not valid measures of dietary restriction, replicating findings from prior studies that examined objective measures of caloric intake.

Theorists have asserted that dieting increases risk for onset and maintenance of binge eating and bulimia nervosa (Fairburn, 1997; Huon, 1996; Levine & Smolak, 2006; Neumark-Sztainer, 2005; Polivy & Herman, 1985). Dieting, or dietary restraint[1], refers to intentional and sustained restriction of caloric intake for the purposes of weight loss or maintenance (Herman & Mack, 1975; Wadden, Brownell, & Foster, 2002; Wilson, 2002). Dietary restriction must result in a negative energy balance for weight loss or a balance between intake and output for weight maintenance. Polivy and Herman (1985) argue that dieters' chronic hunger increases the risk of binge eating and that a reliance on cognitive controls over eating leaves dieters vulnerable to uncontrolled eating when these cognitive processes are disrupted. Binge eating theoretically precipitates redoubled dietary restraint and the use of compensatory weight control techniques (e.g., vomiting), which may escalate into a binge–purge cycle (Fairburn, 1997).

In support of this theory, prospective studies indicate that females with high versus low scores on dietary restraint scales are at greater risk for future onset of binge eating, bulimic symptoms, and bulimic pathology (Killen et al., 1996; Neumark-Sztainer et al., 2006; Stice, Killen, Hayward, & Taylor, 1998; Stice, Davis, Miller, & Marti, 2008) and increases in bulimic symptoms (Johnson & Wardle, 2005; Stice, 2001; Wertheim, Koerner, & Paxton, 2001). These studies primarily used the restraint scale (RS; Polivy, Herman, & Warsh, 1978) and the Dutch restrained eating scale (DRES; van Strien, Frijters, van Staveren, Defares, & Deurenberg, 1986). Given the consistency of these prospective findings, it is widely accepted that dieting plays a causal role in the onset of bulimic pathology (Fairburn, 1997; Levine & Smolak, 2006; Neumark-Sztainer, 2005). Thus, eating disorder prevention programs often advise against dieting (e.g., Smolak, Levine, & Schermer, 1998; Stewart, Carter, Drinkwater, Hainsworth, & Fairburn, 2001), and some researchers have evaluated interventions that reduce dietary restriction and propose a moratorium on dieting (Bacon et al., 2002; Polivy & Herman, 1992).

In contrast to the results from prospective studies, randomized trials have found that assignment to weight loss diet interventions reduce binge eating and bulimic symptoms. Trials indicate that assignment to 5–6-month energy-deficit weight loss interventions, versus waitlist control conditions, resulted in significantly greater decreases in binge eating for overweight and obese women (Klem, Wing, Simkin-Silverman, & Kuller, 1997; Goodrick, Poston, Kimball, Reeves & Foreyt, 1998; Reeves et al., 2001). Trials also indicate that assignment to 6-week energy-deficit weight loss interventions, versus waitlist control conditions, produced

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[1] We use the terms dieting and dietary restraint interchangeably based on the practice of other investigators in the literature (e.g., Polivy & Herman, 1985).

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significantly greater decreases in bulimic symptoms among normal-weight adolescent girls and young women (Groesz & Stice, 2007; Presnell & Stice, 2003) and women with bulimia nervosa (Burton & Stice, 2006). Participants in these interventions are instructed to reduce caloric intake and increase physical activity to achieve the negative energy balance necessary for weight loss. Further, assignment to a weight maintenance intervention that significantly reduced risk for weight gain and obesity onset over a 3-year period resulted in decreased bulimic symptoms and reduced risk for future onset of eating disorders in adolescent girls relative to assessment-only controls (Stice, Marti, Spoor, Presnell, & Shaw, 2008). Participants in this intervention were encouraged to bring their caloric intake into balance with their energy expenditure to avoid unhealthy weight gain.

It is important to determine why these contradictory findings have emerged because they have opposing public health implications. If dieting causes bulimic pathology, interventions should attempt to decrease dieting. Yet, if dieting reduces bulimic symptoms and facilitates weight control, interventions should help individuals diet more effectively. The evidence that 45% of adolescent girls report dieting underscores the import of determining whether dieting has adverse effects (Neumark-Sztainer, 2005).

One potential explanation for the inconsistent findings is that the dietary restraint scales used in the prospective studies are not valid measures of dietary restriction. The original dietary restraint scale was developed to identify individuals currently suppressing their weight through dietary restriction (Herman & Polivy, 2008; Polivy, Herman, & Warsh, 1978). Other dietary restraint scales were developed to provide more valid measures for identifying people engaging in dietary restriction for weight control purposes (van Strien et al., 1986). If the scales used in the prospective studies do not identify individuals who are actually achieving the energy-deficit diet necessary for weight loss, it could explain why these studies produce findings that are discrepant from those emerging from experimental trials involving energy-deficit diets. That is, if the experiments are placing people on energy-deficit diets that result in documented weight loss, whereas the prospective studies are studying people who desire, but are not achieving an energy-deficit diet, it could explain why results from these two lines of research do not accord; the experiments are studying caloric deficit diets and the prospective studies are not. The evidence that people often under-report caloric intake, particularly those with elevated dietary restraint scores (Bandini, Schoeller, Dyr, & Dietz, 1990; Lichtman et al., 1992; Prentice et al., 1986), suggests this is a reasonable supposition.

We conducted four studies that investigated whether five dietary restraint scales showed inverse correlations with directly observed caloric intake during single eating episodes (Stice, Fisher, & Lowe, 2004). We used caloric intake as the criterion because the original validity studies used self-reported intake as the criterion (French, Jeffery, & Wing, 1994; Kirkley, Burge, & Ammerman, 1988; Neumark-Sztainer, Jeffery, & French, 1997; van Strien et al., 1986; Wardle & Beales, 1987). All five dietary restraint scales were developed to assess intentional dietary restriction for the purposes of weight control: the RS (Polivy et al., 1978), three factor eating questionnaire-restraint scale (TFEQ-R; Stunkard & Messick, 1985), DRES (van Strien et al., 1986), eating disorder examination questionnaire-restraint subscale (EDEQ-R, Fairburn & Beglin, 1994), and dietary intent scale (DIS; Stice et al., 2004). These scales showed weak and generally non-significant correlations with objectively measured caloric intake during unobtrusively observed eating episodes across the four studies (M, $r = -.07$, range: $-.34$ to .20; Stice et al., 2004). For instance, the average correlation between three dietary restraint scales and observed caloric intake of students eating meals in dorm cafeterias was $-.09$. Our findings replicate results from other studies that examined objectively measured caloric intake during single eating episodes (Epstein et al., 2004; Hetherington, Bell, & Rolls, 2000; Jansen, 1996; Ouwens, van Strien, & van der Staak, 2003; Sysko, Walsh, & Wilson, 2007; Wardle & Beales, 1987).

Studies have also tested whether dietary restraint scales correlated with objective measures of caloric intake during multiple eating episodes, which should provide a more representative index of habitual caloric intake. Lean and overweight adults with high versus low scores on the TFEQ-restraint scale did not show significant differences in caloric intake during three meals and a snack consumed during a 20-h monitoring period in the lab (Rolls et al., 1997). The EDE-restraint scale did not correlate significantly with observed caloric intake during three separate taste tests of snack foods for normal-weight pre-adolescents (Jansen et al., 2003). The TFEQ-restraint scale did not correlate significantly with observed caloric intake during four separate healthy meals consumed by normal-weight young women (Martin et al., 2005). The TFEQ-restraint scale, DIS, EDEQ-restraint scale, and EDE-restraint scale (Fairburn & Cooper, 1993) did not correlate significantly with observed caloric intake of a yoghurt shake eaten during two sessions by women with anorexia nervosa (Sysko, Walsh, Schebendach, & Wilson, 2005).

Other studies have tested whether dietary restraint scales correlated with objectively measured caloric intake over longer time intervals. One study found that the TFEQ-restraint scale did not correlate with the caloric content of lunches purchased at workplace cafeterias over a 3-month period (Stice, Cooper, Schoeller, Tappe, & Lowe, 2007). Other studies used doubly labeled water (DLW) to estimate habitual caloric intake over a 2-week period. DLW uses isotopic tracers to assess total carbon dioxide production, which can be used to generate accurate estimates of habitual caloric intake (Schoeller et al., 1986). It is considered to be the gold standard measure of habitual caloric intake because participants can be kept blinded to the objective of the study, it provides a precise estimate of total caloric intake over the monitored period, and requires minimal effort on the part of participants (Schoeller et al., 1986). Only one dietary restraint scale has been evaluated using DLW; the TFEQ-restraint scale did not shown significant inverse correlations with DLW estimates of caloric intake over a 2-week period among normal-weight women (Bathalon et al., 2000; Tuschl et al., 1990) or overweight women (Stice et al., 2007).

Although this literature suggests that self-report dietary restraint scales are not valid measures of dietary restriction, there are gaps in this literature. First, the validity studies that assessed caloric intake over extended time periods involved only the TFEQ-R; no studies have tested whether other widely used dietary restraint scales correlate with DLW estimates of caloric intake. Second, many of the prior validity studies involved small samples, limiting confidence in the findings. Third, the studies that assessed caloric intake over extended time periods focused solely on adults; it would be useful to study adolescents because most risk factor studies implicating dieting in the etiology of bulimic pathology have focused on teens. Fourth, we thought it useful to investigate the validity of dietary restraint scales among individuals with eating disorders, as only two prior studies have addressed this question. Fifth, we also tested whether dietary restraint scales showed quadratic relations to caloric intake because it is possible that particularly high scores (e.g., the upper quartile) accurately identify individuals who exhibit dietary restriction, whereas participants with lower scores consume similar amounts of calories. To our knowledge, no previous study has tested for quadratic effects.

We analyzed data from three studies that used objective measures of caloric intake to extend the evidence-base regarding the validity of dietary restraint scales. Study 1 tested whether the