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A Model for Assessing the Self-Schemas of Restrained Eaters

Margaret E. Morris,[1] Timothy E. Goldsmith,[2] Samuel Roll,[2] and Jane Ellen Smith[2,3]

This study explored the ways in which self-appraisal relates to concerns about weight and food among restrained eaters. Network modeling was used to visually depict the restrained eaters' self-schemas, structures that organize information relevant to self-assessment, and to compare the self-schemas of restrained eaters and controls. Twenty-six restrained eaters and 24 controls rated the relatedness of self-evaluation and weight/food-related concepts. These relatedness ratings were transformed via a scaling algorithm into schematic networks, which were interpreted as models of self-schemas. The self-schemas of restrained eaters centered more around weight/food-related concepts and contained more links between self-evaluative and weight/food-related concepts than the schemas of controls. This study offers empirical support for theoretical formulations about distorted self-evaluation among restrained eaters and provides a novel methodology for assessing self-representation.

KEY WORDS: self-schemas; self-representation; restrained eating; eating disorders.

INTRODUCTION

There is a growing recognition of the roles played by self-perception and self-assessment in a variety of psychological conditions, particularly eating disorders. Individuals with anorexia nervosa and bulimia nervosa have been shown to evaluate themselves in terms of shape and weight to a greater extent than people without eating disorders (Geller et al., 1998; Geller, Johnston & Madsen, 1997). There is reason to think this tendency may be shared by women with restrained eating, which is characterized by a cycle of strict dieting and overeating (Heatherton, Herman, Polivy, King, & McGree, 1988). This extreme form of dieting has been causally linked to binge eating and may even set the stage for bulimia (Polivy & Herman, 1995). Research suggests that restrained eaters resemble patients with

[1]Department of Psychiatry, Stanford University, Stanford, California 94305.
[2]Department of Psychology, University of New Mexico, Albuquerque, New Mexico 87131-1161.
[3]Correspondence should be directed to Jane Ellen Smith, Ph.D., Department of Psychology, University of New Mexico, Albuquerque, New Mexico 87131-1161, e-mail: janellen@unm.edu.

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bulimia in the degree of their weight concerns (Rossiter, Wilson, & Goldstein, 1989). However, there have been few studies on the influence of weight and food concerns on the restrained eater's sense of self-worth.

The purpose of this study was to visually represent specific relationships between aspects of self-evaluation and concerns about eating among restrained eaters. Concepts related to either self-evaluation or to body weight and food were rated by participants in terms of the strength of the association between that concept and every other concept. Schematic networks derived from these ratings were used to depict the extent to which an individual bases self-evaluation on weight concerns and to illustrate associations among concepts within these two general concept categories. The network models derived in this study are discussed as representations of self-schemas. The term self-schema refers to the mental organization of concepts related to the self, which guides an individual's perceptions, interpretations, and memories of experiences (Markus, 1977). This study investigated whether the self-schemas of restrained eaters, when compared to those of unrestrained eaters, would depict a greater influence of weight- and food-related concerns on self-evaluation.

This study extends past research on self-schemas of women who are preoccupied with their weight. Markus, Hamill, and Sentis (1987) investigated ''body-weight self-schema,'' structures which organize many independent representations of body-weight (Markus et al., 1987). These researchers concluded that almost everyone constructs some type of body-weight schema, but only for some individuals are they the primary structures through which social stimuli are organized. The concept of overdeveloped body-weight schemas is supported by Striegel-Moore, McAvay, and Rodin's (1986) finding of a correlation between feeling fat and the tendency to let general life failures affect feelings about one's body. Using the repertory grid, a technique derived from Kelly's (1955) personal construct theory, Butow, Beumont, and Touyz (1993) similarly found that bulimic patients associated low weight with positive self-attributes.

Research using the Stroop test has also yielded findings relevant to the study of self-schemas among restrained eaters. It has been shown that patients are generally slower to name the color of words that are associated with their particular clinical condition (Williams, Mathews, & MacLeod, 1996), possibly due to increased schematic processing. Restrained eaters have been found to respond more slowly to food-related words (Overduin, Jansen, & Louwerse, 1995; Stewart & Samoluk, 1997) and to body-shape-related words (Green & Rogers, 1993). Using a somewhat similar methodology with a subliminal lexical decision task, Meijboom, Jansen, Kampan, and Schouten (1999) found that the automatic processing of body shape and weight words was associated with a state of low self-esteem among restrained eaters.

The current study was intended to extend the research above by providing a visual depiction of ways in which food and weight concerns influence the restrained eater's feelings of self-worth. One of the main contributions of this study is the methodology through which representations of self-schemas were derived. These representations were generated from empirical observations of word associations and then formally represented through psychometrically established scaling tech-

niques. This methodology permits objectivity in the elicitation of ratings, derivation of networks, and evaluation of these structures. The schematic networks, like the self-schema they represent, have structural characteristics. It was by comparing the structural characteristics of the restrained eaters' network and the unrestrained eaters' network that inferences were made about the self-schemas of restrained eaters.

Schematic Networks: Background and Key Principles

Schematic networks derived via scaling algorithms have been primarily used to represent individuals' understanding of concepts within a specific academic subject (P. J. Johnson, Goldsmith, & Teague, 1995). These representations are produced by having individuals judge the relatedness of pairs of central concepts within a subject. From these ratings, a scaling algorithm generates a network which depicts the relationships among concepts. An individual's knowledge is assessed by comparing the structure of his or her network to that of an expert in the domain. This technique stems from the premise in cognitive psychology that knowledge is based on an understanding of the relationships among central concepts (P. J. Johnson et al., 1995).

Data analyses can be performed on both the raw relatedness ratings (i.e., proximity data) and the schematic networks derived from relatedness ratings. Proximity data are used to determine the *centrality* of each concept, i.e., the average degree of relatedness between that concept and all others. Network data analysis involves visually comparing networks in terms of *clusters*, i.e., groupings of concepts with close internal links and few links with outside concepts.

Current Use of Network Modeling to Represent Self-Schemas

The current study followed many of the methods for collecting and analyzing data described above, but used network modeling to create representations of self-schemas rather than knowledge structures. The schematic networks in this study were derived from subjective rather than factual word associations. Participants judged the degree to which pairs of concepts were related. The 27 concepts, all of which were paired with one another, fell into two categories. The first category, ''self-evaluative'' concepts, contained concepts related to feelings, goals, and priorities (e.g., *self-esteem*, *anxiety*, *control*, *success*). It was thought that these would be concepts in most people's self-schema. The second category, weight/food-related concepts, consisted of terms, selected by the authors, that frequently emerge in popular, clinical and academic discussions of dieting and eating disorders (e.g., *fat*, *calories*, *weight-loss*, *weight-gain*, *metabolism*). It was thought that these weight/food-related concepts would be external to most people's self-schema, but more salient to the restrained eater. The relatedness ratings that participants attributed to pairs of these concepts were converted into schematic networks. Concepts with greatest centrality were thought to indicate focal points in their self-schemas, and clusters were interpreted as representing their associations among select groups of concepts.

The schematic networks of individuals who qualified as restrained eaters were compared to those of individuals who reported no evidence of restrained eating. It was predicted that the weight/food-related terms would occupy a more central position in the structures of the high-restraint participants than in those of low-restraint participants. Additionally, it was anticipated that more direct links between self-evaluative and weight/food-related concepts would be visible in the networks of the high-restraint participants than in those of low-restraint participants. In other words, it was predicted that self-evaluative and weight/food-related concepts would form more disparate clusters in the low-restraint than in the high-restraint network.

METHOD

Participants

Fifty normal-weight female undergraduates participated in this study. They received credit for psychology classes in exchange for participation. The cutoff criterion on the Restraint Scale was 17 for the high-restraint group and 7 for the low-restraint group. These cutoffs delineated the top and bottom thirds of scores from an early pilot sample of 50 women who completed the Restraint Scale. In a subsequent semester, these criteria were applied to a second sample of 150 women. Of those who agreed to participate from both samples, 26 fell into the high-restraint group and 24 fell into the low-restraint group. The mean Restraint Scale scores were 20.92 (SD = 2.74) for the high-restraint group and 4.8 (SD = 1.97) for the low-restraint group.

Materials

The Restraint Scale (Herman, Polivy, Lank, & Heatherton, 1987), a 10-item self-report survey designed to identify people who restrict their food intake, was administered to all participants to determine their group placement. The Restraint Scale contains two subscales: the concern for dieting factor and the weight fluctuation factor (Ruderman, 1983). High scores are thought to indicate a desire to eat less, coupled with fluctuations between overeating and undereating (Ogden, 1993). This scale has been shown to have high internal consistency and good construct validity (Ruderman, 1983, 1985).

Experimental rooms contained a chair, a desk, and an IBM-compatible computer. Each computer was equipped with a program designed to collect the participants' relatedness ratings of word pairs. The program generated all of the distinct possible word pairs (351) from the list of 27 self-evaluative and weight/food-related terms. Word pairs were presented in random order. Participants rated each pair on a scale of 1–5, where 1 = unrelated and 5 = strongly related. Instructions indicated that the strength of the relationship between two words should not be influenced by whether the words were positively related (e.g., *exercise* and *weight-loss*) or negatively related (e.g., *exercise* and *weight-gain*). Twenty-five word pairs were repeated to test reliability. Participants responded by moving the cursor to

the appropriate number along a scale, at which point the next pair of terms was presented on the screen.

The particular scaling algorithm used in this study to generate networks from relatedness ratings was Pathfinder (Dearholt & Schvaneveldt, 1990). Pathfinder creates a network of most related pairs by deleting those direct links between pairs where there is an alternate route from one to the other which has a smaller path distance. The resultant network displays only those links between the pairs of words that a participant judges to be most highly related.

Procedure

Each participant first read detailed instructions from a computer screen, which indicated that all word pairs were to be rated on a scale of 1–5. Participants were instructed to make relatedness ratings based on a quick association and not to contemplate any particular pair for more than a couple of seconds. They were also instructed to base their ratings on their feelings, experiences, and associations, and told that there were no correct ratings. After practicing on several sample word pairs, participants rated the relatedness of all pairs (351) of the 27 terms.

RESULTS

Proximity Data Analyses

Analyses on proximity data included (a) reliability tests, (b) a general test of differences in the ratings of high-restraint and low-restraint participants, (c) a rank-ordering of concepts according to centrality and a comparison of rank orderings between the two groups, and (d) a rank-ordering of the 351 concept pairs according to degree of relatedness. These pairs were also rank-ordered according to maximum difference between the two groups.

The reliability of each participant's relatedness ratings was computed by correlating her ratings for the first occurrence of a pair with her ratings for the second occurrence of the 25 repeated pairs. The mean reliabilities for the high-restraint and low-restraint groups were .70 and .64, respectively. Correlations of this magnitude reflect a relatively high degree of consistency in an individual's ratings of the word pairs (Goldsmith, Johnson, & Acton, 1991). Participants who had reliability scores below .4 were rejected. Such low reliability scores for this type of rating task generally indicate disinterest on the part of the participant as indicated by random keyboard responses (P. J. Johnson, Goldsmith, & Teague, 1995). Approximately 10% of the participants were excluded from the study due to low reliability.

Overall differences between the relatedness ratings of high- and low-restraint participants were examined in the following way. First, the correlation of each high-restraint participant's ratings with the average high-restraint participant ratings was computed. Then, the correlation of each high-restraint participant's ratings with the average low-restraint participant ratings was calculated. Finally these two sets of correlations were compared in an independent-pairs *t* test. There was a significant

difference between these two sets of correlations, $t(25) = 2.15$, $p < .05$, indicating that, on the most general level, the two participant groups differed in how they rated the concepts.

The centrality of each concept was calculated because it was expected that weight- and food-related concepts would be judged to be more central by high-restraint than by low-restraint participants. A measure of centrality for each of the 27 concepts was computed from participant's relatedness ratings. For each participant, the ratings given to each term, as it was paired with each remaining term, were averaged. These average scores were then transformed to z scores, in order to standardize the centrality measure across participants. The Wilcoxon signed ranks test showed a significant overall difference in concept centrality between the high- and low-restraint groups ($Z = -2.330$, $p = .02$). Table I shows the five most central concepts for the high- and low-restraint groups. Four of the five most central concepts for the high-restraint group were weight/food-related, whereas only two of the five most central concepts for the low-restraint group were weight/food-related. More striking is the difference in the most central concept between these two groups. For the high-restraint group, *fat* was the most central concept, whereas the most central concept for the low-restraint group was *self-esteem*. This key difference captures the maladaptive importance of weight concerns in the self-schemas of restrained eaters.

In a post hoc analysis, the weight/food terms were subcategorized as either weight-related or food-related. The standardized centrality scores mentioned above were averaged across the weight- and food-related terms in order to compare the centrality of these two sets of concepts. The weight-related terms were judged to be more central than the food-related terms for both the high-restraint group ($Z = -4.457$, $p < .01$) and for the low-restraint group ($Z = -4.229$, $p < .01$). It should be noted that the concept *fat* was omitted from this analysis since it could conceivably belong to either the weight or food category.

The rank-ordering of concept pairs according to their degree of relatedness was also examined. The 10 most highly related pairs for the high- and low-restraint groups are shown in Table II. The average rating for each pair was computed separately for each group. No weight/food-related concepts appear in this ranking for the low restraint group, but 10 of the 20 concepts in the high-restraint group were weight/food-related. This ranking suggests that the high-restraint group prioritizes

Table I. Five Most Central Terms for High- and Low-Restraint Groups

High restraint	Low restraint
1. Fat	Self-esteem
2. Weight-loss	Stress
3. Weight-gain	Exercise
4. Exercise	Anxiety
5. Self-esteem	Weight-loss

Note: This table is excerpted from the rank-ordering of all 27 concepts according to centrality.

Table II. Ten Most Related Concept Pairs for High- and Low-Restraint Groups

High restraint		Low restraint	
1. Fat	Weight-gain	Security	Stress
2. Self-esteem	Success	Self-esteem	Success
3. Attractiveness	Self-esteem	Attractiveness	Self-esteem
4. Exercise	Weight-loss	Loneliness	Sadness
5. Fat	Self-esteem	Anxiety	Stress
6. Loneliness	Sadness	Failure	Self-esteem
7. Calories	Exercise	Failure	Stress
8. Attractiveness	Weight-loss	Security	Self-esteem
9. Calories	Weight-loss	Anger	Stress
10. Failure	Stress	Popularity	Self-esteem

Note: This table is an excerpt from the rank-ordering of all 351 concept pairs according to degree of relatedness.

weight and appearance, and strongly associates these and related concepts with general self-evaluative concepts. In contrast, the low-restraint group gave the highest ratings to pairs of two self-evaluative concepts (e.g., *self-esteem* and *success*). *Self-esteem* was paired primarily with achievement and internal evaluative concepts in the low-restraint ranking and mostly with weight/food-related concepts for the high-restraint ranking.

To quantitatively compare the two groups' rank-orderings of concept pairs, all concept pairs were rank-ordered according to maximum disagreement (see Table III). That is, the concept pairs that received the most distinct ratings from the two groups were ranked highest and those that were rated very similarly by the two groups were ranked lowest. The pairs that were rated as significantly more related by the high-restraint than by the low-restraint group were exclusively combinations of weight/food-related and self-evaluative concepts that are suggestive of eating

Table III. Rank-Ordering of Concept Pairs According to Maximum Differences in the Relatedness Ratings of High- and Low-Restraint Participants

	Z score	Concept pair	
1	−3.13**	Competence	Weight-loss
2	−2.97**	Fat	Stress
3	−2.73**	Attractiveness	Fat
4	−2.64**	Calories	Stress
5	−2.37*	Security	Weight-loss
6	−2.28*	Anger	Calories
7	−2.05*	Attractiveness	Metabolism
8	−2.04*	Calories	Self-esteem
9	−1.99*	Calories	Control
1	2.58**	Loneliness	Success
2	2.26*	Failure	Self-esteem
3	2.21*	Laxatives	Metabolism

Note: Negative Z values indicate that a pair was rated as more highly related by high-restraint than low-restraint participants. Positive Z values indicate that a pair was rated as more highly related by low-restraint than high-restraint participants.
* $p < .05$; ** $p < .01$.

disturbances (e.g., *competence* and *weight-loss*). In contrast, the only pairs that were rated as significantly more related by the low-restraint group than by the high-restraint group are combinations of concepts within the same category (e.g., *failure* and *self-esteem*).

Network Data Analyses

Figures 1 and 2 show the averaged schematic networks for the high- and low-restraint groups, respectively. Visual inspection supports the expectation that there would be less distinct groupings of self-evaluative and weight/food-related concepts in the network of the high-restraint group than in that of the low-restraint group.

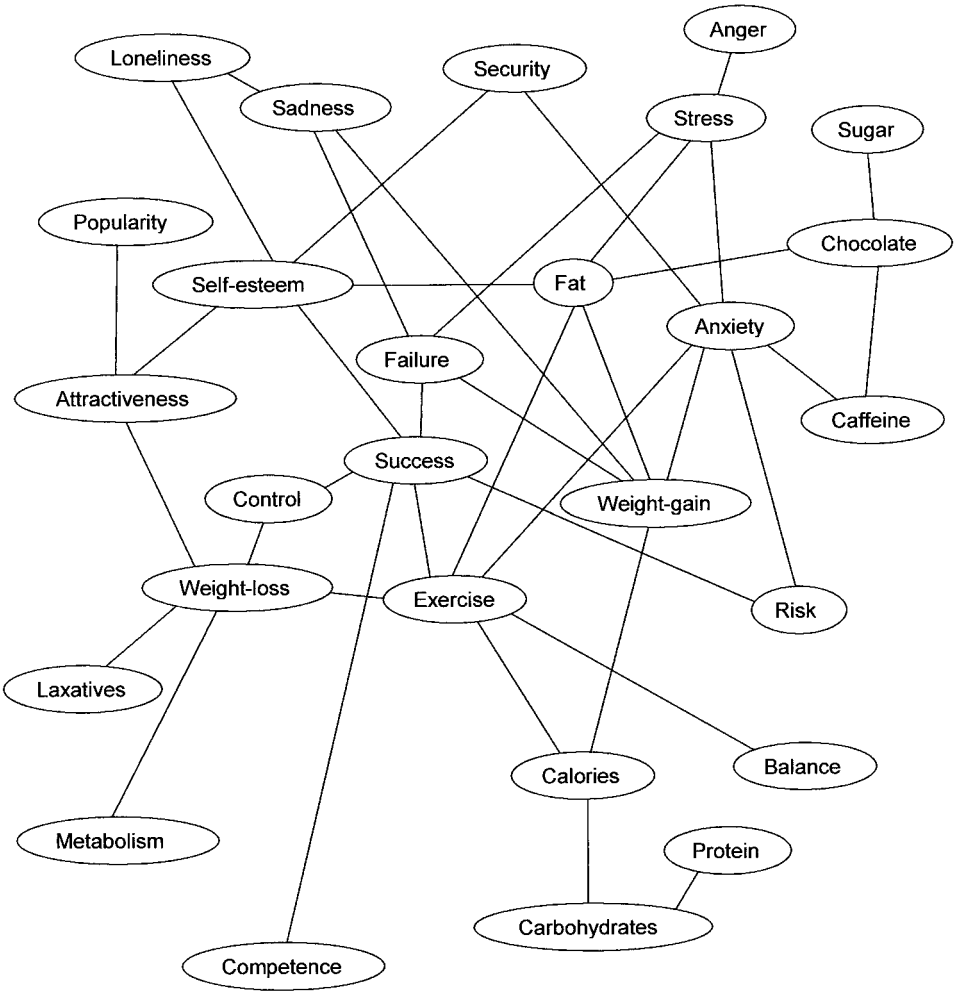

Fig. 1. Network representation of restrained eaters' self-schemas.

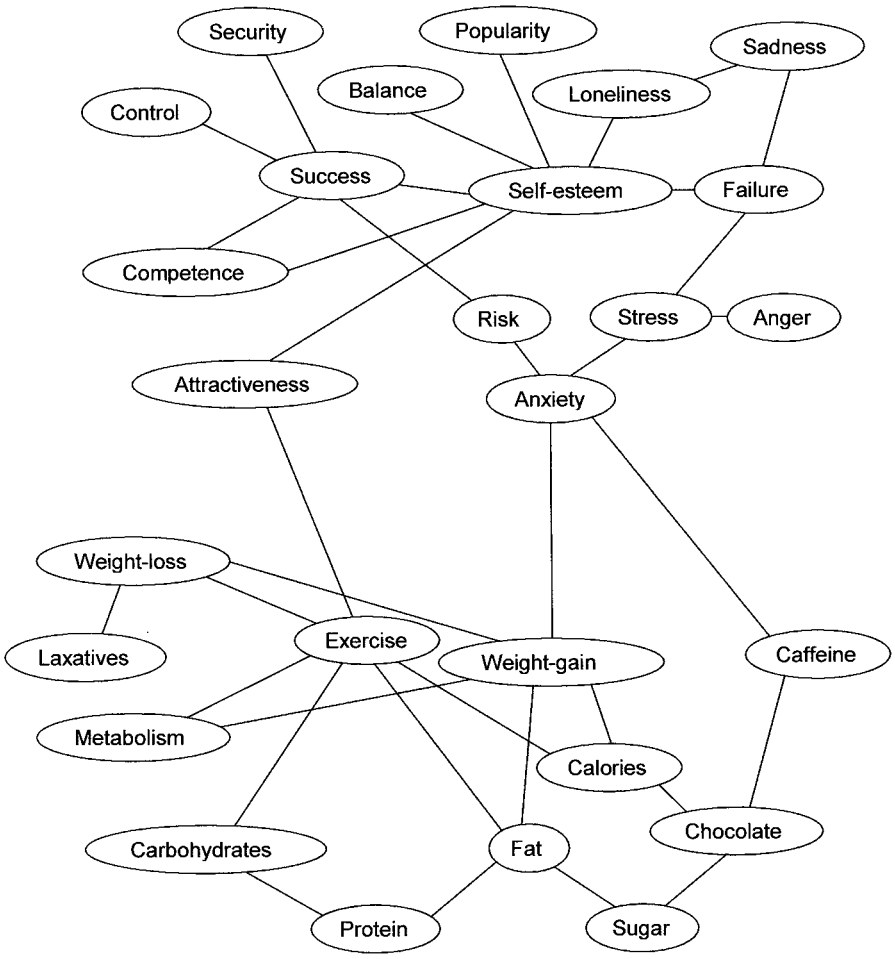

Fig. 2. Network representation of unnrestrained eaters' self-schemas.

The concepts in the high-restraint network lie in one relatively undifferentiated group, whereas the low-restraint network is characterized by discrete groupings of self-evaluative and weight/food-related concepts. The high-restraint network centered around several concepts (i.e., *weight-gain*, *fat*, and *success*), which were closely linked with many terms in both the self-evaluative and weight/food-related categories. In contrast, the low-restraint network was characterized by two clusters, one of weight/food concepts and one of self-evaluative concepts. Both of these clusters in the low-restraint network had dense internal connections, but there were only two links connecting the two clusters of concepts. Note that the physical distance between concepts in these networks is arbitrary and does not reflect the degree of relatedness between any two concepts; more critical is whether or not there is a direct link between two concepts.

There were also subtle differences in concept organization between the high- and low-restraint groups. For example, there were differences in a particular type of cluster called a ''cycle''; a cycle is a loop or string of concepts in which the last concept is linked directly to the first concept. The following cycles were found only in the high-restraint network: (a) *success*, *self-esteem*, *attractiveness*, *weight-loss*, and *control*; (b) *weight-gain*, *failure*, *stress*, and *anxiety*; (c) *weight-gain*, *fat*, *stress*, and *anger*; (d) *weight-gain*, *failure*, and *sadness*. These cyclical clusters of concepts illustrate the restrained eater's belief that one's security, success, and emotional well-being depend on weight control.

The networks of the high- and low-restraint groups were also compared by examining which concepts were directly linked with a subset of concepts particularly relevant to the question of self-representation and restrained eating (see Table IV). Of this subset of concepts, *self-esteem* is intuitively most directly associated with self-evaluation and self-representation. *Self-esteem* was linked to *fat* in the high-restraint network and to *competence* and *balance* in the low-restraint network. This disparity suggests that self-worth is more dependent on body weight for high-restraint participants and more on an internal sense of efficacy and well-being by low-restraint participants. Another example is given by the concepts linked to *weight-gain*. Only in the high-restraint network was *weight-gain* linked to *failure*. In the low-restraint network, *weight-gain* had several logical links not found in

Table IV. Concepts to Which Particular Concepts Are Directly Linked in the Two Networks

Concept	High restraint	Low restraint
Self-esteem	*Fat*	*Competence*
	Attractiveness	*Balance*
	Security	Success
	Success	Popularity
	Loneliness	Loneliness
		Attractiveness
Control	Success	Success
	Weight-loss	
Stress	*Fat*	Failure
	Failure	Anxiety
	Anxiety	Anger
	Anger	
Attractiveness	*Weight-loss*	Self-esteem
	Popularity	Exercise
	Self-esteem	
Popularity	*Attractiveness*	*Self-esteem*
Weight-loss	*Attractiveness*	Exercise
	Control	*Weight-gain*
	Laxatives	Laxatives
	Metabolism	
	Exercise	
Weight-gain	*Failure*	*Weight-loss*
	Exercise	*Metabolism*
	Calories	Calories
	Anxiety	Anxiety
	Fat	Fat

Note: Differences of particular interest are italicized.

the high-restraint network: *weight-loss* and *metabolism*. A final key difference to emerge from this comparison was that, in the high-restraint network only, *control* was linked to *weight-loss*, and *stress* was linked to *fat*. This difference, along with the finding above that *control* was cyclically linked with *success*, *self-esteem*, *attractiveness*, and *weight-loss* in the high-restraint network, suggests that restrained eaters may overvalue self-control as a means of succeeding with weight loss and other goals.

DISCUSSION

Much has been written about the distortions in self-representation and self-evaluation among individuals with eating disturbances. However, most formulations on the topic have lacked empirically derived models of self-schemas. Several researchers have called for empirically based methods of assessing self-representation, particularly among eating-disordered individuals (Strauman & Higgins, 1993; Vitousek & Ewald, 1993). The current study responded to this need by using network modeling techniques developed within cognitive psychology to represent the self-schemas of restrained eaters.

Significant differences emerged on both general and local levels between the self-schemas of high-restraint and low-restraint participants. The high restraint network was distinguishable from the low-restraint network in two main ways: (a) greater centrality of weight/food-related concepts and (b) greater association between self-evaluative and weight/food-related concepts. The results, which concur with findings from earlier investigations of body-weight schemas, lend empirical support for the connection between self-evaluation and concerns about weight and food among restrained eaters. Additionally, the findings visually depict the way in which the restrained eater's preoccupation with weight can override concerns relating to self-esteem, relationships, and achievement.

The network analyses in this study also lent empirical support to clinical observations that control issues play a role in eating disturbances. The finding of links between *control* and other key concepts, such as *weight-loss*, in the high-restraint network is congruent with previous reports that women with bulimia have more fear of losing control than normal subjects (Miller & Smith, 1999; Smith, Waldorf, & McNamara, 1993). Related findings were reported by Butow, et al. (1993), whose repertory grid studies showed that anorexic patients tended to evaluate themselves almost exclusively in terms of self-control, and that both anorexic and bulimic patients tended to see themselves as either completely in control or completely out of control. Such dichotomous thinking is thought to characterize eating disorders and has been associated with a rigid reliance on self-control (Garner & Bemis, 1982, as cited in Butow, et al., 1993). The findings in the current study suggest that the restrained eater, like patients with anorexia and bulimia, struggles to manage the complexities of her life through exaggerated control of eating.

It should be noted that this study was limited by the lack of specific information on participants' eating behavior and weight. It is possible that a few of the participants in the high-restraint group may have had more serious eating disturbances,

but the percentage of such individuals would probably be similar to that found among high-restraint participants in other studies. It also would have been preferable to have more than a visual assessment of participants' weight, although this method has occasionally been used in restraint studies (W. G. Johnson, Corrigan, Schlundt, & Dubbert, 1990; Rogers & Hill, 1989). A number of researchers have either not detected weight differences between restrained and unrestrained eaters (Gattellari & Huon, 1997; Hickford, Ward, & Bulik, 1997) or found that weight has not predicted particular outcome measures relevant to restraint (Corrigan & Ekstrand, 1988; Kirschenbaum & Dykman, 1991). Others have found that the extent to which self-esteem is based on shape and weight is independent of actual shape and weight (Geller et al., 1998). Nevertheless, future restraint studies should assess the influence of actual and perceived weight on the extent to which self-schemas focus on weight concerns.

This study was also limited by the use of extreme scores on the Restraint Scale. The low-restraint group had somewhat lower Restraint Scale scores than those found in most control groups, and may therefore represent a group of women who are unusually *un*concerned with weight and eating. At the same time, the high-restraint group was not as extreme as the groups used in most studies (Kirschenbaum & Tomarken, 1982; Ruderman & Besbeas, 1992). In any case, it is common to use extreme groups when exploring a novel methodology in attempt to decrease within-group heterogeneity (Kirschenbaum & Dykman, 1991) or to maximize the chances of demonstrating group differences initially. Since interesting differences emerged from this study, it should be followed up with a larger study that uses the entire sample.

This research could be extended in several directions. Comparing the schematic networks of restrained eaters to those of patients with bulimia could help illuminate some of the differences between these disturbances, and possibly provide clues for preventing bulimia. Since this study and previous research generally suggest that weight- rather than food-related concepts are most salient to restrained eaters and patients with bulimia (Cooper & Fairburn, 1992; Green, Elliman, Rogers, & Welch, 1997), it would make sense to compare the configuration of particular weight concepts in the schematic networks of the two groups. Another area of research would be to apply the methodology used in this study to develop prototypical self-schemas for patients suffering from other clinical problems, such as depression.

There are also potentially valuable clinical applications of the methodology used in this study. According to a model based on Kelly's (1955) personal construct theory, restrained eaters and eating-disordered patients have difficulty modifying their behavior due to highly polarized and rigid self-schemas in which weight has become maladaptively central (see Butow et al., 1993, for a summary). Therapeutic progress could be evaluated by comparing the centrality of weight concepts in a client's pre- and posttreatment schematic networks. In addition, this methodology may offer clinicians a powerful visual aid to impress upon clients the inappropriate centrality that weight concerns have had in their lives. Being confronted with this visual depiction of personal values could help a client see what important concerns, such as achievements and relationships, have been pushed aside at the expense of preoccupation with body weight.

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