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Do Females with Bulimia Nervosa and Eating Disorder Not Otherwise Specified Have Selective Memory Biases?

Emma Griffith, Willem Kuyken and Ed Watkins

University of Exeter, UK

Alysun Jones

Avon and Wiltshire Partnership NHS Trust, Bristol, UK

Background: The cognitive model suggests memory biases for weight/shape and food related information could be important in the maintenance of eating disorders. **Aims:** The current study aims to evaluate this and extend previous research by (a) including females with eating disorder not otherwise specified (EDNOS) as a discreet group; (b) considering whether levels of hunger and the pleasantness of the stimulus words are important in word recall. **Method:** The study includes three groups of females, 16 with bulimia nervosa, 18 with EDNOS and 17 non-dieting general population controls. All participants completed a self-referential encoding and memory recall task. **Results:** A main effect of word type ($p < .01$) with no group by word type interaction or between group difference was found. A priori contrasts indicated that both eating disorder groups recalled significantly more weight/shape and food words compared to all other word categories ($p < .01$) compared to the control group; with no significant difference found between the eating disorder groups. In relation to the recall of food words, no significant differences were found between groups for levels of hunger. Both eating disorder groups rated the negative weight/shape ($p < .01$), negative food ($p < .01$) and neutral body words ($p < .01$) as more unpleasant than the control group. **Conclusions:** The implications for cognitive theory and future research are discussed.

Keywords: Eating disorders, memory biases, weight, shape, eating, food.

Introduction

The cognitive model proposes that beliefs concerning shape, weight, eating/food and the implication of these for the self (Hunt and Cooper, 2001; Vitousek, 1996; Vitousek and Hollon, 1990) promote the maintenance of the emotional distress and symptomatology of anorexia and bulimia nervosa. Once such beliefs are formed, information processing biases are suggested to select for information consistent with them (Blackburn and Davidson, as cited in Hunt and Cooper, 2001). A number of information processing biases have been studied,

Reprint requests to Emma Griffith, Department of Psychology, University of Bath, Bath BA2 7AY, UK. e-mail: e.j.griffith@bath.ac.uk

including attentional, interpretational and selective memory biases (see Lee and Shafran, 2004; Williamson, White, York-Crowe and Stewart, 2004 for a review). However, despite the theoretical importance of evaluating the role of memory biases, reviews highlight a lack of research in this area (Harvey, Watkins, Mansell and Shafran, 2004; Lee and Shafran, 2004).

The cognitive model suggests memory biases select for information congruent with beliefs about weight, shape and eating/food; thus this information is more elaborately encoded and/or more readily recalled as there are more cues for retrieval (Hermans, Pieters and Eelen, 1998). Few studies that evaluate this have been conducted; this study will focus on three key studies, namely Sebastian, Williamson and Blouin, 1996; Hermans et al., 1998; and Hunt and Cooper, 2001. Sebastian et al. (1996) conducted a study involving three groups of 30 females: weight preoccupied, non-weight preoccupied, and a heterogeneous eating disorder group with diagnoses of anorexia nervosa (AN; $n = 10$), bulimia nervosa (BN; $n = 10$) and EDNOS ($n = 10$). The stimulus words were categorized as "fat body", "non-fat body", and neutral (Sebastian et al., 1996, p. 279). The results indicated that the eating disorder group recalled significantly more fat body words than non-fat body or neutral words, which was not found in either of the non-clinical groups (Sebastian et al., 1996). A limitation of this study is the use of negatively toned words, as it is possible the memory bias shown was for the negative tone of the words due to the presence of depression (Hunt and Cooper, 2001).

Hermans et al. (1998) looked at implicit and explicit memory in females with AN ($n = 12$) and non-dieting controls ($n = 12$). The explicit memory task stimulus words were anorexia-related, positive, negative and neutral words with the same affective valence noted for the anorexia-related and anorexia unrelated words (Hermans et al., 1998). The results indicated that individuals in the AN group exhibited an explicit, however not implicit, memory bias for anorexia related words that was not shown by the control group (Hermans et al., 1998). A limitation of this study was that the weight/shape words were not distinguished from food words in the anorexia-related word category and as with the Sebastian et al. (1996) study, levels of hunger were not considered.

Hunt and Cooper (2001) considered both levels of depression and the valence of the words (Lee and Shafran, 2004). Furthermore, the impact of hunger on the recall of food words was assessed. Three groups of female participants were included in the study, these were BN ($n = 12$), depression ($n = 12$) and control ($n = 18$). The stimulus words included five categories: weight/shape words; food words; emotion words; neutral body words; and neutral nouns, each category containing 24 words. The first three categories of words subdivided into equal numbers of positively and negatively toned words (Hunt and Cooper, 2001). The study found that females in the bulimia group showed "a bias to recall positive and negative weight/shape words compared to emotional words, but not compared to neutral nouns and body words" (Hunt and Cooper, 2001 p. 93). Whilst the BN group recalled more food related words than the control group, this was also the case for the depression group. Furthermore, this enhanced recall correlated with levels of hunger for both groups, which led the authors to suggest enhanced recall for food words was dependent on levels of hunger (Hunt and Cooper, 2001). The limitations of the study include its specificity to bulimia nervosa and small sample size.

Lee and Shafran (2004) suggest future research should address two key areas. First, the inclusion of the range of eating disorders seen in clinical practice. As the most prevalent and least researched diagnoses (Fairburn and Harrison, 2003), it would seem useful to conduct research that includes EDNOS. Second, that there is a need for future research to be more

ecologically valid to gain better insight into how memory biases operate in everyday life (Lee and Shafran, 2004). In line with this, Nikendei et al. (2008) considered memory biases using pictorial and semantic food related stimuli. Three groups, AN ($n = 16$), 16 control participants that had food prior to the task and 16 that had fasted prior to the task took part (Nikendei et al., 2008). The authors concluded there were "behavioural indications of abnormal processing of food related and neutral stimuli" (p. 439) for the AN group that were similar to fasting controls, with no significant difference between the AN and non-fasting control group (Nikendei et al., 2008). This perhaps highlights the importance of considering hunger in relation to the encoding task.

Legenbauer, Maul, Rühl, Kleinstäuber and Hiller (2010) suggest that BN has been "largely overlooked" within the literature related to memory biases (p. 304). This study included a BN group ($n = 25$) and control group ($n = 27$) that were "exposed to body related, food related and neutral TV commercials" (p. 349). The results suggested a memory bias for the BN compared to the control group; however, this was for poorer recall and recognition of body-related rather than "schema consistent materials" (p. 312) e.g. weight as suggested in previous research (Sebastian et al., 1996).

In an attempt to clarify the role of memory biases and extend the current literature, the current study aims to consider memory biases for weight/shape and food words utilizing, as far as possible, the methodology of Hunt and Cooper (2001). The study aims to extend this research in terms of sample size and ecological validity via the inclusion of females with EDNOS as a discrete group.

Hypotheses

1. Females with BN will recall more weight/shape and food words, both positively and negatively toned, compared to all three other word categories (emotion, neutral nouns, and neutral body words). As suggested by the transdiagnostic theory this will also be demonstrated by the EDNOS group, but not by the control group. Furthermore, that differences in the recall of food words will not be accounted for by differing levels of hunger between groups.
2. Information related to current concerns, namely negative weight, shape and food related information, will be more unpleasant for females in the bulimia nervosa and EDNOS groups than the control group.

Method

Design

The study's design is quasi experimental with independent samples completing self-report questionnaires and a memory task.

Participants

Inclusion criteria for all participants was a body mass index (BMI) within the normal range (BMI of 18.50 – 24.99) as defined by the World Health Organization (2006), aged 18–35 and English as a fluent language. Exclusion criteria were current problematic substance use

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and a history of traumatic head injury. Inclusion criterion for the eating disorder groups was a diagnosis of bulimia nervosa or EDNOS, with the diagnostic items of the eating disorder examination (EDE) completed to highlight symptomatology consistent with these diagnoses (American Psychological Association (APA), 2000). EDNOS was defined as a clinically significant eating disorder as assessed by the researcher using the EDE and DSM-IV-TR (APA, 2000) criteria. An exclusion criterion for the eating disorder groups was current inpatient treatment. Specific exclusion criteria for the control group were the participant reporting a diagnosed eating disorder, current clinical depression, or formal dieting in the past 4 weeks. Clinical depression was not an exclusion criterion for the eating disorder groups as "depressive symptoms and major depressive disorder" are suggested to be prevalent in females with bulimia nervosa (Wildes, Simons and Marcus, 2005 p. 9).

Fifty-one participants met inclusion criteria; 16 in the Bulimia Nervosa group, 18 in the EDNOS group, and 17 in the control group.

Measures

Demographic information. Participants were asked their educational level, age and number of years in education post 16 years of age. Weight and height were taken to calculate BMI; participants in the eating disorder groups were given the option to have this taken from their records. All participants described themselves as fluent in English.

In line with Rees (2002) this study used only the diagnostic items of the EDE (12th edition; Fairburn and Cooper, 1993) to highlight bulimia nervosa or EDNOS. The Eating Disorder Examination Questionnaire (EDEQ) self-report measure (Fairburn and Beglin, 1994) was used to provide a subjective assessment of symptomatology over the past 28 days for all groups. Both the EDE and EDEQ are suggested to be reliable and valid (Fairburn and Cooper, 1993; Shafran and Robinson, 2004).

As the study words were presented both aurally and in writing, the National Adult Reading Test second edition (NART2; Nelson, 1991) was used to ensure groups were matched in terms of comprehension of written English. Scores on the NART2 are highlighted as not affected by the presence of depression (Crawford, Besson, Parker, Sutherland and Keen, 1989). The Beck Depression Inventory II (BDI II; Beck, Steer and Brown, 1996) was included, which is suggested to have high reliability and validity. A hunger rating scale (HRS; Grand, 1968) was used to measure levels of hunger, as used by Hunt and Cooper (2001).

The 120 words used by Hunt and Cooper (2001) formed the basis for stimulus words used in this study. These break down into five categories: positively and negatively toned weight/shape words; food words; emotion words; neutral body related words; and non-body related neutral words (see Hunt and Cooper, 2001 for selection criteria for the words). The emotional valance of the word set was re-rated by three female eating disorder service users, after which 39 additional words were generated. As in the Hunt and Cooper (2001) study the words were then rated for emotional valence by 14 female postgraduates. Four words were substituted in the neutral noun category and two words added to each category in an attempt to increase the percentage agreement between raters for the final word set (Appendix 1). As with the Hunt and Cooper (2001) study, positively valenced words were defined as thin related and negatively valenced as fat related.

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Table 1. Demographic information and questionnaire means and standard deviations by group

Group	Bulimia Nervosa $n = 16$	EDNOS $n = 18$	Control $n = 17$
Mean age in years	26.75 (5.04)	25.50 (5.16)	29.18 (4.35)
Mean years education 16+	4.69 (2.61)	3.83 (1.82)	5.06 (2.30)
BMI in Kg/m^2	21.67 (1.78)	22.08 (2.29)	21.45 (1.65)
NART2*	32.13 (9.45)	33.35 (7.07)	32.75 (5.85)
BDI II	31.61 (13.24)	27.55 (11.79)	4.88 (3.67)
BDI II excluding q18**	29.69 (13.90)	26.06 (11.37)	4.65 (3.59)
EDEQ	4.50 (1.00)	4.54 (1.03)	0.76 (0.47)

Standard deviations in parentheses; Mean years education 16+ = the mean number of years in full time education from the age of 16 upwards.
*$N = 49$ One participant did not complete the NART2. One participant's data were excluded.
**The BDI II was totalled both including and excluding question 18 concerning appetite to consider if this had a significant impact on the scores for the bulimia nervosa and EDNOS groups.

Procedure

The bulimia and EDNOS groups were recruited via clinicians in NHS adult mental health services and voluntary services. The general population control group was recruited through strategies such as posters. Following informed consent, demographic information was recorded after which females in the eating disorder groups were interviewed using the diagnostic items of the EDE. All females then completed the HRS. Participants were then asked to listen to 130 tape-recorded words in a "random fixed order" and to "imagine themselves in a scene involving the word and themselves" (Hunt and Cooper, 2001, p.96). The words were presented one every 15 seconds. Initially up to six practice trials were completed. After completing a distracter task of counting backwards in threes from 100 for 20 seconds (Hunt and Cooper, 2001), participants were given a sheet of paper and asked to recall as many words as possible. Only exact words were scored in terms of the suffix; however words spelt incorrectly that did not change the sense of the word were included. The NART2, BDI II and EDEQ were then completed.

Results

Sample characteristics

The demographic information and questionnaire totals are shown in Table 1.

Preliminary analysis

One way analysis of variance (ANOVA) indicated no significant differences between groups for age, F (2, 48) = 2.56, $p = .09$, $\eta p^2 = 0.10$, level of education, F (2, 48) = 1.37, $p = .27$, $\eta p^2 = 0.05$ and BMI F (2, 48) = 0.51, $p = .60$, $\eta p^2 = 0.58$. One way ANOVA with

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Table 2. Means and standard deviations for words recalled in total and for each word category by group

Group	Valence	Bulimia Nervosa $n = 16$	EDNOS $n = 18$	Control $n = 17$
Weight/shape	Positive	3.13 (2.31)	4.00 (2.59)	3.71 (2.51)
	Negative	3.56 (1.63)	3.39 (1.50)	3.47 (1.66)
	Total	6.69 (3.22)	7.39 (3.89)	6.94 (3.91)
Emotion	Positive	2.75 (1.81)	2.56 (1.85)	3.29 (1.65)
	Negative	1.81 (1.33)	1.67 (1.85)	2.71 (2.08)
	Total	4.56 (2.83)	4.22 (2.96)	6.00 (3.12)
Food	Positive	4.00 (1.26)	4.39 (2.12)	3.41 (2.03)
	Negative	4.06 (1.57)	3.61 (1.88)	3.59 (1.88)
	Total	8.06 (2.24)	8.00 (3.34)	7.00 (3.12)
Body words	Neutral	5.75 (2.96)	6.28 (3.75)	7.53 (4.06)
Neutral nouns	Neutral	5.38 (3.70)	5.11 (2.45)	5.00 (2.37)
Total words recalled		32.75 (11.03)	31 (11.96)	32.47 (12.63)

Standard deviations in parentheses

post hoc Bonferroni tests indicated no significant differences for the NART2 F (2, 46) = 0.11, p = .90 ηp^2 = 0.02. Following a log transformation completed as Levenes test was significant (Wuensch, 2006), a significant difference was found between groups on the BDI II both including (F (2, 48) = 33.49, $p < .001$, $\eta p^2 = 0.58$) and excluding (F (2, 48) = 30.63, $p < .001$, $\eta p^2 = 0.56$) question 18 concerning appetite, with both eating disorder groups scoring significantly higher than the control group ($p < .001$). A Kruskal Wallis ANOVA highlighted a significant difference between groups ($x^2(2, N = 51) = 32.21, p = <.01$); with both the bulimia nervosa ($U = 0.00$, $r = -0.85$) and EDNOS ($U = 5.00$, $r = -0.83$) groups scoring significantly higher on the EDEQ than the control group ($p < .001$).

Analysis for the total word recall by group

Table 2 highlights the mean number of words recalled by word type and in total for each group. A one-way ANOVA revealed no significant differences between groups for total words recalled F (2, 48) = 0.10, p = .90, ηp^2 = 0.00.

Analysis of word valence recall

Two three-way mixed ANOVAs were completed to consider any differences in terms of the valence of the words recalled for the three word categories containing both positively and negatively valenced words (weight/shape, food, and emotion). The first [group x words type (weight/shape versus emotion words) x valence (positive versus negative)] with repeated measures on the second and third factors indicated no significant interaction for group by valence $F(1, 48) = 0.64$, p = .53, ηp^2 = 0.03 or group by word type by valence $F(2, 48) = 0.63$, p = .54, ηp^2 = 0.03. The between group main effect was non-significant $F(2, 48) = 0.37$, p = .70, ηp^2 = 0.02.

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The second three way mixed ANOVA [group x words type (food versus emotion words) x valence (positive versus negative)] with repeated measures on the second and third factors indicated no significant interaction for group by valence $F(1, 48) = 1.02$, $p = .37$, $\eta p^2 = 0.04$ or group by word type by valence $F(2, 48) = 0.37$, $p = .70$, $\eta p^2 = 0.02$. The between group main effect was also non-significant $F(2, 48) = 0.91$, $p = .91$, $\eta p^2 = 0.01$.

Hypothesis 1: analysis for the recall of the word set

A two-way ANOVA [group (control, bulimia nervosa and EDNOS) by word type (weight/shape, food, emotion word, neutral nouns, and neutral body words)] with repeated measures on the second factor was conducted. The Greenhouse-Geisser correction was used as Mauchly's test of Sphericity was significant ($p = .019$), which indicated a significant main effect of word type, $F(1, 3.42) = 11.52$, $p < .001$, $\eta p^2 = 0.19$. The interaction of group by word type ($F(2, 6.84) = 1.38$, $p = .22$, $\eta p^2 = 0.05$) and the between group analysis ($F(2, 48) = 0.132$, $p = .88$, $\eta p^2 = 0.05$) were non significant.

This analysis was then repeated with the two eating disorder groups combined into one group. The results of this analysis highlighted a significant main effect of word type ($p < .001$), with both the interaction of group by word type ($p = .05$) and the between group analysis being non significant when the Greenhouse-Geisser correction was applied ($p = .62$).

A new variable was then computed prior to completing the a priori contrasts that allowed the specific area of interest for Hypothesis 1 to be considered; this weighted the word categories positively and negatively (Fields, 2005), with the weight/shape and food words weighted positively and the neutral nouns, neutral body words, and emotion words weighted negatively. Two a priori orthogonal contrasts were conducted via a univariate ANOVA which was significant $F(1, 48) = 3.231$, $p = .048$, $\eta p^2 = 0.12$. The first contrast indicated that the two eating disorder groups, but not the control group, recalled significantly more weight/shape and food words compared to all other word categories ($p < .001$, 95% confidence interval [CI] between groups on the weighted word variable, 22.50, 52.19). The second contrast revealed no significant differences between the two eating disorder groups for the recall of weight/shape and food words compared to the other three word categories ($p = .63$, 95% CI, -10.65, 6.51).

Hunger and recall of food words

No significant relationship between hunger and recall of food words was found using non parametric tests (all $p > .05$).

Hypothesis 2: pleasantness of the stimulus words

The means and standard deviations by group for the pleasantness ratings of the words are shown in Table 3. One way ANOVA with post hoc Bonferroni tests were used to consider group differences for the pleasantness ratings of all the word types. A significant difference was found between groups for the positive weight/shape words $F(2,48) = 4.12$, $p = .02$, $\eta p^2 = 0.15$, with the EDNOS however not the BN group rating these words as significantly more pleasant than the control group ($p = .02$). A significant difference was found between groups for the negative weight/shape words $F(2, 48) = 12.18$, $p < .001$, $\eta p^2 = 0.34$, with both

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Table 3. Means and standard deviations for pleasantness ratings for each word category by group

Group	Valence	Bulimia Nervosa $n = 16$	EDNOS $n = 18$	Control $n = 17$
Weight/shape	Positive	15.19 (25.33)	28.67 (13.56)	10.94 (17.23)
	Negative	− 38.94 (16.75)	− 46.22 (17.67)	− 19.65 (14.42)
	Total	− 23.75 (24.62)	− 17.56 (13.24)	− 8.71 (20.42)
Emotion	Positive	24.47 (24.22)	31.06 (15.88)	39.88 (13.06)
	Negative	− 37.69 (18.82)	− 41.44 (14.36)	− 31.06 (12.76)
	Total	− 16.47 (31.42)	− 10.39 (18.12)	8.82 (12.61)
Food	Positive	18.25 (16.26)	14.44 (13.99)	21.29 (15.87)
	Negative	− 28.75 (20.54)	− 32.47 (20.42)	10.71 (9.38)
	Total	− 10.50 (30.32)	− 18.03 (23.22)	32.00 (22.26)
Body words	Neutral	− 16.50 (24.63)	− 15.08 (22.31)	6.35 (18.81)
Neutral nouns	Neutral	23.06 (21.93)	24.67 (21.63)	35.82 (20.63)

Standard deviations in parentheses

the BN and EDNOS groups rating the words as significantly more unpleasant than the control group ($p < .001$).

No significant differences were found between groups for the positive food words $F(2,48) = 0.88$, p - .42, $\eta p^2 = 0.04$. A Kruskal Wallis ANOVA indicated a significant difference between groups for the recall of negative food words ($x^2(2,N = 60) = 30.47, p = <.001$). Post hoc Mann Whitney tests indicated both the BN ($U = 3.50$, $r = -0.83$) and EDNOS ($U = 10.00$, $r = -0.80$) groups rated the words significantly more unpleasant than the control group ($p < .001$).

No significant differences were found between groups for the pleasantness ratings of positive or negative emotion words or neutral nouns. A significant difference was found between groups for neutral body words $F(2, 48) = 5.95$, $p = .01$, $\eta p^2 = 0.20$, with the BN and EDNOS groups rating the words significantly more unpleasant than the control group ($p = .01$).

Discussion

Hypothesis one states that females with BN will recall more weight/shape and food words, both positively and negatively toned, compared to all three other word categories (emotion, neutral nouns, and neutral body words). As suggested by the transdiagnostic theory this will also be demonstrated by the EDNOS group, but not by the control group. Furthermore, that differences in the recall of food words will not be accounted for by differing levels of hunger between groups.

The results for hypothesis 1 indicated that, whilst the omnibus ANOVA highlighted a main effect of word type, the interaction of group by word type and the between group differences were non significant. This finding is not consistent with the prediction of hypothesis one. A priori contrasts were used to consider the specific prediction of hypothesis 1 in relation to the pattern of word categories recalled between groups. The orthogonal contrasts completed allowed greater specificity in terms of analyzing this specific prediction (Field, 2005).

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The a priori contrasts indicated that females in the bulimia nervosa and EDNOS groups, but not the control group, recalled more weight/shape and food related words compared to all other word categories (emotion words, neutral nouns and neutral body words). This finding is consistent with the cognitive model of eating disorders (e.g. Fairburn, 1981; Vitousek and Hollon, 1990) in relation to memory biases for weight/shape and food-related information. In line with the transdiagnostic cognitive model, the second contrast found no significant difference between the two eating disorder groups. Unlike the Hunt and Cooper (2001) study, enhanced recall for food words was not found to be dependent on differing levels of hunger between groups. Hypothesis 2 proposed that information related to current concerns would be more unpleasant for females in the eating disorder groups. The results demonstrated that both the bulimia nervosa and EDNOS groups found the negative weight/shape ($p < .01$), negative food ($p < .01$) and neutral body ($p < .05$) words significantly more unpleasant than the control group. The EDNOS, however not the bulimia nervosa group, found the positive weight/shape words significantly more pleasant than the control group ($p < .05$). No significant differences were found between groups for the neutral nouns, positive food words or emotion words.

Sebastian et al. (1996) propose that memory biases in eating disorders may be similar to those for depression. This is important to consider in the current study given the significant difference between both the eating disorder groups compared to the controls for mean BDI II score. Both the eating disorder groups rated the negative weight/shape and negative foods words, but not the negative emotion words, as more unpleasant than the control group. This supports Hunt and Cooper's (2001) conclusion that the memory biases are specific to weight/shape and not to negatively toned words per se as suggested for individuals with depression (e.g. Ridout, Astell, Reid, Glen and O'Carroll, 2003). There were also no differences in the total recall of words between groups, which could suggest that the groups did not differ in terms of concentration. It is therefore possible that whilst the cognitive style of females with eating disorders and depression are similar, the precise content of the cognitions differ (Phillips, Tiggemann and Wade, 1997).

In line with the Williams, Watts, MacLeod and Mathews (1997) model, the results suggest it is possible information related to weight/shape and food could be more elaborately encoded and readily retrieved for individuals experiencing BN and ENDOS. Through the process of elaboration, stronger links would be made between concepts leading to more retrieval cues being available (Hermans et al., 1998). Hermans et al. (1998) suggest that in relation to anorexia nervosa this process could "lead to the formation of strong associative links between … anorexia-related concepts and many other (often neutral) memory representations" (Hermans et al., 1998 p. 198). In the current study, the percentage concordance of raters was lowest for the neutral noun category, which perhaps suggests the difficulty of finding truly neutral words.

The lack of an overall significant difference between groups for the omnibus ANOVA completed for hypothesis 1 contrasts with the Hermans et al. (1998) and Sebastian et al. (1996) studies, which reported differences between groups. This could reflect the differing diagnoses of the participants, that this study was underpowered, or methodological differences between the studies e.g. word types.

There are a number of limitations to this research. The most important of these is the small sample size. The difficulties encountered recruiting to all groups are reflected in the unequal numbers in the groups and that the numbers required for the a priori power calculation were not achieved, which has implications for the generalization of the findings. This could also

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explain the non significant result between groups for the omnibus ANOVA. Other limitations of the research include the use of words as the stimuli, which could have lowered the ecological validity of the study, and the specific word set used. The word set being so large ($N = 130$ words) could have led to floor effects and is recognized to be beyond human memory capacity. It is acknowledged that the number of words in each category was too high given the number of participants. It is also recognized that asking participants what they imagined when instructed to imagine themselves in a scene with the word could have strengthened the methodology. A further limitation is the exclusive reliance on a free recall paradigm relative to a recognition paradigm.

An additional limitation of the word set relates to the difference in imageability of words as suggested by the University of Western Australia (UWA) database (1981); with the neutral nouns and body words being significantly more imageable than the weight/shape words and the food words more imageable than the emotion words. This could explain the difference found between the recall of food and emotion words in terms of the emotion words being less imageable than food words; however, this does not explain the within group differences.

Given the above limitations, this study suggests support for the cognitive model of eating disorders (e.g. Fairburn, 1981) in that the a priori contrasts revealed both eating disorder groups recalled significantly more weight and shape and food words than the control group. Importantly, this was not found to relate to difference levels of hunger between groups. Both eating disorder groups also found weight and shape, food and neutral nouns more unpleasant than the control group. This suggests the importance of considering the role of memory biases within clinical practice when working with clients. This study provides preliminary support for the use of the transdiagnostic approach to the theory and treatment of eating disorders and highlights the importance of future research that considers this approach to treating eating disorders.

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Appendix 1. Final word data set

Weight/shape words	Food words	Emotion words	Neutral nouns	Neutral body words
Positively toned:	Positively toned:	Positively toned:		
Dainty	Ecstatic	Apple	Time	Rib
Graceful	Cheerful	Fruit	Tutor	Skin
Toned	Contented	Coffee	Luggage	Wrists
Taut	Excited	Tomato	Meadow	Jaw
Slender	Joyful	Salad	Movie	Throat
Thin	Exuberant	Carrot	Cruise	Shoulders
Trim	Merry	Lettuce	College	Ear
Willowy	Thrilled	Sage	Hall	Finger
Slim	Wonderful	Vegetable	Orchard	Neck
Sleek	Satisfied	Herb	Chair	Forehead
Lithe	Carefree	Melon	Traffic	Shin
Petite	Enthusiastic	Cabbage	Harbour	Mouth
Leggy	Happy	Celery	Hotel	Thumb
Negatively toned:	Negatively toned:	Negatively toned:		
Flabby	Irritated	Potato	Canal	Eyeball
Fleshy	Worried	Sweets	Gift	Toenails
Thickset	Gloomy	Doughnut	Shampoo	Elbows
Chubby	Helpless	Sugar	Sideboard	Freckles
Plump	Useless	Cream	Painting	Cheek
Blubber	Anxious	Chocolate	Priest	Teeth
Bulging	Hopeless	Lard	Villa	Chin
Dumpy	Pessimistic	Butter	Journey	Ankles
Bulky	Sad	Cakes	Vase	Forearm
Pudgy	Worthless	Calories	Lane	Knuckles
Massive	Angry	Biscuits	Kitten	Brow
Obese	Tense	Fried	Printer	Eyelid
Heavy	Miserable	Chip	Tour	Knee

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