

# Disordered Eating and Obsessive-Compulsive Symptoms in a Sub-clinical Student Population

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The link between anorexia nervosa and obsessive-compulsive disorder has been well established in the clinical literature. However, little research has explored this relationship in terms of the specific subtypes of obsessive-compulsive disorder (e. g. checking, ordering, contamination). The present study aimed to add to this small body of research by investigating the self-report disordered eating and obsessive-compulsive tendencies of 141 female undergraduate students. A significant relationship was found between disordered eating and obsessive-compulsive tendencies, with one third of participants exhibiting disordered eating patterns. High comorbid obsessive-compulsive disorder rates were observed among those with high disordered eating scores. Whereas hoarding was the most endorsed obsessive-compulsive characteristic in the disordered eating group, ordering/arranging was found to be most predictive of disordered eating symptomology across measures. It is suggested that routine screening for obsessive-compulsive disorder should be carried out on identification of an eating disorder.

Anorexia Nervosa (AN), an eating disorder (ED) predominantly found among young western females, is characterised by a deliberate weight loss that is both initiated and maintained by the individual affected (World Health Organisation, 1992). AN presents as a refusal to maintain at least 85% of expected body weight, accompanied by an intense fear of gaining weight (American Psychiatric Association [APA], 2000). Perceived shape and weight are significantly distorted; despite vast evidence to the contrary, the anorectic still believes that they are 'fat'. In some cases of AN, additional behaviours such as excessive exercise and laxative use are employed to assist weight loss. Amenorrhoea is a further characteristic of AN among females. Clinical AN affects an estimated 1% of the adolescent

population in western countries (Carr, 1999), however community studies have reported prevalence rates from 0.5% (Patton, Selzer, Coffey, Carlin & Wolfe, 1999) to 20% (Nelson, Hughes, Katz & Searight, 1999). Females with AN outnumber males 9:1 during adolescence (Carr, 1999).

New Zealand specific research concurs with these findings, with the Christchurch Psychiatric Epidemiology Study (CPES) placing lifetime prevalence of clinical AN at 0.3% for females and 0% for males (Wells, Bushnell, Hornblow, Joyce & Oakley-Browne, 1989). An investigation into the eating habits of 1514 adolescent schoolgirls in Auckland, New Zealand found that 14% of girls scored above the cutoff on the Eating Attitudes Test, indicating the possible presence of an ED (Lowe, Miles & Richards,

1985). More recently, Fear, Bulik, and Sullivan (1996) administered the Eating Disorder Inventory-2 to 363 14-year-old Christchurch schoolgirls. It was found that 54% engaged in dieting behaviour, where the average age of first dieting was 12.9 years. An overwhelming 71% of these girls desired to be a smaller size than their current weight for height.

The DSM-IV-TR (APA, 2000) distinguishes between two disordered eating patterns in AN: restrictive type (ANr) and binge-eating-purging type (ANbp). ANr refers to where food intake is either significantly limited or completely refused. ANbp refers to restrictive eating coupled with periods of excessive food consumption and self-induced purging episodes. Such behaviours can see the development of social withdrawal, depression, fine body hair (lanugo), dental erosion (in ANbp), and long-term health complications such as chronically low blood pressure and heart rate (Barlow & Durand, 2005). Though the aetiology of AN remains largely unknown, theories encompass sociocultural, neurochemical, genetic, and familial factors (for a review, see Carr, 1999). Cognitive-behavioural models of AN have received perhaps the most attention. These theories are largely based on the cognitive distortions identified by Beck in his cognitive-behavioural model of depression (Beck, 1976). For example, Garner and Bemis (1985) highlight the role of cognitive distortions such as all-or-nothing thinking, selective abstraction and overgeneralisation in maintaining

restrictive eating behaviours.

Bulimia Nervosa (BN) is characterised by dieting behaviour interspersed with unrestrained periods of binge eating and purging. Unlike AN, women with BN often will not exhibit such severe weight loss (Barlow & Durand, 2005). For the purposes of this paper, however, the focus will be on AN rather than BN.

AN often presents in conjunction with other psychological disorders. It has been found that 58-97% of inpatients with AN have comorbid axis I (APA, 2000) disorders, and 56-84% have comorbid Axis II (personality) disorders (Grilo, Levy, Becker, Edell & McGlashan, 1996). Patients with an ED have been found to display every type of personality disorder according to DSM-III-R criteria, including antisocial, histrionic, schizotypal and paranoid (Oldham et al., 1995). The most common Axis I disorders include major depressive disorder, anxiety disorders and substance abuse (Wildman, Lilienfeld & Marcus, 2004). Body dysmorphic disorder, which shares the distorted body perception element of AN, has been reported in up to 39% of women with AN (Grant, Kim & Eckert, 2002). One Axis I disorder that has received significant attention regarding AN is obsessive-compulsive disorder (OCD).

OCD is an anxiety disorder characterised by obtrusive and unwanted obsessive thoughts, coupled with compulsive rituals or behaviours (APA, 2000). Obsessions and compulsions co-occur in about 60% of cases (Carr, 1999), where compulsions serve to alleviate the anxiety associated with the obsession. In the other 40% of cases, compulsions occur without obsessions. The most common obsessions include fear of contamination, catastrophes (such as fires, illness and death), need for symmetry and order, lucky/unlucky numbers, and forbidden sexual thoughts. Common compulsions aptly parallel the above obsessions, including washing, ordering and arranging objects, counting, repetition, neutralising (performing a behaviour to cancel out a previous behaviour), collecting (hoarding), and incessant checking. Diagnostic criteria include marked distress associated with the obsessions and compulsions, and the

realisation (on at least one occasion) that the obsessions or compulsions are irrational (APA, 2000). Prevalence rates for OCD can be placed anywhere from 0.05% to 3.5% (Castle & Grove, 2000), with the CPES observing New Zealand rates of 3.4% in females and 1.0% in males (Wells et al., 1989). As with AN, much theoretical attention regarding OCD is focussed on cognitive-behavioural accounts. Where cognitive distortions are thought to maintain disordered eating patterns in AN, compulsions are thought to maintain the obsessions in OCD (Carr, 1999). Effectively, the compulsion serves to alleviate the anxiety created by the obsession.

#### *AN and OCD Comorbidity*

The association between AN and OCD has been well documented for over 50 years (Kaye, Weltzen & George Hsu, 1993). Numerous case reports have highlighted the obsessive behaviours of women with AN, such as rituals involving food selection, purchase, preparation, cooking and presentation (Fisher, Fornari, Waldburn & Gold, 2002; Yaryura-Tobias, Pinto & Neziroglu, 2001). Notably, even when these food-centred obsessions and compulsions are controlled for, women with anorexia still display high enough levels of OCD behaviours to merit diagnosis (Kaye, Weltzin, George Hsu, Bulik, McConaha & Sobkiewicz, 1992). Concurrent prevalence rates of comorbid OCD in AN range from 9.5% (Laessle, Wittchen, Fichter & Pirke, 1989) to 68% (Halmi et al., 2003) in ANr, and 10% (Laessle et al., 1989) to 79.1% (Halmi et al., 2003; Maranon, Echeburua & Grijalov, 2004) in ANbp, indicating that OCD is prevalent in both AN subtypes. This finding has been replicated by Milos, Spindler, Ruggiero, Klaghofer and Schnyder (2002), who found comorbidity rates in a Swiss-German sample of 28.6% in outpatients with AN, and 42.1% in inpatients with AN, where no significant differences were found between those with ANr and ANbp. Lifetime prevalence rates have been reported as higher in ANbp (43%) than ANr patients (29%; Sperenza et al., 2001). These prevalence rates of OCD among AN populations are significantly higher than that observed in the general population (2.5%; Carr, 1999).

In most cases, AN has been found to develop subsequent to OCD. Thorton and Russell (1997) examined 35 Australian inpatients with AN, 37% of whom also met criteria for OCD. It was found that OCD was diagnosed on average 5.4 years earlier than AN. In no case was AN diagnosed before the onset of OCD, though in two cases diagnosis was concurrent. These differing presentations have been referred to as concomitant and sequential presentations (Yaryura-Tobias et al., 2001). However, it should be noted that an initial diagnosis of OCD does not necessarily indicate that OCD was present before the AN.

Other authors have investigated the relationship between AN and OCD among a group of OCD (rather than AN) outpatients (Pigott et al., 1991). It was found that female OCD patients, none of whom had an ED diagnosis, displayed significantly higher levels of disordered eating patterns than age matched controls as measured by the Eating Disorder Inventory (Garner & Olmstead, 1984). This difference was particularly evident on the body dissatisfaction subscale.

Further evidence for the relationship between AN and OCD has emerged from the relatives of those with an ED. Bellodi, Cavallini, Bertelli, Chiapparino, Riboldi and Smeraldi (2001) investigated the incidence of OCD among first-degree relatives of 136 patients with an ED. OCD spectrum disorders were found in nearly 10% of ED relatives compared to 0% of control subjects, highlighting a genetic link between ED and OCD. Likewise, Anderluh, Tchanturia, Rabe-Hesketh and Treasure (2003) found evidence for a link between retrospective childhood obsessive-compulsive traits and the development of an ED. Likelihood of later ED increased 6.9% with each additional obsessive-compulsive characteristic (e.g., perfectionism, drive for order/symmetry) observed in childhood. Approximately two-thirds of AN participants reported perfectionism and rigidity in childhood.

#### *Is AN a type of OCD?*

Some authors have suggested that the high level of comorbidity between AN and OCD indicates that one disorder is a subset of the other; specifically, that

AN is a subset of OCD (Holden, 1990; Rothenberg, 1986). This observation was first made by Palmer and Jones in 1939 (cited in Holden, 1990). Rothenberg postulates that the western ideal body type, having made a stark transition from curvaceous to thin, is the cause of this latest manifestation of what he has termed the "modern obsessive-compulsive disorder" (Rothenberg, 1986, pp. 45). According to Rothenberg, obsessive-compulsive patterns form the foundation upon which disordered eating behaviours and rituals emerge. This hypothesis is consistent with the aforementioned finding that OCD was diagnosed prior to AN in most cases (Thornton & Russell, 1999). Rothenberg goes one step further by suggesting that just as someone with OCD is labelled a 'checker' or a 'hoarder', those with a diagnosis of AN are more aptly classified under the OCD umbrella as displaying 'food' obsessions and compulsions. Rothenberg's conclusions can be criticised due to small sample sizes ( $n=11$ ), and unwarranted comparison across studies with considerable variation in methodology. However, Rothenberg is not the only author to posit such a relationship between AN and OCD. In a review of the genetic, comorbid, and epidemiological evidence regarding the relationship between AN and OCD, Holden (1990) agrees that there is some overlap between AN and OCD. It is postulated that prior obsessive and compulsive tendencies may be magnified by the onset of AN. However, such a relationship does not mean that AN is a subtype of OCD: It is likely that a stressful event other than the onset of AN (e.g., the dissolution of a marriage) could also result in the aggravation of already present obsessive-compulsive behaviours. This does not make divorce a subset of OCD; it simply means that divorce (a stressful event) impacts the severity of OCD behaviours. Holden clearly states that any further hypothesis regarding a causal relationship "should remain highly speculative" (Holden, 1990, pp. 4). In short, although the two disorders show strong clinical similarities (Milos et al., 2002), there is little evidence that AN is a subtype of OCD.

### *Does OCD influence AN outcome?*

Although the conception of AN as an OCD subtype is speculative, there is mixed evidence that the presence or absence of OCD can influence the course of AN. Thiel, Broocks, Ohlmeier, Jacoby and Schüssler (1995) found that level of disordered eating symptomology was more severe in a group of 93 ED women if comorbid OCD was observed. Unfortunately, this analysis does not make a distinction between AN and BN, and the sample is largely made up of patients with BN.

A subsequent study by Milos et al. (2002) found that subjects with OCD and an ED were both more likely to have a longer duration ED, and more likely to have developed the ED at an earlier age. Again, this study does not distinguish between AN and BN, and only 35% of the sample had AN. However, no significant differences were obtained when comparing the AN and BN populations, suggesting that the results may be applicable to both clinical groups. Matsunaga, Kaye, McConaha, Plotnicov, Pollice and Rao (2000) found that OCD symptoms persisted among 30% of recovered ANr and 38% of recovered ANbp patients. These levels approximate those previously reported among current sufferers of AN (Milos et al., 2002). Because of the cross-sectional nature of this study, no information is given regarding the prevalence of OCD prior to recovery. This makes conclusions based on these results hard to construct.

Further inconclusive findings come from a longitudinal study looking at thirty-month outcome in women with AN with or without comorbid OCD (Thiel, Züger, Jacoby & Schüssler, 1998). No significant changes in symptomology were observed either within or between groups, indicating that comorbid OCD does not affect the recovery of women with AN. However, Gee and Telew (1999) report the case study of a 14 year old girl who remained unresponsive to persistent treatment (both pharmacotherapy and psychotherapy) focused specifically on her AN. After 18 months of no response, she was seen by a psychiatrist who diagnosed her with comorbid OCD.

Within 10 weeks of pharmacotherapy and cognitive-behavioural therapy targeting the OCD (rather than AN), both her OCD and AN improved dramatically. Six months later, both were essentially in remission. Thus, OCD may influence both the duration and recovery of women with AN.

### *AN and OCD subtypes*

Little research has taken the association between AN and OCD and examined it in terms of the distinct subtypes of OCD, i.e. whether different manifestations of OCD (e.g., hoarding, neutralising) are more often found in AN than other manifestations. Only four studies have been found that investigate this relationship in more depth (Bastiani, Altemus, Pigott, Rubenstein, Weltzin & Kaye, 1996; Halmi et al., 2003; Matsunaga, Kiriike, Iwasaki, Miyata, Yamagami & Kaye, 1999a; Matsunaga, Miyata, Iwasaki, Matsui, Fujimoto & Kiriike, 1999b). Bastiani et al. (1996) used the Yale-Brown Obsessive Compulsive Scale to assess the OCD symptomology of 18 women with ANr and 16 women with OCD (as diagnosed by the DSM-III-R). The most frequent symptom among women with ANr was the order/symmetry obsession, which was endorsed by 72% of the women with ANr. This was higher, though not significantly, than the OCD sample, of whom 63% endorsed this symptom. The next most endorsed symptom for women with ANr was ordering/arranging compulsion (67%). This is not surprising, given ordering/arranging is the compulsion utilised to alleviate the anxiety associated with the order/symmetry obsession. Though women with ANr scored higher on this symptom than OCD patients (38%), the difference was again not significant.

Similar results were obtained by Matsunaga et al. (1999b) among Japanese women with AN. OCD symptomology was measured by the Yale-Brown Obsessive Compulsive Scale, using participants that fit the DSM-III-R criteria for AN, BN and OCD. Unfortunately, like the previous study, the sample size was small (AN;  $n=32$ ), with women with ED split into ANr ( $n=16$ ), ANbp ( $n=16$ ), and BN ( $n=16$ ) groups (OCD;  $n=18$ ). The same pattern of results emerged, specifically regarding ANr patients

where 68.8% endorsed both order/symmetry obsessions and ordering/arranging compulsions. This was the only statistically significant difference found between the AN and the OCD group. These same symptoms were observed among 50% of the ANbp group, and 22.2% of the OCD group. However, although AN obsessions and compulsions were specific to ordering and arranging, the OCD group displayed a wider range of symptoms, including checking and repetition.

Additional replication of these results was obtained in an American sample of 53 women with AN with either no ( $n=32$ ) or comorbid ( $n=21$ ) OCD (Matsunaga et al., 1999a). A comparison with 23 females with OCD revealed that women with AN and comorbid OCD were significantly more likely to display order/symmetry obsessions (66.7%) and ordering/arranging compulsions (61.9%) than their OCD counterparts (30.4%, 21.7% respectively). Interestingly, it was also found that 38.1% of the anorexics with OCD also met DSM-III-R criteria for Obsessive-Compulsive Personality Disorder, compared to only 8.7% of the OCD patients. This high level of comorbidity of OCD and Obsessive-Compulsive Personality Disorder among women with ED is often explained in terms of perfectionism, a trait that is common among those with AN. A discussion of the relationship between AN and OCPD can be found elsewhere (Cassidy, Allsopp & Williams, 1999; Serpell, Livingstone, Neiderman & Lask, 2002).

The most recent research in this area was conducted by Halmi et al. (2003) amongst a group of 324 AN and 116 OCD control patients. Halmi et al. found lifetime obsessions and compulsions in 68% of the ANr and 79.1% of their ANbp population. The most highly endorsed obsessions among the ED group were aggressive obsessions (ANr, 53.5%; ANbp, 69.3%), order/symmetry (ANr, 51.5%; ANbp, 57.1%) and contamination (ANr, 49.5%; ANbp, 54.3%). The most highly endorsed compulsion among women with both ANr and ANbp was checking (64.5% and 67.1%, respectively), followed by ordering/arranging (49.5%) in the

ANr group, and cleaning (60%) and ordering/arranging (57.9%) in the ANbp group. These findings differ from the aforementioned studies (Bastiani et al., 1996; Matsunaga et al., 1999b; Matsunaga et al., 1999a) in that ordering/arranging was the second most endorsed OCD subtype, rather than the most highly endorsed. However, Halmi et al. (2003) state that of checking, ordering/arranging and contamination, ordering/arranging was the only subtype that did not show significantly lower scores than the OCD control group. That is, ratings of the ordering/arranging OCD subtype by women with AN were comparable to those observed among those with a diagnosis of ordering/arranging OCD. This result is comparable to that obtained by Bastiani et al. (1996). The Halmi et al. study was however limited, in that it was a familial based investigation of AN and OCD which did not allow for random sampling. Thus, results may not be representative of the general AN population.

Despite the fact that the above four studies share complimentary findings, results are simply presented without any further explanation. Possible implications of findings are not addressed. The need for more in depth investigations is highlighted, particularly concerning larger sample sizes, inclusion of a matched healthy control group, and the use of common raters (Bastiani et al., 1996). The present study aims to improve on the above studies in three ways. Firstly, a considerably larger sample size (compared to that of Bastiani et al., 1996; Matsunaga et al., 1999b; Matsunaga et al., 1999a) will be employed to increase the validity of the results. Although a subclinical population will be used, results will still be didactic in that they will indicate if the same relationships between AN and OCD found in clinical populations also relate to subclinical populations. It is believed that disordered eating patterns at a subclinical level are important to study, as such behaviours can still have significant, negative effects on an individual. Secondly, self-report measures will be used to eliminate rater confounds. Self-report measures can introduce their own confounds,

however a third aim of the current study is to investigate the reliabilities of the employed measures, as little research regarding psychometric properties of the current scales in a New Zealand population exists.

Three hypotheses have been formulated: 1) there will be a significant, positive correlation between ED score and OCD score; 2) those with a high disordered eating (DE) score will predominantly show obsessions and compulsions relating to order and symmetry; 3) all scales will show satisfactory reliability.

## Method

### Participants

Participants were 157 first year undergraduate psychology students from Victoria University of Wellington. All participants were female, aged between 17-23 years of age ( $M = 18.66$ ,  $SD = 1.18$ ). The majority of participants were NZ European/Pakeha (76.4%), however Asian (12.5%) and Maori/Pacific Islands (5.7%) groups were also represented (Other = 5.4%). Males were excluded from the study due to the lack of male AN found in the CPES (Wells et al., 1989). Additionally, previous NZ research has also focussed on the female population (Lowe et al., 1985). Fourteen cases with missing data were deleted from the sample. A further two cases were identified as outliers on the EAT-26 and the OCI-R, using regression with a random variable. After exclusion of outliers and missing data, 141 participants were included in data analyses.

### Measures

**Obsessive Compulsive Inventory-Revised (OCI-R; Foa et al., 2002):** The OCI-R is an updated, shortened version of the Obsessive Compulsive Inventory (Foa, Kozac, Salkovskis, Coles & Amir, 1998), designed for use as a screening instrument to measure levels of obsessive or compulsive behaviours in subclinical individuals. The OCI-R is an 18-item self-report scale, where items are rated on 5-point likert scale from 0 (*not at all*) to 4 (*extremely*). Item examples include "I check things more often than usual" and "I need things to be arranged in a particular order". Foa et al. (2002) found the

OCI-R to have strong psychometric properties among both OCD ( $\alpha = .81$ ) and nonanxious control ( $\alpha = .89$ ) participants. Good to excellent test-retest reliability over a 1-week period was found for the nonanxious control group. Convergent and discriminant validity was also confirmed (Foa et al., 2002). A subsequent study (Hajcak, Huppert, Simons & Foa, 2004) has confirmed the factor structure, internal consistency ( $\alpha = .88$ ), test-retest reliability ( $r = .70$ ), and convergent and divergent validity of the OCI-R in an undergraduate student population.

**Eating Attitudes Test-26 (EAT-26; Garner, Olmstead, Bohn & Garfinkel, 1982):** The EAT-26 is a shortened version of the 40-item Eating Attitudes Test (EAT; Garner & Garfinkel, 1979). The 26-item scale is highly correlated with the original measure ( $r = .98$ ; Garner et al., 1982). The EAT-26 is a self-report measure, designed to indicate disordered eating patterns among subclinical populations. It is not intended for use as a diagnostic tool, however a cut-off of 20 is recommended as indicative of disordered eating patterns (Garner et al.). Participants indicate their response to each item on a scale from *Always* to *Never*. Item examples include "I avoid foods with sugar in them" and "I feel extremely guilty after eating". The EAT-26 has been widely used as a screening measure for eating disorders, and exhibits high internal reliability in both clinical ( $\alpha = .90$ ) and subclinical ( $\alpha = .83$ ) populations (Garner et al.). Moreover, Tilgner, Wertheim and Paxton (2004) found that the EAT-26 was free from social desirability bias in a sample of high school girls.

**Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994):** The EDE-Q is the self-report version of Fairburn and Cooper's (1993) Eating Disorder Examination (EDE) interview. Both measures have been found to perform comparably (Fairburn & Beglin, 1994). Participants respond to the 28 items on either a 7-point likert scale (0=*no days*, 6=*every day* or 0=*not at all*, 6=*markedly*) or by giving a frequency rating. Item examples include "Have you *tried* to exclude from your diet any foods that you like in order to influence

*your shape or weight (whether or not you have succeeded)", and "Over the past 28 days, how many times have you taken laxatives as a means of controlling your shape or weight".* Demographic information (weight, height) is also collected. Items comprise four subscales; restraint, eating concern, shape concern, and weight concern. EDE-Q subscales display good to excellent internal reliability ( $\alpha = .78 - .92$ ) among female undergraduate students (Luce & Crowther, 1999). Excellent test-retest reliability over a 2-week period was also obtained ( $r = .81 - .94$ ). Community norms (Fairburn & Beglin) and young adolescent female norms (Carter, Stewart & Fairburn, 2001) are available for the EDE-Q. It was thought that community norms would be most applicable to the present population, so one standard deviation above the norm given by Fairburn and Beglin (global EDE-Q: 2.77) will be used as indicative of disordered eating pathology as measured by the EDE-Q.

#### Procedure

This study was part of a larger study that investigated both the psychometric properties and social desirability response bias of the three clinical measures employed. Participants self-selected into the study, and gained a half hour credit toward their 1<sup>st</sup> year paper for participation.

All participants were told that the study was voluntary, and that they could leave at any time. Responses were confidential; however student identification numbers were collected so that those whose questionnaire responses identified them as needing support (regarding disordered eating or obsessive-compulsive characteristics) could be contacted. Participants were fully debriefed on completion of the questionnaires.

## Results

### Descriptive Statistics

Participants had a mean body mass index (BMI; weight [kg]/height [m]<sup>2</sup>) of 21.77 ( $SD = 4.31$ ), indicating a healthy average (albeit self-report) height to weight ratio. Thirty-three participants (23.1%) scored above the cut-off of 20 on the EAT-26 (Garner et al., 1982). Thirty-one participants (21.7%) scored above the norm on the EDE-Q (Fairburn & Beglin, 1994), with 21 (68%) of these participants also scoring above the cutoff on the EAT-26. This gave a total of 43 participants (30.5%) exhibiting disordered eating patterns.

Thirty-six participants (23.1%) scored above the norm on the OCI-R (Foa et al., 2002), with 19 (53%) of these participants also scoring above the cutoff on the EAT-26, the norm on the EDE-Q, or both. Of the 33 participants scoring above the cutoff on the EAT-26 measure, 24 (72.7%) also scored above the norm on the OCI-R. Of the 31 participants scoring above the norm on the EDE-Q, 24 (77.4%) also scored above the norm on the OCI-R. These figures indicate high comorbid OCD tendencies in the disordered eating subgroup. See Table 1 for descriptive statistics on all four measures.

Three one-way analyses of variance (ANOVAs) indicated that there was no significant difference by ethnic group for OCI-R,  $F(140) = 1.84, p = .06ns$ , EAT-26,  $F(139) = 1.46, p = .17ns$ , or EDE-Q scores,  $F(140) = .76, p = .66ns$ . No significant correlation was found between age and disordered eating score on the EAT-26,  $r(139) = .15, p = .08ns$ , or the EDE-Q,  $r(140) = .11, p = .19ns$ . A significant, positive, weak correlation was found between BMI and disordered eating on the EAT-26,  $r(140) = .20, p = .02$ ,

Table 1. Descriptive statistics for the OCI-R, EAT-26 and, EDE-Q

	Mean	SD	$\alpha$
OCI-R	20.48 (18.82)	10.66 (11.10)	.87
EAT-26	13.6 (9.9)	9.39 (9.2)	.87
EDE-Q	1.86 (1.55)	1.48 (1.21)	.91

Note: Figures in brackets indicate normative mean and SD scores for subclinical populations (Foa et al., 2002; Garner et al., 1982; Fairburn & Beglin, 1994).

and the EDE-Q,  $r(141) = .21, p = .01$ , indicating that disordered eating was not independent of BMI. Specifically, the more disordered eating symptomology, the higher the BMI.

Hoarding was the most endorsed OCD subscale of those scoring above the cutoff on the EAT-26 ( $M = 6.03, SD = 3.03$ ) and the norm on the EDE-Q ( $M = 5.94, SD = 2.64$ ). This was followed by the ordering subscale in both cases ( $M = 5.52, SD = 2.61; M = 5.39, SD = 2.72$ ). Further investigation revealed that high hoarding behaviours were prevalent across the entire student population ( $M = 5.38, SD = 2.70$ ), whereas the high ordering scores were specific to the DE population. See Table 2 for a breakdown of OCI-R subscale scores among those with and without disordered eating symptomology.

### Correlation Analyses

Pearson's correlations were calculated between scales and subscales of the employed measures. The EAT-26 and the EDE-Q displayed a significant, strong, positive correlation with each other,  $r(140) = .76, p < .01$ , indicating significant criterion validity between the two eating disorder measures. The EDE-Q displayed a slightly higher significant, moderate, positive correlation with the OCI-R,  $r(141) = .46, p < .01$ , than the EAT-26,  $r(140) = .44, p < .01$ . This indicates that scores on both eating disorder measures were significantly related to scores on the OCI-R. Table 3 depicts the correlations between ED measures and OCI-R subscales. Nearly all correlations were significant, with neutralising and ordering subscales of the OCI-R yielded the highest correlations with both ED measures.

### Regression Analyses

In order to further examine the data by taking pooled variance into account, two multiple regressions were calculated. OCI-R subscale scores were regressed onto EAT-26 scores. A significant result was found,  $F(6,133) = 8.89, p < .001$ , with obsessive-compulsive tendencies accounting for 25.4% (Adj  $R^2$ ) of the variance in disordered eating scores. Significant predictors of disordered eating scores were neutralizing ( $\beta = .37$ ), ordering/arranging ( $\beta = .32$ ) and checking ( $\beta = -.20$ ). A significant regression was also found when OCI-

Table 2. Descriptive statistics for subscale scores on the OCI-R for those scoring above and below the cutoff/norm on the EAT-26 and/or EDE-Q

	"Disordered Eaters" (n = 43)		"Non-Disordered Eaters" (n = 98)		Effect Size
	Mean	SD	Mean	SD	
Hoarding	5.86	2.86	5.24	2.67	0.23
Checking	3.29	2.02	2.74	1.97	0.28
Ordering	5.38	2.70	3.65	2.69	0.64**
Neutralising	3.33	2.55	1.71	2.24	0.69**
Washing	2.90	2.89	1.97	2.31	0.37*
Obsessing	4.57	3.16	3.42	2.73	0.40*
OCI-R Total	25.33	11.85	18.72	10.07	0.62**

Notes: See text for cutoff/norm criteria.

Mean difference 2-tailed t-test \*\*  $p < 0.01$ , \*  $p < 0.05$

R scores were regressed on EDE-Q scores,  $F(6,134) = 7.43, p < .001$ , where obsessive-compulsive tendencies accounted for 21.6% of the variance in disordered eating scores. The only significant predictor found regarding EDE-Q scores was ordering/arranging ( $\beta = .24$ ). Taken together, these results suggest that high endorsement of the ordering/arranging subtype of OCD is a robust predictor of disordered eating behaviours across measures.

### Reliability and Validity

Cronbach's Alphas were calculated for all subscales and full scales employed in this study. As seen in Table 1, the OCI-R, EAT-26 and EDE-Q all displayed high internal reliability. Of the OCI-R subscales, Hoarding (.70), Neutralizing (.70), Obsessing (.84), Ordering (.81) and Washing (.70) displayed acceptable alphas, whereas Checking (.54) did not. For the EAT-26, Dieting (.85) and Bulimia (.78) displayed acceptable alphas; however Oral Control (.64) did not. Regarding the EDE-Q, all subscales (Restraint  $\alpha = .84$ ; Eating Concern  $\alpha = .85$ ; Shape Concern  $\alpha = .77$ ; Weight

Concern  $\alpha = .87$ ) displayed excellent alpha coefficients. The alpha for Shape Concern was raised to .91 if item 28<sup>1</sup> was deleted. However, this item was not deleted as the original alpha was acceptable.

### Discussion

The present study revealed a significant relationship between ED and OCD score, supporting the first hypothesis. A DE<sup>2</sup> prevalence rate of approximately one third across both eating disorder measures was observed. Of those with DE, the vast majority also scored above the norm on the OCI-R, indicating high comorbidity. Contrary to hypothesis 2, hoarding was found to be the most endorsed OCD subtype among the DE group. Conversely, the ordering/arranging OCD subtype was most predictive of DE symptomology across measures.

It should be noted that participants did not receive formal clinical assessment or diagnosis. Even so, it is interesting that DE prevalence rates in this subclinical population were consistent with the

Table 3. Correlations between ED measures and OCI-R subscales

	EAT-26	EDE-Q
Hoarding	.24**	.16
Checking	.16	.29**
Ordering	.41**	.41**
Neutralising	.46**	.42**
Washing	.23**	.35**
Obsessing	.33**	.34**

Note: \*\* ( $p < .01$ )

highest rates reported in the clinical literature (Nelson et al., 1999). Likewise, extremely high comorbid OCD rates were observed. These comorbidity figures are again comparable with the highest rates in the clinical literature (Bastiani et al., 1996; Halmi et al., 2003; Lilienfeld et al., 1998; Maranon, Echeburua & Grijalov, 2004; Matsunaga et al., 1999b; Matsunaga et al., 1999a). An explanation for this high level of psychopathology among a subclinical population is somewhat unclear. It has been suggested that self-report measures tend result in an over-reporting of symptoms, however Fairburn and Beglin (1994) found EDE-Q scores to closely resemble those on the clinician rated EDE. Furthermore, participants were aware of the general nature of the current study and subsequently self-selected into it. It is possible that those with DE symptomology may have been more likely to choose the current study, as it dealt with an issue that they were personally involved in. However, it is also possible that those with DE did not select the current study for the same reason. Additionally, participant's perception of the employed measures may have influenced results: Participants were told that the current study was looking at aspects of everyday life, such as daily routines and eating habits. Because they were unaware that the measures they were completing are also used to indicate clinical conditions, it is possible that questions were interpreted with more leniency; thus yielding higher scores than if they had been informed that items referred to clinically significant behaviours. Such an explanation seems plausible, given that participants were first year students who had limited knowledge of both psychometric questionnaires and clinical conditions.

The finding that hoarding was the most endorsed OCD characteristic in the DE group differs to the results of Bastiani et al., (1996) Kaye et al., (1992) Matsunaga et al., (1999b) and Matsunaga et al. (1999a). These studies consistently found ordering/arranging to be the most endorsed OCD subtype among their clinical populations. Even so, it should be noted that hoarding was *not* a significant predictor of DE score: Ordering/arranging was the only significant predictor of DE across

measures. This indicates that although hoarding items of the OCI-R were more highly rated, they were not predictive of DE symptomology. Moreover, in the case of the EDE-Q, hoarding was not significantly correlated with DE scores, thus reinforcing the possibility that the relationship between DE and hoarding may be spurious. Subsequent analysis revealed that high endorsement of hoarding was evident across the whole sample, not just among the DE group. This provides evidence for hoarding as a characteristic of this entire subclinical population, rather than a characteristic specific to the DE population. Indeed, high levels of hoarding behaviours have been reported elsewhere in both student (Coles, Frost, Heimberg & Steketee, 2003) and community populations (Samuels & Nestadt, 1997). Thus, this paper will focus on the OCD subtype specific to and predictive of the DE group; ordering and arranging.

As the most prevalent compulsions across cultures are checking (coupled with doubting obsession) and washing (coupled with contamination obsession; Matsunaga et al., 1999a), the finding that ordering/arranging is most predictive of DE indicates that it is an OCD subtype characteristic of the AN/DE group. Bastiani et al. (1996) reported that ANr patients presented with a more restricted range of OCD symptoms than did OCD patients. It has been suggested that this is because the obsessions and compulsions of AN patients are often centred around the ordering and arranging of their food (Fisher et al., 2002; Yaryura-Tobias, 2001), however Kaye et al. (1992) found that this same trend persevered after controlling for such obsessions and compulsions. Though neutralising was the strongest significant predictor of EAT-26 scores, this result was not replicated regarding EDE-Q scores. This discrepancy is interesting, as neutralising behaviours may describe aspects of the AN cycle; for example the use of purging in order to compensate for a previous binge episode could be interpreted as neutralising, where purging behaviour serves to "neutralise" the weight gain potential of the binge episode. Other potential neutralising behaviours could be excessive exercise or laxative abuse, as these actions are also likely to be carried out following food consumption, in order to compensate

for (or neutralise) potential weight gain following the calorie intake. Such a suggestion requires further research.

It is unclear why neutralising was not a significant predictor of EDE-Q scores, however as the same participants completed both ED scales, this result is likely due to differences in the employed measures.

Interestingly, the third predictor of EAT-26 scores, also not replicated by the EDE-Q, is the checking subscale. Although the internal reliability of the checking subscale failed to reach an acceptable level, this finding merits further discussion as a negative relationship was found, indicating that the higher the DE score, the lower the checking score. As outlined above, checking has been reported as the most highly endorsed compulsion by OCD control patients (Matsunaga et al., 1997, Matsunaga et al., 1999a). It seems that the negative relationship found between checking and EAT-26 score lends support to the conception of AN as a separate disorder to OCD: If AN did share the same underlying mechanisms as OCD, a positive relationship would be expected. Additionally, no significant correlation was found between checking and EAT-26 score. Based on these results, it is proposed that the relationship between AN and OCD suggested by Rothenberg (1986) and Holden (1990), is not supported by the findings presented here.

Further evidence against the notion of AN as an OCD subtype comes from comorbidity statistics. One might advocate that AN cannot be a manifestation of OCD or all AN patients would merit a concurrent diagnosis for OCD. This is not the case, as it has been reported that although numerous AN patients have a lifetime diagnosis of OCD, in many cases this label is not appropriate (Halami, Eckert, Marchi, Sampugnaro, Apple, & Cohen, 1991). Numerous AN patients never meet the criteria for OCD. Though some can become obsessively rigid regarding food rituals, the majority of AN patients with comorbid OCD do not generalise these behaviours, or display different OCD tendencies in other domains.

It is interesting that the same trend in terms of both comorbidity and endorsed OCD subtype has been found among both

clinical and now subclinical disordered eating populations. This finding lends support to the conceptualisation of EDs as a continuum, rather than discrete categories as outlined by the DSM-IV-TR (APA, 2000). The finding that behavioural patterns are similar regardless of whether a diagnosis is met indicates that both groups share the same underlying characteristics, and therefore can be best described as less or more severe forms of the same condition.

Internal reliabilities for all three scales were high, confirming hypothesis 3. The only two subscales to not show adequate cronbach's alphas were the checking subscale of the OCI-R, and the oral control subscale of the EAT-26. Therefore, any conclusions made based on these two subscales should be tentative.

### Applications

The applications of the current findings are threefold; preventative, diagnostic, and treatment oriented. As comorbid OCD is so high among the disordered eating population (both clinical and subclinical), prevention programs designed for eating disorders should include an OCD component. While it is acknowledged that the success of primary prevention in ED to date is limited (for a review, see Rosenvinge & Borresen, 1999), the clear link between ED/DE and OCD suggests that the inclusion of an OCD component may increase the success of such programs. Such an undertaking should be specifically focused on the ordering/arranging subtype of OCD, as this is most predictive of disordered eating. It may also be prudent to educate health professionals about the link between OCD symptomology and ED, that they may be made aware of potential behaviours that could develop and exacerbate an ED.

Perhaps most importantly, these results call for routine screening for obsessive-compulsive characteristics when an ED/DE is present. This is not the first time that such a suggestion has been made (see Gee & Telew, 1999). Case reports such as that of Gee and Telew have highlighted that when comorbid OCD remains undiagnosed, this can have drastic implications on treatment efficacy. Had comorbid OCD

been diagnosed earlier, it is very possible the length and severity of ED in the case described by Gee and Telew could have been significantly reduced. This indicates that it is not only important to include screening for OCD when an ED is suspected, but that if OCD is found, treatment needs to be tailored to account for the comorbid disorder. This is highlighted in all three case descriptions of comorbid ED and OCD reported by Fisher et al. (2002), where the presence of obsessive-compulsive symptomology played a significant role in ED treatment response. Early detection of comorbid OCD would result in earlier development of appropriate treatment programs (both psychotherapy and pharmacotherapy) for those suffering from both disorders. In turn, tailored treatment would result in more effective portioning of the already scarce resources available for this area of mental health in New Zealand. Early diagnosis would result in a more efficient, positive outcome for patients with comorbid ED and OCD.

### Limitations

The use of self-report measures as a sole means of data collection is often criticised. Statistical analyses however revealed that all scales employed in the current study displayed sound reliability, indicating that the measures provided an accurate representation of participant behaviours. Furthermore, because of the large sample size and the nature of the current study, the use of clinician rated measures would have been both time consuming and expensive. Even so, certain characteristics of the psychometric measures employed may have limited results. Particularly, whereas the EDE-Q measures both AN and BN symptomology, the EAT-26 is primarily a measure of AN. This means that it is difficult to define the clinical group that the current results are most applicable to in terms of a subclinical comparison. If using data only from the EAT-26, results are most applicable to the AN population. However, if using the EDE-Q, results are applicable to both AN and BN. Thus, results must be taken with caution when compared to those of clinical populations. It should also be noted that the sample consisted of self-selecting female undergraduate students; this is again another threat to external validity, and one that should

be considered in the interpretation of the results.

Additionally, although the OCI-R is a psychometrically sound measure of OCD symptomology, it is primarily focused on compulsions rather than obsessions. This means that the current study has essentially concentrated on the visible behaviours of OCD, leaving internal cognitions and obsessions almost completely unaddressed. Bastiani et al. (1996), Halmi et al. (2003), and Matsunaga et al. (1999b) used the Yale-Brown Obsessive-Compulsive Inventory (Goodman et al., 1989), a clinician rated measure addressing obsessions and compulsions. Including an evaluative measure that assessed both obsessions and compulsions could have provided more comprehensive results, potentially replicating the finding that order/symmetry obsessions are as prevalent as ordering/arranging compulsions in a DE population (Bastiani et al., 1996; Matsunaga et al., 1999b).

### Future directions

Additional replication of the current findings is needed both in clinical and subclinical populations. As this study is one of very few investigating DE and OCD subtypes, results remain speculative. Moreover, there is a need for cross-cultural research to investigate this relationship. It was hoped that the current study would be able to make a cultural comparison between NZ European/Pakeha and Maori/Pacific Island females, to investigate whether these two coexisting cultures would exhibit differing symptomology. Unfortunately, the small number of Maori/Pacific Island participants made this comparison unfeasible. Cross-cultural comparisons to add to Matsunaga et al.'s (1999b) Japanese population would indicate whether the order/symmetry finding among a DE population is culturally specific.

In order for a causal relationship between AN/DE and OCD to be established, longitudinal research is required to follow an AN and/or DE population over time. Such an undertaking should include measures of both the obsessive and compulsive aspects of OCD, as well as detailed examination of OCD subtypes. Data collection methods should not be



confined to psychometric questionnaires, in order to increase the validity of findings. Results could serve to further elucidate the AN/OCD relationship, which would in turn aid professionals in the development of more effective prevention and treatment programs.

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**Notes**

1. EDE-Q item 28: "How uncomfortable have you felt about others seeing your shape or figure?"
2. Those scoring above the norm on the eating disorder scales (EAT-26 and EDE-Q) will be referred to as exhibiting disordered eating (rather than as eating disordered), as they have not been officially diagnosed with an eating disorder.

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