



## The evolutionary psychology of eating disorders: Female competition for mates or for status?

Lisa Marie Faer, Alexandra Hendriks, Riadh T. Abed\*  
and Aurelio José Figueredo

Department of Psychology, University of Arizona, USA

The relationship between eating disorders and female intrasexual competition (ISC) was studied. More specifically, it was predicted that Female ISC for mates would be the strongest predictor of bulimia, and that, in contrast, Female ISC for status would be the strongest predictor of anorexia nervosa. A group of 202 undergraduate women, attending the University of Arizona, Tucson, USA, participated in this study. These respondents completed surveys that contained the following measures: the Female competition for mates scale, the Female competition for status scale, the General Competitiveness Scale, the Eating Disorders Inventory (EDI), and an additional measure specific to Anorexia. The internal consistencies of the measures were computed using Cronbach's alpha, and the measures were found to have adequate measurement reliability. Correlations were computed and a structural equation model was constructed for all the subscales within the measures. The resulting model demonstrated that ISC for mates was ultimately the driving factor that contributed to Female competition for status, General competitiveness, Perfectionism, Body dissatisfaction, Drive for thinness, and both Bulimia and Anorexia. Contrary to initial expectations, the results supported a mostly spurious causal relationship between Female competition for status and anorexia, with the only indirect causal effect being through the influence of perfectionism, which was uniquely on anorexia and not on bulimia. The role of perceived personal and Ideal partner mate value was also explored. Although they were strongly positively related to each other, these were shown to have nearly equal and opposite effects on body dissatisfaction.

Anorexia nervosa and bulimia nervosa are eating disorders characterized by a morbid fear of fatness, a distorted body-image and a preoccupation with food and eating.

\*Correspondence should be addressed to Dr Riadh T. Abed, Department of Psychiatry, Rotherham District General Hospital, Moorgate Road, Rotherham S60 2UD, UK (e-mail: [abedrt@btinternet.com](mailto:abedrt@btinternet.com))

Anorexia is also characterized by a marked reduction in body weight, 15% below normal according to ICD-10 (World Health Organization, 1992) and DSM-IV (American Psychiatric Association, 1994), and endocrine changes. Patients with bulimia nervosa suffer from episodes of binge eating as well as compensatory behaviour to prevent weight gain, such as self-induced vomiting and/or abuse of laxatives or diuretics. Although these two disorders have distinct clinical features, epidemiology, outcomes, and familial profiles, they have important features in common (Beumont, 2002). They share the core psychopathology of the 'morbid fear of fatness', they are primarily disorders that affect females of reproductive age, and have their highest prevalence in Western societies where females enjoy a high degree of personal autonomy. In addition, a sizable proportion of those with bulimia have a history of either anorexia nervosa or atypical anorexia (Sullivan, 2002; Fairburn, 2002), and there is evidence of co-aggregation between bulimia and anorexia nervosa with increased rates of both disorders among relatives of probands of either condition (Fairburn, 2002). It is notable that the phenomenon of the pursuit of thinness among females has a similar geographical distribution to eating disorders. Both have their highest prevalence in the same Western societies (Littlewood, 1995). It is suggested, therefore, that available epidemiological evidence lends support to a continuum model of eating disorders that connects the non-pathological states of dieting and the pursuit of thinness among females in the general population with partial syndromes of anorexia and bulimia, and ultimately with the clinical disorders of anorexia and bulimia nervosa (Dancyger & Garfinkel, 1995).

Despite the numerous theories that attempt to explain these disorders and the masses of data collected over the last 25 years, the causation of eating disorders remains poorly understood. However, very little data has been collected to test the few Darwinian hypotheses in the literature that attempt to explain these disorders. Three distinct Darwinian formulations can be identified in the current literature, all proposing hypotheses for the ultimate causation of these disorders (see Barkow, Cosmides, & Tooby, 1992; Buss, 1999; Gaulin & McBurney, 2001).

One theory is that anorexia represents an adaptive attempt at reproductive suppression by the affected female (Surbey, 1987; Voland & Voland, 1989; Wasser & Barash, 1983). This is based on the observation that females of many species appear able to suppress or delay reproduction when conditions are unfavourable within the environment. Another formulation suggests that anorexia is a manifestation of reproductive suppression of subordinates by dominant females within a process of female intrasexual competition (Mealey, 2000). Finally, a hypothesis that suggests anorexia and bulimia, as well as the phenomenon of the pursuit of thinness, stem from the process of female ISC. This is known as the sexual competition hypothesis (SCH) (Abed, 1998). The first two formulations limit themselves to explaining the causation of anorexia, and suggest that this disorder serves an adaptive purpose (to the subject herself and to the dominant female, respectively), whereas the latter hypothesis attempts to explain the whole range of eating disorders. According to the SCH, eating disorders are

considered to be the pathological by-products of an originally adaptive strategy of the 'pursuit of thinness'. The current paper attempts to test aspects of this latter hypothesis.

The SCH is based on the Darwinian theory of sexual selection. Sexual selection operates through the processes of intersexual and ISC (Darwin, 1871). ISC tends to be higher in the sex with the lower minimum investment in offspring (Trivers, 1971). As human females have a much higher minimum investment in offspring, one would expect them to compete less than males for access to the opposite sex. While human females are more selective than males when making mating decisions (Symons, 1979) they must still compete for male commitment.

A major element in the process of ISC in females involves the display of cues of physical attractiveness involving mainly signs of youth and good health. The SCH contends that a number of factors have arisen in Western societies that have influenced and intensified female ISC. These include declining fertility (Vining, 1986) leading to the prolongation of women's youthful appearance, high levels of female autonomy (see Rubin, 2003) that has meant that they are able to regulate their short- and long-term mating strategies with minimal interference from kin, and the increasing instability of long-term mateships that has led both males and females to return repeatedly to the mate market (see Stone, 1990). In addition, the increasing prevalence of media images of youthful (nubile) females and living in large cities with numerous other youthful-looking autonomous females is likely to have led to a further intensification of female ISC (see Abed, 1998). It is hypothesized that, due to these and other factors, females in Western societies, where populations enjoy high standards of health, have to compete with other females primarily through the display of signs of youth.

Youth, of course, is a major determinant of female reproductive potential and, therefore, must have been a major determinant of female mate value in the ancestral environment. It is hypothesized that the signs of youth that are most difficult to fake would be those most likely to be employed by females engaged in female ISC. In a well-nourished population, weight gain and the deterioration of the (hour-glass) nubile shape is a feature of advancing age (Cohen, 1989) and, therefore, slimness is likely to be associated with youthfulness (see Singh, 1993). According to SCH, the above explains the phenomenon of the Drive for thinness among females in Western societies; a trend that has been progressing over the last few decades as shown by the increasing thinness of media images (Voracek & Fisher, 2002). The extreme variant of this tendency, according to the SCH, results in eating disorders in certain females (due to a range of genetic and/or environmental factors) as this process spirals out of control and becomes maladaptive.

The role of the media, according to SCH, is to provide images of high quality competitors rather than simple role models that must be emulated. This would also explain the power and persistence of thin media images and the selective attention paid to them by females to the exclusion of alternatives.

Traditionally, media theories have posited direct effects between media exposure and eating disorders. However, a more appropriate conceptualization of the relationship

involves examining the individual differences that may interact with exposure to slim and youthful bodies in media. We would suggest that intrasexual competitiveness is one of the variables that is likely to affect the relationship between media exposure and the development of eating disorders.

The SCH accepts that standards of beauty and attractiveness can vary from one environment and society to another. Therefore, in societies where malnutrition is common, relative thinness may not be the preferred shape and relative plumpness may be the signal that is most difficult to fake to demonstrate high mate value. This may explain recent findings that in some hunter-gatherer societies the preferred waist-to-hip ratio for women is in excess of that found most attractive in Western societies (Marlowe & Westman, 2001). Interestingly, researchers (Pope, Katz, & Hudson, 1993; Andersen, 2002) have recently described a phenomenon exclusive to men, called 'reverse anorexia' that offers further support to SCH. The disorder affects male body-builders and is associated with a distorted body-image, where subjects express the belief that they are too small despite their highly muscular and large size. The large size of the upper body for men serves a clear competitive function against other males and was, most probably, a visual attractor for females in the ancestral environment. In addition, the finding of an association between eating disorders and a history of childhood sexual abuse (Smolak & Murnen, 2002) may also support the SCH as the traumatic early experience can lead to increased body dissatisfaction, thus increasing the drive for self-improvement and ISC.

People with bulimia who maintain a body weight within normal limits, and are clearly able to engage in ISC for mates, may fit in with the SCH. However, those with anorexia with their emaciated, unattractive figures, and low sex drive (Lesser Haines & Katz, 1988; Wiederman, Pryor, & Morgan, 1996) do not appear to be actively engaged in ISC for mates. This raises the question as to whether there are two subtypes of ISC operating in this group. One variant is a direct process of ISC for mates, that is particularly marked in people with bulimia and the other is an indirect process of ISC, most prevalent in people with anorexia, where females compete among themselves for status.

In an attempt to address these issues, we have set about testing this theory in a non-clinical population based on the assumption that bulimic and anorexic symptoms in the general population exist on a continuum where the full-blown clinical syndromes represent the severe end of these phenomena. It is expected that ISC for mates will play a larger role in bulimia and that ISC for status will play a larger role in anorexia, although these two causal factors might not be perfectly discriminable. Because of this potential partial confounding, we needed to use a multivariate causal model to distinguish the separate effects of the different underlying factors hypothesized. In the context of this multivariate model, controlling for the effects of the other variables in the system, our specific hypotheses for direct causal influences were as follows:

- (1) Higher Personal Mate Value will predict higher Ideal Partner Mate Value;
- (2) Higher Personal Mate Value will predict lower Body Dissatisfaction;

- (3) Higher Ideal Partner Mate Value will predict higher Body Dissatisfaction;
- (4) Higher Female ISC for Mates will predict higher Body Dissatisfaction;
- (5) Higher Female ISC for Mates will predict higher Drive for Thinness;
- (6) Higher Body Dissatisfaction will predict higher Drive for Thinness;
- (7) Higher Drive for Thinness will predict higher Bulimia;
- (8) Higher Drive for Thinness will predict higher Anorexia;
- (9) Higher Personal Mate Value will predict higher Anorexia;
- (10) Higher Female ISC for Mates will predict higher Female ISC for Status;
- (11) Higher Female ISC for Status will predict higher General Competitiveness;
- (12) Higher Female ISC for Status will predict higher Perfectionism;
- (13) Higher Female ISC for Mates will predict lower General Competitiveness;
- (14) Higher Female ISC for Mates will predict lower Perfectionism;
- (15) Higher Perfectionism will predict higher Anorexia.

## Method

### Participants

A total of 202 adult undergraduate women, recruited from social science classes at a large south-western US university, participated in this study. The average age of respondents was 21.8 years ( $SD = 5.0$  years), with ages ranging from 19 to 54 years. The sample was broken down by ethnicity as follows: 83.7% Caucasian, 5.4% Hispanic/Latino, 3.5% African-American, and 7.4% of an 'other' ethnicity. Most respondents identified themselves as single (86.1%) and heterosexual (97.4%). Respondents earned extra credit in their classes for participating in the study. To ensure that students did not participate in the study more than once, those who had already participated in another class were offered an alternate extra credit activity.

### Procedure

This observational study was conducted using a paper-and-pencil survey. Participants, who were seated in a room with about 20 other students, were given identical questionnaire packets, which included the Female Competition for Mates Scale, the Female Competition for Status Scale, the General Competitiveness Scale, and the Eating Disorders Inventory (EDI). The outcome variables consisted of the scores on the following subscales of the EDI: bulimia, perfectionism, body dissatisfaction, and drive for thinness. Additionally, an additional scale (Anorexia) was created to measure characteristics specifically associated with anorexia nervosa. Participants were instructed to answer all of the questions honestly and to the best of their ability. After all of the participants completed the questionnaire packet, they were debriefed as a group.

### Measures

Four distinct measures were employed as predictor variables in this study. The first three of these measures included the General Competitiveness Scale, the Female Competition

for Status Scale, and the Female Competition for Mates Scale. These three measures of competitiveness were created (see Appendix A, B, and C) and tested for internal validity using Cronbach's alpha (see next section on scale construction). All of these measures contained statements requiring participants to rate, on a 6-point Likert scale, their level of agreement from '*strongly disagree*' to '*strongly agree*'. The Female Competition for Status Scale and Female Competition for Mates Scale also contained third-person vignettes. The vignettes consisted of questions in which participants read a situation and chose how appropriate the behaviour of the fictional character was on a 6-point scale from '*completely inappropriate*' to '*completely appropriate*'. The scores on each question were reversed scored as appropriate. A higher score on the scale indicated higher competitiveness on that measure. The outcome measure for this study was the EDI. The EDI consists of eight subscales: Body Dissatisfaction scale, Drive for Thinness scale, Bulimia scale, Ineffectiveness, Perfectionism, Interpersonal distrust, Interoceptive Awareness, and Maturity Fears. Out of these scales, the Body Dissatisfaction, Drive for Thinness, Bulimia, and Perfectionism scales (see Appendix D) were the only ones used in this study. Because our theoretical perspective implied that these subscales represented different stages in the hypothesized causal sequence, they were used as separate variables in the multivariate model, rather than aggregated into a single diagnostic inventory. Finally, two forms of the Mate Value Inventory (MVI; Kirsner, Figueredo, & Jacobs, 2003) were included to measure participant ratings of Personal mate value and Ideal partner mate value (see Appendix E).

### *Eating Attitudes Test*

In addition to the scales described above, an extra scale labelled 'Anorexia' was created to measure eating behaviours specific to anorexia as this was missing from the EDI. The seven items comprising the scale are taken from the Oral control subscale of the Eating Attitudes Test (EAT). This test, developed by Garner and Garfinkel (1979), is a self-report questionnaire that measures the symptoms of anorexia and includes the following subscales: (a) dieting, (b) bulimia and food preoccupation, and (c) oral control (self-control of eating and the perceived pressure of others to gain weight). As reported in Garner, Olmsted, Bohr, and Garfinkel (1982), the EAT has been validated with patients with anorexia but also with non-clinical samples (Garner & Garfinkel, 1979; Button & Whitehouse, 1981; Thompson & Schwartz, 1982). They explain that most non-clinical individuals who score high on the EAT do not satisfy diagnostic criteria for anorexia, but the majority display abnormal eating patterns that interfere with psychological functioning.

## **Statistical analyses**

### *Scale construction*

The Statistical Analysis System (SAS), version 8.0 (SAS Institute, 1999) was used for all data management and scale construction. The unit-weighted factor scores for all of the scales that were constructed were computed with SAS (PROC STANDARD

and DATA), using either sums or means of the raw item scores for all non-missing items in each scale (Figueredo, McKnight, McKnight, & Sidani *et al.*, 2000). Unit-weighted factor scores entail using either sums or means of unweighted (equally weighted) items rather than differentially weighted items, but generally correlate .95 with differentially weighted factor scores (Gorsuch, 1983). Cronbach's alpha and covariance matrices were also computed for the scales using SAS (PROC CORR).

All of the scales were found to have acceptable alphas and were thus determined to have adequate internal consistency. The following are the respective alphas for the different scales (see Appendix A, B, C, D, and E for the scales): (1) Body Dissatisfaction, .874; (2) Female ISC for Mates, .887; (3) Female ISC for Status, .797; (4) General Competition, .823; (5) Perfectionism, .770; (6) Bulimia, .650; (7) Anorexia, .620; (8) Drive for Thinness, .836; (9) Self-Mate Value Inventory, .934; and (10) Ideal Partner Mate Value Inventory, .984.

### *Multivariate analyses*

These data were subjected to a multivariate causal analysis by factor analytic structural equations modelling using EQS 5.7b (Bentler, 1995). The factor analytic structural equations model consisted of two major components: (1) a 'measurement' model, and (2) a 'structural' model.

A measurement model is essentially a confirmatory factor analysis, wherein a number of directly measured variables (manifest variables or indicators) are related to a smaller set of hypothetical constructs (latent variables or common factors) inferred to be causing the correlations among the indicators. Confirmatory factor analysis permits theoretical specification of latent variables as *a priori* hypotheses to be tested against the correlational data. By the exclusive prior assignment of each indicator to the theoretically specified latent variable, confirmatory factor analysis also reduces the number of parameters estimated in the model, and so enhances the efficiency of parameter estimation.

The structural component of the model is essentially a path analysis among the latent variables that were detected by the factor analysis. Structural equations modelling consists of imposing a restricted set of causal pathways, also specified *a priori*, and testing them against the correlations among the latent variables. Structural equations modelling allow the reproduction of the correlations among these factors by a theoretically driven model. This model may include any combination of direct effects, indirect effects, spurious effects, and residual effects (James, Mulaik, & Brett, 1982). Briefly, a direct effect exists when A directly causes B, or B directly causes A. An indirect effect exists between A and C when A causes B, and then B, in turn, causes C. B is then referred to as 'mediating' the causal relationship between A and C. A spurious effect exists between A and B when C causes both A and B in common, but there is no direct causal relation between A and B. A residual effect is a correlation that is unexplained because the causal relation that generated it remains unknown.

## Results

### **Descriptive statistics**

#### *EDI sample means*

Garner, Olmstead, and Polivy (1983) claim that the presence or absence of bulimia differentiates subtypes of anorexia. These two subtypes are termed 'restricters' and 'binge eating/purging' by DSM-IV (1994). In a cross validation of the EDI, Garner, and colleagues reported means for each EDI subscale for 'anorexic' females versus 'comparison' group females (university students). In comparing EDI subscale means from the Garner *et al.*, study with EDI means from the present sample, the approximate location of the present sample on the eating disorder continuum can be examined. The present sample scored lower than the clinical anorexic group on all subscales. However, the present sample had higher mean scores than the comparison group on Drive for Thinness (comparison,  $M = 5.0$ ,  $SD = 5.3$ ; present sample,  $M = 7.1$ ,  $SD = 5.7$ ), Bulimia (comparison,  $M = 1.8$ ,  $SD = 3.1$ ; present sample,  $M = 3.0$ ,  $SD = 3.5$ ), and Perfectionism (comparison,  $M = 5.6$ ,  $SD = 4.0$ ; present sample,  $M = 6.7$ ,  $SD = 4.4$ ).

A frequency analysis was also conducted to see how many women in the present sample were in the anorexic range defined by Garner's study. For the present sample, 30 women (15%) exceeded a score of 14 on Drive for Thinness, 9 women (4%) exceeded a score of 11 on Bulimia, 48 women (24%) exceeded a score of 14 on Body Dissatisfaction, and 46 women (23%) exceeded a score of 10 on Perfectionism.

From a combination of these descriptive analyses, we may conclude the following. First, although some of our sample means were higher than the comparison group means, overall they were closer to the comparison group means than to the means of women who had been specifically diagnosed as anorexic. This is reasonable because our sample was composed of university students who had not been screened for either presence or absence of anorexia. On the other hand, our sample did contain a small proportion of women who had scores on all subscales that were greater than the means of the women diagnosed with anorexia, whether they were restricters or bulimics, in these two previous studies.

### **Multivariate causal analysis**

#### *Goodness of fit of the model*

The chi-squared value for the model was statistically significant,  $X^2(30) = 56.893$ ,  $p = .002$ , indicating that the model did not perfectly predict all the observed covariances. However, the practical indices of fit were acceptable, including the Bentler-Bonett Normed Fit Index (NFI = .906), and the Comparative Fit Index (CFI = .952). Indices of fit exceeding .90 are generally considered acceptable for practical purposes (Bentler & Bonett 1980; Bentler 1995), although there is no absolute rule for these cut-offs (cf. Bollen 1989). The Root Mean Squared Error Of Approximation (RMSEA) was .067 (90% confidence interval, .039, .093), which was just above the .050 criterion for an excellent model, and well within the .100 criterion for a well-fitting

model. The CFI was given greater weight in our evaluation of model adequacy because it is adjusted for model parsimony, and also because it performs well with moderate to small samples ( $N < 250$ ), especially with maximum likelihood estimation (Bentler 1990; Hu & Bentler 1995).

### *The structural model*

Figure 1 displays the path diagram for the structural equations model tested. All path coefficients shown are standardized regression weights, estimated by maximum likelihood, and are statistically significant ( $p < .05$ ).

Personal mate value had a positive direct effect (.673) on Ideal Partner Mate Value, indicating that the higher one's perceived mate value, the higher one's corresponding standard will be for a long-term romantic partner. Personal Mate Value also had a negative direct effect ( $-.270$ ) on Body Dissatisfaction, as might be expected from a more positive assessment of satisfaction with one's general mate value. However, Ideal Partner Mate Value had a positive direct effect (.288) on Body Dissatisfaction indicating that higher standards for a romantic partner puts pressure on women to possess an even more attractive body.

Female ISC for mates had positive direct effects on both Body Dissatisfaction (.321) and Drive for Thinness (.230), as predicted by Abed's (1998) theory. Body dissatisfaction also had a very large and positive direct effect (.510) on Drive for Thinness, as has been generally found in this area of research. Drive for Thinness, in turn, had the expected positive direct effects on both Bulimia (.346) and Anorexia (.241). In addition, personal mate value had a small but positive direct effect (.136) on Anorexia, indicating that higher mate value females are marginally more likely to become anorexic than bulimic.

However, Female ISC for Mates had an extremely high and positive direct effect (.799) on Female ISC for Status, somewhat eroding the main distinctions originally hypothesized between these two different sources of motivation. Female ISC for Status, in turn, had substantial and large direct effects on General Competitiveness (.521) and Perfectionism (.352). Nevertheless, Female ISC for Mates had negative direct effects on both General Competitiveness ( $-.280$ ) and Perfectionism ( $-.237$ ), indicating that females who are interested in obtaining mates tend to limit their competitiveness more to same-sex rivals, and may not generalize as much to others because it might bring them into competition with potential mates. Finally, Perfectionism had a small but positive direct effect (.170) on Anorexia, providing some support for the hypothesis that anorexia, but not bulimia, is partially fuelled by competition for status.

### *Summary of results*

These findings supported the contention that ISC for mates drives two different major pathways: (1) ISC for mates positively influences both body dissatisfaction and drive for thinness, which in turn contributes to both anorexia and bulimia; and (2) high ISC for mates also positively influences high female ISC for status, general competitiveness, and perfectionism, which in turn contributes only to anorexia. The only connection

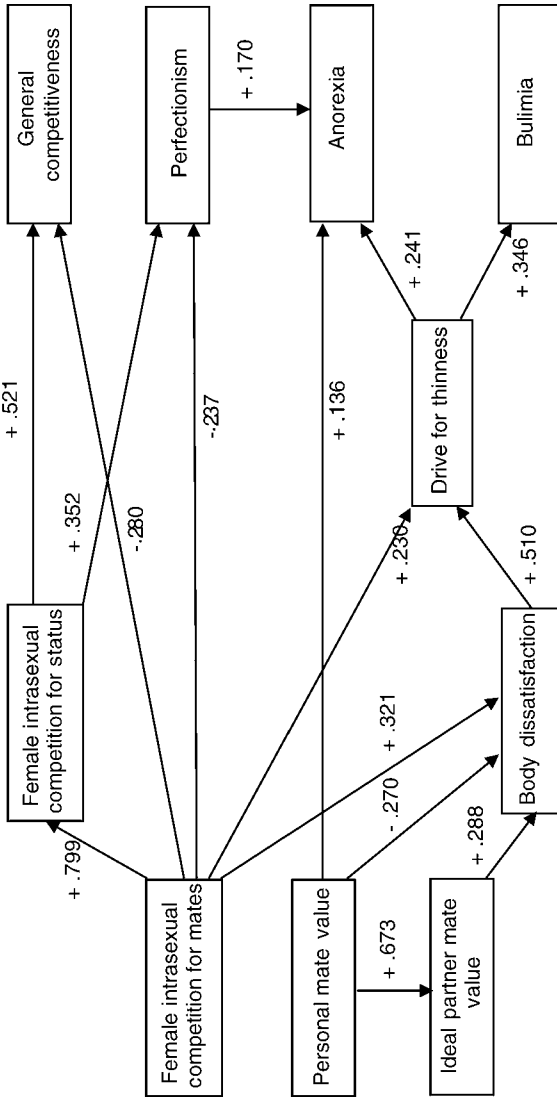


Figure 1. Structural equation model for the relations between intrasexual competition and eating disorders.

between these two major pathways is that of perfectionism contributing to anorexia. In addition, the perceived mate values of the self and of the imagined ideal partner, although positively related to each other, contribute to body dissatisfaction in nearly equal but opposite ways. Personal mate value also contributes directly to anorexia. Similarly, although Female competition for mates and Female competition for status are positively related to each other, they directly influence General competitiveness and perfectionism in opposite ways, with competition for mates appearing to reduce the forms of competitiveness that might entail also competing with members of the opposite sex.

## Discussion

An interpretation of the results suggests that the relationship between eating disorders and ISC may not be as straightforward as originally hypothesized. It was hypothesized that Female ISC for status would be a major causal factor in anorexia but play a less important role in bulimia, and that female ISC for mates would be a major causal factor in bulimia but play a less important role in anorexia. According to this view, females are driven by either: (1) ISC for mates to adopt behaviours that cause females to focus on their physical appearance, causing them to be dissatisfied with their bodies and then subsequently choose behaviours to achieve their desired thinness which may result in eating disorders, or (2) female ISC for status to adopt highly competitive behaviours, in which they seek achievement, to win at all costs, and to achieve high status among their female peers. However, the structural equation model demonstrates that ISC for mates appears to be the ultimate force that drives females to take either or both of these two paths in order to attract the mates that they desire. Thus, both anorexia and bulimia are ultimately driven by female ISC for mates. Nevertheless, it was found that female ISC for status did indeed play a greater role in anorexia than in bulimia.

The model appears to support the SCH (Abed, 1998), which suggested that eating disorders may have originated from the human female's psychological adaptation to be concerned with physical attractiveness (in the Western context; primarily to maintain and display signs of youth) in order to attract and retain a mate. However, as explained above, there were difficulties in explaining some of the features of AN according to this hypothesis. Whereas bulimics normally are within 10% of their normal body weight, anorexics may reduce their weight to levels that render them unattractive to the opposite sex and are hazardous to their health (Barlow & Durand, 1999).

The present results suggest that ISC for status may simply be another way that females attempt to compete for mates. In other words, females that are high on ISC for mates are highly likely to become both highly achievement-oriented and generally competitive, or dissatisfied with their body and become focused on reducing their body weight. However, contrary to our initial hypothesis, a certain proportion of the relationship between the female ISC for status and anorexia appears to be spurious (see James *et al.*, 1982), having as the ultimate common cause female ISC for mates. Nevertheless, limited support for this latter theory was provided by the significant

causal pathway between perfectionism and anorexia, making at least some portion of the relationship between Female ISC for status and anorexia indirectly causal through perfectionism.

These results are also partially consistent with Mealey's (2000) recent interpretation of the reproductive suppression model that casts this suppression of fertility as a manipulative strategy that is socially imposed on subordinate females by more dominant females. Although females who are more sensitive to social cues that indicate high ISC might be more susceptible to such manipulation, our results provide no support for the additional contention that anorexics are more socially subordinate and thus compelled by social circumstances to adopt a 'losing' strategy. One would predict that women who perceive themselves as 'losers' in the ISC would show a substantial reduction in perceived personal mate value, as was found to be the case for those suffering from depressive symptoms (Kirsner *et al.*, 2003). However, if dominance or subordination in ISC can be indexed by perceived personal mate value, the results of our structural model indicate a small but positive total effect of higher mate value on anorexia, as multiplied and partially mediated by ideal partner mate value, body dissatisfaction, and drive for thinness. Thus, anorexics appear to be, if anything, slightly higher in perceived mate value than average, and presumably less likely to see themselves as losers. One may even suggest that anorexics show an unrealistically high opinion of their mate value. If such a finding is replicated it may help explain the paradox in anorexics of intense ISC for status coupled with an apparently lowered interest in relations with the opposite sex. The apparent lowered interest in the opposite sex may be a manifestation of anorexics setting their standard for a suitable mate unreasonably high and thus less attainable. In spite of this, however, anorexics tend to feel that their popularity and self-esteem is contingent upon their success at weight reduction presumably due to their increased competitive drive.

The results of this study support the SCH and thus offer an explanation of the ultimate causation of eating disorders. Although it had been widely documented that the drive for thinness was the major motivating factor behind both anorexia and bulimia, and that this, in turn, was influenced by body dissatisfaction, the origins of these motivational factors remained obscure. Also, whereas the influence of the mass media had been implicated in aggravating this phenomenon (Stice & Shaw, 1994; Ogden & Munday, 1996), the differential susceptibility of individuals to such messages had not been adequately explained. The knowledge that high ISC for mates in females has a causal relationship to body dissatisfaction, drive for thinness, and eating disorders may help predict anorexia nervosa and other eating disordered behaviours, as well as help clinicians develop new approaches to helping those with eating disorders.

Furthermore, the differences between anorexics and bulimics had previously been inadequately explored. For example, many bulimics have a history of anorexia, but generally fail to restrict their food intake sufficiently to lose as much weight through their shorter stints of fasting. Anorexics appear to be proud of their successful performance in weight reduction through their strategy of austere self-control, whereas

bulimics appear to be ashamed of their failure to exercise comparable self-control and to have to resort to purging as a less effective means to achieve some degree of weight reduction (Barlow & Durand, 1999). Our model suggests that anorexics differ from bulimics in that they have the extra motivational drive, provided by ISC for status through perfectionism, to achieve extraordinary levels of self-control in their dieting behaviour.

Our findings lend support to the contention that eating disorders ultimately originate from Female ISC for mates. While this empirical finding can be potentially useful in developing novel therapeutic interventions for anorexic and bulimic patients, we recognize that such a process may not be straightforward. Nevertheless, if the current findings were replicated in a clinical population there would be a strong case for presenting this knowledge within an educational package both to patients with eating disorders and to females considered to be at risk. There would also be the clear potential for incorporating this approach into a cognitive-behavioural programme for anorexics and bulimics. For example, entirely new areas such as personal and Ideal partner mate values and the intrasexual competitive drive for mates and for status may be formally introduced into the clinical assessment as well as the therapeutic programs of anorexic and bulimic patients. Anorexics and bulimics can then be helped to identify and subsequently challenge the systematic evaluative errors they make in these areas to help reduce their body dissatisfaction and intrasexual competitiveness to more manageable and less destructive levels.

Our results underline the potential that ISC for mates has to influence such a negative psychological disorder in females, and suggests that ISC may also play a significant role in the causation of the male phenomenon of reverse anorexia.

We recognize that the major limitation of this study is the reliance on data collected from a non-clinical population with an average age of 21.8 years. The lack of clinically diagnosed bulimics and anorexics probably accounted for the relatively smaller effect sizes found in this study. Presumably, the effect sizes would be much larger with more severe cases than with a non-clinical population. In addition, childhood and adult onset eating disorders cannot be examined in this study due to the restricted participant age range. Our findings, therefore, await replication in future studies using clinical populations of anorexics and bulimics with a more diverse age range.

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## Appendix A

### Female competition for mates measure

Likert scale questions:

0                      1                      2                      3                      4                      5

*Strongly disagree*

*Strongly agree*

- (1) The skinnier I am, the more attractive I am to men.
- (2) If women think that I am attractive, they will stay away from my partner.
- (3) I work out or watch what I eat because I want a body that will impress men.
- (4) When I buy clothes, I think about what men will find attractive.
- (5) I don't care if other women think I dress too provocatively because men like it.
- (6) I prefer to go out to clubs with female friends who are less attractive than I am.
- (7) Having a romantic partner is important to me.
- (8) I exercise because I want a body that will impress men.

### Vignettes – how appropriate is Mary's behaviour

0                      1                      2                      3                      4                      5

*Completely inappropriate*

*Completely appropriate*

- (1) Mary and her boyfriend Jim are at a party. During the entire evening, Mary notices Jim looking at Jane, who is wearing a very revealing dress. Irritated but not wanting to complain, Mary tells Jim that she had heard that Jane had recently contracted a sexually transmitted disease.
- (2) Jane confides to Mary that she is romantically interested in Jim, but that he never seems to notice her. Mary, who is also interested in Jim, tells Jane that she thinks Jim hasn't noticed her because he is already romantically involved with someone else. Mary knows this is a lie but says this so she can go after Jim herself.
- (3) Mary overhears her boyfriend Jim telling his buddy Jack that he thinks Jane has a very attractive body. The next day, while Jim goes out, Mary casually mentions to Jack that Jane had extensive cosmetic surgery and derogates her figure as artificial. When Jim returns, Jack tells Jim about Jane's surgery and ridicules how Jim had been admiring her.

- (4) Jane and Mary, who are both single, signed up for carpentry classes in hopes of meeting eligible bachelors. Both are excited when they discover that many single men are taking part in this class. However, as the class progresses, Mary is frustrated by the fact that all the men are paying attention to Jane. Mary convinces Jane that she is a lousy carpenter and that she should drop the class.
- (5) Mary, who works out at a local gym both as a means of getting in shape and as a way to meet single men, is frustrated by the fact that there are so many attractive women who attend the gym. Thus, Mary spends close to an hour getting ready for her workout every day.
- (6) Jane and Mary are going out to a club together. Jane asks Mary if she looks good in her new outfit. While Mary actually thinks the outfit makes Jane look fat, she tells Jane that she looks great so guys will not pay attention to her.
- (7) Jane, Mary's good friend, has a crush on Jim. Mary considers Jim to be attractive, but she is not as interested in him as Jane is. However, one night Jim calls Mary and asks her out. Mary accepts the offer.

## Appendix B

### *Female competition for status measure*

Likert scale questions:

0            1            2            3            4            5

*Strongly disagree*

*Strongly agree*

- (1) I feel powerful when I am thinner than other women.
- (2) When I buy clothes, I think about what other women will think about them.
- (3) I would not be concerned about my appearance at a women-only gym.
- (4) I don't like to be in situations where I have to compete with other women.
- (5) When playing a game with female friends, I would prefer to tie than to win.

### *Vignette style questions – how appropriate is Mary's behaviour?*

0            1            2            3            4            5

*Completely inappropriate*

*Completely appropriate*

- (1) Mary is Jane's immediate supervisor in a department store. Mary is afraid that Jane is very ambitious and may be after her job. One day, Jane tells Mary that she has an idea for an advertising campaign. Mary dismisses it, telling Jane that it would never work, but later submits the same idea to her own supervisor, representing it as her own.
- (2) Mary and Jane are writing reports on similar topics. Jane, who is struggling with the material, asks Mary for help. Mary, who feels that she has worked too

hard to give what she has earned to Jane, gives Jane a thick stack of printouts from a computer search that she had made that she knows did not yield any useful information.

- (3) Mary’s boss has been interviewing all the employees at the firm because management reported there might soon be layoffs. During Mary’s interview, her boss asks her what she thinks of Jane’s performance on the job. Not wanting to appear to derogate Jane, Mary sweetly says that she thinks Jane has been coping very well with her drinking problem and that Jane’s job performance should be considered acceptable, considering what she must be going through. Unknown to Mary’s boss, however, Jane does not drink to excess.
- (4) Mary and Jane are best friends. Jane has recently learned that she has been accepted to attend Harvard on a full scholarship. Mary, who desperately wanted to attend Harvard, was not accepted and must instead attend Boston College. Mary begins to distance herself from Jane, eventually ceasing communication with her altogether.
- (5) Mary and Jane have been selected to represent their community in a regional mountain biking meet. Mary attended this meet the previous year and knows that succeeding on this course requires specific adjustments to one’s bike. While Mary and Jane are friends and are expected to collaborate on the course, Mary decides not to reveal this information to Jane, fearing that it could result in Jane beating her in the competition.
- (6) Mary’s friend Jane is always talking about what a fantastic golf player she is. Mary has never considered herself to be a very good player. One day Mary and Jane decide to play together and Mary beats Jane. Mary feels great satisfaction and tells Jane’s friends that she is the better player.
- (7) Mary and Jane receive their grades on a difficult midterm exam. Mary, who studied very hard for this exam, receives a B. After Jane receives her exam, she gets up and goes to the bathroom. Mary peeks over at Jane’s grade.

## Appendix C

### General competitiveness measure

Likert scale questions:

0                    1                    2                    3                    4                    5

*Strongly disagree*

*Strongly agree*

### Competitiveness:

- (1) I love to play competitive sports.
- (2) When I play any game, my main goal is to win.
- (3) My friends would not say that I am a competitive person.

- (4) I don't really enjoy playing competitive games.
- (5) When playing a game with male friends, I would prefer to tie than to win.

## Appendix D

### *Eating Disorders Inventory*<sup>1</sup>

0	1	2	3	4	5
Always					Never

#### **Bulimia:**

- (1) I eat when I am upset.
- (2) I stuff myself with food.
- (3) I have gone on eating binges where I have felt that I could not stop.
- (4) I think about bingeing (overeating).
- (5) I eat moderately in front of others and stuff myself when they're gone.
- (6) I have the thought of trying to vomit in order to lose weight.
- (7) I eat or drink in secrecy.

#### **Perfection:**

- (1) Only outstanding performances are good enough in my family.
- (2) As a child, I tried very hard to avoid disappointing my parents and teachers.
- (3) I hate being less than best at things.
- (4) My parents have expected excellence of me.
- (5) I feel that I must do things perfectly or not do them at all.
- (6) I have extremely high goals.

#### **Body dissatisfaction:**

- (1) I think that my stomach is big.
- (2) I think that my thighs are too large.
- (3) I think my stomach is just the right size.
- (4) I feel satisfied with the shape of my body.
- (5) I like the shape of my buttocks.
- (6) I think that my hips are too big.
- (7) I think that my thighs are just the right size.
- (8) I think that my buttocks are too large.
- (9) I think that my hips are just the right size.

<sup>1</sup> All subscales except for Anorexia come from the Eating Disorders Inventory (Garner et al., 1983; Garner, 1991).

**Drive for thinness:**

- (1) I exaggerate or magnify the importance of weight.
- (2) I am terrified of gaining weight.
- (3) I am preoccupied with the desire to be thinner.
- (4) If I gain a pound, I worry that I will keep gaining.
- (5) I eat sweets and carbohydrates without feeling nervous.
- (6) I think about dieting.
- (7) I feel extremely guilty after overeating

**Anorexia:**

- (1) Other people think that I am too thin.
- (2) I feel that others would prefer if I ate more.
- (3) I feel that others pressure me to eat.
- (4) I cut my food into small pieces.
- (5) I take longer than others to eat meals.
- (6) I do not display self-control around food.
- (7) I do not avoid eating when I am hungry.

**Appendix E**

**The mate value inventory (Kirsner et al., 2003)**

– 3                      – 2                      – 1                      0                      1                      2                      3

*Extremely low on this characteristic*                      *Don't care/average on this characteristic*                      *Extremely high on this characteristic*

- Ambitious
- Attractive face
- Attractive body
- Desires children
- Enthusiastic about sex
- Faithful to partners
- Financially secure
- Generous
- Good sense of humour
- Healthy
- Independent
- Intelligent

Kind and understanding

Loyal

Responsible

Shares my values

Shares my interests

Sociable

Emotionally stable

Self-rating: describe yourself as accurately as possible.

Ideal friend: describe the characteristics of an ideal friend for you.

Ideal long-term partner: describe the characteristics of a long-term (several years or more) romantic partner who would be ideally suited for you.

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