

RESEARCH ARTICLE

My Sister Myself: A Controlled Study of the Relationship Between Women with a Lifetime Diagnosis of Anorexia Nervosa and Their Sisters

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Abstract

This study focused on the quality of the relationship between women with a lifetime anorexia nervosa (AN) diagnosis and their sisters, in the context of family functioning. Participants were 112 sister pairs including a woman with a lifetime diagnosis of AN, and 356 sister pairs with no history of an eating disorder. Participants completed the Sibling Relationship Questionnaire, Family Environment Scale and Eating Attitudes Test-26. We hypothesised that sister relationships would be less favourably assessed by women with an AN diagnosis than by their sisters, and less favourably assessed overall in the AN sister pairs than in the healthy sib-pair controls. These hypotheses were confirmed. Also, the AN sisters viewed the family as less cohesive and more conflicted than their non-affected sisters. For the AN sisters, there was an inverse relationship between level of current pathology and how favourably they viewed the sister relationship. Sister relationships may suffer during AN and improve as the pathology recedes. This would mean that the quality of sister relationships has clinical significance and may serve as an indicator of recovery. Copyright © 2016 John Wiley & Sons, Ltd and Eating Disorders Association.

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Keywords

anorexia nervosa; sister relationship; family dysfunction; recovery

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Introduction

Sister relationships have a lasting and formative influence on women's relationships throughout their lifetime (Mize & Pinjala, 2002). Women siblings report more intimacy and satisfaction with their relationship as adults than opposite-sex siblings or brothers (Riggio, 2006).

The study of women with a lifetime diagnosis of anorexia nervosa (AN) and their siblings have mainly been in the context of the genetics of eating disorders (EDs). Steinhausen, Jakobsen, Helenius, Munk-Jørgensen, and Strober (2015), in a three-generation Danish family study, reported an OR of 3.45 for sisters of probands with a lifetime diagnosis of AN. This result is consistent with many previous studies, showing familial risk for AN. A Swedish study recently found that a parent with an ED confers additional risk for a daughter's ED but not for a son's (Bould et al., 2015). It is in the context of a genetic sib-pair study of AN that the data presented here were collected. The genetic results have been previously studied and reported (Bachner-Melman et al., 2004; Bachner-Melman et al., 2005; Bachner-Melman et al., 2007). Sisters of AN probands are at increased genetic risk for eating pathology, and the sister relationship may be an important environmental factor for both sisters' health.

There has been some research on sisters discordant for AN and their family relationships. Karwautz et al. (2003) studied freshly admitted adolescent girls diagnosed with AN and their healthy sisters, elegantly examined their perspectives on the family relationships, omitting the sibling relationship, and focused on the parents' relationship and the parental-child relationships.

'Siblings are in general a neglected group in research on eating disorders', wrote Vandereycken and Van Vreckem in 1992 (Vandereycken & Van Vreckem, 1992a, p.273). These authors took an invaluable look at the role of unaffected brothers and sisters in protecting their affected siblings and helping them to recovery (Vandereycken & Van Vreckem, 1992b). Other researchers have also drawn attention to this lack of systematic research on the siblings of eating-disordered individuals (Bachner-Melman, 2005; Moulds et al., 2000). In a qualitative study of sibling relationships of women with AN, Bachner-Melman (2005) found that AN sisters reported on non-relationships, on very negative or adversarial relationships, on ongoing feuds and years of non-communication between siblings. Withers et al. (2014) examined in a qualitative study 20 adolescent siblings of AN patients who reported that the sibling relationship was complicated by the disorder, so that they required support and 'time-out' from engagement with the sibling and with the consequences of the disorder.

Few of the published studies that focused specifically on sister relationships in families with AN took a quantitative approach. Murphy, Troop, and Treasure (2000) compared 28 women with anorexia with their unaffected sisters and found that the sisters reported more antagonism towards and jealousy of their sisters than *vice versa*. Dimitropoulos, Freeman, Bellai, and Olmsted (2013) found that the 26 AN patients reported greater jealousy of their siblings than did their siblings, replicating the results of the former study. Latzer, Katz and Berger (2015) found that the sisters of young females with ED reported higher levels of negative sibling relationships and depressive symptoms than the sisters of healthy controls.

Although relationships do not enter into the diagnostic criteria of any ED, there is a wealth of evidence that social withdrawal and increasing isolation are part of the pathological process, and may play a central role in relapse (Stewart, 2004). In AN, the increasing focus on food intake and on body shape, the co-morbid depression, the privacy needed for the increasingly abnormal rules governing food, and finally the fatigue arising from malnutrition all impact the individual's ability to make and maintain social relationships. Morris, Bramham, Smith, and Tchanturia (2014) reported that women with acute AN were less empathic and more anti-social than women who recovered from AN, who in turn were less empathic and more anti-social than healthy controls.

Having a child with AN may affect the family dynamics so that family resources are diverted to the sick child, away from the other children and other family needs (Hollesen, Clausenb, & Rokkedal, 2013). Thus, the AN itself might harm sister relationships through the effect of the AN on the parents and their relationship with the daughter and family dysfunction may ensue.

In a systematic review of the literature on family relationships and eating disorders, Holtom-Viesel and Allan (2014) found that although there was no specific pattern of family dysfunction associated with specific eating disorders, the eating-disordered patients rated their family as more dysfunctional than the other family informants. Furthermore, those patients who rated the family function more favourably generally had more positive outcomes, irrespective of the severity of their symptoms. Rienecke, Accurso, Lock, and Le Grange (2016) found that maternal hostility at the outset was an important moderator of treatment efficacy of adolescent AN and an important predictor of family function at termination of therapy. Thus, family function and dysfunction are related to the sibling relationships as well as to AN outcomes. In the current study, we assessed family function as well as sister relationships.

On a brighter note, the process of recovery from AN includes re-connecting to people in one's life and maintaining social involvements and friendships (Linville, Brown, Sturm, & McDougal, 2012). Connection is consistently reported to be a critical dimension of recovery from AN (Pettersen & Rosenvinge, 2002; Tozzi, Sullivan, Fear, McKenzie, & Bulik, 2003). In their research with women recovered from ED, Peters and Fallon (1994) identified key themes relating to connection in relationships. Meaningful relationships have been identified to be as important as therapy in the process of recovery (Beresin, Gordon, & Herzog, 1989), and Nilsson and Hägglöf (2006) identified social support as the most helpful dimension of the recovery process. Just as reconnection is a prominent dimension of successful recovery, a lack of

reconnection presents a profound impediment to it (Cockell, Zaitsoff, & Geller, 2004; Weaver, Wuest, & Ciliska, 2005). It therefore seems likely that the sister relationship should improve as the AN recedes, and the previously sick sister re-engages with positive meaningful relationships and activities.

The aims of the current study were to examine the perception of the relationship between sisters, as reported by a woman with a lifetime diagnosis of AN and her closest-in-age sister, to compare this perception with that of sisters without EDs and to test the possibility that the level of ED symptomatology in women with a lifetime AN diagnosis would affect the perception of the quality of the sister relationship. A group of sister pairs screened clean of lifetime ED diagnoses serves for comparison. The study hypotheses are as follows: (1) AN sister pairs would report less favourable relationships than comparison sister pairs. (2) Sisters of AN probands would perceive the relationship more favourably than their lifetime AN sisters. (3) A higher level of current AN symptomatology would be associated with worse sister relationships than recovered or partially recovered AN.

Methods

Participants

Nine hundred and thirty six (468 sib pairs) Israeli women participated in this study, a subset of the participants in a large genetic study (Bachner-Melman et al., 2007). Participants were recruited from the community *via* announcements on college campuses throughout Israel, in newspapers, and on the internet and comprised two groups:

1. AN group: one hundred and twelve probands diagnosed with lifetime DSM-IV AN and their healthy sisters.
2. Control group: three hundred and fifty-six sib pairs without a history of an eating disorder.

Participants in the control group responded to an announcement calling for women between the ages of 13 and 35 with a sibling between the ages of 13 and 35, and no more than 10 years older or younger than them. If there was more than one sister, the closest-in-age sister participated. The sister who initiated contact with the researchers was designated as the proband and her sister as the non-proband.

Probands' ages in both groups were between 14 and 33 (mean = 22.69, SD = 3.37) and their sisters' ages ranged between 13 and 35 (mean = 21.27, SD = 4.67). The majority of the probands (426, 91.6%) and their sisters (403, 86.5%) were single; 35 (7.5%) of the probands and 58 (12.4%) of their sisters were married. All the participants were Jewish (464, 99.4%), except one sib pair that was Christian and one Muslim. Around half (229, 51.7%) of the women reported being secular, 130 (29.3%) religious and 84 (19.0%) traditional. Twenty-six (5.6%) of the fathers had not completed high school, 158 (34.1%) had high school education only, and 280 (60.3%) had a university degree. Twenty (4.3%) of the mothers had not completed high school, 151 (32.4%) had high school education only and 295 (63.3%) had a university degree. No differences were found between AN probands and non-AN probands on demographic variables.

Initially, 196 women were screened by telephone for eligibility as AN probands. Ascertainment rules were age 13 to 36, an unequivocal lifetime diagnosis of AN by strict DSM-IV criteria, and a sister within this age range willing to complete questionnaires. Exclusion criteria, determined upon screening, were organic brain syndrome, mental retardation, insufficient Hebrew language proficiency to complete questionnaires and a history of a medical condition rendering diagnosis uncertain. One hundred and twelve women satisfied all inclusion and exclusion criteria. Thirteen fulfilled all DSM-IV criteria for AN at the time of the study, and the remaining 99 were in various stages of recovery. The vast majority of the women who participated in the study were in recovery because the sample was recruited in the community and not *via* clinical treatment centres.

Measures

1. SCID-IV: AN diagnoses were made using an expanded version of the Structured Clinical Interview for DSM-IV (First, Spitzer, Gibbon, & Williams, 1996). Interviews were conducted face to face, and in a minority of cases by telephone ($n = 39$), when distance and/or circumstances prevented participants from travelling to the research centre. Best-estimate diagnosis was reached by a clinical psychologist (R.B.M.), in consultation with a senior colleague (A.H.Z.), who read exact minutes of the interviews. SCID-based current and lifetime diagnoses of AN have been shown to be highly reliable (Williams, 1992).
2. The Eating Attitudes Test-26 (EAT-26) is a reliable and valid measure of disordered eating attitudes and behaviours (Garner, Olmsted, Bohr, & Garfinkel, 1982). For screening purposes, the three least frequent categories ('never', 'rarely' and 'sometimes') are scored 0, 'often' 1, 'usually' 2 and 'always' 3. The Hebrew version (Koslowsky et al., 1992) has been used widely for research and clinical purposes. While high scores on the EAT-26 do not necessarily indicate clinical eating disorders, Garner and his colleagues found that 83.6% of cases based on a cutoff point of 20 were correctly classified (Garner et al., 1982). We deleted item 19 ('I exhibit self-control in food matters') because it lowered the reliability of the scale, so we adjusted the cutoff score to 19. In the current, study reliability was good (Cronbach's $\alpha = .93$).
3. The Cohesion and Conflict subscales of the Family Environment Scale (FES; Moos & Moos, 1986) were used to assess these interpersonal domains.

Each subscale contains nine items that are scored on a 5-point Likert scale probing the adolescents' descriptions of their family. The Cohesion subscale measures the extent to which family members are helpful and supportive of each other (e.g. 'there is a feeling of togetherness in our family'). The Conflict subscale assesses the degree to which the open expression of anger and aggression and conflictual interactions are characteristic of the family (e.g. 'we fight a lot in our family'). Higher scores indicate higher levels of cohesion and conflict. The FES has good psychometric properties (Loveland-Cherry, Youngblut, & Kline Leidy, 1989), and we used a Hebrew translation previously used in research (Raviv & Palgi, 1985). In the current study, reliability was good (Cronbach's α for cohesion and conflict = .87 and .75, respectively).

4. Sibling Relationship Questionnaire (SRQ; Furman & Buhrmester, 1985): The SRQ assesses dimensions of sibling relationships and includes 48 items scored on a 5-point Likert scale. In this study, the Warmth/Closeness factor, the Conflict factor and the Power factor were used. Higher scores on Warmth/Closeness, Power and Conflict dimensions indicate more warmth, power and conflict, respectively, in the sibling relationship. The Warmth/Closeness factor includes the following subscales: intimacy, prosocial behaviour, companionship, affection, similarity, admiration of the sibling and admiration by the sibling. The Conflict factor includes subscales that assess quarrelling, antagonism and competition, and the Power factor includes subscales that assess dominance of and by the sibling. Each subscale contained three items, with higher scores indicating higher intimacy, affection, conflict and so on. Internal consistency coefficients for all subscales have been found to be high (Furman & Buhrmester, 1985). Cronbach's α for Warmth/Closeness factor, the Conflict factor and the Power factor were .72, .71, .73, respectively.

Procedure

Ethics approval was obtained from the Hebrew University of Jerusalem Ethics Committee. Participants and parents of participants under 18 years of age signed consent forms and returned them by mail after receiving a full explanation about the study.

Non-AN probands and their sisters (who had initially reported never having suffered from an eating disorder) were rescreened for history of an eating disorder using the following criteria: a reported BMI of 17.5 or less or over 30 currently or since reaching current height, an ideal BMI of 17.5 or less, amenorrhea, or an EAT-26 score of 20 or above (Garner et al., 1982). Respondents were also asked whether 'eating has ever been problematic or a source of distress for you', and the responses of those replying in the positive were examined. Women who described symptoms compatible with eating disorders, or who met at least one of the other criteria above ($n = 21$), were contacted and interviewed by phone with the SCID-IV. Those for whom a lifetime diagnosis of the full clinical syndrome of AN was confirmed were transferred to the AN group ($n = 2$). Those with a lifetime diagnosis of bulimia nervosa ($n = 1$) or eating disorder not otherwise specified ($n = 3$) were excluded. Eating disorder not otherwise specified included subthreshold AN or BN, and other pathological eating patterns. Those who refused to be interviewed ($n = 2$) were also excluded. Sisters of AN probands were similarly screened for a history of an eating disorder.

All participants were handed or sent the study questionnaires, and requested to post them upon completion. Towards the end of data collection, phone calls were made to 120 randomly selected AN probands and 90 control probands, and mailed to the 74 AN probands and 75 control probands who agreed (also on behalf of their sisters) to complete an extra optional questionnaire. A subset of 50 sister pairs from each group returned appropriately completed sets of questionnaires and these data were included in the analyses.

Statistical analyses

Analysis of variance (ANOVA) two-way 2×2 mixed designs were implemented: the between factor was AN sib pairs versus non-ED sib pairs and a repeated measure factor was probands versus her

sister. In this case, the interaction term was observed first, ascertaining to the proband by group effect. In cases in which the interaction was not significant, both main effects were assessed: (1) overall differences between groups, that is, AN sib pairs versus non-ED sib pairs. (2) Overall differences between probands and sisters. In cases in which the interaction was significant, simple effects were then assessed. Independent sampled *t*-tests examined the differences between AN sib pairs and non-ED sib pairs, whereas paired sampled *t*-tests examined the differences between probands and sisters.

Results

Hypothesis 1

AN sister pairs will report on less favourable sister relationships and family relationships than non-ED sister pairs.

Hypothesis 2

Sisters of AN probands will perceive the relationship and family atmosphere more favourably than their lifetime AN sisters.

In order to test these hypotheses, mixed-design ANOVA with Bonferroni corrections was conducted for the SRQ subscales (Table 1) and for the FES subscales (Table 2). In Tables 1 and 2, AN sib pairs versus non-ED sib pairs were the between group variable and proband versus sister were the repeated measure variable.

Table 1 shows significant interactions for admiration by sibling, competition, dominance by and over sibling.

For admiration by sibling, *post hoc* tests (simple effects) revealed a significant difference between AN sib pairs (mean = 7.23, SD = 3.00) and non-ED sib pairs (mean = 8.25, SD = 2.59; $t_{(462)} = 3.48$, $p = .001$), with AN sib pairs feeling less 'admiration by sibling' than non-ED sib pairs. *Post hoc* tests (simple effects) also revealed a significant difference between probands (mean = 8.01, SD = 2.73) and sisters (mean = 7.74, SD = 2.74; $t_{(463)} = 2.03$,

$p = .043$), with probands feeling overall more 'admiration by sibling' compared with the sisters.

For competition, *post hoc* tests (simple effects) revealed a significant difference between AN sib pairs (mean = 2.77, SD = 3.08) and non-ED sib pairs (mean = 1.88, SD = 2.39; $t_{(462)} = -3.15$, $p = .002$), with AN sib pairs feeling more competition compared with non-ED sib pairs. *Post hoc* tests (simple effects) also revealed a significant difference between probands (mean = 2.09, SD = 2.60) and sisters (mean = 1.69, SD = 2.21; $t_{(464)} = 2.92$, $p = .004$), so that overall, probands felt more competition than their sisters.

For dominance by sibling, *post hoc* tests (simple effects) did not reveal significant difference between AN sib pairs and non-ED sib pairs. *Post hoc* tests (simple effects) did, however, reveal a significant difference between probands (mean = 2.80, SD = 2.50) and sisters (mean = 3.50, SD = 2.85; $t_{(463)} = -4.60$, $p = .000$), with probands feeling overall less 'dominance by sibling' than their sisters.

For dominance over sibling, *post hoc* tests (simple effects) revealed a significant difference between AN sib pairs (mean = 2.77, SD = 2.78) and non-ED sib pairs (mean = 3.59, SD = 2.89; $t_{(462)} = 2.62$, $p = .009$), with AN sib pairs feeling less dominance over sibling compared with non-ED sib pairs. *Post hoc* tests (simple effects) also revealed a significant difference between probands (mean = 3.40, SD = 2.88) and sisters (mean = 2.84, SD = 2.53; $t_{(463)} = 3.44$, $p = .001$), with probands feeling overall more dominance over siblings than their sisters.

Overall, in seven out of nine positive feelings concerning the relationship between the sisters, AN probands had the least favourable score, and their sisters had the second-least favourable score. For negative feelings, in four out of five feelings concerning the relationship between sisters, AN probands had the highest or second-highest score. In all, for 8 of the 14 feelings measured, the group differences were significant.

Table 1 Mixed-design analysis of variance assessing the differences between AN sib pairs versus non-ED sib pairs and proband versus sister perceive the sibling relationship

	Main effect: differences between AN sib pairs and non-ED sib pairs	Main effect: differences between probands and sisters	Interaction between sib pairs and probands
<i>Warmth/Closeness</i>			
Prosocial behaviour	$F_{(1,462)} = 1.46$, $p = .23$	$F_{(1,462)} = 1.15$, $p = .28$	$F_{(1,462)} = .18$, $p = .68$
Affection	$F_{(1,462)} = 1.62$, $p = .20$	$F_{(1,462)} = .004$, $p = .95$	$F_{(1,462)} = 1.24$, $p = .27$
Companionship	$F_{(1,462)} = 1.01$, $p = .32$	$F_{(1,462)} = .71$, $p = .40$	$F_{(1,462)} = .38$, $p = .54$
Similarity	$F_{(1,466)} = 6.75$, $p = .01$	$F_{(1,466)} = 9.78$, $p = .002$	$F_{(1,462)} = 2.03$, $p = .16$
Intimacy	$F_{(1,462)} = .28$, $p = .60$	$F_{(1,462)} = .64$, $p = .43$	$F_{(1,462)} = .02$, $p = .89$
Admiration by sibling	$F_{(1,462)} = 4.77$, $p = .03$	$F_{(1,462)} = .02$, $p = .88$	$F_{(1,462)} = 9.34$, $p = .002$
Admiration of sibling	$F_{(1,462)} = 4.01$, $p = .046$	$F_{(1,462)} = 3.14$, $p = .08$	$F_{(1,462)} = 1.30$, $p = .25$
<i>Conflict</i>			
Quarrelling	$F_{(1,462)} = .18$, $p = .67$	$F_{(1,462)} = 4.08$, $p = .04$	$F_{(1,462)} = .15$, $p = .70$
Antagonism	$F_{(1,462)} = .004$, $p = .95$	$F_{(1,462)} = 6.83$, $p = .009$	$F_{(1,462)} = 3.26$, $p = .07$
Competition	$F_{(1,462)} = 5.33$, $p = .02$	$F_{(1,462)} = 14.67$, $p = .000$	$F_{(1,462)} = 6.41$, $p = .012$
<i>Power</i>			
Dominance by sibling	$F_{(1,462)} = .58$, $p = .45$	$F_{(1,462)} = 5.73$, $p = .017$	$F_{(1,462)} = 9.01$, $p = .003$
Dominance over sibling	$F_{(1,462)} = 3.40$, $p = .07$	$F_{(1,462)} = 3.38$, $p = .07$	$F_{(1,462)} = 4.52$, $p = .03$
Nurturance by sibling	$F_{(1,462)} = 7.82$, $p = .005$	$F_{(1,462)} = 7.04$, $p = .008$	$F_{(1,462)} = 3.62$, $p = .46$
Nurturance of sibling	$F_{(1,462)} = 6.40$, $p = .01$	$F_{(1,462)} = 5.45$, $p = .02$	$F_{(1,462)} = .45$, $p = .50$

AN, anorexia nervosa; ED, eating disorder.

Table 2 Mixed-design analysis of variance assessing the differences between AN sib pairs versus non-ED sib pairs and proband versus sister family conflict and lack of cohesion

	Main effect: differences between AN sib pairs and non-ED sib pairs	Main effect: differences between probands and sisters	Interaction between sib pairs and probands
Family conflict	$F_{(1,60)} = 19.71, p = .000$	$F_{(1,60)} = 19.27, p = .000$	$F_{(1,60)} = .074, p = .79$
Lack of cohesion	$F_{(1,60)} = 15.51, p = .000$	$F_{(1,60)} = 193.75, p = .000$	$F_{(1,60)} = 3.73, p = .05$

AN, anorexia nervosa; ED, eating disorder.

For lack of cohesion, *post hoc* tests (simple effects) revealed a significant difference between AN sib pairs (mean = 20.73, SD = 6.42) and non-ED sib pairs (mean = 14.61, SD = 6.45; $t_{(69)} = -3.70, p = .000$). *Post hoc* tests (simple effects) also revealed a significant difference between probands (mean = 15.60, SD = 6.22) and sisters (mean = 5.31, SD = 3.31; $t_{(61)} = 14.52, p = .000$).

In order to further test our hypothesis that sib pairs in which the proband had been diagnosed with lifetime AN ('the AN sib pairs') would have less satisfactory relationships than the contrast-paired siblings ('the non-AN sib pairs'), we conducted paired, one-tailed *t*-tests to compare all relationship indices between the AN sib pairs and the non-AN sib pairs (including Bonferroni corrections for multiple tests). The sisters in the AN sib pairs significantly differed from one another in similarity, conflict, antagonism, competition, nurturance by sibling, family conflict and lack of family cohesion. The sisters in the non-AN sib pairs significantly differed from one another on admiration of/by sibling, nurturance by/of sibling, dominance of/by sibling, family conflict and lack of family cohesion.

Hypothesis 3

Current AN, or a higher level of AN symptomatology, will be associated with worse sister relationships than recovered or partially recovered AN.

In order to test this hypothesis, mixed-design ANOVA with Bonferroni corrections was conducted for the SRQ subscales and for the FES subscales (Table 3). Only AN sib pairs were included in the analysis. High versus low EAT-26 scores were used to divide participants into two groups, using the accepted

cutoff point for clinical significance (refer to Methods section). EAT-26 scores were the between group variable and proband versus sister status was the repeated measure variable.

Table 3 shows significant interactions for antagonism and family conflict.

For antagonism, *post hoc* tests (simple effects) revealed a significant difference only for women with high disordered eating. Probands with high disordered eating felt higher antagonism towards their sisters (mean = 5.56, SD = 2.77) than their sisters felt towards them (mean = 4.12, SD = 2.89; $t_{(67)} = 4.12, p = .000$). *Post hoc* tests also revealed a significant difference between probands with high disordered eating (mean = 5.56, SD = 2.77) and probands with low disordered eating (mean = 3.67, SD = 2.93; $t_{(109)} = -3.41, p = .001$), so that probands with high disordered eating felt more antagonism towards their sisters than probands with low disordered eating.

For family conflict, *post hoc* tests (simple effects) revealed a significant difference only for women with low disordered eating. Probands with low disordered eating reported lower family conflict (mean = 11.14, SD = 4.85) than their sisters (mean = 22.14, SD = 5.08; $t_{(6)} = -3.91, p = .008$). *Post hoc* tests (simple effects) also revealed a significant difference between probands with high disordered eating (mean = 17.36, SD = 5.00) and probands with low disordered eating (mean = 11.86, SD = 4.94; $t_{(20)} = -2.66, p = .02$), so that probands with high disordered eating felt more family conflict than probands with low disordered eating. *Post hoc* tests (simple effects) also revealed a significant difference between sisters with high disordered eating (mean = 18.00, SD = 2.75) and sisters with low disordered eating (mean = 22.14, SD = 5.08; $t_{(15)} = 2.18, p = .05$), so that sisters with high disordered eating felt less family conflict than sisters with low disordered eating.

Table 3 Mixed-design analysis of variance assessing effect of interaction between group and EAT-26 on probands' perception of sibling relationship (Sibling Relationship Questionnaire) and family conflict and lack of cohesion for AN sisters

	Main effect: differences between AN probands and sib pairs	Main effect: differences between high and low EAT scores	Interaction between sib pairs and EAT scores
<i>Warmth/Closeness</i>			
Similarity	$F_{(1,109)} = 5.00, p = .028$	$F_{(1,109)} = .11, p = .75$	$F_{(1,109)} = .08, p = .77$
Admiration by sibling	$F_{(1,109)} = .98, p = .33$	$F_{(1,109)} = 4.52, p = .04$	$F_{(1,109)} = 3.23, p = .08$
<i>Conflict</i>			
Antagonism	$F_{(1,109)} = 2.79, p = .10$	$F_{(1,109)} = 4.52, p = .04$	$F_{(1,109)} = 14.32, p = .000$
Competition	$F_{(1,109)} = 8.53, p = .004$	$F_{(1,109)} = 3.15, p = .08$	$F_{(1,109)} = 1.74, p = .19$
Family conflict	$F_{(1,14)} = 14.37, p = .002$	$F_{(1,14)} = .32, p = .58$	$F_{(1,14)} = 14.96, p = .002$

AN, anorexia nervosa; EAT, Eating Attitudes Test.

Discussion

This study aimed to compare how women with a lifetime AN diagnosis perceive their relationships with their healthy sisters, with how these sisters perceive this same relationship. These perceptions were also compared with those of sisters who had never suffered from an ED. It was hypothesised that poorer relationships would be reported by AN sister pairs than by control sister pairs, that sisters of AN probands would perceive the relationship as more positive than their sisters with a lifetime AN diagnosis and that more severe current AN symptomatology would be associated with poorer sister relationships than recovered or partially recovered AN.

All hypotheses were confirmed. Overall, as found by Latzer et al. (2015), the AN sister relationships were less favourable than those of the comparison non-AN sisters, and the AN probands' perception of the relationship was less favourable than that of their non-AN sisters'. Each individual member of the sib pairs tended to view her relationship with her sister differently to how her sister perceived this same relationship, irrespective of AN status. This is consistent with the finding that in general, siblings tend to perceive the (same) relationship between them in different ways (Stocker & McHale, 1992). However, we found a meaningful difference between the two sets of sib pairs. While both AN sib pairs and non-AN sib pairs differed from each other on many relationship indices, the AN proband viewed the relationship as less favourable than her sister on all but one variable (family conflict), whereas the non-AN proband did not. In the comparison group, there were differences in the perception of the relationship between sisters but they were randomly distributed: for half of the variables, the non-AN proband viewed the sister relationship less favourably than her sister, and for the remaining variables, the non-AN proband viewed it more favourably.

These results confirm the study hypotheses and the clinical observation that the pathological process of developing AN is associated with increasing isolation and withdrawal from activities and social connections. There is even some evidence that social inhibition precedes the onset of EDs and is significantly higher in sisters that develop AN than in their discordant healthy sisters (Adambejan et al., 2012). That AN should be associated with poorer sister relationships in particular is understandable, in that the healthy sisters of girls or women with AN are also subjected to the direct and indirect effects of the pathology. Because sister relationships are particularly important to women throughout their lives (Mautner, 2005), the quality of sister relationships may not only be affected by symptoms of AN in their sisters, but also reflect the severity of symptoms.

Although siblings tend to perceive the (same) relationship differently (Stocker & McHale, 1992), it is of interest that girls and women with AN tend to view the relationship with their sisters more negatively than their non-AN sisters view that same relationship. This may be a consequence of the negative cognitions, interpersonal impairments and/or low self-image associated with AN. Similarly, the sisters with a lifetime AN diagnosis perceived a significantly greater lack of cohesion in the family than their healthy sisters, when the family referred to is one and the same. Yet overall, AN sib pairs felt less family cohesion compared with non-ED sib pairs. Both sisters in the AN sister pairs also seem

to perceive a high level of conflict in the family as compared with sister pairs free of an AN history. These results no doubt reflect the high levels of conflict that objectively result from AN. Karwautz et al. (2003) similarly found that patients and their healthy sisters viewed the marital relationships of their parents differently, whereas sisters discordant for an ED did not.

The association between levels of disordered eating and the quality of sister relationships observed in the AN sister pairs suggests that just as the pathological process of the disease is associated with less favourable sisterhood, so the recovery from AN may be associated with more favourable sisterhood. This finding is consistent with the results of social behaviour and attitudes of women with AN in general being worst in women with acute AN and better in symptomatically recovered women with AN (Morris et al., 2014).

Recovery from an ED entails learning how to communicate verbally instead of *via* symptoms (Jenkins & Ogden, 2012), and relationships between sisters, like other social connections, would evidently benefit from this. Another qualitative study found that those in recovery learned to make their own decisions while making social connections and utilising other support networks, which could include sister relationships (Cockell et al., 2004). At follow up interviews, maintaining connections with social supports was a factor identified by participants as contributing to the maintenance and continuation of their recovery. Patching and Lawler (2009) found that connectedness was significant to the development, maintenance and recovery from an ED. Recovery occurred when the women re-connected with life and engaged in a process of developing skills to deal with conflict resolution that enabled them to rediscover their sense of self. Such conflict resolution skills as applied to sister relationships would lead to a decrease in conflict between sisters and an increase in supportive aspects of the connection, as suggested by the results of this study.

This investigation of the quality of sister relationships of women with a lifetime diagnosis of AN has its limitations. Because the AN probands were ascertained from the community, they may represent a less severe phenotype than those ascertained from clinical centres (as in Morris et al., 2014). In particular, they may, even at the height of their AN, have had fewer co-morbid conditions (Kaye et al., 2014). Also, the majority of the parents had university degrees, and the high socio-economic background of the sample may limit the generalizability of results. Another limitation is our omission to collect information about which sister pairs lived together at the time of the study, which meant we could not examine whether or not responses were associated with this factor. Finally, normal body mass index in adolescents depends on age and some adolescents with a body mass index that would be considered pathologically low in an adult may not have had AN and have therefore been wrongly excluded from the control group.

Because the study is cross-sectional in design, it is not possible to describe processes or to deduce causality. It should also be noted that although all the results of this study are consistent with the hypotheses and statistically significant, they are weak to moderate in their significance. Thus, the results discussed here should be considered with these limitations in mind.

Sister relationships may be viewed as the canary in the mine, the potentially informative, intimate, long-lasting, formative

social relationship associated with AN pathology. Although sister pairs have been studied in the context of the aetiology of eating disorders, the results of this study suggest that further research is needed targeting the quality of the sister relationship. A comprehensive, comparable, consistent and clinically meaningful definition of recovery from ED (Bachner-Melman, Zohar, & Ebstein, 2006; Bardone-Cone et al., 2010) should include social re-engagement, of which sister relationships is a component.

Women with AN report that their experience is affected by their sibling's response to the illness (Honey, Clarke, Halse, Kohn, & Madden, 2006). Parental efforts to support their daughters well no doubt help to enable these daughters to understand and accept their sisters' AN and to improve the quality of the sister relationship (Honey & Halse, 2006). The results of this study underscore the importance of including healthy

adolescents and adults in the therapeutic process of their sisters suffering from AN. Withers et al. (2014) showed that the inclusion of siblings in family-based treatment enhanced communication within the family. More research should be devoted to the benefits of including sisters in the therapy of their eating-disordered sisters. This study adds to a growing body of research that supports the inclusion of sisters in therapy for AN. It is regrettable that the therapeutic value of sisters is underestimated, and recommended unequivocally that wherever relevant, therapy should draw out the benefits of the sister relationship and its healing effects. To summarise, not only does the quality of the relationship between women with AN and their sisters reflect the level of AN symptomatology, it may also play a role in alleviating symptoms.

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