



A new social-family model for eating disorders: A European multicentre project using a case–control design



Isabel Krug^{a,*}, Matthew Fuller-Tyszkiewicz^b, Marija Anderluh^c, Laura Bellodi^d, Silvia Bagnoli^e, David Collier^f, Fernando Fernandez-Aranda^g, Andreas Karwautz^h, Sarah Mitchellⁱ, Benedetta Nacmias^e, Valdo Ricca^e, Sandro Sorbi^e, Kate Tchanuria^j, Gudrun Wagner^h, Janet Treasure^{j,1}, Nadia Micali^{k,1}

^a School of Psychological Sciences, University of Melbourne, Australia

^b School of Psychology, Deakin University, Australia

^c University Psychiatric Hospital Ljubljana, Slovenia

^d Department of Neuropsychiatric Sciences (DSNP), Fondazione Centro S. Raffaele del Monte Tabor, Italy

^e Department of Neurosciences, Psychology, Drug Research and Child Health (NEUROFARBA), University of Florence, Italy

^f Social, Genetic and Developmental Psychiatry Research Centre, Institute of Psychiatry, King's College London, UK

^g Department of Psychiatry, Bellvitge University Hospital-IDIBELL, Ciber Fisiopatología de la Obesidad y Nutrición (CIBERObn), Spain

^h Department of Child and Adolescent Psychiatry, Medical University of Vienna, Austria

ⁱ School of Psychological Sciences, Monash University, Australia

^j Psychological Medicine, Institute of Psychiatry, King's College London, UK

^k Institute of Child Health, University College London (UCL), UK

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ABSTRACT

Objective: To examine a new socio-family risk model of Eating Disorders (EDs) using path-analyses.

Method: The sample comprised 1264 (ED patients = 653; Healthy Controls = 611) participants, recruited into a multicentre European project. Socio-family factors assessed included: perceived maternal and parental parenting styles, family, peer and media influences, and body dissatisfaction. Two types of path-analyses were run to assess the socio-family model: 1.) a multinomial logistic path-model including ED sub-types [Anorexia Nervosa-Restrictive (AN-R), AN-Binge-Purging (AN-BP), Bulimia Nervosa (BN) and EDNOS)] as the key polychotomous categorical outcome and 2.) a path-model assessing whether the socio-family model differed across ED sub-types and healthy controls using body dissatisfaction as the outcome variable.

Results: The first path-analyses suggested that family and media (but not peers) were directly and indirectly associated (through body dissatisfaction) with all ED sub-types. There was a weak effect of perceived parenting directly on ED sub-types and indirectly through family influences and body dissatisfaction. For the second path-analyses, the socio-family model varied substantially across ED sub-types. Family and media influences were related to body dissatisfaction in the EDNOS and control sample, whereas perceived abusive parenting was related to AN-BP and BN.

Discussion: This is the first study providing support for this new socio-family model, which differed across ED sub-types. This suggests that prevention and early intervention might need to be tailored to diagnosis-specific ED profiles.

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* Corresponding author. Clinical Psychology, University of Melbourne, Psychology Clinic, 14–20 Blackwood Street, Vic 3010, Melbourne, Australia.

E-mail address: Isabel.krug@unimelb.edu.au (I. Krug).

¹ Joint senior authors.

Although Eating Disorders (EDs) are thought to result from various biological, psychological, and social risk factors (Bakalar, Shank, Vannucci, Radin, & Tanofsky-Kraff, 2015; Keel & Forney, 2013), to date, most studies have assessed ED risk factors in isolation, rather than in a multivariate context. Only more recently have researchers appreciated the interdependence of risk factors and

have therefore started to develop integrative aetiological models of risk for disordered eating symptoms (Micali et al., 2015; Papp, Urban, Czegledi, Babusa, & Tury, 2013). However empirical validations of these models using advanced statistical approaches such as path-analyses are lacking in clinical ED populations. This might be due to the fact that large sample sizes are required for such analyses. The current study therefore tested a new socio-family model in a large sample of clinical ED patients and healthy controls in four different European countries using path-analyses.

1. Sociocultural influences of eating pathology

The tripartite influence model (Thompson, Covert, & Stormer, 1999) is one model of sociocultural influences, which proposes that three areas of influence (family, peers and the media) are important predecessors in the development of eating pathology. These three influences are also thought to affect body dissatisfaction indirectly, via two processes: (i) internalization of unrealistic and in many cases unattainable appearance standards (the thin ideal) and (ii) increased appearance comparison. These mediating variables are assumed to lead to body dissatisfaction, which in turn influences onset and maintenance of disordered eating symptoms. The tripartite influence model has received robust empirical verification from community samples assessing female (van den Berg, Thompson, Obremski-Brandon, & Covert, 2002; Papp et al., 2013; Rodgers, McLean, & Paxton, 2015) and male (Tylka, 2011; Tylka & Andorka, 2012) adolescents and young adults. However, to our knowledge there is no study that has assessed the perceived influences from the family, peers and the media from the tripartite model concurrently in a contextual model in a clinical ED population. Therefore, it is not yet understood whether these influences hold true for clinical ED cases and whether they might differ across ED sub-types.

2. Parenting behaviours and eating pathology

Despite being comprehensive, the tripartite influence model does not address the role of parenting styles in affecting pressures from the family. The literature on parenting styles and EDs has generally found that compared to healthy controls, ED patients report that their parents displayed significantly lower levels of care, increased level of overprotection (Caglar-Nazali et al., 2014) and more critical comments about weight and shape (Tetley, Moghaddam, Dawson, & Rennoldson, 2014). However, not all studies replicate these findings (Kent & Clopton, 1992; Kumnick et al., 2013). Much less attention has been given to the role of broader aspects of maladaptive parenting such as emotional and verbal abuse (Kong & Bernstein, 2009; Racine & Wildes, 2015; Rorty, Yager, & Rossotto, 1994a, 1994b), although sexual forms of abuse have been more widely examined (Madowitz, Matheson, & Liang, 2015). To our knowledge, no previous study has included overprotective, critical and verbally abusive parenting styles into a socio-family model of EDs using the three perceived influences (family, peers and media) from the tripartite influence model to explain the basis for family pressures regarding physical appearance. Parenting styles might be important precursors of family influences since they might shape the parent–child bond, which in turn may determine the extent to which the child adopts the parents' opinions and values regarding appearance and dieting. In addition, little is known about the different contributions of mothers' versus fathers' parenting styles, with only a few studies showing that fathers are also important contributors to the development of ED symptoms (Agras, Bryson, Hammer, & Kraemer, 2007). Hence, incorporating maternal as well as paternal parenting styles seems to be a logical extension for the

development of a new socio-family ED model.

3. Differences in the socio-family factors across ED sub-types

Whereas several reviews (Jacobi, Hayward, de Zwaan, Kraemer, & Agras, 2004; Rikani et al., 2013) have inferred similarities in the sociocultural and parental risk factors for the different ED sub-types, other studies (Hilbert et al., 2014; Machado, Goncalves, Martins, Hoek, & Machado, 2014) have revealed differences in these risk factors across Anorexia Nervosa (AN) and Bulimia Nervosa (BN). BN patients have, for instance, been found to be especially influenced by a history of dieting, childhood obesity, abusive relationships (including abusive parenting), and high expectations, low contact, and critical comments about weight and shape by family members and modelling, teasing and bullying from peers (Micali et al., 2007; Rorty, Yager, & Rossotto, 1994b). Conversely, other studies have revealed that eating conflicts, struggles around meals, and unpleasant meals in childhood (Kotler, Cohen, Davies, Pine, & Walsh, 2001), parental overprotection and high concerns (Taborelli et al., 2013) as well as parental critical comments about appearance and eating (Machado et al., 2014), were most commonly related to a subsequent AN diagnosis. Overall, these studies have studied risk factors for each ED, rather than comparing across ED sub-types in the same study. Hence, research comparing socio-family risk factors across ED sub-types in the same study using advanced statistical modelling techniques is lacking.

To conclude, even though numerous studies have been concerned with identifying socio-family risk factors of EDs in isolation, limited research has focused on the theoretical framework underlying the interconnectedness of these risk factors and even fewer studies have empirically tested these theoretical models. Given that large sample sizes are required to undertake path-analyses, validations of sociocultural models such as the tripartite influence model have been typically restricted to community samples. To our knowledge, no previous study has examined a socio-family model including the family, peer and media influence variables from the tripartite influence and has tested whether parenting styles have an impact on the family influence variable outlined in the tripartite model in a clinical ED sample. Thus, there appears to be a need for a more comprehensive, empirically validated socio-family model of EDs to increase researchers' and practitioners' understanding of the specific sociocultural and family influences of EDs in a multivariate context. Identifying modifiable variables that together might be associated with EDs, can inform prevention and early intervention programs.

4. The current study

The present study was part of the Fifth European Framework project on "Healthy Eating", a collaboration of eight countries with the common task of examining the individual and environmental factors related to EDs (Krug et al., 2013; Penelo et al., 2011). The main aim of the current study was to assess a new socio-family model for EDs using a large sample of clinical ED patients and healthy controls from four European countries (UK, Spain, Italy, and Slovenia). A further aim was to assess whether the model differed across ED sub-types [AN-Restrictive (AN-R), AN-Binge Purge Sub-type (AN-BP), BN and Eating Disorders not Otherwise Specified (EDNOS)]. Our model included the following ED associated factors: perceived overprotective, critical and verbally abusive maternal and paternal parenting styles and perceived influences from the family, peers and the media as well as body dissatisfaction. We hypothesized that for our new socio-family model, perceived parenting styles (both maternal and paternal) would together with

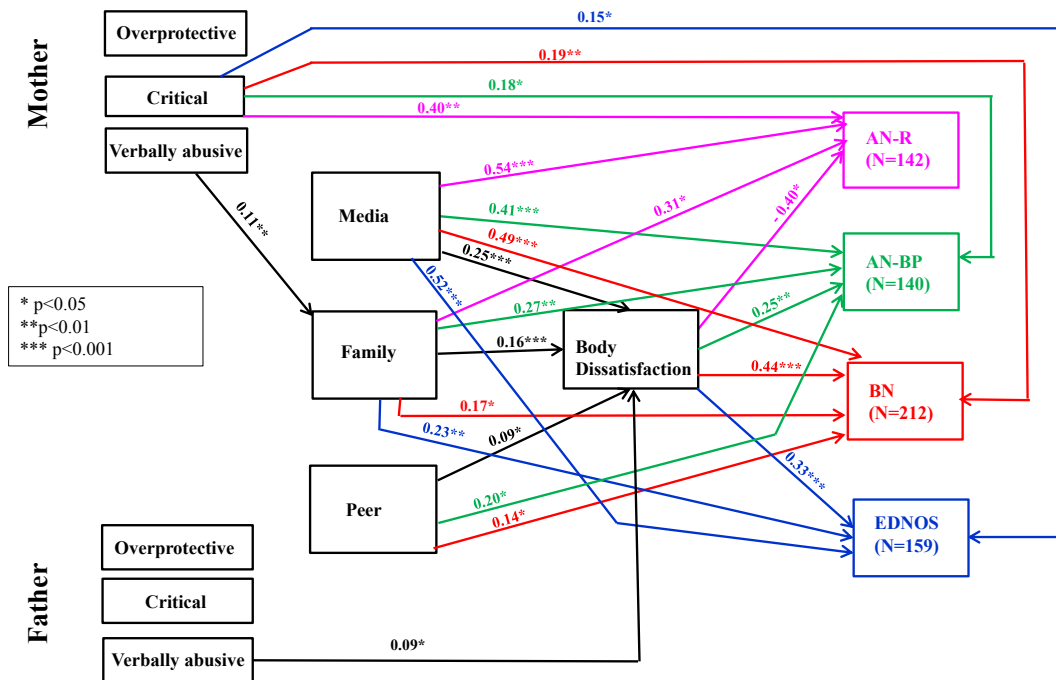


Fig. 1. Socio-family model for whole eating disorder sample (for more explanation see text).

influences from peers and the media lead either directly to EDs or indirectly to ED sub-types via body dissatisfaction (see Fig. 1). Based on the literature, we also hypothesized that our socio-family model would differ across ED sub-types.

5. Methods

5.1. Participants

The present study was part of a larger European Project “The Healthy Eating Project”, which employed a case–control design comprising a total of 1264 female participants (653–ED; 611–healthy controls). Four centres from four European countries (Spain, UK, Slovenia, and two for Italy) participated in the current study: the University Hospital of Bellvitge, Barcelona, Spain; the Eating Disorders Research Unit, Institute of Psychiatry, London, UK; the Department of Neurosciences, University of Florence, Italy; the Department of Psychiatry, Fondazione Centro del Monte Tabor, Milan, Italy and the University Psychiatric Hospital, University of Ljubljana, Slovenia. The distribution of the different ED diagnoses was even across the whole sample (21.7% with AN-R subtype, 21.5% with AN-BP subtype, 32.5% with BN subtype, 24.3% with EDNOS). The EDNOS group comprised 1.) an EDNOS-Restrictive group including patients who failed to meet criteria for AN due to (a) BMI > 17.5 kg/m² or (b) presence of menses and 2.) an EDNOS-Binge Purge group including individuals who (a) did not meet the frequency threshold of binge eating and vomiting for BN or (b) presented with only purging behaviour but not with binge eating behaviour or c) did not meet the frequency threshold for binge eating episodes in order to be classified as Binge Eating Disorder (BED). The mean age of the whole sample was 25.28 years (SD = 8.67).

Most of the ED participants were recruited from clinical institutions and were suffering from ED symptoms at assessment. Some (<20%) came from community sources, for example, user or carer organizations or from advertisements. Participants were diagnosed according to DSM-IV-R (APA, 2000) criteria, using a

semi-structured clinical interview, the Structured Clinical Interview for DSM-IV Axis I Disorders SCID-I (First, Gibbon, Spitzer, & Williams, 1996) or the EATATE (Anderluh, Tchanturia, Rabe-Hesketh, Collier, & Treasure, 2009); (only used in the UK) carried out by experienced psychologists and psychiatrists. For the present analysis, the following individuals had to be excluded from the initial sample of 703 ED patients: (a) males (N = 28) (b) patients with missing values for any diagnostic tools (N = 18), individuals with (c) cognitive impairment (N = 2), and (d) co-morbid psychotic disorder (N = 2). Decisions about diagnoses and exclusion of potential participants were made by psychologists or psychiatrists who completed the assessment together with the treatment team according to published treatment guidelines (APA, 2000).

Healthy controls were recruited from various community sources at each site and were asked to volunteer in a study of factors associated with the development of EDs. All healthy controls were from the same catchment area as index patients. From the initial sample of 684 healthy controls, 67 males and 6 participants, who indicated a lifetime ED screened by the SCID-1 (First et al., 1996) according to DSM-IV-R criteria (APA, 2000) and the EAT-26 (total score > 20); (Garner & Garfinkel, 1979), were excluded. Each site obtained ethical approval separately from its own institutional review board.

5.2. Assessment

5.2.1. Cross-cultural risk factor questionnaire [CCQ (Penelo et al., 2011)]

An expert group from various European countries developed the CCQ (Penelo et al., 2011), which is a retrospective self-administered questionnaire. The CCQ was developed on the basis of the major instruments in the field of EDs, which are the Oxford Risk Factor Interview (Fairburn, Cooper, Doll, & Welch, 1999) and the McKnight Risk Factor Interview (Shisslak et al., 1999). The CCQ includes 51 items with six subscales [1.) demographic information; 2.) eating and weight concerns; 3.) individual and family eating patterns; 4.) family style, expectations and independence; 5.) social ideals of

thinness and 6.) substance use]. The CCQ inquired about things that occurred in the participant's history prior to the age of 12 to ensure that risk factors are being assessed. A more detailed description of the CCQ can be found in earlier publications (e.g. Krug et al., 2009, 2013; Penelo et al., 2011). It has been found to be a reliable instrument with good psychometric properties [please refer to (Penelo et al., 2011) for more details]. In the present study, the questions relating to the perceived influences from parents, the family, peers and the media and body dissatisfaction were used.

5.3. Perceived parenting styles

Perceived parenting styles were assessed by asking participants: "During your first 12 years how frequently were the following statements about how your mother/father figure behaved towards you true?" "Overprotective of me" "Critical of me" and "Verbally abusive of me" Questions were scored separately for mothers and fathers on a 4-point likert scale, ranging from 0 (*never*) to 4 (*always*).

5.4. Perceived influences from the family, peers and the media

- i.) *Family*: Two different questions asked whether participants had been teased by family members about a.) eating and b.) weight/shape during childhood and/or early adolescence. A composite family influence variable was created by summing these two items together.
- ii.) *Peers*: Two different questions assessed whether participants had been teased by peers about a.) eating and b.) weight/shape during childhood and/or early adolescence. A total peer influence variable was created by summing these two items together.
- iii.) *Media*: Two different questions asked whether a.) the mass media (e.g. TV, advertisements; magazines) and b.) current fashion styles influenced the participants eating during childhood/early adolescence. Both items were summed to create an overall media influence variable.

The perceived influences from the family, peers and the media were rated on a 4-point likert scale, ranging from 0 (*Not at all*) to 4 (*extremely*).

5.5. Body dissatisfaction

Participants rated their current body size and their ideal body size by circling a number on body-figure rating scales. The rating scale consisted of ten figure images displayed on the odd numbers, anchored with a scale from 1 (*very thin*) to 10 (*obese*). Body dissatisfaction was determined by subtracting participants' personal ideal body size from their perceived current body shape. Positive numbers indicated that the personal ideal body size was thinner than perception of current body size. A score of 1 indicated a difference in one body size, with a higher score indicating a larger degree of body dissatisfaction (Jaeger et al., 2002).

5.6. Procedure

Participants were invited to participate in the collaborative, multi-centre study across Europe, investigating associated environmental and sociocultural ED factors. ED diagnoses were based on a face to face clinical interview and were consensually derived among members of the clinical team who had participated in the assessment. Informed consent was obtained at enrolment.

5.7. Statistical analyses

Data descriptives and group difference analyses were conducted using IBM SPSS version 22 (SPSS, Chicago, IL, USA). All significance tests were two-tailed. T-tests for continuous and chi-square tests for discrete variables were used to assess whether ED patients and healthy controls differed on sociodemographic data. For the remaining comparisons, ANCOVA analyses (adjusted by age and education level) were carried out with Brown-Forsythe's correction for violations of homogeneity of variance and post-hoc analyses were corrected for Type 1 error inflation using the Games-Howell adjustment. Partial correlation analyses were undertaken for all parental and sociocultural factors after removing the effects of age, and education.

Our socio-family model was tested using two types of path-analyses. For the first analyses (Path-Analyses 1), a multinomial logistic path-model with ED sub-types (healthy controls as the reference category) as the key outcome was tested for the sample as a whole (see Fig. 1). By including ED sub-type as a polychotomous categorical outcome, this model allowed for evaluation of the differential effects of body dissatisfaction on the four ED sub-types (AN-R, AN-BP, BN, and EDNOS). A disadvantage of this whole sample approach detailed above is that the pathways leading to body dissatisfaction average across all participants, and are thus insensitive to potential differences in the strength of these pathways across ED sub-types. Therefore, this whole sample approach was augmented with a second multi-group approach (Path-Analyses 2), which allowed for evaluation of whether our socio-family model differed significantly across ED sub-types and healthy controls (often also referred to as invariance testing) by comparing model fit under two conditions: a.) Model a – where the model parameters are calculated separately for each group (healthy controls, AN-R, AN-BP, BN, and EDNOS), and b.) Model b – where the model parameters are forced to be equal across groups (e.g., the path from perceived influences from the family to body dissatisfaction must take on the same value for all groups). In instances where the parameters differ markedly across groups, the constraints imposed in Model b should produce a substantially worse model fit than Model a, defined as a statistically significant increase in chi square from Model a to Model b, and a practically significant decline in Comparative Fit Index ($\Delta CFI > .01$) from Model a to Model b (Cheung & Rensvold, 2002). Consequently, evidence of a practical or significant difference across the two models provides evidence that the model differs across groups. Finally, it should be noted that as ED sub-types was used as a grouping variable in order to assess group differences in the model fit, it was no longer modelled as a dependent variable. Retaining ED sub-types as a dependent variable in this context would have produced groups with zero variance in the dependent variable (i.e., for the AN-R group, all scores on AN-R would equal 1). However, this compromise still allowed assessment of all pathways leading to body dissatisfaction.

6. Results

6.1. Sociodemographic characteristics

Table 1 contains the sociodemographic characteristics for the total sample stratified by total ED patients, ED sub-types, and controls. Significant differences for all sociodemographic measures were obtained between the ED patients and the controls, with the exception of highest education level for participants and mother's highest education. The ED patients were significantly older and were more commonly employed than the healthy controls, which may account for the fact that more controls than ED patients were currently studying. Furthermore, the ED group was more frequently

Table 1

Socio-demographic characteristics by ED sub-types and country: percentages for categorical variables and mean (SD) for quantitative variables.

	Comparison: ED patients vs controls					Patients with ED: comparison by subdiagnoses ^b									<i>p</i> ^a	Statistical comparisons
	Controls (n = 611)		ED (n = 653)		<i>p</i> ^a	AN-R (n = 142)		AN-BP (n = 140)		BN (n = 212)		EDNOS (n = 159)				
Age, mean (SD)	23.64	7.94	26.80	9.05	.000	25.38	8.64	27.69	9.17	26.50	7.27	27.68	11.12	.086	EDNOS > BN > AN-BP > AN-R	
BMI; mean (SD)	21.40	2.83	20.76	4.81	.016	17.03	2.59	18.31	2.87	22.65	4.14	23.52	5.32	<.001		
Area where brought up (Urban): N (%)	338	55.6%	443	69.0%	.000	96	68.1%	100	73.0%	138	66.0%	109	70.3%	.559	EDNOS > BN	
Highest education level: University (%)	307	50.5%	343	52.9%	.218	75	53.6%	74	52.9%	95	45.0%	99	62.7%	.010		
Students: yes (%)	440	72.7%	302	46.7%	.000	69	48.6%	63	45.3%	86	41.1%	84	53.5%	.121		
Employment: yes (%)	212	37.6%	326	56.0%	.000	69	53.5%	64	51.6%	113	58.9%	80	58.4%	.522		
Mother's highest education: University (%)	118	19.5%	106	17.3%	.175	23	16.8%	24	18.0%	25	12.8%	34	22.8%	.112		
Father's highest education: University (%)	134	22.5%	108	17.5%	.017	27	19.6%	20	15.0%	30	15.2%	31	20.8%	.424		

^a Significant comparison based on chi-square tests for categorical variables and t-test for quantitative variable.^b Sample sizes for ED and ED sub-types does not match, due the lack of some diagnose subtype.

brought up in urban places.

As regards to ED sub-types, significant differences were obtained for BMI and education. As expected AN-R revealed a significantly lower BMI than AN-BP patients, who in turn presented with a significantly lower BMI than BN and EDNOS patients. In terms of education, EDNOS patients reported a significantly higher proportion of completed university studies than BN patients.

6.2. Parenting, tripartite influences (family, peer and media) and body dissatisfaction

Table 2 presents the differences in the variables included in our socio-family model between the overall ED sample (ED sub-types) and healthy controls adjusted by age and education. The ED patients scored significantly higher than the controls on most of the variables included in our socio-family model. The only non-significant findings were found for fathers being perceived as being verbally abusive. When differences across ED sub-types were assessed, the general pattern was that the BN individuals reported the highest scores for most of the variables included in our socio-family model, whereas the AN-R sample provided the lowest scores for these variables (see Table 2).

6.3. Correlational analyses

Correlational analyses were run for the overall ED and healthy control sample separately in order to examine the bivariate relationships that were the basis for the subsequent two types of path-analyses. Partial correlations adjusted by age and education between the variables included in the socio-family model for the overall ED patients and healthy control are displayed in Table 3. Statistical significant correlations for both groups were found between most of the variables included in the model with correlation strength ranging from weak to strong.

6.4. Path-analyses 1

6.4.1. Whole sample approach using ED sub-types as a categorical outcome

As can be seen from Fig. 1, AN-R was significantly predicted by body dissatisfaction ($\beta = -.40$, $p = .031$), mothers being critical ($\beta = .40$, $p = .001$), perceived influences from the family ($\beta = .31$, $p = .010$), and the media ($\beta = .54$, $p < .001$), and education level ($\beta = .20$, $p = .047$). AN-BP was significantly predicted by body dissatisfaction ($\beta = .25$, $p = .004$), mothers being critical ($\beta = .18$,

Table 2

Comparison by group (ED versus controls) and ED sub-types, adjusted by age and education.

Adjusted means (SD)	Comparison: ED patients vs controls					Patients with ED: comparison by sub-types									Statistical comparisons**
	Controls (n = 611)		ED (n = 653)		<i>p</i> *	AN-R (n = 142)		AN-BP (n = 140)		BN (n = 212)		EDNOS (n = 159)		<i>p</i> *	
Mother-overprotective	1.88	1.35	2.12	1.34	.002	2.20	1.39	2.16	1.40	2.00	1.41	2.05	1.40	.449	
Mother-critical	1.16	1.00	1.62	1.00	.000	1.56	1.11	1.67	1.11	1.74	1.11	1.52	1.12	.242	
Mother-verbally abusive	.37	.78	.56	.78	.000	.32	.89	.63	.89	.67	.89	.51	.89	.003	AN-R < BN, AN-BP, EDNOS
Father-overprotective	1.56	1.35	1.75	1.35	.019	1.87	1.42	1.66	1.43	1.62	1.43	1.74	1.43	.443	
Father-critical	1.04	1.04	1.30	1.03	.000	1.17	1.08	1.54	1.08	1.39	1.09	1.11	1.08	.002	AN-BP > AN-R, EDNOS; BN > EDNOS
Father- verbally abusive	.42	.83	.48	.83	.287	.28	.87	.66	.87	.52	.88	.40	.88	.003	AN-R < AN-BP, BN; EDNOS < AN-BP
Family influences	.74	2.02	2.03	2.02	.000	1.55	2.43	2.23	2.43	2.25	2.43	1.97	2.42	.049	AN-R < AN-BP, BN
Peer influences	.68	1.90	1.93	1.91	.000	1.53	2.29	2.02	2.28	2.15	2.29	1.84	2.29	.094	
Media influences	1.71	2.27	3.69	2.28	.000	2.80	2.50	3.39	2.49	4.18	2.50	3.97	2.51	.000	AN-R < BN, EDNOS; AN-BP < BN
Body dissatisfaction	1.00	2.14	2.31	2.14	.000	.67	2.54	2.20	2.54	3.26	2.54	2.59	2.55	.000	AN-R < AN-BP, BN, EDNOS; AN-BP, EDNOS < BN

^{*}*p*-value with Brown-Forsythe correction for heterogeneity in variances between groups.^{**}Post-hoc analyses corrected by Games-Howell correction for multiple comparisons.

Table 3

Partial correlations adjusted by age and education for overall sample.

	M1	M2	M3	F1	F2	F3	FI	PI	MI	BD
Mother was overprotective (M1)		.10	−.05	.42**	.12*	.01	−.05	.08	.08	−.01
Mother-critical (M2)	.12*		.48**	.06	.33**	.21**	.20**	.09	.05	.11*
Mother- verbally abusive (M3)	−.06	.39**		−.05	.14*	.40**	.17**	.05	.09	.13*
Father-overprotective (F1)	.50**	.09	−.02		.03	−.14*	−.04	.03	−.01	−.03
Father-critical (F2)	.03	.42**	.23**	.07		.49**	.21**	.19**	.10	.14*
Father was verbally abusive (F3)	−.09	.19**	.51**	.00	.46**		.15**	.07	.05	.18**
Family influences (FI)	.03	.11*	.08	−.03	.13*	.09		.55**	.15**	.22**
Peer influences (PI)	.02	.11*	.15**	.00	.12*	.14*	.55**		.27**	.21**
Media influences (MI)	.10	.04	.04	.02	.11*	.11*	.20**	.31**		.22**
Body dissatisfaction (BD)	.06	.03	−.04	.01	.10	.04	.25**	.26**	.35**	

* $p < .01$; ** $p < .001$ (two-tailed).Control group ($n = 611$) partial correlations provided below the main diagonal, and ED group ($n = 653$) partial correlations reported above the main diagonal.

$p = .026$), age ($\beta = .28, p < .001$), and perceived influences from the family ($\beta = .27, p = .002$), the media ($\beta = .41, p < .001$), and peers ($\beta = .20, p = .044$), and also predicted by education level ($\beta = .21, p = .004$). BN status was significantly predicted by body dissatisfaction ($\beta = .44, p < .001$), mothers being critical ($\beta = .19, p = .007$), age ($\beta = .19, p < .001$), and perceived influences from the family ($\beta = .17, p = .014$), the media ($\beta = .49, p < .001$), and peers ($\beta = .14, p = .048$). EDNOS was significantly predicted by body dissatisfaction ($\beta = .33, p < .001$), mother being critical ($\beta = .15, p = .045$), age ($\beta = .25, p < .001$), perceived influences from the family ($\beta = .23, p = .001$) and the media ($\beta = .52, p < .001$), and also predicted by education level ($\beta = .24, p < .001$).

Body dissatisfaction was significantly predicted by fathers being verbally abusive ($\beta = .09, p = .034$), as well as perceived influences from the family ($\beta = .16, p < .001$), peers ($\beta = .09, p = .045$), and the media ($\beta = .25, p < .001$). Each of the sources of perceived influences was significantly related to each other: family with peers ($\beta = .57, p < .001$) and media ($\beta = .26, p < .001$), and media with peers ($\beta = .37, p < .001$). Perceived influences from the family was significantly predicted by mothers being critical ($\beta = .11, p = .001$). Fig. 1 provides a graphical representation of the whole sample approach using ED sub-types as a categorical outcome. Please note that only significant pathways are outlined in the model. It should also be noted that in order to reduce complexity, age, education and the covariates were not included in the model.

6.5. Path-analyses 2

6.5.1. Multi-group approach: differences across ED sub-types

6.5.1.1. Model estimation. When parameters were allowed to be freely estimated for each diagnostic ED category (including the healthy control group), the model provided an acceptable fit: χ^2 ($df = 60$) = 103.48, $p < .001$; $\chi^2/df = 1.72$, CFI = .939, RMSEA = .054 (90% CI: .036, .071). Imposition of equality constraints across the different groups [including the healthy control group, two AN groups (AN-R and AN-BP), BN, and EDNOS] substantially worsened model fit: χ^2 ($df = 212$) = 434.78, $p < .001$; $\chi^2/df = 2.05$, CFI = .685, RMSEA = .064 (90% CI: .056, .073), $\Delta\chi^2_{(df=152)} = 331.30, p < .001$; $\Delta CFI = .254$. Inspection of modification indices suggested misfit was due to a diffuse range of discrepancies in parameter estimates across groups, rather than being attributed to one or two pathways. Consequently, the model comparison strategy was terminated at this stage rather than seeking to establish partial invariance. Models were therefore run separately for each ED sub-type and controls. Significant model parameters for each of the groups are reported separately below and all parameters are summarised in Table 4.

A.) Healthy control group

Body dissatisfaction was significantly predicted by perceived influences from the media ($\beta = .29, p < .001$) and the family ($\beta = .12, p = .048$). The three tripartite influences were also found to be associated: family with peers ($\beta = .55, p < .001$) and media ($\beta = .22, p < .001$), and peers with media ($\beta = .33, p < .001$). None of the parenting style variables significantly predicted perceived influences from the family or body dissatisfaction. Collectively, the model accounted for 17% of variance in body dissatisfaction.

B.) Anorexia Nervosa – Restrictive Subtype (AN-R)

For individuals with AN-R, body dissatisfaction was not predicted by any of the tripartite influences, parental style variables, or age. However, the three tripartite influence variables were all inter-related: family with peers ($\beta = .58, p < .001$) and media ($\beta = .21, p = .012$), and peers with media ($\beta = .25, p = .001$). None of the parenting style variables significantly predicted by the perceived influence from the family. Collectively, the model accounted for 11% of variance in body dissatisfaction.

C.) Anorexia Nervosa-Binge Purge Subtype (AN-BP)

For individuals with AN-BP, body dissatisfaction was significantly predicted by verbally abusive fathers ($\beta = .28, p = .011$) and critical mothers ($\beta = .24, p = .033$). Perceived influences from the family was associated with perceived influences from peers ($\beta = .49, p < .001$), and perceived influences from peers and the media were also correlated ($\beta = .18, p = .039$). Verbally abusive mothering style was the only parenting style variable to predict perceived influences from the family ($\beta = .28, p = .018$). Collectively, the model accounted for 14% of variance in body dissatisfaction.

D.) Bulimia Nervosa (BN)

Body dissatisfaction was only significantly predicted by verbally abusive fathers ($\beta = .18, p = .031$). Perceived influences from the family was associated with perceived influences from peers ($\beta = .53, p < .001$), and perceived influences from peers and the media were also correlated ($\beta = .29, p < .001$). None of the parenting style variables reliably predicted perceived influences from the family. Collectively, the model accounted for 15% of variance in body dissatisfaction.

E.) EDNOS

Body dissatisfaction was significantly predicted by perceived influence from the family ($\beta = .22, p = .016$) and the media ($\beta = .31, p < .001$) as well as age ($\beta = .24, p = .003$). Each of the tripartite influences was associated with each other: family with peers

Table 4
Model parameters for the socio-family model by group.

Pathways	Healthy controls (n = 611)	AN-R (n = 142)	AN-BP (n = 140)	BN (n = 212)	EDNOS (n = 159)
Body dissatisfaction predicted by ...					
Overprotective mother	.030 (.523)	.153 (.145)	-.034 (.692)	-.132 (.125)	.058 (.416)
Critical mother	-.003 (.943)	-.028 (.778)	.236 (.033)	.010 (.904)	.042 (.661)
Verbally abusive mother	-.080 (.093)	.120 (.188)	-.052 (.667)	-.084 (.304)	-.129 (.279)
Overprotective father	-.008 (.857)	-.166 (.097)	.117 (.217)	.093 (.238)	-.023 (.759)
Critical father	.052 (.248)	.107 (.292)	-.185 (.060)	.077 (.345)	.010 (.910)
Verbally abusive father	-.013 (.805)	.083 (.319)	.281 (.011)	.184 (.031)	-.011 (.907)
Family influences	.116 (.048)	.108 (.380)	.060 (.551)	.163 (.053)	.223 (.016)
Peer influences	.110 (.135)	-.039 (.737)	.076 (.480)	.121 (.165)	.112 (.273)
Media influences	.289 (.000)	.055 (.510)	.075 (.367)	.102 (.185)	.314 (.000)
Family pressures predicted by ...					
Overprotective mother	.036 (.423)	.070 (.399)	-.074 (.384)	-.121 (.074)	-.053 (.530)
Critical mother	.044 (.394)	.166 (.055)	-.039 (.688)	.127 (.105)	.139 (.077)
Verbally abusive mother	-.026 (.644)	-.029 (.676)	.276 (.018)	.050 (.481)	-.115 (.178)
Overprotective father	-.045 (.285)	-.120 (.088)	.067 (.376)	-.036 (.544)	-.039 (.614)
Critical father	.059 (.327)	.077 (.380)	.105 (.247)	.007 (.935)	.102 (.146)
Verbally abusive father	-.014 (.797)	-.069 (.248)	.072 (.414)	.024 (.776)	.151 (.077)
Covariances					
Family with peer influences	.553 (.000)	.582 (.000)	.487 (.000)	.525 (.000)	.586 (.000)
Family with media influences	.218 (.000)	.213 (.012)	.066 (.452)	.109 (.158)	.189 (.031)
Friend with media influences	.325 (.000)	.245 (.001)	.177 (.039)	.292 (.000)	.278 (.000)

All parameters are reported as standardized coefficients (beta weights). All pathways are co-varied for age and education. Two-tailed p-values are in brackets.

($\beta = .59, p < .001$) and media ($\beta = .19, p = .031$), and peers with media ($\beta = .28, p < .001$). None of the parenting style variables predicted perceived influences from the family. Collectively, the model accounted for 26% of variance in body dissatisfaction.

7. Discussion

The current study is the first to assess a new socio-family model in a clinical ED population from four European countries (UK, Spain, Italy and Slovenia). When the model was assessed for the overall sample using ED sub-types as a categorical outcome, we found that perceived influences from the family and the media were directly related to all ED sub-types. Conversely, peer influences were found to be directly related only to AN-BP and BN. Perceived influences from the family, peers and the media were also all significantly associated with body dissatisfaction, which was subsequently related to all ED sub-types, however for the AN-R group this relationship was negative. The only significant direct effect for parenting for all ED sub-types was found for critical mothers. Verbally abusive fathers and body dissatisfaction and critical mothers and perceived influences from the family were also found to be positively related, but these pathways were averaged across the different ED sub-types. When invariance was assessed for our socio-family model using body dissatisfaction as the outcome, results indicated that the model differed significantly across ED sub-types and was therefore tested separately for each ED sub-type and healthy controls. Results for these individual path-analyses, indicated that whereas perceived influences from the family and the media were directly related to body dissatisfaction in the EDNOS and control sample, verbally abusive parenting styles were shown to have an important direct and indirect effect (through family influences) on body dissatisfaction in the AN-BP and the BN samples, indicating that these socio-family factors seem to act differently across ED sub-types. Each of these findings will be explained in more detail below.

7.1. Whole sample approach using ED sub-types as a categorical outcome

Results from the overall multinomial logistic path model with

ED sub-types (healthy controls as the reference category) as the key outcome, are in line with previous research, which has shown that the three tripartite (family, peer and media) influence variables were directly and indirectly (through body dissatisfaction) related to ED symptomatology (Papp et al., 2013; Rodgers et al., 2015). Accordingly, perceived influences from the family have been shown to foster body dissatisfaction and eating pathology through one or more of the following influences: general negative attitudes toward weight and shape, teasing or negative verbal commentary, encouragement to diet, parental weight loss practices and/or modelling of weight concerns (Bailey & Ricciardelli, 2010; Kluck, 2010; Palfreyman, Haycraft, & Meyer, 2014). Perceived influences of the media have also commonly been found to lead directly to disordered eating symptoms and indirectly through body dissatisfaction (Mabe, Forney, & Keel, 2014; Spettigue & Henderson, 2004). In line with our finding that peer influences revealed a direct effect for individuals presenting mainly with bulimic symptomatology (AN-BP and BN), previous studies have also shown that during adolescence, peers can, through negative comments about one's body, teasing, bullying and even sexual harassment, have direct effects on bulimic symptomatology (Hilbert et al., 2014; Young, McFatter, & Clopton, 2001). It is also possible that youngsters learn how to engage in bulimic behaviours by modelling their peers believing that it would help them to fit in with others expectations of behaviour and body size. Overall, the strength of the direct socio-family influence effects in our model is of particular importance, as it demonstrates the strong and detrimental effects the perceived influences of the family, peers and the media have on subsequent EDs.

The finding that body dissatisfaction had a significant but negative effect on AN-R was unexpected and could be related to the denial of the illness commonly found in AN (Abbate-Daga, Amianto, Delsedime, De-Bacco, & Fassino, 2013) or could be due to the fact that the silhouette technique, used in the current study, assessed cognitive-evaluative dissatisfaction with one's body, but not the perceptual body size distortion, which is another important component of body image assessment (Skrzypek, Wehmeier, & Remschmidt, 2001). Future studies should therefore incorporate measures that can assess self-perceptions, cognitions, affective and behavioural aspects of body dissatisfaction.

7.2. The effect of parental practices

The lack of direct and indirect effects of the perceived maternal and paternal parenting variables in our socio-family model is interesting. These findings therefore only partially support the research indicating a relationship between maladaptive parenting styles and EDs as outlined in a recent review by Tetley et al. (2014), however none of the studies outlined in this review accounted for the tripartite influence effects. From a developmental perspective, it makes sense that parental influences would be especially relevant during early childhood and that by adolescence factors outside the family (e.g. peers and romantic partners) may become more influential. Overall, the mothers had more direct effects than fathers, which could be related to the fact that mothers might have higher levels of communication and intimacy with their children than fathers. The finding that perceived critical mothers were directly related to all ED subdiagnoses is supported by previous studies (Machado et al., 2014). It is possible that these mothers were critical about their child's eating styles and body shape because they themselves suffered from an ED, which is in line with other studies (Allen, Gibson, McLean, Davis, & Byrne, 2014; Micali et al., 2015; White et al., 2014).

7.3. Multi-group approach: differences across ED sub-types

Overall, the results from the separate ED models revealed that whereas a direct relationship was observed for the perceived influences from the family and the media for EDNOS and healthy controls, verbally abusive parenting styles were more pertinent both directly and indirectly (through family influences) in the bulimic (AN-BP and BN) ED sub-types. The current findings are therefore in accordance with previous studies (Hilbert et al., 2014; Jacobi et al., 2004) that have shown that sociocultural and parenting risk factors may operate differently across ED sub-types and are less in accord with the dimension hypothesis (Lavender, Crosby, & Wonderlich, 2013) and the transdiagnostic theory (Fairburn, Cooper, & Shafran, 2003).

It is interesting to note that in both the EDNOS and healthy control sample, perceived influences from the family and the media were significantly associated with body dissatisfaction. It is also worth highlighting that our socio-family model accounted for most of the variance for these two groups (EDNOS: 26%; Controls: 17%). It therefore seems that these factors are non-specific to full-blown EDs and may have a more general effect on body dissatisfaction in subthreshold and community populations as found in previous studies (Rodgers, Chabrol, & Paxton, 2011; Shroff & Thompson, 2006). Our findings also provide evidence that prevention efforts targeted at maladaptive influences from the media and the family are especially important for precluding the progression from subthreshold symptoms to full-blown EDs.

The finding that perceived verbally abusive parenting was related to ED sub-types with mainly bulimic symptoms is in accordance with previous studies (Groleau et al., 2012; Rorty et al., 1994a, 1994b), that found that rates of childhood emotional and physical abuse were associated with subsequent bulimic symptoms. Our observation that perceived verbally abusive parenting by fathers was related to body dissatisfaction may suggest that the daughter–father relationship is becoming more important in the development of ED symptoms and should therefore be targeted in future prevention and treatment programmes for EDs. Future studies should assess how multiple forms of abuse from parents including sexual, physical, emotional and neglect relate to different ED sub-types.

Finally, the finding that none of our socio-family predisposing factors were significantly related to AN-R, is interesting and might

indicate that for this ED sub-type, biological factors such as genes (Helder & Collier, 2011) and/or temperament (Young, Rhodes, Touyz, & Hay, 2013) or more complex interactions between biological and environmental factors (Karwautz et al., 2011) might be more important, however future studies are needed to verify this observation.

8. Limitations of the study

The results of the current study should be interpreted in the context of several important limitations. Primarily, the design was cross-sectional (with retrospective assessments) therefore temporal precedence and causation cannot be established. There may also be recall bias. It should also be noted that the parenting variables were the perception of the participants not the parents themselves. Secondly, it is possible that although we characterised the model as describing the *onset* of EDs, a study involving participants with an established ED might also explore *maintenance* of ED status. Fourthly, our healthy control group was not precisely matched with the ED group as in the majority of cases these were students whereas a proportion of ED cases were young adults. Set against these limitations is the large number of clinical ED cases that were included. Epidemiological samples have better matching but often have fewer cases. Finally, it should also be noted that our model did not include other important factors such as biological (e.g. genetic, epigenetics, biochemistry etc.), or psychological vulnerability (e.g. predisposing personality traits, coping strategies, emotion regulation).

9. Implications and future research

Possible differences in our socio-family model across ED sub-types are interesting from a theoretical perspective, but are also important to better select high-risk individuals for targeted prevention and intervention programs. The findings from our individual socio-family models suggest that interventions aimed at reducing abusive parenting styles may be more beneficial in preventing EDs characterized by mainly bulimic symptomatology. Conversely, a focus on family and media influences may be more broadly relevant in prevention for body dissatisfaction in EDNOS and controls. Future studies should further investigate our socio-family model by including specific ED symptom levels such as restricting, binge-eating/purging, dieting and compulsive exercise of eating problems longitudinally, ranging from symptom onset to the emergence of clinical EDs and maintenance of the disorders. These studies should also focus more on how psychosocial, biological, and developmental variables might influence the risk factors included in our socio-family model. Finally exploration of protective pathways together with risk pathways would allow a better understanding of how EDs develop.

10. Conclusion

To conclude, the current study sought to assess a new socio-family model for EDs in a large case–control sample from four (UK, Spain, Italy and Slovenia) different European countries. Collectively, the current findings build on previous theory and research underscoring the importance of the three influences (family, peer and media) outlined in the tripartite influence model on the onset of clinical ED. Findings from the current study also suggest that the variables included in our socio-family model may operate uniquely for the different ED sub-types, with parental factors being uniquely related to EDs with bulimic characteristics, whereas perceived influences from the family and the media having a broader impact on body dissatisfaction and ED

psychopathology. An enhanced understanding of socio-family ED profiles could help target specific ED sub-types in early intervention. Future studies should further assess the underlying mechanisms driving the relationships of our socio-family model.

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