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Schema Modes, Trauma and Disordered Eating

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Abstract

Maladaptive schema modes may mediate between trauma and disordered eating, however there is little relevant evidence. This study aimed to predict disordered eating from modes, trauma and age & gender. Also, to re-examine the factor structure of the Schema Mode Inventory for Eating Disorders, using an online cross-sectional survey of 612 volunteer participants aged 18 – 65, recruited from online eating disorder support groups, including people with and without diagnosed eating disorders. Measures were sociodemographic variables, the SMI-ED-SF, the Eating Disorder Examination Questionnaire (EDE-Q) and the Trauma History Questionnaire (THQ). Confirmatory factor analysis produced 16 factors similar to the 16 modes. Differences were that Vulnerable Child, Happy Child and Healthy Adult appeared as a one factor, that all ED items appeared as one factor, and that Bully & Attack and Self-Aggrandizer modes appeared combined. In stepwise linear regression, EDE-Q scores was predicted by Total maladaptive mode score (37.3% of variance), Total adaptive mode score (1.5%) variance, Vulnerable Child (2.8%), Detached Self-Soother (1.5%). Other modes accounted for 1% or less of variance. Schema modes predicted EDE-Q, but the stable existence of discrete persona-like modes was less clear. Further research should refine the structure of SMI-ED-SF and relate modes to interpersonal traumas.

Keywords: Schema Modes; Disordered Eating; Trauma; Schema Therapy.

Introduction

Schema Therapy (ST) is increasingly being used for eating disorders (EDs) for two main reasons. First, there is research to support the use of ST in helping individuals with other hard-to-treat psychological disorders, such as Borderline Personality Disorder (BPD) (Bamelis, Evers & Arntz, 2012; Jacob & Arntz, 2013). Moreover, perhaps up to 69% of people with ED also meet criteria for BPD (Blinder, Cumella & Sanathara, 2006).

Second, the underlying theory offers an explanation of how complex and persistent problems such as ED develop following childhood adversity and maltreatment (Young, Klosko & Weishaar, 2003). Schema therapy extends cognitive behavioural therapy by addressing clients' core schemata and modes that underlie their dysfunctional thoughts and behaviours.

Within the theory an Early Maladaptive Schema is "a broad pervasive theme or pattern regarding oneself and one's relationship with others, developed during childhood and elaborated throughout one's lifetime, and dysfunctional to a significant degree" (Young, et al., 2003, p. 7). Schemata can act as psychological action plans that tend to get enacted relatively rapidly and automatically when triggered.

A Schema Mode is a grouping of schemata and coping styles that was functional at some time in the past (Young et al., 2003). Modes have been developed more recently in the theory specifically relating to disordered eating (Simpson, 2012). They are postulated to be automatic ways of coping with circumstances that the person finds challenging. Modes are different ways of being, somewhat akin to Heidegger's phenomenological concept of 'disposedness' to interact with the world in certain skilled ways (Kaufer & Chemero, 2015). However, maladaptive modes are not functional, appear semi-automatically in response to cues learned in the past, and appear even in situations where they are dysfunctional or even dangerous. For example, the 'detached protector' mode may cause the person to detach completely, withdrawing or fleeing, at a difficult moment in a relationship when discussion and engagement are desirable. There are also two functional modes, the 'happy child' and the 'healthy adult'. It is theorised that some people with maladaptive modes have very limited or non-existent functional modes and need to learn these ways of being (Young et al., 2003).

Relationships between eating disorders and schemata/ modes appear complex. People with an ED have more EMS that controls (Jones, Leung & Harris, 2007). Waller et al., (2000) found that binge and purge behaviours in BN were linked to *defectiveness / shame* and

emotional inhibition schemata. People with an ED also score higher than controls on schema modes (Talbot, Smith, Tomkins, Brockman & Simpson, 2015; Voderholzer et al., 2014). Specifically, individuals with ED scored higher on all but two maladaptive modes *Self-Aggrandiser* and *Bully and Attack* and lower on the two healthy modes, *Happy Child* and *Healthy Adult* (Talbot et al., 2015). Masley (2012) found a positive correlation between maladaptive modes and more severe disordered eating with *Detached Self-Soother* and *Vulnerable Child* being most predictive.

A difficulty is that modes and schemata are derived by factor analysis of questionnaires and questions remain about whether the different components are stable, discrete factors, as well as how many factors and modes there are. One study (Simpson et al., 2018) used confirmatory factor analysis and found evidence for 16 factors mapping on to the theorised modes. Another study found fewer, more general, factors (Smith, 2015), suggesting further research is required on the composition of the psychological domain assessed by modes.

Theoretically, maladaptive schemata and modes develop in response to childhood maltreatment (Young et al., 2003). People with EDs often report childhood abuse and maltreatment (Molendijk, Hoek, Brewerton, & Elzinga, 2017; Dancyger, Narayan, & Fornari, 2017; Madowitz, Matheson, & Liang, 2015), which can affect ED symptoms (Thompson & Wonderlich, 2004; Moulton et al., 2015). A systematic review and meta-analysis of 32 studies found that BN and BED were associated with childhood abuse, but the relationship was not consistent for AN (Caslini et al., 2016). Childhood maltreatment often precedes disordered eating (Madowitz, Matheson, & Liang, 2015; Brewerton & Brady, 2014). Meyer & Stanick (2017) found that sexual abuse was a significant predictor of worries relating to food and weight gain. Jenkins, Meyer & Blissett, (2013) found that core beliefs related to EMS, including mistrust, abuse and abandonment were related to childhood abuse and eating attitudes in a student sample. However, Ganis et al., (2003) failed to find such relationships amongst inpatients with ED.

Childhood adversity can be precursor of ED (Johnson, Cohen, Kasen, & Brook et al., 2002b), which can also trigger its onset (Berge, Loth, Hanson, Croll-Lampert, & Neumark-Sztainer, 2012; Degortes et al., 2014). Additionally, women with lifetime BN, BED and AN report high lifetime prevalence of up to 78% of interpersonal trauma

(Mitchell et al., 2012). However, trauma is a non-specific precursor to many other mental health problems (Garland, Pettus-Davis & Howard, 2012; Rajkumar, 2014).

There is also evidence that people who remember being maltreated also have higher scores on schemata and modes. Pilkington, Bishop & Younan (2020), in a systematic review and meta-analysis, also found evidence that various maladaptive schemata were correlated with childhood abuse and neglect, although some correlations were small and there was only one longitudinal study in the analysis. Emotional deprivation appeared to be most strongly related to abuse and neglect. Higher levels of EMS may also be found in people who have experienced interpersonal trauma (Karatzias, Jowett, Begley & Deas, 2016). A difficulty is that some potentially traumatic and mode developing events are dependent on subjective (often retrospective) interpretation, which may be biased by the respondent's current psychological condition, including bullying, neglect, emotional abuse and interpersonal invalidation. Therefore, the study reported here focussed on traumas with less possibility of such bias, such as being victim of a crime, seeing a dead body other than at a funeral, or having sex without consent.

As childhood maltreatment is often related to parenting, there is also research on participants' perceptions of parenting. Deas (2010) found that compared to controls, individuals with AN had higher EMS scores and viewed their parents as more controlling and less caring. Being controlling and not caring about the child's wishes could systemically be a result of AN, as the parents try and get the child to eat. Nonetheless, emotional abuse and invalidation experiences from parents have been linked to ED (Ford, Waller & Mountford, 2010; Waller, Corstorphine & Mountford, 2007). Furthermore, Sheffield, Waller, Emanuelli, Murray & Meyer (2009) found that in clinical ED and non-clinical samples, perceptions of parenting are predictive of ED symptoms, which are in turn accounted for by the presence of specific schemata. Maladaptive modes are also related in complex ways to how people with eating disorders retrospectively perceive their parenting (Brown, Selth, Stretton & Simpson, 2016).

Study aims

There is need for a better understanding of how maladaptive modes, trauma and ED relate, which was the aim of the present study. On the basis of the research reviewed above, trauma should be related to ED score severity, as should maladaptive mode scores, although it is not possible to specify precisely which maladaptive modes are related to EDs. Moreover, healthy

mode scores should be inversely related to ED score severity, again without it being possible to predict the precise pattern. The study will also investigate the relative extent to which trauma and SMI-ED-SF scores together predict ED scores, and will check the validity of the 16 separate mode factors, as it has not yet been established that these are stable across different studies.

The study recruited people from online eating disorder support groups. It aimed to examine the relationships between disordered eating, past trauma and maladaptive modes all measured by online questionnaire, attempting to predict disordered eating scores from modes and trauma scores plus age and gender variables. The study also aimed to re-examine the factor structure of the schema mode questionnaire.

Hypotheses

First, it was hypothesised that disordered eating will be predicted by higher trauma scores. Second, that the factor structure of the SMI-ED-SF will be approximately 16 factors similar in content to the 16 theoretical modes. Third, that disordered eating will be predicted by maladaptive mode scores. Fourth, that disordered eating will be negatively predicted by healthy mode scores.

Method

Design

An online survey using questionnaires to measure self-reported trauma, maladaptive modes and disordered eating, plus age, gender and self-reported body mass index (BMI). A sample size calculation completed using G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009) suggested that a minimum sample of 41 was needed to detect expected effects with an effect size $f^2 = .8$, power of 80% and a significance level of 5% for multiple regression analysis.

Participants

Recruitment was online through specialist eating disorder support groups on Facebook. Inclusion criteria required participants to be aged 18-65 years. A total of 671 were recruited, but 59 were removed from the data due to being outside of the age range or for having incomplete data, so 612 were used for data analysis. Participants were 13.9% male ($n = 85$), 84.5% female ($n = 517$) and 1.6% other gender ($n = 10$). The mean age was 27.2 (SD = 8.43).

Questionnaires

Questionnaires were completed online using [onlinesurveys.ac.uk](https://www.onlinesurveys.ac.uk), following the paper layouts. The online questionnaire included self-reported age, gender, height and weight. Participants were also asked if they had ever received a diagnosis for an eating disorder and, if so, to state what this was.

Also, the Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994) which has satisfactory psychometric properties regarding disordered eating (Peterson et al., 2007) and moderate to strong positive correlations with the Eating Disorder Examination structured interview (Berg, Peterson & Frazer et al., 2011). It showed good internal consistency with Cronbach's Alpha $\alpha = .965$ in the present sample. Fairburn & Beglin's (1994) cut-off score of 4 or more was used to indicate disordered eating.

Additionally, the Schema Mode Inventory for Eating Disorders (Short Form) (SMI-ED-SF; Simpson et al., 2018; Pietrabissa et al., 2019) measures schema modes for disordered eating specifically. It is a 64-item tool with 6-point Likert scales (0 = never or almost never; 5 = always). It assesses 16 schema modes: Vulnerable Child; Angry Child; Enraged Child; Impulsive Child; Undisciplined Child; Happy Child; Punitive Mode; Demanding Mode; Healthy Adult; Compliant Surrender; Detached Protector; Detached Self Soother; Self Aggrandiser; Bully-Attack; Helpless Surrender; Eating Disorder Over-Controller. This measure has been validated in Italian (Pietrabissa et al., 2019) and English (Tait, Duffy, Gillanders & Simpson, 2019). The SMI-ED-SF showed good internal consistency with Cronbach's Alpha $\alpha = .940$ in this sample.

Finally, the Trauma History Questionnaire (THQ) which aims to measure previous experiences of trauma in a comprehensive and explicit manner. It is a 24-item measure that assesses 3 categories of trauma, including Physical and Sexual Experiences (6 items), General Disaster and Trauma (13 items), Crime Related Experiences (4 items), plus a write-in item for any other types of trauma. Answers are in a yes/no format with subsequent questions asking about the frequency and age of the event. The THQ has shown good psychometric properties in clinical and non-clinical samples, including test-retest reliability and inter-rater reliability, although, according to the authors, because it is not a scale in the traditional sense, internal validity and reliability statistics are not available (Hooper, Stockton & Krupnick et al., 2011). Nonetheless, in the present sample the THQ demonstrated an acceptable internal consistency with Cronbach's Alpha $\alpha = .720$.

Ethics

Ethical approval was granted by the Faculty of Health Sciences Research Ethics Committee at the University of Hull which accords with the Declaration of Helsinki.

Procedure

Potential participants were contacted through adverts on online support groups for eating disorders. Adverts contained a URL link to questionnaire pack and brief information about the study. Completing the questionnaires took approximately 15 minutes. The survey was available from 4th June, 2019 to 15th June, 2019.

Data analysis

Statistical analyses used SPSS for Macintosh 25.0 & 27.0 (IBM Corp, 2017/2020). Data were screened to ensure that the assumptions of multiple regression and factor analysis were met. This involved multicollinearity, homoscedasticity, independence of residuals through Durbin-Watson tests and assessment of histograms and skewness and kurtosis to ensure normal distribution. These assumptions were not violated. After considering various approaches, confirmatory principal components factor analysis with varimax rotation was conducted, forcing 16 factors to align with the 16 theoretical modes. Other methods that did not force a set number of factors tended towards solutions that did not extract 16 factors but rather a smaller number of larger factors.

Results

Table 1 shows the number of participants who reported having had an ED diagnosis and how many met EDE-Q criteria for disordered eating. In this sample 83.1% surpassed the cut-off, compared to 5% in the general population (Aardoom, Dingemans, Slof, Landt, Van Furth, 2012). It was decided to use the cut-off rather than the self-reported diagnosis in further analyses because the diagnosis might not be current and not all participants would have been diagnosed.

****Insert Table 1 about here

Table 2 shows the scores for all variables from the disordered eating and non-disordered eating groups. All variables were significantly different between the two groups, except BMI. Unexpectedly, the non-disordered eating group had a significantly higher THQ score than the disordered eating group.

****Insert Table 2 about here

Trauma

The mean total number of different types of event reported was 19.7/24 (Range 5-24). Only 10% of the sample scored 15 or less out of 24. For General Disaster and Trauma the mean number was 11.6/14 (Range 0-12), for Physical and Sexual Experiences it was 4.71/6 (Range 1-6) and for Crime Related Experiences it was 3.41/4 (Range 0-4). Because bingeing is known to be associated with prior trauma, the sample were divided into 292 who reported bingeing at least once in the past 28 days and 320 who did not. However, neither total nor subscale trauma scores differed significantly between these groups by one-way ANOVA so bingeing was not considered in subsequent analyses as a variable separate from disordered eating in general.

First order correlations

Correlations were conducted to assess how the predictor variables were related to the independent variable. None of the correlations reached the .80 threshold, therefore the assumption of multicollinearity was not violated. As can be seen in Table 3, the maladaptive modes were significantly, positively correlated with the EDE-Q scores. The EDE-Q was only negatively correlated with the two healthy modes; Happy Child ($r_s = -.560, p < .001$) and Healthy Adult ($r_s = -.513, p < .001$). The THQ was only negatively correlated with the two healthy modes; Healthy Adult ($r_s = -.136, p < .001$) and Happy Child ($r_s = -.167, p < .001$). The EDE-Q was modestly positively correlated with total THQ, as shown in Table 3. Regarding the THQ subdomains, the EDE-Q was positively correlated with Crime-Related Events ($r_s = .109, p < .01$), and negatively correlated with both General Disaster and Trauma ($r_s = -.110, p < .01$) and Physical and Sexual Experiences ($r_s = -.293, p < .001$). Apart from the Undisciplined Child, all maladaptive modes were positively correlated with each other, many > 0.4 , which raises a question about the independence of the modes.

****Insert Table 3 about here

Factor analysis of the SMI-ED-SF

Confirmatory principal components factor analysis was conducted on the SMI-ED-SF, forcing 16 factors. Table 4 shows the rotated factor matrix. Although many of the modes appeared as distinct factors, there were important differences from schema mode theory. First, items assessing Healthy Adult, Happy Child and Vulnerable Child all loaded on a

single factor (1), rather than these modes emerging as discrete factors. Second, all items referring to disordered eating loaded on a single factor (2), including items intended to measure other modes. Third, Self-Aggrandizer and Bully and Attack did not emerge as discrete factors, but rather overlapped with each other (4). Fourth, although Detached Self-Soother emerged as a factor (13), using eating behaviours to self-soothe was more related to disordered eating (2). Fifth, because 16 factors were forced, but factor 1 contained three modes, the final three factors (14-16) load predominantly on single items.

****Insert Table 4 about here

Consequently, it was decided to attempt to predict disordered eating from the original theoretical modes. However, because there was a strong factor 1 combining Healthy Adult, Happy Child and Vulnerable Child, variables were also created using the mean of SMI-ED-SF scores for all maladaptive modes summed, except Eating Disorder Over-Controller as questions are too closely related to the EDE-Q questions, and the sum of the two functional modes (Healthy Adult and Happy Child).

Given that factor 2 loaded highly on all disordered eating items, it was possible that this factor was highly related to EDE-Q scores. As shown in Table 3, Eating Disorder Over-Controller scores correlated with EDE-Q total ($r_s = 0.695$, $p < 0.001$). The items loading > 0.4 on factor 2 (Eating Disorder Over-Controller plus additional items) were also all correlated > 0.7 with EDE-Q. It should also be noted that in this sample the EDE-Q subscales and total all correlated highly (> 0.6) with each other.

Predicting disordered eating scores

Linear regression to predict EDE-Q scores was conducted with the following model, within each of 4 blocks variables were entered stepwise. 1. Age and gender. 2. THQ total score plus the three subscales. 3. Total maladaptive mode score and total functional mode score. 4. Individual maladaptive mode scores. All mode measures excluded items specifically referring to disordered eating and the Eating Disorder Over-Controller mode was not included, as these items overlap substantially with the EDE-Q.

The final model predicted 67% of EDE-Q variance and included the following variables (in order of entry with R^2 change in brackets): Gender (0.066); Age (0.039); THQ Physical and Sexual Experiences (0.067); THQ Crime Related Experiences (0.013); Maladaptive mode score (0.373); Happy Mode score (0.015); Vulnerable Child (0.028); Detached Self-Soother (0.015). As shown in Table 5., the following modes contributed 1% or less of

variance: Bully & Attack; Helpless Surrenderer; Enraged Child; Detached Protector; Punitive Mode; Angry Child; Undisciplined Child; Compliant Surrenderer; Demanding Mode; Impulsive Child.

****Insert Table 5 about here

Because the individual modes predicted some variance in disordered eating scores even when including total maladaptive and functional mode scores, it was possible that in a model excluding them the individual modes might be able to predict EDE-Q. Therefore, a second linear regression model was run, which was the same as that described above, but removing the total maladaptive and functional mode scores. This model included the following variables (in order of entry with R^2 change in brackets): Gender (0.070); Age (0.043); THQ Physical and Sexual Experiences (0.066); THQ Crime (0.013); Vulnerable Child (0.364); Detached Self-Soother (0.050); Demanding Mode (0.010); Impulsive Child (0.004); Compliant Surrenderer (0.005). This model predicted 62% of the variance in EDE-Q scores.

It was also possible that the THQ scores accounted for variance that could also be predicted by modes. Moreover, the relationship between trauma and disordered eating was the opposite of that expected in this sample, so a third stepwise regression was conducted this time only using age and gender as control variables in block 1 and all the mode scores in block 2. This made little difference to the results except that the amount of variance explained by Vulnerable Child mode increased: Gender (0.071); Age (0.042); Vulnerable Child (0.434); Detached Self-Soother (0.055); Then Demanding Mode, Happy Adult, Impulsive Child, Bully and Attack, Self-Aggrandizer, Compliant Surrenderer and Helpless Surrenderer all accounting for 1% or less of variance. Referring back to Table 3., it can be seen that Vulnerable Child scores were highly correlated with most of the other mode scores. The second and third regression results are available in the supplementary file.

Discussion

EDE-Q scores could be well predicted from THQ scores and SMI-ED-SF, with the latter contributing more variance. This supports hypothesis 1, that trauma predicts disordered eating. However, with hindsight it would have been better to measure childhood maltreatment, including bullying, neglect, interpersonal invalidation and emotional abuse, rather than overt trauma.

SMI-ED-SF, excluding Eating Disorder Over-Controller, predicted substantial variance in EDE-Q scores, even when THQ scores were entered first, suggesting that schema modes are

more than the product of prior trauma as measured by the THQ. Confirmatory factor analysis confirmed the existence of many of the 16 modes, but major differences were that Vulnerable Child, Happy Child and Healthy Adult appeared as a single factor, that all disordered eating items appeared as one factor, and that the Bully and Attack and Self-Aggrandizer modes appeared combined.

Theoretically, maladaptive modes can initially be functional methods of coping with difficult situations, especially interpersonal ones (Young et al., 2003; Simpson, 2012). However, the domain of trauma assessed by the THQ may not cover the full range of life difficulties that can develop maladaptive modes, and further research should also use other forms of assessment. The THQ includes general, but rare, traumatic events such as general disasters, robbery and rape however it does not measure less overt interpersonal traumas such as bullying, neglect, emotional abuse and interpersonal invalidation, which are related to EMS (Karatzias et al., 2016) and disordered eating (Mitchell et al., 2012). These types of issue may shape maladaptive mode formation and therefore mental health difficulties (Harding et al., 2012; Lobbestael et al., 2005).

An unanticipated finding was the high level of reported trauma, with 90% reporting 16/24 or higher numbers of different type of trauma. The THQ does not provide norms or cut-offs, but this seems substantial and is a potential source of bias in this study. A related issue was that some THQ scores were higher amongst participants who did not meet the criteria for disordered eating. As well as people with eating disorders, a volunteer sample recruited via online support groups for eating disorders may have contained some people who were recovering from an ED, sometimes without ever having a diagnosis, and hence had lower EDE-Q scores than they might have in the past and also some with other mental health issues that they felt were relevant to ED, such as past experience of trauma with some eating issues, but without meeting full criteria for an eating disorder diagnosis.

Another difference from most previous relevant research was that 60% of the sample had not received a diagnosis of ED at any point. It is therefore possible that the relatively weak effects of trauma in predicting EDE-Q scores were due to sampling bias, as the majority of the sample reported multiple traumas, whether or not they met cut-offs for ED caseness. Despite these limitations, the SMI-ED-SF could discriminate participants who surpassed the EDE-Q cut off from those who did not.

This suggests that the mode questionnaire measures a valuable domain of psychopathology relative to ED. However, the present findings suggest that people's problems within that domain do not cluster fully into the theoretically proposed modes, as was also found by Smith (2015). Hypothesis 2 was partially supported, but further refinement of schema mode theory may be required. One area for exploration is the extent to which Happy Child and Healthy Adult simply measure general psychological wellbeing and represent the opposite of Vulnerable Child, rather than being different modes.

Nonetheless, the total maladaptive mode score was the largest predictor of disordered eating (37% of variance) which supports hypothesis 3. In contrast total functional mode score accounted for only 1.5% of the variance in disordered eating, which only weakly supports hypothesis 4, that lack of functional modes should predict disordered eating. However, this finding should be interpreted with caution, because functional modes loaded negatively on the same factor as Vulnerable Child mode, suggesting that they are opposite ends of a continuum rather than discrete modes or factors; low Vulnerable Child scores were related to high Happy Child and Healthy Adult scores.

It was also of interest that EDE-Q scores, as measured by SMI-ED-SF, were highly correlated with EDE-Q scores, which applied to Eating Disorder Over-Controller mode scores and even more so to that combined with the other disordered eating relevant items from elsewhere in SMI-ED-SF. This implies that SMI-ED-SF itself adequately measures ED issues and that it may not always be necessary also to assess disordered eating with another questionnaire.

Various specific modes predicted small amounts of additional variance, including all four maladaptive child modes, but, overall, the total maladaptive mode score was a better predictor than individual modes. In a second regression analysis using only the individual modes to predict EDE-Q scores, by far the best predictor was the Vulnerable Child mode (36% of variance), which was negatively correlated with functional modes, with the Detached self-soother accounting for another 5% of variance. Like the previous analysis, this also suggests the need to further refine the 16 theoretical modes.

This study had a number of limitations. First, with hindsight the THQ may not assess the full range of life difficulties that might develop maladaptive modes. Second, the study used a non-clinical volunteer sample, which makes it difficult to compare to clinical samples, or to the general population. The sample appeared to have experienced more trauma than would be

expected. Modes may possibly be more distinct in clinical ED populations. Third, the study was cross-sectional and retrospective.

Nonetheless, the domain of dysfunction measured by the SMI-ED-SF strongly predicted disordered eating, even after controlling for overt trauma, but the theoretical modes did not map perfectly onto how people answered the questions and specific modes did not emerge as strong predictors of disordered eating after controlling for general maladaptiveness. Some modes may be taxonomic descriptions of common dysfunctional behaviour patterns, rather than being phenomenologically distinct modes of being. The mode that seemed to have the most phenomenological reality for this sample was the Vulnerable Child, although other mode scores did predict small, but significant, amounts of variance.

Conclusion

Trauma did not well predict ED in this sample, but this was probably due in part to sampling bias. Moreover, with hindsight it would have been better to assess childhood maltreatment as well as overt trauma. The SMI-ED-SF could predict EDE-Q scores quite well and confirmatory factor analysis confirmed many discrete modes, although further work is required to establish how modes are structured, especially regarding the relationships between Vulnerable Child, Happy Child and Healthy Adult. Nonetheless, the SMI-ED-SF taps into an important domain of psychological concerns relevant to eating disorders which deserves further research.

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Table 1. Eating Disorder Examination Questionnaire criteria for eating disorders compared with reported diagnoses of eating disorders. Raw numbers are shown.

		By EDE-Q cut off of 4 or more		
		Disordered	Not disordered	Total
ED diagnosis Reported	Yes	9	239	248
	No	94	270	364
Total		103	509	612

Table 2. Means and standard deviations for key variables by EDE-Q disordered eating group.

	Disordered eating (n=103) Mean (SD)	No disordered eating (n=509) Mean (SD)	Total (n=612) t	Mean (SD)	p	95% CI of difference
BMI	24.87 (5.98)	25.40 (8.55)	-.604	25.31 (8.17)	.546	-1.917 – .849
EDE-Q	2.84 (.60)	9.44 (2.54)	-26.26	8.33 (3.39)	<.001	-6.856 – 6.356
THQ	3.06 (2.73)	4.56 (3.23)	-4.41	4.31 (3.19)	<.001	.839 – 2.177
<u>SMI-ED-SF:</u>						
Vulnerable Child	8 (3.02)	15.43 (4.36)	-16.51	14.18 (5.00)	<.001	-8.125 – 6.727
Angry Child	6.89 (2.95)	12.18 (5.29)	-9.34	11.29 (5.35)	<.001	-6.023 – 4.552
Enraged Child	6.12 (2.22)	11.20 (4.97)	-4.85	7.87 (4.09)	<.001	-2.676 – 1.535
Impulsive Child	7.42 (2.81)	11.20 (4.97)	-7.49	10.57 (4.88)	<.001	-4.483 – -3.091
Undisciplined Child	8.89 (3.23)	11.70 (4.73)	-5.75	11.22 (4.63)	<.001	-3.554 – -2.051
Happy Child	18.03 (3.78)	12.19 (4.76)	12.25	13.18 (4.92)	<.001	4.999 – 6.670
Healthy Adult	18.17 (3.60)	13.37 (4.06)	11.16	14.18 (4.37)	<.001	4.020 – 5.591
Demanding Mode	10.56 (3.59)	16.80 (4.80)	-12.60	15.75 (5.14)	<.001	-7.049 – -5.424
Compliant Surrender	12.20 (3.49)	16.74 (4.60)	-9.52	15.97 (4.72)	<.001	-5.321 – -3.745
Detached Protector	8.22 (3.18)	14.18 (4.83)	-12.08	13.17 (5.12)	<.001	-6.755 – -5.253
Detached Self-Soother	8.98 (3.29)	16.36 (4.48)	-15.87	15.12 (5.11)	<.001	-8.132 – -6.629
Self-Aggrandizer	8.73 (2.94)	12.64 (4.48)	-8.62	11.98 (4.51)	<.001	-4.662 – -3.271
Bully & Attack	6.19 (3.63)	8.28 (4.18)	-6.07	7.83 (4.05)	<.001	-3.173 – -1.990
Helpless Surrender	9.63 (3.85)	14.70 (4.88)	-9.94	13.85 (5.08)	<.001	-5.930 – -4.206

Eating Disorder Over-controller	6.19 (3.63)	15.82 (6.32)	-14.99	14.19 (6.96)	<.001	-10.533 – -8.748
Punitive mode	5.75 (2.67)	11.89 (5.61)	-10.88	10.86 (5.71)	<.001	-6.862 – -5.439

Table 3. *Correlations (Spearman's rho) between measures.*

	THQ	EDE-Q	VC	AC	EC	IC	UC	HC	PM	DM	HA	CS	DP	DS	SA	BA	HS
THQ																	
EDE-Q	.173**																
VC	.169**	.715**															
AC	.273**	.436**	.570**														
EC	.185**	.215**	.296**	.631**													
IC	.196**	.449**	.477**	.512**	.516**												
UC	.073	.336**	.387**	.415**	.363**	.586**											
HC	-.167**	-.560**	-.719**	-.456**	-.215**	-.341**	-.317**										
PM	.201**	.595**	.722**	.511**	.286**	.435**	.362**	-.604**									
DM	.163**	.549**	.560**	.400**	.214**	.291**	.116**	-.374**	.602**								
HA	-.136**	-.513**	-.623**	-.410**	-.214**	-.374**	-.353**	.760**	-.625**	-.311**							
CS	.192**	.471**	.494**	.260**	.035	.210**	.267**	-.413**	.519**	.451**	-.461**						
DP	.208**	.555**	.730**	.500**	.275**	.395**	.383**	-.700**	.668**	.489**	-.624**	.479**					
DS	.277**	.641**	.656**	.507**	.308**	.455**	.338**	-.540**	.585**	.621**	-.442**	.469**	.626**				
SA	.099*	.403**	.418**	.443**	.366**	.384**	.283**	-.258**	.360**	.500**	-.231**	.128**	.376**	.441**			
BA	.112**	.250**	.324**	.461**	.422**	.405**	.300**	-.275**	.299**	.336**	-.230**	.055	.374**	.349**	.665**		
HS	.086*	.433**	.580**	.561**	.347**	.438**	.513**	-.450**	.481**	.383**	-.427**	.371**	.502**	.529**	.494**	.446**	
ED	.162**	.695**	.628**	.412**	.244**	.429**	.252**	-.414**	.596**	.624**	-.378**	.448**	.495**	.634**	.461**	.342**	.446**

Note: ** $p < 0.01$; * $p < 0.05$. THQ = Trauma History Questionnaire; EDE-Q = Eating Disorder Examination Questionnaire; VC; Vulnerable Child, AC; Angry Child, EC; Enraged Child, IC; Impulsive Child, UC; Undisciplined Child, HC; Happy Child, PM; Punitive Mode, DM; Demanding Mode, HA = Happy Adult, CS = Compliant Surrender, DP = Detached Protector, DS = Detached Self-Soother, SA = Self-Aggrandizer, BA= Bully and Attack, HS = Helpless Surrender, ED = Eating Disorder Overcontroller.

Table 4: Rotated component matrix after confirmatory factor analysis of the Schema Mode Inventory for Eating Disorders, forcing 16 factors. Loadings <0.2 are shown in blue. Highest loading for each item is shown bold. Factors 1,2,14,15 and 16 do not correspond to individual modes.

Item	Mode	Unhappy'	Eating Disorder	Enraged Child	Self-aggrandiser/ Bully & attack	Punitive mode	Undisciplined Child	Impulsive child	Compliant Surrenderer	Helpless Surrenderer	Angry Child	Detached Protector	Demanding mode	Detached self-soother	Critical of others'	Different Rules'	Lonely'
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
I feel lonely	VC	0.565	0.251	0.036	0.044	0.2	0.083	0.058	0.081	0.241	0.102	0.252	-0.035	0.032	0.066	-0.109	0.413
If I lose control of my eating I feel unsafe	VC	0.282	0.657	0.088	0.011	0.172	-0.02	0.21	0.106	0.075	0.16	0.108	0.034	0.12	0.14	0.017	0.122
I feel lost	VC	0.559	0.253	0.098	0.028	0.243	0.179	0.109	0.081	0.212	0.19	0.278	0.009	0.099	0.156	-0.014	0.254
I feel weak and helpless	VC	0.498	0.309	0.147	-0.007	0.284	0.157	0.175	0.105	0.288	0.13	0.221	0.009	0.03	0.148	-0.057	0.216
I have a lot of anger inside of me that I can only soothe through my eating behaviours (e.g. restriction, bingeing, purging, exercising)	AC	0.254	0.411	0.282	0.083	0.131	0.189	0.143	0.022	0.106	0.492	0.086	0.092	0.166	0.056	0.075	0.012
I feel like telling people off for the way they have treated me	AC	0.125	0.069	0.256	0.173	0.097	0.095	0.115	0.003	0.181	0.764	0.069	0.055	-0.027	0.034	-0.034	0.015
I have a lot of anger built up inside of me that I need to let out	AC	0.25	0.153	0.342	0.146	0.122	0.139	0.108	0.045	0.143	0.699	0.132	0.072	0.127	0.014	0.038	-0.023
I feel like lashing out or hurting someone for what he/she did to me	AC	0.137	0.099	0.497	0.235	0.144	0.111	0.097	0.041	0.138	0.55	0.03	0.015	-0.021	0.116	0.062	0.036
I destroy things when I'm angry	EC	0.052	0.116	0.801	0.105	0.136	0.126	0.063	0.01	0.058	0.023	0.022	0.024	0.085	-0.126	0.008	0.006

I have rage outbursts	EC	0.073	0.098	0.852	0.119	0.029	0.074	0.173	-0.025	0.018	0.204	0.022	-0.014	0.04	0.089	0.012	- 0.014
My anger gets out of control	EC	0.134	0.119	0.813	0.125	0.046	0.076	0.186	-0.024	0.022	0.222	0.053	-0.013	0.005	0.104	0.039	- 0.002
I have been so angry that I emotionally hurt others (e.g. by shouting at him/her)	EC	0.034	0.069	0.704	0.201	0.048	0.112	0.258	-0.047	0.106	0.211	0.065	0.082	0.04	0.087	-0.001	0.042
I say what I feel or do things impulsively, without thinking of the consequences	IC	0.113	0.172	0.356	0.164	0.136	0.182	0.714	-0.014	0.081	0.044	0.079	-0.036	0.055	0.109	-0.036	- 0.015
It feels impossible for me to control my impulses	IC	0.233	0.291	0.218	0.069	0.077	0.244	0.678	0.046	0.126	0.156	0.112	0.042	0.117	0.056	0.026	- 0.056
I act first and think later	IC	0.157	0.172	0.231	0.101	0.124	0.238	0.807	0.034	0.061	0.066	0.027	0.012	0.025	0.083	0.03	0.015
If I feel the urge to do something, I just do it	IC	0.06	0.17	0.119	0.146	0.064	0.261	0.81	0.071	0.027	0.097	0.013	-0.006	0.046	-0.077	0.072	0.037
I don't discipline myself to complete routine or boring tasks	UC	0.087	0.016	0.072	0.099	0.003	0.826	0.218	0.063	0.044	0.034	0.079	-0.031	-0.051	-0.033	-0.024	- 0.007
I can't bring myself to do things that I find unpleasant, even if I know it is for my own good	UC	0.164	0.111	0.133	0.091	0.094	0.787	0.181	0.128	0.116	0.066	0.036	-0.098	0.057	-0.021	-0.016	0.031
It's not worth the effort to plan how you'll handle situations	UC	0.081	-0.001	0.19	0.081	0.127	0.635	0.218	0.006	0.059	0.153	0.038	-0.071	0.053	-0.05	0.278	0.198
If I can't reach a goal, I become easily frustrated and give up	UC	0.201	0.134	0.099	0.057	0.129	0.643	0.182	0.117	0.214	0.112	0.056	-0.019	0.078	0.184	-0.049	- 0.112
I feel loved and accepted	HC	-0.755	-0.171	-0.103	-0.156	-0.178	-0.025	-0.067	-0.056	-0.011	-0.1	-0.21	0.008	-0.113	0.015	0.009	- 0.112
I feel at peace on my own	HC	-0.744	-0.173	-0.021	-0.113	-0.049	-0.102	-0.064	-0.077	-0.146	- 0.017	0.136	-0.091	-0.072	0.091	0.165	- 0.173
I feel content and at ease	HC	-0.815	-0.242	-0.059	-0.038	-0.101	-0.114	-0.028	-0.112	-0.113	- 0.105	-0.078	-0.004	-0.098	0.026	0.001	- 0.124
I feel connected to other people	HC	-0.735	-0.103	-0.04	-0.131	-0.055	-0.009	-0.038	-0.08	0.022	- 0.117	-0.406	0.006	-0.141	0.025	-0.018	- 0.014

I don't deserve anything that gives me pleasure (e.g. eating, play, nurturance)	PM	0.344	0.337	0.038	0.06	0.643	0.157	0.137	0.149	0.045	0.114	0.16	0.132	0.025	-0.085	-0.069	0.076
I'm a bad person	PM	0.358	0.223	0.159	0.083	0.688	0.115	0.142	0.127	0.156	0.055	0.096	0.043	0.089	0.093	0.068	-0.072
I don't allow myself to do pleasurable things that other people do because I'm bad	PM	0.305	0.324	0.122	0.055	0.746	0.093	0.114	0.138	0.058	0.148	0.105	0.109	0.04	0.012	0.043	0.024
I deny myself pleasure because I don't deserve it	PM	0.297	0.35	0.107	0.067	0.727	0.081	0.072	0.157	0.064	0.105	0.121	0.112	0.037	-0.046	0.02	0.058
I demand high standards of my body to avoid being judged	DM	0.197	0.585	0.09	0.117	0.213	0.059	0.058	0.222	0.019	0.071	-0.014	0.243	0.139	0.187	0.187	0.262
I sacrifice pleasure, health, or happiness to meet my own standards	DM	0.263	0.555	0.058	0.149	0.342	0.025	0.114	0.159	-0.008	0.085	0.073	0.319	0.174	0.073	0.166	0.214
My life revolves around getting things done and doing them right	DM	-0.008	0.243	-0.001	0.143	0.086	-0.218	-0.007	0.075	0.031	0.069	0.043	0.819	0.079	0.019	0.074	0.057
I know that there is a 'right' and a 'wrong' way to do things; I try hard to do things the right way, or else I start criticising myself	DM	0.025	0.262	0.055	0.077	0.148	0.026	-0.013	0.17	0.094	0.057	0.121	0.764	0.154	0.147	-0.144	-0.074
I feel that I am basically a good person	HA	-0.651	-0.122	-0.128	-0.124	-0.442	0.015	-0.118	-0.058	-0.029	-0.037	-0.014	0.07	-0.072	-0.019	-0.119	0.227
I assert what I need without going overboard	HA	-0.666	-0.076	-0.055	-0.048	-0.121	0.031	-0.133	-0.249	-0.038	0.078	0.053	0.022	-0.003	-0.041	-0.006	0.364
I have a good sense of who I am and what I need to make myself happy	HA	-0.776	-0.145	-0.02	0.019	-0.166	-0.147	-0.085	-0.178	-0.073	0.016	-0.042	-0.036	-0.039	-0.018	0.005	0.097
I feel able to learn, grow and change	HA	-0.663	-0.126	-0.075	0.014	-0.057	-0.261	-0.069	-0.088	-0.011	0.123	-0.094	-0.009	0.103	-0.11	-0.27	0.188

I let other people get their own way instead of expressing my own needs	CS	0.161	0.108	-0.031	-0.095	0.057	0.03	0.034	0.812	0.088	0.045	0.121	0.092	-0.012	-0.14	0.042	0.026
In relationships, I let the other person have the upper hand	CS	0.158	0.159	-0.026	-0.08	0.124	0.088	0.06	0.799	0.019	0.025	0.069	0.052	0.026	0.056	-0.05	-
I try very hard to please other people in order to avoid conflict, confrontation or rejection	CS	0.159	0.195	-0.031	-0.056	0.052	0.107	-0.008	0.798	0.132	-	0.007	0.052	0.111	-0.001	-0.012	0.004
In relationships, I have to give more to compensate for my lack of worth	CS	0.312	0.307	0.048	0.02	0.351	0.1	0.035	0.597	0.08	0.057	0.131	0.048	0.139	0.108	-0.047	0
I feel distant from other people	DP	0.497	0.236	0.048	0.12	0.155	0.077	0.053	0.179	0.087	0.152	0.586	0.036	0.13	0.09	-0.037	0.049
If people try to come too close I keep them at a distance	DP	0.283	0.211	0.077	0.223	0.151	0.069	0.099	0.175	-0.031	0.1	0.643	0.107	0.138	0.007	0.059	-
I feel detached (no contact with myself, my emotions or other people)	DP	0.481	0.205	0.095	0.136	0.186	0.154	0.074	0.129	0.163	0.05	0.581	0.133	0.091	0.038	0.108	0.078
I don't care about anything; nothing matters to me	DP	0.459	0.18	0.129	0.128	0.29	0.174	0.081	0.066	0.131	0.06	0.447	0.091	0.028	-0.049	0.198	0.098
My eating behaviours (i.e. restriction, bingeing, purging, exercising) help me to detach from difficult emotions	DSS	0.317	0.583	0.107	0.077	0.153	0.146	0.146	0.078	0.137	0.163	0.23	0.125	0.26	0.064	-0.02	-
I like doing something exciting or soothing to avoid my feelings (e.g. working, gambling, eating, exercise, shopping, sexual activities, watching TV)	DSS	0.214	0.29	0.115	0.103	0.055	0.254	0.133	0.148	0.099	0.112	0.162	0.032	0.626	0.1	-0.197	-

I work or play sports intensively so that I don't have to think about upsetting things	DSS	0.12	0.23	0.107	0.123	0.058	-0.116	0.069	0.072	0.011	-0.011	0.082	0.239	0.733	-0.059	0.281	0.08
I want to distract myself from upsetting thoughts and feelings	DSS	0.349	0.304	0.026	0.044	0.167	0.134	0.095	0.133	0.339	0.1	0.142	0.1	0.524	0.116	-0.128	-0.011
I'm quite critical of other people	SA	0.024	0.104	0.094	0.416	-0.018	-0.003	0.08	-0.008	0.12	0.125	0.071	0.121	0.038	0.712	0.098	-0.02
I feel I shouldn't have to follow the same rules that other people do	SA	-0.039	0.178	0.059	0.394	0.087	0.189	0.111	-0.136	0.154	0.043	0.196	-0.101	0.09	0.174	0.546	-0.035
Thinness is a way in which I can be better than others	SA	0.193	0.616	0.13	0.289	0.093	0.079	0.045	0.125	0.061	0.053	-0.084	0.111	0.032	0.29	0.204	0.176
I'm demanding of other people	SA	-0.006	0.04	0.159	0.56	0.009	0.074	0.081	-0.153	0.166	0.002	-0.051	0.213	0.035	0.474	-0.01	0.09
By dominating other people, nothing can happen to you	BA	0.119	0.166	0.137	0.786	0.05	0.072	0.085	-0.1	0.044	0.102	0.015	0.111	0.066	0.032	0.019	-0.056
I belittle others	BA	0.09	0.034	0.216	0.666	-0.002	0.09	0.069	-0.133	0.126	-0.094	0.154	-0.053	0.013	0.242	-0.008	-0.018
If you don't dominate other people, they will dominate you	BA	0.119	0.109	0.098	0.809	0.085	0.067	0.1	-0.029	0.079	0.139	0.092	0.024	0.01	-0.015	0.074	-0.03
I always look for ways to outsmart others, to ensure that they cannot take advantage of me or hurt me in any way	BA	0.064	0.199	0.1	0.716	0.063	0.05	0.096	0.092	0.12	0.23	0.075	0.073	0.082	0.014	0.042	0.106
I want people to understand me without me having to say anything	HS	0.139	0.117	0.072	0.238	0.018	0.153	0.021	0.195	0.661	0.104	0.226	0.077	0.042	-0.039	0.12	-0.041
I need people to listen to me and make me feel better	HS	0.12	0.14	0.086	0.169	0.099	0.114	0.06	0.086	0.811	0.126	-0.092	0.03	0.054	0.13	-0.065	0.067
It's too hard to make changes to my behaviour	HS	0.319	0.245	0.1	0.112	0.087	0.408	0.111	0.056	0.394	0.052	0.055	0.091	0.063	0.078	0.282	-0.143

I feel angry and desperate when people can't see I need help	HS	0.229	0.256	0.113	0.139	0.117	0.179	0.215	0.073	0.582	0.303	0.05	0.017	0.09	0.069	0.102	0.044
Feeling in control of my eating 'trumps' any problems or disappointments going on in my life	ED	0.173	0.822	0.102	0.085	0.095	0.061	0.114	0.1	0.148	0.034	0.109	0.09	0.038	-0.06	-0.053	- 0.031
Controlling my eating gives me a physical and mental 'high'	ED	0.14	0.877	0.068	0.106	0.102	0.038	0.123	0.095	0.094	0.014	0.088	0.055	0.068	-0.03	0.033	- 0.017
Controlling my eating makes me feel in control of everything	ED	0.164	0.877	0.055	0.092	0.122	0.027	0.126	0.125	0.111	0.02	0.08	0.078	0.062	-0.012	0.026	- 0.063
Controlling my eating stops me being too needy	ED	0.132	0.781	0.088	0.14	0.225	0.103	0.078	0.14	0.042	0.085	0.087	0.069	0.068	-0.04	-0.046	- 0.117

Table 5. Results of first stepwise linear regression analysis; final model predicting Eating Disorder Scores (EDE-Q). Adjusted R²=0.672.

Predictor	Unstandardized		Standardized		p
	B	SE	Beta	t	
(Constant)	.993	1.414		.702	.483
Gender	.377	.224	.042	1.681	.093
Age	.010	.010	.025	.974	.331
THQ Physical/ Sexual	-.112	.059	-.052	-1.913	.056
THQ Crime	.238	.098	.061	2.421	.016
Maladaptive Modes Total	7.124	.629	1.854	11.335	.000
Functional Modes Total	-.445	.119	-.144	-3.742	.000
Vulnerable Child	.329	.146	.122	2.263	.024
Bully & Attack	-.913	.123	-.275	-7.420	.000
Helpless Surrenderer	-.736	.110	-.277	-6.710	.000
Enraged Child	-.665	.119	-.202	-5.568	.000
Detached Protector	-.659	.116	-.249	-5.681	.000
Punitive Mode	-.596	.101	-.252	-5.931	.000
Angry Child	-.475	.105	-.188	-4.523	.000
Undisciplined Child	-.385	.103	-.132	-3.737	.000
Compliant Surrenderer	-.339	.099	-.118	-3.426	.001
Demanding Mode	-.425	.127	-.162	-3.348	.001
Impulsive Child	-.341	.111	-.123	-3.084	.002