International Journal of Cognitive Therapy
https://doi.org/10.1007/s41811-022-00149-7

Early Maladaptive Schemas and Mental Disorders in Adulthood: a Systematic Review and Meta-analysis

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Accepted: 19 October 2022

Abstract

Early maladaptive schemas (EMSs) are broad and pervasive themes regarding oneself and one's relationships with others originating from adverse childhood experiences. Although the concept of EMSs was initially developed for the treatment of personality disorders, the associations of EMSs with a variety of other mental disorders have been investigated. The goal of the present study was to summarize and analyze the EMSs-disorder associations in studies in which patients with specific psychiatric diagnoses were compared to healthy controls. Of the 28 studies that met the inclusion criteria, 27 were included in a meta-analysis. Across diagnoses, all EMSs were elevated in the clinical groups. The largest effect sizes were observed for the social isolation, the negativity/pessimism, the defectiveness/shame, and social undesirability schemas. Depression ($n=8$), borderline personality disorder ($n=5$), and obsessive–compulsive disorder ($n=5$) were the most frequently studied mental disorders. Heterogeneity between studies was high. Results suggest that mental disorders are not characterized by specific EMSs.

Keywords Early maladaptive schemas · Mental disorders · Systematic review · Meta-analysis · Young Schema Questionnaire

Introduction

Personality difficulties and personality disorders are common in the general population and among individuals who seek help for psychological problems (Mars et al., 2021; Yang et al., 2010; Zimmerman et al., 2005). Young (1990; Young et al., 1993) proposed the concept of early maladaptive schemas (EMSs) to conceptualize the core problems of these patients and developed schema therapy (ST) for their

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Published online: 21 November 2022

treatment. In ST, EMSs are thought as the deepest level of cognition and the core of personality disorders and many chronic symptom disorders and interpersonal problems (Young, 1999). Young et al. (2003) define an EMS as "a broad, pervasive theme or pattern, comprised of memories, emotions, cognitions, and bodily sensations regarding oneself and one's relationships with others, developed during childhood or adolescence, elaborated throughout one's lifetime and dysfunctional to a significant degree" (p. 7). EMSs are assumed to originate from the interplay between innate temperament and repeated adverse experiences with the social environment in childhood, in which the child's basic psychological needs (e.g., safety, secure attachment, and autonomy) are not met (Young et al., 2003). Based on clinical observations, Young and colleagues developed a list of EMSs covering a variety of themes that are commonly seen in patients with personality difficulties and personality disorders (Young, 1990). To aid the assessment of EMSs, the self-report Young Schema Questionnaire (YSQ; Young, 1990) was developed. Over the years, the schema list has evolved with new EMSs being included and one EMSs (social undesirability) being removed from the list after psychometric investigations of the YSQ. The current list of EMSs along with brief descriptions of the schemas is shown in Table 1. Similarly, the first version of the YSQ has undergone a major revision, and since then, several modifications and new forms of the inventory have been developed, including abbreviated forms and versions assessing newly added EMSs (for an overview, see Rijkeboer (2012)).

Table 1 Brief descriptions of EMSs

EMSs	Description
Emotional deprivation (ED)	The expectation that one's emotional needs will not be met by others
Abandonment (AB)	The expectation that one will be abandoned by significant others
Mistrust/abuse (MA)	Overly mistrusting of others
Social isolation (SI)	The feeling of not being part of a group
Defectiveness/shame (DS)	The belief has one has fundamental flaws
Failure to achieve (FA)	The belief that one will fail in regard to performance
Dependence/incompetence (DI)	The belief that one needs the help of others to handle everyday life
Vulnerability to harm (VH)	The fear that a negative event can occur at any time
Enmeshment (EM)	The lack of an individual identity
Subjugation (SB)	The belief that one has to relinquish control to others
Self-sacrifice (SS)	The belief that others' needs are more important than one's own
Emotional inhibition (EI)	The exaggerated suppression of emotion
Unrelenting standards (US)	The belief that one has to meet very high standards
Entitlement (ET)	The belief that one is entitled to special treatment and privileges
Insufficient self-control (IS)	The lack of sufficient self-control to achieve one's goals
Approval-seeking (AS)	The exaggerated need to gain approval from others
Negativity/pessimism (NP)	The tendency to overly focus on the negative sides of life
Punitiveness (PU)	The belief that mistakes should be harshly punished
Social undesirability (SU)*	The belief that one is socially inept and physically unattractive

*Not included in the current list of EMSs in ST

EMSs are, by definition, dysfunctional and can lead to a variety of psychological problems, such as depression, loneliness, addictions, and psychosomatic disorders (Young, 1999). Similar to Beck's generic cognitive model of psychological disorders (Beck & Haigh, 2014), the activation of EMSs by events that are related to the developmental origins of the EMSs is theorized to cause mental distress and disorders (Young et al., 2003). Beck's schema model has received considerable empirical support (Beck & Dozois, 2011), and substantial associations between EMSs and mental disorders can therefore be expected. However, maladaptive coping strategies to deal with schema activation (i.e., resignation, avoidance, and inversion; cf. Arntz et al., 2021) are emphasized more in ST than in Beck's schema model (Young et al., 2003). Further, unlike the cognitive specificity hypothesis in Beck's cognitive therapy (Beck, 1991), Young and colleagues have not hypothesized that different mental disorders are characterized by specific EMSs. However, the observation that patients with borderline personality disorder tend to score high on almost all EMSs on the YSQ led to the development of the concept of schema modes, defined as the EMSs and coping responses that are currently active in an individual (Young et al., 2003). Other scholars, on the other hand, have proposed that certain mental disorders are characterized by specific EMSs (e.g., Arntz & Van Genderen, 2009; Bernstein, 2002; Hawke & Provencher, 2011; Renner et al., 2013). For example, Bernstein (2002) suggested that borderline personality disorder is especially associated with the abandonment, defectiveness/shame, mistrust/abuse, emotional deprivation, social isolation, and insufficient self-control schemas. Renner et al. (2013) proposed a schema model of chronic depression, in which the EMSs of abandonment, emotional deprivation, and failure are central. After reviewing the research literature, Hawke and Provencher (2011) suggested that the defectiveness and insufficient self-control schemas are specific to depression and that anxiety disorders have the vulnerability to harm schema in common. In addition, Hawke and Provencher (2011) found that posttraumatic stress disorder (PTSD) was characterized by the emotional inhibition schema and obsessive–compulsive disorder (OCD) by social isolation.

A number of researchers have set out to investigate empirically the associations between EMSs and mental disorders to identify the EMSs that are especially pronounced in these disorders. Several studies have approached this issue by examining the correlations between EMSs and the symptoms of a variety of mental disorders, including, but not limited to, depression (e.g., Renner et al., 2012), agoraphobia (Hedley et al., 2001), social anxiety (Hinrichsen et al., 2004), PTSD (e.g., Dutra et al., 2008), substance use (Shorey et al., 2014), bulimia (e.g., Meyer et al., 2001), psychosis (e.g., Boyda et al., 2018), and personality disorders (e.g., Carr & Francis, 2010; Kunst et al., 2020). For example, Renner et al. (2012) reported that the abandonment/instability, the failure, and the emotional deprivation schemas were significantly associated with depressive symptoms in a sample of depressed patients. In these studies, psychiatric symptoms are commonly assessed with self-report questionnaires. An important limitation of this approach, however, is that self-report symptom inventories have usually been developed to assess symptom severity but not to establish diagnoses, e.g., the Beck Depression Inventory (Beck et al., 1996).

A stronger approach to the examination of the EMSs-mental disorder associations is to investigate full psychiatric diagnoses rather than symptoms of mental illness.

The comparison of EMSs in individuals with a given psychiatric diagnosis with a healthy control group provides information about the EMSs that are connected with the diagnosis. This research design has been applied by other researchers (e.g., Atalay et al., 2008; Halvorsen et al., 2009; Pinto-Gouveia et al., 2006; Waller, 2003). Existing reviews and meta-analyses of the research literature on EMSs and mental disorders are limited to particular diagnoses (e.g., Barazandeh et al., 2016; Bishop et al., 2022; Tariq et al., 2021) or diagnosis groups, e.g., anxiety and mood disorders (Hawke & Provencher, 2011) and eating disorders (Pugh, 2015) and blend findings from the symptom-based and diagnosis-based approaches of assessing disorders. For example, Bishop et al. (2022) found positive relationships between all 18 EMSs and depression with large effect sizes for the social isolation and defectiveness/shame schemas. However, a comprehensive review of studies that uses the preferable methodology is currently lacking.

Thus, the purpose of the present study was to summarize and analyze the empirical literature on the EMS-mental disorder associations that examined EMSs in adults with a specific psychiatric diagnosis compared to healthy controls. Since the use of a structured interview is regarded as the gold standard for determining a psychiatric diagnosis (Nordgaard et al., 2012), the current investigation focused on studies that meet this criterion.

Methods

The protocol registration with the International Prospective Register of Systematic Reviews (PROSPERO) was submitted on May 08, 2020, and published on July 05, 2020 (registration number CRD42020184976). In accordance with the preregistered protocol, a systematic search was conducted using the databases PsycINFO, EMBASE, Web of Science, and Pubmed on May 22, 2020. The search term "early maladaptive schema*" was used to find relevant studies. In addition, published systematic reviews (Barazandeh et al., 2016; Hawke & Provencher, 2011; Lim & Barlas, 2019; Pugh, 2015) were hand searched for relevant studies. After duplicates were removed, the first author screened titles, abstracts, publication type, and language for eligibility in EndNote 20. Next, studies that possibly met the inclusion criteria were obtained in full text and assessed by the first author and a research assistant. The inclusion criteria were as follows: (1) comparison of EMSs between individuals with mental disorders and non-clinical controls; (2) adult samples; (3) at least 15 individuals with the target disorder; (4) the diagnosis must be recognized in DSM-IV/DSM-5 or in ICD-10/ICD-11; (5) use of a structured interview to establish the diagnosis; (6) assessment of EMSs with a version of the YSQ; (7) information to calculate effect sizes is provided; (8) publication in a peer-reviewed journal; (9) English language. Review articles, qualitative studies, and book chapters were excluded. Study authors were contacted when (1) only group differences in schema domains were reported in the publication; (2) the comparison was performed with a mixed clinical group but there were diagnostic subgroups with $n > 15$ participants according to the sample description; (3) results were reported for only some EMSs,

but from the publication, it appeared that the full YSQ was administered; (4) means and standard deviations for the healthy control group were not reported.

For each study, the first author extracted the target disorder; the structured interview used to establish the diagnosis (if specified); information on the number, age, and gender composition of the patient and the control sample; the version of YSQ used; and statistics to calculate effect sizes. The second author checked all extracted values. For all comparisons, the standardized mean difference (Hedge's g) was computed as a measure of the effect size (ES). According to Cohen's (1988) benchmarks, ESs of 0.2, 0.5, and 0.8 are considered small, medium, and large, respectively.

The quality of the included studies was assessed using the 14-item checklist developed by Kmet et al. (2004). The Kmet et al. (2004) checklist items have shown high percentages of inter-rater agreement, and the checklist has been widely used in systematic reviews and meta-analyses of observational studies, including the Barazandeh et al. (2016) study of the associations of EMSs and borderline personality disorder. The first and the second author conducted the assessment independently. Disagreements were discussed and resolved by consensus.

A series of meta-analyses were performed for the specific EMSs across all included studies and for individual diagnoses when at least two studies were available (cf. Borenstein et al., 2009). The calculation of mean ESs across studies was based on a random effects model. The Hartung-Knapp adjustment was applied, which uses the t distribution rather than the normal distribution for the calculation of the confidence interval for the pooled ES. The Hartung-Knapp method has shown more favorable statistical properties in terms of type I error rates compared to the commonly used DerSimonian-Laird method, especially when the number of studies is small (IntHout et al., 2014). Since several studies provided more than one ES to the meta-analyses of the overall associations between mental disorders and EMSs, meta-analyses with robust variance estimation (Hedges et al., 2010) were conducted. Correlated effects models with small-sample corrections were fitted. Rho was set at 0.80. Study heterogeneity was assessed with the I^2 statistic, defined as the proportion of variation between studies that is not due to chance (Higgins et al., 2003), where 30 to 60%, 50 to 90%, and 75 to 100% are suggested to indicate moderate, substantial, and considerable heterogeneity, respectively (Higgins et al., 2021). Tests of indicators of possible publication bias (e.g., funnel plot asymmetry) were also considered. However, the number of studies in the diagnosis-based meta-analyses was smaller than the recommended minimum number ($k \geq 10$) for performing analyses of funnel plot asymmetry (Sterne et al., 2011). In addition, it has been advised against publication bias analyses when the between-study heterogeneity is high (Harrer et al., 2021), which was the case for most meta-analyses in the present investigation. For mental disorders that were investigated by only single studies, findings were not excluded from our study and are summarized in the results section.

The calculation of ESs was conducted in R (version 4.1.2; R Core Team, 2021) using the packages meta (version 5.01–1; Schwarzer, 2021) when means and standard deviations were available, and esc (version 0.5.1; Lüdecke, 2019) when F values were reported. The meta-analyses were performed using the packages meta and robumeta (version 2.0; Fisher & Tipton, 2015). The dmetar package (version 0.0.9000; Harrer et al., 2019) was used to detect outliers—defined as non-overlapping

confidence intervals of the study and the pooled effect—in the meta-analyses of diagnostic categories. When outliers were detected, the analyses were rerun with the outliers excluded.

Results

Study Selection and Study Characteristics

The selection process is displayed in Fig. 1. The search identified 790 unique records. After the screening process, 72 publications were retained and retrieved in full text. Fourteen corresponding authors were contacted, and four provided data that were not contained in their publications. Assessment of eligibility resulted in 28 articles that were included in the current investigation. These publications reported 40 comparisons between diagnostic groups and healthy controls on 14 different diagnoses.

The characteristics of the included studies are shown in Table 2. All studies were published between 2003 and 2020. Most studies (26) were conducted in European and Asian countries, and two studies were from Australia. Overall, 2,074 patients were included ($M = 51.9$, $SD = 37.3$, range = 16–218) with mean ages ranging from 22.7 to 51.5 years (three studies did not report mean ages). The average proportion of female participants in the patient groups was 62.5% ($SD = 31.6\%$, four missing data points). The mean sample size of the healthy control groups was 60.0 ($SD = 49.5$, range = 20–264). Mean age ranged from 19.0 to 45.4 years (four studies did not provide this information), and 60.5% ($SD = 29.7\%$) were female on average (four studies did not report gender composition). A summary of the characteristics of the studies included in the meta-analyses of specific mental disorders is displayed in Table 3. The quality ratings of the studies ranged from 0.82 to 1 with a mean of 0.96 ($SD = 0.05$) (see Table 1 and the supplementary material).

A variety of versions of the YSQ were used in the different studies (see Table 2). One study (Pinto-Gouveia et al., 2006) used the first version of the YSQ, which is in large part incompatible with subsequent versions. The Pinto-Gouveia et al. (2006) study was therefore excluded from the meta-analyses. ESs for all studies (except for the Pinto-Gouveia et al. (2006) study) are displayed in Table 4.

Overall Associations Between EMSs and Mental Disorders

Across all diagnoses examined, patients scored higher on all EMSs compared to healthy controls with large ESs ($g > 0.80$) using Cohen's (1988) criteria (Table 5). The highest ESs were found for the social isolation ($g = 1.93$, 95% CI [1.33, 2.52]), the negativity/pessimism ($g = 1.74$, 95% CI [1.02, 2.46]), the defectiveness ($g = 1.63$, 95% CI [1.26, 2.00]) and the social undesirability ($g = 1.63$, 95% CI [1.23, 2.04]) schemas. The differences between the patient and healthy control groups were smallest for the unrelenting standards ($g = 1.09$, 95% CI [0.67, 1.50]), the entitlement

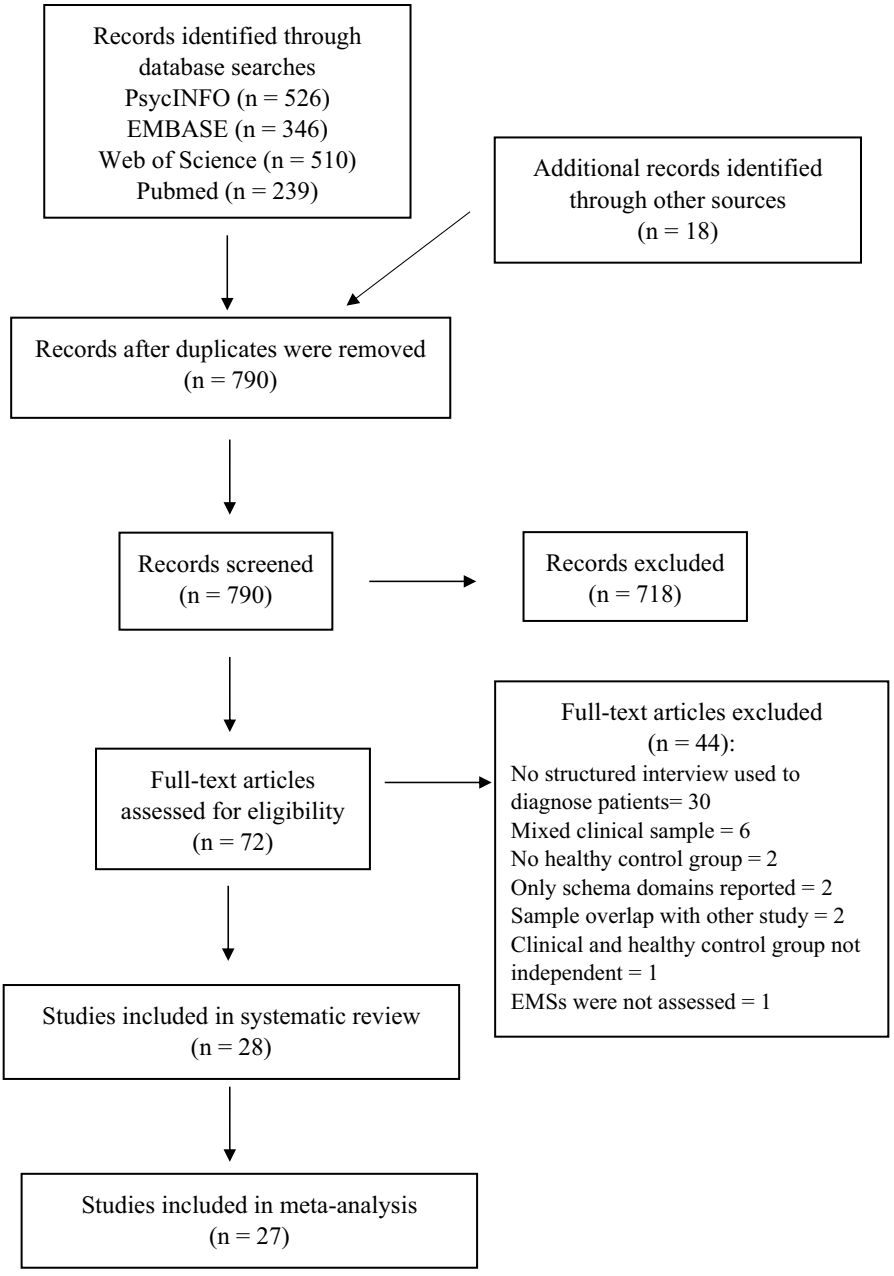

Fig. 1 Flowchart of the search and selection procedure

($g = 0.91$, 95% CI [0.60, 1.21]), and the self-sacrifice schemas ($g = 0.82$, 95% CI [0.52, 1.11]). I^2 was substantial, ranging from 61.9% (entitlement) to 85.0% (social isolation), except for social undesirability (0%).

Table 2 Overview of studies included in the systematic review

Study	Country	Target disorder	Diagnostic interview	Clinical sample			Healthy controls				YSQ-version	Quality score
				N	Mean age (SD)	% female	Characteristics	*N*	Mean age (SD)	% female		
Ahmadian et al. (2015)	Iran	Acute posttraumatic stress disorder	SCID	30	43.0 (5.3)	0	Armed forces personnel with similar experience of war but without PTSD	30	43.3 (5.2)	0	YSQ-L3	1
Ahmadian et al. (2015)	Iran	Chronic posttraumatic stress disorder	SCID	30	44.6 (3.2)	0	Armed forces personnel with similar experience of war but without PTSD	30	43.3 (5.2)	0	YSQ-L3	1
Ahmadpanah et al. (2017)	Iran	Depression	MINI	30	44.7 (7.3)	63.3	Matched on gender and age; assessed with MINI	30	45.4 (4.9)	60	YSQ-L3	.95
Ahmadpanah et al. (2017)	Iran	Depression with suicidality	MINI	30	45.3 (8.9)	70	Matched on gender and age; assessed with MINI	30	45.4 (4.9)	60	YSQ-L3	.95
Ak et al. (2012)	Turkey	Bipolar disorder	SCID-I, SCID-II	18	28.6 (5.1)	44.4	Similar socio-demographic characteristics; assessed with SCID	20	35.7 (7.5)	50	YSQ-S3	.91

Table 2 (continued)

Study	Country	Target disorder	Diagnostic interview	Clinical sample			Healthy controls				YSQ-version	Quality score
				N	Mean age (SD)	% female	Characteristics	*N*	Mean age (SD)	% female		
Aloi et al. (2020)	Italy	Binge eating disorder with obesity	SCID-5, EDE	55	39.2 (13.3)	100	Obese without BED; assessed with SCID-5 and EDE	45	37.7 (10.1)	100	YSQ-S3	1
Atalay et al. (2008)	Turkey	Obsessive–compulsive disorder	SCID-I, SCID-II	45	32.0 (10.6)	68.9	Matched on gender and age; interviewed	45	32.8 (9.6)	66.7	YSQ-S3	1
Atalay et al. (2011)	Turkey	Major depressive disorder	SCID-I, SCID-II	40	32.2 (9.4)	75	Hospital staff; SCID administered when a psychiatric disorder was suspected	46	32.1 (7.3)	70	YSQ-S3	.95
Atalay et al. (2011)	Turkey	Panic disorder	SCID-I, SCID-II	40	32.7 (11.3)	52.5	Hospital staff; SCID administered when a psychiatric disorder was suspected	46	32.1 (7.3)	70	YSQ-S3	.95

Table 2 (continued)

Study	Country	Target disorder	Diagnostic interview	Clinical sample			Healthy controls				YSQ-version	Quality score
				N	Mean age (SD)	% female	Characteristics	*N*	Mean age (SD)	% female		
Bach and Farrell (2018)	Denmark	Borderline PD	SCID-II	101	28.3 (7.4)	70.3	Matched on gender and age, screened with SCL-90-R	101	28.4 (7.4)	70.3	YSQ-S3	.95
Bortolon et al. (2013)	France	Schizophrenia	SCID	48	37.0 (10.3)	33.3	Community-dwelling adults without past/present psychiatric disorder; assessed with MINI	44	37.0 (13.4)	36.4	YSQ-SF	1
Chen et al. (2019)	Republic of China (Taiwan)	Persistent depressive disorder	MINI	30	50.7 (10.8)	70	Recruited through advertisement and without psychiatric disorders	30	42.1 (15.1)	60	YSQ-S3	1
Chen et al. (2019)	Republic of China (Taiwan)	Major depressive disorder	MINI	24	51.5 (12.8)	62.5	Recruited through advertisement and without psychiatric disorders	30	42.1 (15.1)	60	YSQ-S3	1

Table 2 (continued)

Study	Country	Target disorder	Diagnostic interview	Clinical sample			Healthy controls				YSQ-version	Quality score
				N	Mean age (SD)	% female	Characteristics	*N*	Mean age (SD)	% female		
Dingemans et al. (2006)	Netherlands	Bulimia nervosa	–	16	30.3 (9.4)	–	Screened for past/present eating disorders	27	33.9 (11.1)	–	YSQ-L2	.91
Dingemans et al. (2006)	Netherlands	Binge eating disorder	–	36	35.0 (10.3)	–	Screened for past/present eating disorders	27	33.9 (11.1)	–	YSQ-L2	.91
Halvorsen et al. (2009)	Norway	Depression	SCID-I	23	37.7 (12.5)	73.9	Never depressed, assessed with SCID-I	40	39.1 (13.1)	82.5	YSQ-L2	1
Henker et al. (2019)	Germany	Depression	SCID	83	34.9 (12.0)	68.7	Students, screened with the Patient Health Questionnaire	39	42.7 (11.3)	–	YSQ-GSF	.95
Jalali et al. (2011)	Iran	Opioid abuse	SCID-I	56	29.7 (–)	0	Selected from two state factories	56	- (range 20–45 years)	0	YSQ-S3	.81
Khosravani et al. (2019a)	Iran	Schizophrenia	SCID-I	105	33.0 (10.0)	59	Students with low scores on the Schizotypal Personality Scale	90	19.0 (2.5)	60	YSQ-SF	.91

Table 2 (continued)

Study	Country	Target disorder	Diagnostic interview	Clinical sample			Healthy controls				YSQ-version	Quality score
				N	Mean age (SD)	% female	Characteristics	*N*	Mean age (SD)	% female		
Khosravani et al. (2019b)	Iran	Obsessive–compulsive disorder	SCID-I	120	33.9 (12.6)	51.7	Community-dwelling adults; assessed with SCID-I	60	28.6 (11.1)	50	YSQ-SF	1
Khosravani et al. (2019b)	Iran	Bipolar disorder	SCID-I	100	36.7 (8.5)	43	Community-dwelling adults; assessed with SCID-I	60	28.6 (11.1)	50	YSQ-SF	1
Khosravani et al. (2019b)	Iran	Schizophrenia	SCID-I	82	34.8 (9.1)	58.5	Community-dwelling adults; assessed with SCID-I	60	28.6 (11.1)	50	YSQ-SF	1
Kwak and Lee (2015)	South Korea	Obsessive–compulsive disorder	SCID-I	51	28.0 (8.9)	31.4	First-year graduate students; assessed with SCID-I	70	25.5 (2.3)	30	YSQ-S3	1
Kwak and Lee (2015)	South Korea	Panic disorder	SCID-I	46	37.7 (9.7)	69.6	First-year graduate students; assessed with SCID-I	70	25.5 (2.3)	30	YSQ-S3	1

Table 2 (continued)

Study	Country	Target disorder	Diagnostic interview	Clinical sample			Healthy controls				YSQ-version	Quality score
				N	Mean age (SD)	% female	Characteristics	*N*	Mean age (SD)	% female		
Legenbauer et al. (2018)	Germany	Bulimia nervosa	SCID-I	29	27.0 (8.4)	100	Females; assessed with the SCID-I screening questionnaires	30	26.8 (6.2)	100	YSQ-S3	.95
Legenbauer et al. (2018)	Germany	Binge eating disorder	SCID-I	30	30.5 (8.5)	100	Females; assessed with the SCID-I screening questionnaires	30	26.8 (6.2)	100	YSQ-S3	.95
Moir et al. (2017)	Australia	Borderline PD	SCID-I, SCID-II	33	- (range 19–50 years)	85	Recruited from a community-based online survey site	103	- (range 20–75 years)	61	YSQ-SF	1
Nilsson et al. (2010)	Denmark	Borderline PD	SCID-II	31	32.0 (7.4)	100	Female students reporting no own or parental mental disorder	29	27.0 (5.3)	100	YSQ-S3	1

Table 2 (continued)

Study	Country	Target disorder	Diagnostic interview	Clinical sample			Healthy controls				YSQ-version	Quality score
				N	Mean age (SD)	% female	Characteristics	*N*	Mean age (SD)	% female		
Nilsson et al. (2010)	Denmark	Bipolar disorder	SCAN	30	33.0 (8.8)	100	Female students reporting no own or parental mental disorder	29	27.0 (5.3)	100	YSQ-S3	1
Pinto-Gouveia et al. (2006)	Portugal	Social phobia	ADIS-IV	62	25.5 (6.9)	54.8	General population	55	30.8 (10.0)	61.8	YSQ	.91
Unoka et al. (2015)	Hungary	Borderline PD	SCID-I, SCID-II	78	29.9 (7.6)	94.9	Community/staff members matched on age, gender, and years of education	76	30.7 (7.9)	90.8	YSQ-L3	1
Unoka and Vizin (2017)	Hungary	Borderline PD	MINI, SCID-II	56	30.3 (10.3)	82.1	Community/staff without current or previous axis I/II disorder; screened with SCL-90-R	80	31.6 (10.1)	75	YSQ-S3 (plus a SU-scale)	1
Voderholzer et al. (2014)	Germany	Obsessive–compulsive disorder	SCID	60	35.9 (10.9)	56.7	Matched on gender and age	142	35.5 (13.8)	71.8	YSQ-S3	1

Table 2 (continued)

Study	Country	Target disorder	Diagnostic interview	Clinical sample			Healthy controls				YSQ-version	Quality score
				N	Mean age (SD)	% female	Characteristics	*N*	Mean age (SD)	% female		
Voderholzer et al. (2014)	Germany	Chronic pain disorder	SCID	40	47.0 (11.2)	100	Matched on gender and age	142	35.5 (13.8)	71.8	YSQ-S3	1
Waller (2003)	UK	Binge eating disorder	–	25	30.6 (9.2)	100	Matched on age and BMI	25	30.5 (8.1)	100	YSQ-SF	.95
Waller (2003)	UK	Bulimia nervosa-purging subtype	–	25	29.8 (9.2)	100	Matched on age and BMI	25	30.5 (8.1)	100	YSQ-SF	.95
Wesley and Manjula (2015)	India	Depression	MINI	30	- (range 18–60 years)	–	Matched on age and gender	30	- (range 18–60 years)	–	YSQ-SF	.91
Yalcin et al. (2020)	Australia	Posttraumatic stress disorder	CAPS-5	218	48.7 (12.9)	10.6	Recruited from university, social media, Prolific	264	35.8 (12.2)	48.9	YSQ-L3	1
Yoosefi et al. (2016)	Iran	Obsessive–compulsive disorder	SCID-I	50	–	–	Volunteers	51	–	–	YSQ-SF	.86
Ozdel et al. (2015)	Turkey	Antisocial PD	SCID-II	38	22.7 (1.9)	0	Soldiers; screened for psychiatric history	24	21.8 (2.4)	0	YSQ-SF	.91

"-" not reported. *CAPS-5* Clinician-Administered PTSD Scale for DSM-5, *EDE* Eating Disorder Examination, *MINI* Mini International Neuropsychiatric Interview, *PD* personality disorder, *SCID* Structured Clinical Interview for DSM, *YSQ* Young Schema Questionnaire, *YSQ-GSF* Young Schema Questionnaire – German Short Form (Grutschpalk, 2008)

Depression

A total of eight studies (Ahmadpanah et al., 2017; Atalay et al., 2011; Chen et al., 2019; Halvorsen et al., 2009; Henker et al., 2019; Wesley & Manjula, 2015) examined EMSs in depressed patients. The results of the meta-analyses showed the largest ESs for social isolation ($g = 3.13$, 95% CI [0.88, 5.38]), abandonment ($g = 2.14$, 95% CI [0.97, 3.31]), emotional deprivation ($g = 2.12$, 95% CI [1.00, 3.23]), defectiveness/shame ($g = 2.11$, 95% CI [0.49, 3.73]), and negativity/pessimism ($g = 2.10$, 95% CI [1.08, 3.12]) (Table 5). The ES for the punitiveness schema was also among the largest ESs ($g = 2.57$). However, the 95% confidence interval for this ES included zero (−0.16, 5.30]). The ESs were lowest for the self-sacrifice ($g = 0.74$, 95% CI [0.53, 0.96]) and the entitlement schemas ($g = 0.91$, 95% CI [0.41, 1.42]). Study heterogeneity was considerable ($I^2 > 75\%$) for all EMSs, except for subjugation (38.9%), self-sacrifice (1.9%), and social undesirability (0%). When outliers were removed from the analyses, the negativity/pessimism schema showed the largest average ES ($g = 2.10$, 95% CI [1.08, 3.12], $I^2 = 90.5\%$), followed by the social isolation ($g = 1.81$, 95% CI [0.46, 3.17], $I^2 = 90.6\%$), emotional deprivation ($g = 1.78$, 95% CI [0.86, 2.70], $I^2 = 87.4\%$), and abandonment ($g = 1.75$, 95% CI [0.88, 2.63], $I^2 = 85.9\%$) schemas.

Borderline Personality Disorder

Comparisons of EMSs in patients with BPD and healthy controls were reported in five studies (Bach & Farrell, 2018; Moir et al., 2017; Nilsson et al., 2010; Unoka & Vizin, 2017; Unoka et al., 2015). The meta-analyses revealed the largest ESs for the social isolation ($g = 2.23$, 95% CI [1.54, 2.92]), the defectiveness ($g = 2.05$, 95% CI [1.75, 2.35]), and the negativity/pessimism ($g = 2.02$, 95% CI [1.75, 2.29]) schemas (Table 5). The lowest ESs were found for unrelenting standards ($g = 0.89$, 95% CI [0.38, 1.41]), self-sacrifice ($g = 0.80$, 95% CI [0.51, 1.08]), and entitlement ($g = 0.68$, 95% CI [−0.01, 1.37]). I^2 varied between 0% (subjugation, negativity/pessimism) and 88.6% (entitlement) with a mean of 57.2% ($SD = 28.1\%$).

Obsessive Compulsive Disorder

EMSs associated with OCD were examined in five studies (Atalay et al., 2008; Khosravani et al., 2019b; Kwak and Lee, 2015; Voderholzer et al., 2014; Yoosefi et al., 2016). As shown in Table 5, the largest mean ESs were observed for social isolation ($g = 1.41$, 95% CI [0.86, 1.96]), failure ($g = 1.35$, 95% CI [0.52, 2.18]), and defectiveness/shame ($g = 1.31$, 95% CI [0.65, 1.97]). Study heterogeneity was considerable ($I^2 > 75\%$) for all EMSs, except for vulnerability to harm/illness (71.7%), negativity/pessimism (66.7%) subjugation (66.2%), mistrust/abuse (58.2%), punitiveness (57.3%), and approval seeking (0%).

Binge Eating Disorder

The associations of EMSs with BED were reported in four studies (Aloi et al., 2020; Dingemans et al., 2006; Legenbauer et al., 2018; Waller, 2003). The largest mean ESs were found for defectiveness/shame ($g = 1.43$, 95% CI [0.13, 2.73]) and dependence/incompetence ($g = 1.21$, 95% CI [0.18, 2.23]). I^2 ranged from 0% (emotional deprivation, abandonment) to 89.7% (emotional inhibition) with a mean of 63.9% ($SD = 28.0\%$) (Table 5).

Bipolar Disorder

EMSs in patients diagnosed with BP compared to healthy controls were investigated in three studies (Ak et al., 2012; Khosravani et al., 2019b; Nilsson et al., 2010). As displayed in Table 5, the 95% confidence intervals for mean ESs included zero for all EMSs, except for emotional deprivation ($g = 0.91$, 95% CI [0.24, 1.57]). Study heterogeneity was larger than 89% for all EMSs but vulnerability to harm and illness (73.7%) and emotional deprivation (24.9%).

Schizophrenia

The relationships of EMSs with schizophrenia were examined in three studies (Bortolon et al., 2013; Khosravani et al., 2019a, b). The largest ESs with confidence intervals not including zero were found for emotional deprivation ($g = 1.06$, 95% CI [0.01, 2.11]), enmeshment ($g = 0.88$, 95% CI [0.51, 1.25]), and social isolation ($g = 0.82$, 95% CI [0.03, 1.62]) (Table 5). Study heterogeneity was moderate to high, except for enmeshment (0%) and self-sacrifice (0%).

Bulimia Nervosa

EMSs in patients compared to healthy controls were reported in three studies (Dingemans et al., 2006; Legenbauer et al., 2018; Waller, 2003). The only ES with a confidence interval not including zero was observed for the emotion inhibition schema ($g = 1.75$, 95% CI [0.70, 2.79], $I^2 = 87.0\%$) (Table 5).

Panic Disorder

The associations of EMSs with panic disorder were investigated in two studies (Atalay et al., 2011; Kwak and Lee, 2015). Only the vulnerability for harm schema showed a pooled ES with a confidence interval not including zero ($g = 1.16$, 95% CI [0.04, 2.30], $I^2 = 0\%$) (Table 5).

PTSD

EMSs associated with PTSD were examined in two studies (Ahmadian et al., 2015; Yalcin et al., 2020). The findings of these two studies diverged widely (Table 5),

Table 3 Characteristics of the studies included in the meta-analyses of specific mental disorders

Diagnosis	$N_{studies}$	$N_{total\ sample}$	Clinical sample			Healthy controls			Mean quality rating
			N	Mean age (SD)[1]	% female[1]	*N*	Mean age (SD)[1]	% female[1]	
Binge eating disorder	4	273	146	34.9 (11.1)	75.3	127	32.9 (9.2)	78.7	.95
Bipolar disorder	3	257	148	34.9 (8.2)	54.7	109	29.5 (9.3)	63.3	.97
Borderline PD	5	688	299	26.4 (7.7)	83.6	389	21.9 (7.0)	75.0	.99
Bulimia nervosa	3	152	70	28.8 (8.9)	77.1	82	30.3 (8.6)	67.1	.93
Depression	8	565	290	36.3 (10.2)	62.1	275	36.2 (10.4)	59.4	.96
Obsessive–compulsive disorder	5	694	326	27.9 (10.4)	43.9	368	27.2 (10.3)	49.7	.97
Panic disorder	2	202	86	35.4 (10.5)	61.6	116	28.1 (4.9)	45.9	.98
Posttraumatic stress disorder	2	542	248	48.2 (12.1)	9.3	294	36.6 (11.6)	43.9	1
Schizophrenia	3	429	235	34.4 (9.8)	53.6	194	26.0 (9.0)	51.6	.97

[1]Weighted for sample size

Table 4 Effect sizes (Hedge's *g*) of the individual studies

Study[1]	Target disorder	ED (95% CI)	AB (95% CI)	MA (95% CI)	SI (95% CI)	DS (95% CI)	FA (95% CI)	DI (95% CI)	VH (95% CI)	EM (95% CI)	SB (95% CI)
Ahmadian et al. (2015)	Acute post-traumatic stress disorder	6.47 (5.17, 7.77)	2.60 (1.90, 3.30)	5.81 (4.62, 7.00)	4.05 (3.14. 4.95)	5.39 (4.27, 6.51)	4.68 (3.67, 5.68)	4.33 (3.39, 5.28)	7.01 (5.61, 8.40)	6.40 (5.11, 7.69)	7.09 (5.69, 8.50)
Ahmadian et al. (2015)	Chronic post-traumatic stress disorder	8.05 (6.48, 9.62)	2.90 (2.16, 3.64)	8.85 (7.14, 10.57)	5.94 (4.73. 7.15)	3.42 (2.61, 4.23)	4.85 (3.82, 5.89)	7.35 (5.90, 8.80)	4.86 (3.83, 5.90)	8.45 (6.81, 10.09)	9.00 (7.26, 10.74)
Ahmad-panah et al. (2017)	Depression	3.73 (2.87, 4.59)	3.76 (2.90, 4.63)	1.60 (1.02, 2.19)	4.33 (3.38. 5.28)	2.84 (2.11, 3.57)	3.03 (2.28, 3.79)	3.06 (2.30, 3.82)	2.06 (1.43, 2.70)	3.30* (2.51, 4.09)	1.89 (1.27, 2.50)
Ahmad-panah et al. (2017)	Depression with suicidality	4.57* (3.59, 5.56)	4.92* (3.88, 5.96)	2.57 (1.88, 3.27)	7.20* (5.78. 8.63)	6.83* (5.47, 8.19)	4.03* (3.13, 4.93)	3.27* (2.48, 4.06)	3.31* (2.52, 4.11)	2.95 (2.21, 3.70)	1.88 (1.26, 2.49)
Ak et al. (2012)	Bipolar disorder	1.47 (0.74, 2.20)	3.27 (2.27, 4.28)	3.45 (2.42, 4.49)	4.54 (3.29. 5.79)	3.07 (2.10, 4.03)	4.34 (3.13, 5.56)	6.06 (4.48, 7.63)	1.67 (0.92, 2.42)	4.39 (3.17, 5.61)	6.24 (4.62, 7.85)
Aloi et al. (2020)	Binge eating disorder	1.02 (0.60, 1.44)	0.94 (0.52, 1.36)	0.27 (−0.13, 0.67)	0.71 (0.31. 1.12)	1.02 (0.60, 1.44)	0.85 (0.44, 1.27)	0.90 (0.49, 1.32)	0.37 (−0.03, 0.77)	0.29 (−0.11, 0.68)	0.38 (−0.02, 0.77)
Atalay et al. (2008)	Obsessive–compulsive disorder	0.65 (0.23, 1.07)	0.32 (−0.10, 0.73)	0.33 (−0.09, 0.75)	0.83 (0.40. 1.26)	0.54 (0.12, 0.96)	0.58 (0.16, 1.01)	0.56 (0.14, 0.98)	0.86 (0.42, 1.29)	0.38 (−0.03, 0.80)	0.62 (0.20, 1.04)
Atalay et al. (2011)	Major depressive disorder	1.30 (0.84, 1.77)	0.93 (0.48, 1.38)	0.90 (0.45, 1.34)	0.89 (0.45, 1.34)	0.49 (0.06, 0.92)	1.13 (0.67, 1.59)	0.61 (0.17, 1.04)	0.84 (0.39, 1.28)	0.36* (−0.07, 0.79)	1.15 (0.69, 1.60)

Table 4 (continued)

Study[1]	Target disorder	ED (95% CI)	AB (95% CI)	MA (95% CI)	SI (95% CI)	DS (95% CI)	FA (95% CI)	DI (95% CI)	VH (95% CI)	EM (95% CI)	SB (95% CI)
Atalay et al. (2011)	Panic disorder	−0.04 (−0.46, 0.38)	0.48 (0.05, 0.91)	0.26 (−0.16, 0.69)	−0.14 (−0.57, 0.28)	−0.10 (−0.53, 0.32)	0.53 (0.10, 0.96)	0.30 (−0.12, 0.73)	1.07 (0.61, 1.52)	0.14 (−0.29, 0.56)	0.25 (−0.18, 0.67)
Bach and Farrell (2018)	Borderline PD	1.63 (1.31, 1.95)	1.78 (1.45, 2.10)	2.20 (1.85, 2.55)	2.11 (1.76, 2.45)	2.00 (1.66, 2.34)	1.74 (1.41, 2.06)	1.74 (1.42, 2.07)	1.70 (1.38, 2.03)	1.42 (1.11, 1.73)	1.77 (1.44, 2.09)
Bortolon et al. (2013)	Schizophrenia	1.14 (0.70, 1.59)	0.64 (0.22, 1.07)	0.53 (0.11, 0.95)	0.91 (0.48, 1.35)	0.94 (0.51, 1.38)	0.96 (0.52, 1.39)	0.82 (0.39, 1.25)	0.67 (0.24, 1.09)	1.01 (0.58, 1.45)	1.01 (0.57, 1.45)
Chen et al. (2019)	Persistent depressive disorder	2.41 (1.74, 3.08)	2.06 (1.43, 2.69)	1.99 (1.36 2.61)	2.37 (1.70, 3.04)	2.04 (1.41, 2.68)	1.59 (1.00, 2.17)	1.43 (0.86, 2.00)	2.12 (1.48, 2.76)	1.76 (1.16, 2.36)	2.23 (1.58, 2.89)
Chen et al. (2019)	Major depressive disorder	1.17 (0.59, 1.75)	1.46 (0.85, 2.07)	1.70 (1.07, 2.33)	0.95 (0.38, 1.52)	1.12 (0.54, 1.70)	0.70 (0.14, 1.25)	0.95 (0.38, 1.52)	1.93 (1.28, 2.59)	1.13 (0.55, 1.72)	1.38 (0.78, 1.98)
Dingemans et al. (2006)	Bulimia nervosa	2.32 (1.52, 3.13)	2.59 (1.75, 3.44)	2.07 (1.30, 2.84)	2.05 (1.28, 2.82)	2.33 (1.53, 3.14)	2.07 (1.30, 2.85)	2.01 (1.25, 2.78)	1.83 (1.09, 2.57)	1.77 (1.04, 2.50)	2.66 (1.81, 3.51)
Dingemans et al. (2006)	Binge eating disorder	1.15 (0.61, 1.69)	1.37 (0.82, 1.93)	1.20 (0.66, 1.74)	1.46 (0.89, 2.02)	1.37 (0.82, 1.93)	1.00 (0.47, 1.53)	1.14 (0.60, 1.68)	0.91 (0.39, 1.44)	1.13 (0.59, 1.67)	1.30 (0.74, 1.85)
Halvorsen et al. (2009)	Depression	2.14 (1.50, 2.78)	2.01 (1.38, 2.63)	2.10 (1.46, 2.73)	7.22* (5.82, 8.62)	1.52 (0.94, 2.10)	1.84 (1.23, 2.45)	1.58 (1.00, 2.17)	2.16 (1.51, 2.80)	1.31 (0.75, 1.88)	1.81 (1.20, 2.42)
Henker et al. (2019)	Depression	1.18 (0.77, 1.60)	1.43 (1.00, 1.86)	1.06 (0.65, 1.47)	1.16 (0.74, 1.57)	1.28 (0.86, 1.70)	1.260.84, 1.68)	1.59 (1.15, 2.03)	1.08 (0.67, 1.49)	1.21 (0.79, 1.62)	1.36 (0.94, 1.79)

Table 4 (continued)

Study[1]	Target disorder	ED (95% CI)	AB (95% CI)	MA (95% CI)	SI (95% CI)	DS (95% CI)	FA (95% CI)	DI (95% CI)	VH (95% CI)	EM (95% CI)	SB (95% CI)
Jalali et al. (2011)	Opioid abuse	1.85 (1.41, 2.29)	3.26 (2.69, 3.83)	1.09 (0.69, 1.48)	1.73 (1.30, 2.17)	2.37 (1.89, 2.86)	0.70 (0.32, 1.09)	2.10 (1.64, 2.57)	1.69 (1.26, 2.13)	1.21 (0.81, 1.61)	0.68 (0.30, 1.06)
Khosravani et al. (2019a)	Schizophrenia	1.43 (1.12, 1.75)	1.06 (0.75, 1.36)	1.37 (1.06, 1.69)	1.08 (0.78, 1.38)	1.10 (0.80, 1.40)	1.00 (0.71, 1.30)	1.07 (0.77, 1.37)	1.07 (0.77, 1.37)	0.94 (0.65, 1.24)	0.89 (0.59, 1.18)
Khosravani et al. (2019b)	Obsessive–compulsive disorder	1.51 (1.16, 1.86)	1.47 (1.13, 1.82)	0.91 (0.58, 1.23)	1.56 (1.21, 1.91)	1.20 (0.87, 1.54)	2.29 (1.90, 2.68)	1.07 (0.74, 1.40)	1.78 (1.42, 2.14)	1.45 (1.11, 1.80)	1.52 (1.17, 1.87)
Khosravani et al. (2019b)	Bipolar disorder	0.83 (0.49, 1.16)	0.94 (0.61, 1.28)	0.63 (0.30, 0.96)	1.02 (0.68, 1.36)	0.89 (0.56, 1.23)	1.90 (1.52, 2.28)	0.83 (0.49, 1.16)	1.05 (0.71, 1.39)	1.28 (0.93, 1.63)	0.92 (0.58, 1.26)
Khosravani et al. (2019b)	Schizophrenia	0.61 (0.27, 0.95)	0.58 (0.24, 0.92)	2.01 (1.60, 2.41)	0.48 (0.14, 0.81)	0.40 (0.06, 0.74)	0.33 (−0.01, 0.66)	0.38 (0.05, 0.72)	0.53 (0.19, 0.87)	0.72 (0.37, 1.06)	0.41 (0.07, 0.75)
Kwak and Lee (2015)	Obsessive–compulsive disorder	1.78 (1.35, 2.20)	0.77 (0.40, 1.14)	1.19 (0.80, 1.58)	2.06 (1.62, 2.51)	1.95 (1.51, 2.39)	1.74 (1.32, 2.17)	1.79 (1.36, 2.21)	1.42 (1.02, 1.83)	1.17 (0.78, 1.56)	1.42 (1.01, 1.82)
Kwak and Lee (2015)	Panic disorder	0.97 (0.58, 1.37)	0.25 (−0.12, 0.62)	0.51 (0.14, 0.89)	0.58 (0.20, 0.96)	0.70 (0.31, 1.08)	0.98 (0.59, 1.38)	0.86 (0.47, 1.25)	1.24 (0.84, 1.65)	0.34 (−0.04, 0.71)	0.88 (0.50, 1.27)
Legenbauer et al. (2018)	Bulimia nervosa										
Legenbauer et al. (2018)	Binge eating disorder										

Table 4 (continued)

Study[1]	Target disorder	ED (95% CI)	AB (95% CI)	MA (95% CI)	SI (95% CI)	DS (95% CI)	FA (95% CI)	DI (95% CI)	VH (95% CI)	EM (95% CI)	SB (95% CI)
Moir et al. (2017)	Borderline PD	1.23 (0.81, 1.65)	1.68 (1.23, 2.12)	1.48 (1.05, 1.91)	1.39 (0.97, 1.82)	1.80 (1.35, 2.25)	1.13 (0.71, 1.54)	1.36 (0.93, 1.78)	1.39 (0.96, 1.81)	0.77 (0.37, 1.18)	1.36 (0.93, 1.78)
Nilsson et al. (2010)	Borderline PD	2.14 (1.49, 2.78)	2.07 (1.44, 2.71)	2.82 (2.10, 3.55)	2.56 (1.86, 3.25)	2.49 (1.80, 3.17)	1.40 (0.83, 1.97)	2.12 (1.48, 2.77)	2.29 (1.63, 2.95)	1.22 (0.67, 1.78)	1.97 (1.34, 2.59)
Nilsson et al. (2010)	Bipolar disorder	0.81 (0.27, 1.34)	0.84 (0.30, 1.37)	0.89 (0.35, 1.42)	0.69 (0.16, 1.21)	0.80 (0.27, 1.34)	0.94 (0.40, 1.48)	0.87 (0.33, 1.40)	0.44 (−0.08, 0.96)	0.97 (0.43, 1.51)	1.16 (0.60, 1.71)
Unoka et al. (2015)	Borderline PD	2.18 (1.77, 2.58)	2.57 (2.14, 3.01)	1.91 (1.52, 2.30)	2.84 (2.39, 3.30)	1.95 (1.56, 2.34)	2.01 (1.62, 2.41)	2.40 (1.98, 2.82)	1.74 (1.36, 2.11)	1.36 (1.00, 1.71)	1.81 (1.43, 2.19)
Unoka & Vizin (2017)	Borderline PD	1.42 (1.04, 1.80)	1.77 (1.37, 2.18)	1.44 (1.05, 1.82)	2.35 (1.91, 2.80)	2.36 (1.91, 2.80)	1.56 (1.16, 1.96)	2.08 (1.66, 2.51)	1.39 (1.00, 1.78)	1.23 (0.85, 1.61)	1.70 (1.30, 2.10)
Voderholzer et al. (2014)	Obsessive–compulsive disorder	1.07 (0.75, 1.39)	1.54 (1.20, 1.88)	0.77 (0.46, 1.08)	1.38 (1.05, 1.71)	1.65 (1.31, 2.00)	1.08 (0.76, 1.40)	1.99 (1.63, 2.35)	1.15 (0.83, 1.48)	1.30 (0.97, 1.62)	1.40 (1.07, 1.74)
Voderholzer et al. (2014)	Chronic pain disorder	1.75 (1.36, 2.15)	0.80 (0.44, 1.16)	0.92 (0.55, 1.28)	1.35 (0.97, 1.73)	1.51 (1.12, 1.89)	0.77 (0.41, 1.13)	1.33 (0.95, 1.71)	0.83 (0.46, 1.19)	0.94 (0.57, 1.30)	1.11 (0.74, 1.48)
Waller (2003)	Binge eating disorder	1.19 (0.58, 1.79)	1.28 (0.67, 1.89)	1.50 (0.87, 2.14)	1.35 (0.73, 1.96)	2.07 (1.37, 2.77)	2.02 (1.33, 2.71)	1.73 (1.08, 2.39)	1.08 (0.49, 1.68)	0.84 (0.26, 1.42)	0.48 (−0.08, 1.05)
Waller (2003)	Bulimia nervosa-purging subtype	1.28 (0.67, 1.89)	1.21 (0.61, 1.82)	0.93 (0.35, 1.52)	1.09 (0.49, 1.68)	1.37 (0.75, 2.00)	1.13 (0.53, 1.73)	0.78 (0.21, 1.36)	0.95 (0.36, 1.53)	0.74 (0.17, 1.32)	0.73 (0.15, 1.30)

Table 4 (continued)

Study[1]	Target disorder	ED (95% CI)	AB (95% CI)	MA (95% CI)	SI (95% CI)	DS (95% CI)	FA (95% CI)	DI (95% CI)	VH (95% CI)	EM (95% CI)	SB (95% CI)
Wesley and Manjula (2015)	Depression	0.80 (0.28, 1.33)	0.93 (0.40, 1.47)	1.17 (0.62, 1.72)	1.44 (0.87, 2.02)	1.28 (0.72, 1.84)	1.60 (1.01, 2.19)	1.32 (0.76, 1.88)	1.28 (0.72, 1.84)	1.480.90, 2.05)	1.75 (1.15, 2.35)
Yalcin et al. (2020)	Posttraumatic stress disorder	0.33 (0.15, 0.51)	0.49 (0.30, 0.67)	0.62 (0.44, 0.80)	0.58 (0.40, 0.77)	0.66 (0.48, 0.85)	0.47 (0.28, 0.65)	0.54 (0.35, 0.72)	0.67 (0.49, 0.85)	−0.08 (−0.26, 0.10)	0.46 (0.28, 0.64)
Yoosefi et al. (2016)	Obsessive–compulsive disorder	1.06 (0.64, 1.48)	0.91 (0.50, 1.32)	0.98 (0.56, 1.39)	1.24 (0.81, 1.66)	1.19 (0.76, 1.61)	1.04 (0.62, 1.46)	1.03 (0.61, 1.44)	0.98 (0.57, 1.40)	0.85 (0.44, 1.26)	1.17 (0.74, 1.59)
Ozdel et al. (2015)	Antisocial PD	1.28 (0.72, 1.84)	0.66 (0.14, 1.19)	1.61 (1.02, 2.20)	2.07 (1.44, 2.71)	1.56 (0.98, 2.15)	1.32 (0.75, 1.88)	1.38 (0.81, 1.95)	1.74 (1.14, 2.34)	0.32 (−0.19, 0.84)	1.21 (0.65, 1.76)

Study[1]	Target disorder	SS (95% CI)	EI (95% CI)	US (95% CI)	ET (95% CI)	IS (95% CI)	AS (95% CI)	NP (95% CI)	PU (95% CI)	SU (95% CI)
Ahmadian et al. (2015)	Acute posttraumatic stress disorder	1.73 (1.14, 2.33)	5.40 (4.28, 6.52)	4.58 (3.59, 5.56)	3.32 (2.52, 4.11)	6.08 (4.84, 7.31)	4.84 (3.81, 5.86)	5.87 (4.67, 7.06)	6.81 (5.45, 8.17)	
Ahmadian et al. (2015)	Chronic posttraumatic stress disorder	2.59 (1.89, 3.28)	6.77 (5.42, 8.12)	6.82 (5.46, 8.19)	2.83 (2.10, 3.56)	5.45 (4.32, 6.58)	4.81 (3.79, 5.83)	6.01 (4.78, 7.23)	6.37 (5.08, 7.65)	

Table 4 (continued)

Study[1]	Target disorder	SS (95% CI)	EI (95% CI)	US (95% CI)	ET (95% CI)	IS (95% CI)	AS (95% CI)	NP (95% CI)	PU (95% CI)	SU (95% CI)
Ahmad-panah et al. (2017)	Depression	0.94 (0.41, 1.48)	2.21 (1.56, 2.86)	1.16 (0.61, 1.71)	1.45 (0.87, 2.02)	2.15 (1.50, 2.79)	1.95 (1.33, 2.57)	2.71 (2.00, 3.43)	6.35 (5.07, 7.63)	
Ahmad-panah et al. (2017)	Depression with suicidality	0.68 (0.16, 1.21)	2.91* (2.17, 3.65)	1.52 (0.94, 2.10)	1.50 (0.92, 2.08)	1.91 (1.29, 2.52)	2.40 (1.73, 3.08)	3.48 (2.66, 4.29)	5.45 (4.32, 6.58)	
Ak et al. (2012)	Bipolar disorder	5.96 (4.41, 7.51)	4.67 (3.39, 5.95)	4.48 (3.24, 5.72)	3.41 (2.38, 4.44)	5.77 (4.26, 7.28)	2.94 (1.99, 3.88)	4.50 (3.26, 5.75)	4.10 (2.94, 5.26)	
Aloi et al. (2020)	Binge eating disorder	0.35 (−0.05, 0.74)	0.21 (0.19, 0.60)	0.20 (−0.20, 0.59)	0.34 (−0.05, 0.74)	1.12 (0.70, 1.55)	0.26 (−0.13, 0.66)	0.31 (−0.08, 0.71)	0.08 (−0.31, 0.48)	
Atalay et al. (2008)	Obsessive–compulsive disorder	0.10 (−0.31, 0.51)	0.10 (−0.32, 0.51)	0.54 (0.12, 0.96)	0.42 (0.01, 0.84)	0.37 (−0.05, 0.78)	0.48 (0.06, 0.90)	0.79 (0.36, 1.22)	0.21 (−0.21, 0.62)	
Atalay et al. (2011)	Major depressive disorder	0.76 (0.32, 1.20)	0.48 (0.05, 0.91)	0.49 (0.06, 0.92)	0.52 (0.09, 0.95)	0.56 (0.13, 1.00)	0.58 (0.15, 1.01)	0.67 (0.24, 1.11)	0.14 (−0.29, 0.56)	
Atalay et al. (2011)	Panic disorder	0.36 (−0.07, 0.78)	−0.31 (−0.74, 0.12)	−0.20 (−0.63, 0.22)	0.27 (−0.15, 0.70)	0.44 (0.01, 0.87)	0.42 (−0.01, 0.84)	0.31 (−0.12, 0.74)	−0.22 (−0.64, 0.21)	
Bach and Farrell (2018)	Borderline PD	0.90 (0.61, 1.19)	1.27 (0.97, 1.57)	0.72 (0.43, 1.00)	0.38 (0.10, 0.66)	1.55 (1.24, 1.87)	0.68 (0.39, 0.96)	2.05 (1.71, 2.39)	1.23 (0.93, 1.53)	

Table 4 (continued)

Study[1]	Target disorder	SS (95% CI)	EI (95% CI)	US (95% CI)	ET (95% CI)	IS (95% CI)	AS (95% CI)	NP (95% CI)	PU (95% CI)	SU (95% CI)
Bortolon et al. (2013)	Schizophrenia	0.29 (−0.12, 0.71)	0.59 (0.17, 1.01)	−0.05 (−0.46, 0.36)						
Chen et al. (2019)	Persistent depressive disorder	1.01 (0.47, 1.54)	1.64 (1.05, 2.23)	2.29 (1.63, 2.94)	1.65 (1.06, 2.25)	1.45 (0.87, 2.02)	0.59 (0.07, 1.11)	2.54 (1.85, 3.23)	1.92 (1.31, 2.54)	
Chen et al. (2019)	Major depressive disorder	0.74 (0.19, 1.30)	1.13 (0.55, 1.71)	1.53 (0.91, 2.14)	1.12 (0.54, 1.70)	0.84 (0.28, 1.40)	0.63 (0.08, 1.18)	1.73 (1.09, 2.36)	1.01 (0.43, 1.58)	
Dingemans et al. (2006)	Bulimia nervosa	2.52 (1.68, 3.35)	2.27 (1.47, 3.07)	2.38 (1.57, 3.19)	1.22 (0.55, 1.90)	2.09 (1.32, 2.86)				2.71 (1.84, 3.57)
Dingemans et al. (2006)	Binge eating disorder	1.37 (0.81, 1.93)	1.27 (0.72, 1.81)	0.85 (0.33, 1.37)	0.64 (0.13, 1.15)	1.81 (1.21, 2.41)				1.90 (1.29, 2.50)
Halvorsen et al. (2009)	Depression	1.04 (0.49, 1.58)	1.86 (1.25, 2.47)	1.22 (0.67, 1.78)	0.92 (0.38, 1.46)	1.83 (1.22, 2.44)				1.53 (0.95, 2.12)
Henker et al. (2019)	Depression	0.68 (0.29, 1.08)	0.92 (0.52, 1.33)	1.12 (0.71, 1.53)	0.01* (−0.37, 0.40)	1.30 (0.88, 1.72)	1.10 (0.69, 1.51)	1.73 (1.28, 2.17)	0.84 (0.44, 1.24)	1.39 (0.96, 1.81)
Jalali et al. (2011)	Opioid abuse	1.89 (1.44, 2.33)	1.45 (1.04, 1.87)	2.51 (2.01. 3.01)	2.05 (1.59, 2.51)	1.67 (1.24, 2.10)	1.38 (0.97, 1.80)	0.96 (0.57, 1.35)	2.65 (2.14, 3.15)	
Khosravani et al. (2019a)	Schizophrenia	0.64 (0.35, 0.92)	1.17 (0.86, 1.47)	1.03 (0.73, 1.33)	1.27 (0.97, 1.58)	1.02 (0.72, 1.32)				

Table 4 (continued)

Study[1]	Target disorder	SS (95% CI)	EI (95% CI)	US (95% CI)	ET (95% CI)	IS (95% CI)	AS (95% CI)	NP (95% CI)	PU (95% CI)	SU (95% CI)
Khosravani et al. (2019b)	Obsessive–compulsive disorder	1.26 (0.92, 1.59)	2.05 (1.68, 2.43)	2.02 (1.65, 2.40)	1.33 (0.99, 1.67)	1.39 (1.05, 1.73)				
Khosravani et al. (2019b)	Bipolar disorder	0.63 (0.30, 0.95)	1.13 (0.79, 1.48)	0.94 (0.61, 1.28)	2.46 (2.04, 2.88)	3.11 (2.64, 3.58)				
Khosravani et al. (2019b)	Schizophrenia	0.60 (0.26, 0.94)	0.49 (0.16, 0.83)	1.02 (0.66, 1.37)	0.95 (0.60, 1.30)	0.71 (0.37, 1.05)				
Kwak and Lee (2015)	Obsessive–compulsive disorder	0.08 (−0.28, 0.44)	1.26 (0.86, 1.65)	0.70 (0.33, 1.08)	0.37 (0.00, 0.73)	1.46 (1.05, 1.87)	0.45 (0.08, 0.81)	1.12 (0.73, 1.50)	0.66 (0.29, 1.03)	
Kwak and Lee (2015)	Panic disorder	0.54 (0.16, 0.91)	0.44 (0.07, 0.82)	0.09 (−0.28, 0.46)	0.13 (−0.25, 0.50)	0.89 (0.50, 1.28)	0.17 (−0.20, 0.54)	0.46 (0.08, 0.84)	−0.14 (−0.51, 0.24)	
Legenbauer et al. (2018)	Bulimia nervosa		1.41 (0.83, 1.98)	2.02 (1.39, 2.65)						
Legenbauer et al. (2018)	Binge eating disorder		1.62(1.03, 2.21)	2.07 (1.43, 2.70)						
Moir et al. (2017)	Borderline PD	0.89 (0.49, 1.30)	0.63 (0.23, 1.03)	0.33 (−0.06, 0.73)	−0.01 (−0.40, 0.38)	1.32 (0.90, 1.74)				

Table 4 (continued)

Study[1]	Target disorder	SS (95% CI)	EI (95% CI)	US (95% CI)	ET (95% CI)	IS (95% CI)	AS (95% CI)	NP (95% CI)	PU (95% CI)	SU (95% CI)
Nilsson et al. (2010)	Borderline PD	1.15 (0.60, 1.70)	1.71 (1.11, 2.30)	1.50 (0.92, 2.07)	0.84 (0.31, 1.37)	2.31 (1.65, 2.98)	1.64 (1.05, 2.23)	2.08 (1.45, 2.72)	1.46 (0.88, 2.03)	
Nilsson et al. (2010)	Bipolar disorder	0.88 (0.34, 1.42)	0.33 (−0.18, 0.85)	0.48 (−0.04, 0.99)	0.47 (−0.05, 0.99)	1.36 (0.79, 1.93)	0.72 (0.19, 1.24)	0.59 (0.07, 1.12)	0.530.01, 1.05)	
Unoka et al. (2015)	Borderline PD	0.75 (0.42, 1.08)	2.16 (1.76, 2.57)	1.13 (0.78, 1.47)	1.47 (1.11, 1.83)	2.66 (2.22, 3.10)	1.55 (1.18, 1.91)	2.18 (1.78, 2.59)	1.51 (1.14, 1.87)	1.82 (1.44, 2.20)
Unoka & Vizin (2017)	Borderline PD	0.47 (0.12, 0.82)	1.09 (0.72, 1.46)	0.94 (0.58, 1.30)	0.74 (0.38, 1.09)	1.82 (1.41, 2.23)	1.22 (0.84, 1.60)	1.79 (1.38, 2.20)	0.88 (0.52, 1.23)	1.39 (1.01, 1.77)
Voderholzer et al. (2014)	Obsessive–compulsive disorder	0.46 (0.15, 0.76)	0.88 (0.57, 1.20)	0.91 (0.60, 1.23)	0.31 (0.00, 0.61)	1.16 (0.83, 1.48)	0.66 (0.35, 0.97)	1.46 (1.12, 1.79)	0.77 (0.46, 1.08)	
Voderholzer et al. (2014)	Chronic pain disorder	1.02 (0.65, 1.38)	0.80 (0.44, 1.16)	0.73 (0.37, 1.09)	0.21 (−0.14, 0.56)	0.49 (0.13, 0.84)	0.13 (−0.22, 0.48)	1.09 (0.72, 1.45)	0.45 (0.09, 0.80)	
Waller (2003)	Binge eating disorder	0.26 (−0.30, 0.82)	2.03 (1.34, 2.72)	0.23 (−0.33, 0.78)	1.25 (0.64, 1.87)	0.42 (−0.14, 0.98)				
Waller (2003)	Bulimia nervosa-purging subtype	−0.07 (−0.62, 0.49)	1.76 (1.10, 2.42)	0.41 (−0.15, 0.97)	0.41 (−0.15, 0.97)	0.38 (−0.18, 0.94)				
Wesley and Manjula (2015)	Depression	0.20 (−0.31, 0.71)	0.63 (0.11, 1.15)	0.27 (−0.24, 0.78)	0.35 (−0.16, 0.86)	0.83 (0.30, 1.36)				

Table 4 (continued)

Study[1]	Target disorder	SS (95% CI)	EI (95% CI)	US (95% CI)	ET (95% CI)	IS (95% CI)	AS (95% CI)	NP (95% CI)	PU (95% CI)	SU (95% CI)
Yalcin et al. (2020)	Posttraumatic stress disorder	0.31 (0.13, 0.49)	1.30 (1.10, 1.50)	0.54 (0.35, 0.72)	0.45 (0.27, 0.63)	1.07 (0.88, 1.26)	0.11 (−0.07, 0.29)	0.40 (0.22, 0.58)	0.65 (0.46, 0.83)	
Yoosefi et al. (2016)	Obsessive–compulsive disorder	0.34 (−0.05, 0.74)	0.84 (0.44, 1.25)	0.40 (0.01, 0.79)	0.59 (0.19, 0.99)	1.05 (0.63, 1.47)				
Ozdel et al. (2015)	Antisocial PD	0.31 (−0.20, 0.83)	1.24 (0.68, 1.80)	0.25 (−0.27, 0.76)	1.23 (0.67, 1.78)	0.80 (0.27, 1.33)				

[1]Effect sizes for the Pinto-Gouveia et al. (2006) study are presented in the text. "*" outlier in meta-analysis. *AB* abandonment, *AS* approval-seeking, *DI* dependence/incompetence, *DS* defectiveness/shame, *ED* emotional deprivation, *EI* emotional inhibition, *EM* enmeshment, *ET* entitlement, *FA* failure to achieve, *IS* insufficient self-control, MA Mistrust/abuse, *NP* negativity/pessimism, *PU* punitiveness, *SB* subjugation, *SI* social isolation, *SS* self-sacrifice, *SU* social undesirability, *US* unrelenting standards, *VH* vulnerability to harm

Table 5 Meta-analytic findings

EMS	Overall	Binge eating disorder	Bipolar disorder	Borderline PD	Bulimia nervosa	Depression	Obsessive–compulsive disorder	Panic disorder	Posttraumatic stress disorder	Schizophrenia
	g [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)
ED	1.54 [1.13, 1.95] (37, 75.1%)	1.09 [0.86, 1.32] (3, 0.0%)	0.91 [0.24, 1.57] (3, 24.9%)	1.69 [1.18, 2.21] (5, 71.2%)	1.77 [−4.85, 8.38] (2, 75.5%)	2.12 [1.00, 3.23] (8, 91.6%)	1.22 [0.68, 1.75] (5, 77.2%)	0.47 [−5.98, 6.92] (2, 91.6%)	4.15 [−44.90, 53.19] (2, 98.9%)	1.06 [0.01, 2.11] (3, 83.4%)
AB	1.49 [1.12, 1.86] (37, 71.9%)	1.14 [0.54, 1.74] (3, 0.0%)	1.62 [−1.72, 4.97] (3, 89.9%)	1.96 [1.50, 2.42] (5, 64.5%)	1.87 [−6,88, 10.62] (2, 85.2%)	2.14 [0.97, 3.31] (8, 91.5%)	1.01 [0.38, 1.64] (5, 85.8%)	0.35 [−1.06, 1.76] (2, 0.0%)	1.67 [−13.67, 17.00] (2, 97.4%)	0.78 [0.12, 1.44] (3, 58.8%)
MA	1.46 [1.05, 1.88] (37, 76.1%)	0.96 [−0.66, 2.57] (3, 85.4%)	1.60 [−2.22, 5.41] (3, 92.3%)	1.92 [1.26, 2.59] (5, 77.8%)	1.87 [−6.88, 10.62] (2, 85.2%)	1.60 [1.12, 2.07] (8, 75.0%)	0.84 [0.46, 1.22] (5, 58.2%)	0.40 [−1.17, 1.98] (2, 0.0%)	4.69 [−47.61, 56.99] (2, 98.9%)	1.30 [−0.53, 3.13] (3, 91.9%)
SI	1.93 [1.33, 2.52] (37, 85.0%)	1.13 [0.10, 2.17] (3, 63.8%)	2.02 [−3.21, 7.25] (3, 93.7%)	2.23 [1.54, 2.92] (5, 82.7%)	1.54 [−4.58, 7.66] (2, 73.6%)	3.13 [0.88, 5.38] (8, 96%)	1.41 [0.86, 1.96] (5, 75.8%)	0.23 [−4.37, 4.82] (2, 83.9%)	3.23 [−30.79, 37.25] (2, 98.6%)	0.82 [0.03, 1.62] (3, 71.7%)
DS	1.63 [1.26, 2.01] (37, 73.9%)	1.43 [0.13, 2.73] (3, 69.1%)	1.53 [−1.59, 4.64] (3, 89.1%)	2.05 [1.75, 2.35] (5, 18.1%)	1.82 [−4.25, 7.88] (2, 70.6%)	2.11 [0.49, 3.73] (8, 92.9%)	1.31 [0.65, 1.97] (5, 84.3%)	0.30 [−4.77, 5.38] (2, 86.7%)	2.01 [−15.49, 19.51] (2, 97.6%)	0.81 [−0.12, 1.75]3, 79.3%)
FA	1.46 [1.12, 1.81] (37, 68.7%)	1.25 [−0.29, 2.78] (3, 75.9%)	2.33 [−1.96, 6.61] (3, 92.6%)	1.58 [1.17, 2.00] (5, 61.4%)	1.57 [−4.40, 7.54] (2, 72.0%)	1.85 [0.96, 2.75] (8, 88.1%)	1.35 [0.52, 2.18] (5, 90.7%)	0.77 [−2.12, 3.65] (2, 56.9%)	2.63 [−25.25, 30.50] (2, 98.5%)	0.76 [−0.19, 1.71] (3, 79.5%)
DI	1.62 [1.18, 2.05] (37, 76.9%)	1.21 [0.18, 2.23] (3, 54.4%)	2.51 [−4.88, 9.89] (3, 95.1%)	1.93 [1.42, 2.43] (5, 70.9%)	1.37 [−6.43, 9.17] (2, 84.2%)	1.69 [0.91, 2.47] (8, 87.5%)	1.29 [0.56, 2.02] (5, 88.4%)	0.59 [−2.96, 4.14] (2, 72.2%)	3.90 [−39.36, 47.16] (2, 98.8%)	0.76 [−0.13, 1.65] (3, 77.8%)
VH	1.41 [1.10, 1.72] (37, 64.0%)	0.75 [−0.20, 1.69] (3, 58.6%)	1.01 [−0.44, 2.47] (3, 73.7%)	1.64 [1.28, 2.00] (5, 42.9%)	1.36 [−4.24, 6.96] (2, 70.2%)	1.80 [1.16, 2.45] (8, 84.5%)	1.25 [0.79, 1.71] (5, 71.7%)	1.16 [0.04, 2.30] (2, 0.0%)	2.73 [−23.90, 29.37] (2, 98.4%)	0.77 [0.05, 1.49] (3, 65.7%)

Table 5 (continued)

EMS	Overall	Binge eating disorder	Bipolar disorder	Borderline PD	Bulimia nervosa	Depression	Obsessive–compulsive disorder	Panic disorder	Posttraumatic stress disorder	Schizophrenia
	g [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)
EM	1.28 [0.81, 1.74] (37, 78.4%)	0.72 [−0.37, 1.81] (3, 70.0%)	2.14 [−2.47, 6.76] (3, 92.3%)	1.22 [0.90, 1.54] (5, 41.7%)	1.23 [−5.28, 7.74] (2, 78.6%)	1.65 [0.84, 2.46] (8, 89.1%)	1.04 [0.52, 1.57] (5, 78.2%)	0.25 [−1.01, 1.51] (2, 0.0%)	4.14 [−50.05, 58.34] (2, 99.0%)	0.88 [0.51, 1.25] (3, 0.0%)
SB	1.54 [1.04, 2.03] (37, 79.5%)	0.70 [−0.54, 1.94] (3, 73.1%)	2.69 [−4.68, 10.06] (3, 95.0%)	1.71 [1.46, 1.95] (5, 0.0%)	1.67 [−10.62, 13.95] (2, 92.6%)	1.63 [1.33, 1.93] (8, 38.6%)	1.18 [0.75, 1.61] (5, 66.2%)	0.57 [−3.49, 4.63] (2, 78.8%)	4.68 [−49.54, 58.91] (2, 98.9%)	0.76 [−0.02, 1.54] (3, 67.3%)
SS	0.82 [0.52, 1.11] (37, 62.1%)	0.65 [−0.87, 2.16] (3, 80.6%)	2.41 [−4.98, 9.80] (3, 95.4%)	0.80 [0.51, 1.08] (5, 31.4%)	1.21 [−15.21, 17.62] (2, 96.1%)	0.74 [0.53, 0.96] (8, 1.9%)	0.58 [0.01, 1.14] (5, 84.4%)	0.46 [−0.68, 1.59] (2, 0.0%)	1.42 [−13.04, 15.89] (2, 97.4%)	0.55 [0.13, 0.96] (3, 0.0%)
EI	1.35 [0.94, 1.75] (39, 74.4%)	1.25 [−0.01, 2.51] (4, 89.7%)	1.98 [−3.68, 7.65] (3, 94.8%)	1.36 [0.63, 2.09] (5, 87.2%)	1.75 [0.70, 2.79] (3, 33.3%)	1.44 [0.75, 2.13] (8, 87.0%)	1.03 [0.15, 1.91] (5, 92.1%)	0.07 [−4.71, 4.85] (2, 85.1%)	3.99 [−30.74, 38.72] (2, 98.4%)	0.76 [−0.16, 1.68] (3, 79.3%)
US	1.09 [0.68, 1.50] (39, 75.9%)	0.82 [−0.56, 2.19] (4, 88.9%)	1.91 [−3.46, 7.28] (3, 94.2%)	0.89 [0.38, 1.41] (5, 73.3%)	1.58 [−1.03, 4.20] (3, 90.5%)	1.17 [0.65, 1.69] (8, 79.7%)	0.92 [0.11, 1.72] (5, 91.0%)	−0.04 [−1.86, 1.79] (2, 0.8%)	3.64 [−36.30, 43.59] (2, 98.8%)	0.68 [−0.86, 2.21] (3, 90.1%)
ET	0.91 [0.60, 1.21] (36, 61.9%)	0.71 [−0.43, 1.84] (3, 66.8%)	2.08 [−1.64, 5.79] (3, 95.5%)	0.68 [−0.01, 1.37] (5, 88.6%)	0.79 [−4.34, 5.93] (2, 69.4%)	0.91 [0.41, 1.42] (8, 82.8%)	0.61 [0.08, 1.14] (5, 83.1%)	0.19 [−0.74, 1.12] (2, 0.0%)	1.61 [−13.49, 16.71] (2, 97.4%)	1.12 [−0.92, 3.17] (2, 45.4%)
IS	1.54 [1.11, 1.97] (36, 75.0%)	1.11 [−0.58, 2.81] (3, 81.9%)	3.33 [−2.11, 8.77] (3, 95.0%)	1.91 [1.23, 2.59] (5, 83.3%)	1.21 [−9.64, 12.07] (2, 91.9%)	1.33 [0.85, 1.81] (8, 76.5%)	1.09 [0.56, 1.62] (5, 77.4%)	0.68 [−2.18, 3.53] (2, 56.6%)	3.22 [−24.60, 31.05] (2, 98.2%)	0.88 [−1.11, 2.87] (2, 45.1%)
AS	1.12 [0.58, 1.67] (23, 76.2%)	–	1.79 [−12.30, 15.88] (2, 93.8%)	1.24 [0.54, 1.94] (4, 83.2%)	–	1.19 [0.37, 2.00] (6, 85.0%)	0.55 [0.25, 0.85] (3, 0.0%)	0.28 [−1.25, 1.81] (2, 0.0%)	2.43 [−27.41, 32.28] (2, 98.7%)	–

Table 5 (continued)

EMS	Overall	Binge eating disorder	Bipolar disorder	Borderline PD	Bulimia nervosa	Depression	Obsessive–compulsive disorder	Panic disorder	Posttraumatic stress disorder	Schizophrenia
	g [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)	*g* [95% CI] (*k*, I^2)
NP	1.74 [1.02, 2.46] (23, 83.8%)	–	2.51 [−22.32, 27.34] (2, 96.9%)	2.02 [1.75, 2.29] (4, 0.0%)	–	2.10 [1.08, 3.12] (6, 90.5%)	1.14 [0.30, 1.98] (3, 66.7%)	0.39 [−0.54, 1.33] (2, 0.0%)	3.17 [−32.43, 38.77] (2, 98.7%)	–
PU	1.61 [0.64, 2.57] (23, 83.8%)	–	2.28 [−20.36, 24.92] (2., 96.7%)	1.24 [0.79, 1.70] (4, 54.1%)	–	2.57 [−0.16, 5.30] (6, 96.7%)	0.57 [−0.16, 1.29] (3, 57.3%)	−0.17 [−0.68, 0.33] (2, 0.0%)	3.47 [−32.86, 39.80] (2, 98.7%)	–
SU	1.63 [1.23, 2.04] (6, 0%)	–	–	1.61 [−1.10, 4.31] (2, 58.2%)	–	1.44 [0.56, 2.31] (2, 0.0%)	–	–	–	–

"–" less than two studies available. *AB* abandonment, *AS* approval-seeking, *DI* dependence/incompetence, *DS* defectiveness/shame, *ED* emotional deprivation, *EI* emotional inhibition, *EM* enmeshment, *ET* entitlement, *FA* failure to achieve, *IS* insufficient self-control, *MA* mistrust/abuse, *NP* negativity/pessimism, *PU* punitiveness, *SB* subjugation, *SI* social isolation, *SS* self-sacrifice, *SU* social undesirability, *US* unrelenting standards, *VH* vulnerability to harm

resulting in large confidence intervals that included zero for all EMS and high heterogeneity estimates ($I^2 > 97.4\%$ for all EMSs).

Other Diagnoses

Several mental disorders have been examined in relation to EMSs by only single studies. The ESs of these studies are displayed in Table 4. Ahmadian et al. (2015) examined EMSs in acute PTSD and reported the largest ESs for the subjugation ($g = 7.09$), the vulnerability to harm ($g = 7.01$), and the punitiveness ($g = 6.81$) schemas. For opioid abuse, the largest differences between the patient and the healthy control group were found for abandonment ($g = 3.37$), punitiveness ($g = 2.65$), and unrelenting standards ($g = 2.51$) (Jalali et al., 2011). Using the first version of the YSQ, Pinto-Gouveia et al. (2006) investigated EMSs in social phobia. The ESs were as follows, ordered according to size: mistrust/abuse ($g = 2.89$), guilt/failure ($g = 2.39$), social isolation/alienation ($g = 2.34$), emotional deprivation ($g = 2.23$), social undesirability/defectiveness ($g = 2.06$), subjugation/lack of individuation ($g = 2.03$), fear of losing self-control ($g = 1.80$), shame ($g = 1.73$), dependence ($g = 1.62$), abandonment ($g = 1.38$), entitlement/insufficient limits ($g = 0.85$), vulnerability to harm ($g = 0.72$), unrelenting standards ($g = 0.25$). In the study by Voderholzer et al. (2014), chronic pain disorder was primarily characterized by the emotional deprivation ($g = 1.75$), defectiveness/shame ($g = 1.51$), and the dependence/incompetence ($g = 1.33$) schemas. For antisocial personality disorder, Ozdel et al. (2015) reported the largest differences between the patient and the healthy control group for social isolation ($g = 2.07$), vulnerability to harm ($g = 1.74$), and mistrust/abuse ($g = 1.61$).

Discussion

The purpose of the present investigation was to evaluate the associations between EMSs and mental disorders in studies comparing diagnosed patients with healthy controls. In total 28 studies met the inclusion criteria. A series of meta-analyses were performed to examine EMSs across disorders and with respect to specific diagnostic categories.

Overall, the clinical samples showed elevated scores on all EMSs with large ESs using Cohen's criteria (all $gs \geq 0.82$). This finding is in accordance with the schema theory (Young, 1999), supporting the proposed maladaptivity of EMSs, and consistent with studies showing high correlations of EMSs with general measures of psychiatric symptoms (e.g., Welburn et al., 2002). There was, however, variation between EMSs in terms of the strength of their associations with psychopathology. Especially large ESs were observed for the social isolation, negativity/pessimism, defectiveness/shame, and social undesirability schemas. The relatively strong associations of these EMSs with a broad specter of mental disorders can be related to their conceptual similarity to established transdiagnostic phenomena. For example,

the social isolation schema is defined as the belief that one is different from other people and not part of a group or community (Young et al., 2003). Lack of social connectedness and loneliness are highly prevalent among adults with mental disorders and contribute to the symptom burden (Michalska da Rocha et al., 2017; Nenov-Matt et al., 2020; Stickley & Koyanagi, 2016). The negativity/pessimism schema involves negative expectations for the future, anxiety about making serious mistakes, an unrealistic negative view of the future, and proneness to rumination (Young et al., 2003). Pessimism is generally related to negative feelings and distress (Carver et al., 2010). Further, rumination as a form of repetitive negative thinking has been found across psychiatric diagnoses (Ehring & Watkins, 2008). Finally, the defectiveness/shame and social undesirability schemas are characterized by the feeling that one is a fundamentally flawed and socially unattractive person (Young, 1990; Young et al., 2003). Shame and self-criticism have been linked to low self-warmth and low self-compassion (Gilbert, 2010; Neff, 2003). Self-criticism and low self-compassion have been shown to be related to a broad range of psychopathology (Muris & Petrocchi, 2016; Werner et al., 2019).

On the other hand, the lowest pooled ESs across diagnostic categories were found for the self-sacrifice, the entitlement, and the unrelenting standards schemas. Focusing on others' needs (the self-sacrifice schema) and striving to meet high standards (the unrelenting standards schema) are valued in many cultures (Young et al., 2003), which may mitigate the emotional costs of having these schemas. The relatively low ES of the entitlement schema (the belief that one is superior to others) may be due to the nature of disorders included in the analyses. Psychiatric diagnoses for which the entitlement schema can be assumed to have a central role (e.g., narcissistic and antisocial personality disorder, Bernstein, 2002) were only weakly represented in the present sample.

With regard to the associations of EMS with specific psychiatric diagnoses, depression was the mental disorder that was investigated most frequently in the included studies, followed by BPD and OCD. A total of eight studies reported EMSs in patients with depression compared to healthy controls. BPD and OCD were investigated in five studies each. Other diagnoses that were addressed in at least two studies included binge eating disorder, bipolar disorder, schizophrenia, bulimia nervosa, panic disorder, and PTSD. Results from the meta-analyses showed strong associations of these disorders with EMSs in terms of large ESs but also low specificity of EMS-disorder associations. However, due to the small number of studies for each disorder, the results must be interpreted with great caution.

For depression, the largest ESs were found for the negativity/pessimism, social isolation, emotional deprivation, and abandonment schemas. These associations are in line with theoretical expectations and the results of previous studies. For example, negative expectations for the future are a core characteristic of depression according to Beck's (1967) cognitive model. Further, a number of studies (e.g., Cacioppo et al., 2006) have demonstrated associations of loneliness with depression. Relationships with the emotional deprivation and abandonment schemas have also been hypothesized by Renner et al. (2013). On the other hand, the proposal by Renner et al. (2013) that the failure schema is especially elevated in depression is not supported by the present study's findings. Similarly, findings that the defectiveness/

shame (Bishop et al., 2022; Hawke & Provencher, 2011) and insufficient self-control schemas (Hawke & Provencher, 2011) are central to depression are not confirmed by the current data.

Consistent with Young et al.'s proposal (2003) that almost all EMSs are elevated in patients with BPD, the results from the meta-analysis showed large ESs for the differences between the clinical groups and the control groups except for the entitlement schema. The confidence intervals for the entitlement and social undesirability schemas further suggested nonsignificant pooled differences between the groups across studies. The largest ESs were observed for the EMSs of social isolation, defectiveness/shame, negativity/pessimism, abandonment, dependence/incompetence, mistrust/abuse, and insufficient self-control. Overall, this result concurs with theoretical predictions (Arntz & Van Genderen, 2009; Bernstein, 2002). Deviating from the hypotheses by Bernstein (2002) and Arntz and Van Genderen (2009), the emotional deprivation, vulnerability to harm/illness, subjugation, and punitiveness schemas were not particularly pronounced in the BPD groups compared to other EMSs, although the ESs were still very large.

Individuals with OCD also differed from healthy controls on a number of EMSs. The largest ESs were found for the social isolation, the failure, and the defectiveness/shame schemas. This finding aligns well with the results of qualitative studies investigating the lived experience of patients with OCD, in which social disconnection, feeling different from others, guilt, and feeling that one fails at life emerged as central personal themes of these patients (Bhattacharya & Singh, 2015; Murphy & Perera-Delcourt, 2014). However, the diagnosis of OCD was also associated with almost all of the other EMSs with medium to large ESs, except for punitiveness, suggesting that EMSs are generally elevated in patients with OCD.

For binge eating disorder, group differences between diagnosed individuals and healthy controls were observed for the defectiveness/shame, dependence/incompetence, social isolation, abandonment, and emotional deprivation schemas with large ESs according to Cohen's (1988) criteria. The high levels of these EMSs compared to the nonclinical groups suggest that binge eating disorder is associated with the experience that one's needs for emotional support, stable relationships, belonging, unconditional love, and autonomy are not met (cf. Aloi et al., 2020). It can be hypothesized that negative emotions resulting from the frustration of these needs trigger binge eating behaviour (cf. Leehr et al., 2015).

With regard to schizophrenia, elevated scores on the enmeshment, social isolation, emotional deprivation, vulnerability to harm/illness, and self-sacrifice were found with medium to large ESs. The enmeshment schema refers to extreme closeness with significant others that interferes with normal identity development (Young et al., 2003). This finding can be related to the identity difficulties that are reported by individuals with psychosis (Ben-David & Kealy, 2020). The relatively high average score on the social isolation schema is consistent with studies showing that loneliness is experienced by many people with psychosis (Stain et al., 2012). Finally, it can be speculated that the result regarding the vulnerability to harm/illness schema is connected with the fear of new psychotic episodes and the central role of anxiety in psychosis in general (cf. Hartley et al., 2013).

According to the study results, bipolar disorder, bulimia nervosa, and panic disorder were reliably associated with only one EMS, i.e., emotional deprivation, emotional inhibition, and vulnerability to harm/illness, respectively. The relationship between the emotional inhibition schema and bulimia nervosa can be seen in connection with findings suggesting that individuals with bulimia nervosa can have difficulties with identifying and expressing positive and negative emotions (Forbush & Watson, 2006). The association between the vulnerability to harm/illness schema and panic disorder may reflect the similarity of the schema (fear of an imminent catastrophe) with the diagnostic criterium for panic disorder that concerns of new panic attacks and their feared consequences are present (American Psychiatric Association, 2013). Extremely high differences on the results of the two included studies on PTSD (Ahmadian et al., 2015; Yalcin et al., 2020) prevent any conclusions about EMSs related to this diagnosis. An additional limitation of these two studies is the small proportion of females in the samples (9.3%).

Several additional diagnoses were examined by only single studies, including substance abuse, ADHD, chronic pain, and antisocial personality disorder. For example, the results of the Özdel et al. (2015) study suggest that antisocial personality disorder is predominantly characterized by the social isolation, the vulnerability to harm/illness, the mistrust/abuse, and the defectiveness/shame schemas. However, based on the high between-study heterogeneity observed in the meta-analyses for the diagnoses investigated in at least two studies, caution is advised when interpreting the results of single studies. More research on the diagnoses investigated by few studies or only a single investigation is needed to identify the EMSs that are especially associated with these diagnoses.

Taken together, the results of this study show that EMSs have been examined in several mental disorders. Strong associations between EMSs and psychiatric diagnoses were found that are meaningful, both conceptually and with respect to existing research on these diagnoses. The results support the notion of EMSs as a transdiagnostic construct in ST. Since EMSs are proposed to reflect unmet psychological needs in childhood (Young et al., 2003), results also suggest that neglected emotional needs in childhood are relevant to the understanding of psychopathology in adulthood. However, given the large number of diagnoses in the current major classification systems, the range of diagnoses investigated using a rigorous research design was rather limited. For example, anxiety disorders, substance use disorders, and personality disorders other than borderline personality disorder were only weakly represented in the studies included in the present investigation. Findings also suggest that the individual EMSs proposed in ST are not specific to particular mental disorders, meaning that certain EMSs can be associated with different diagnoses. Further, for many EMS-disorder associations, the results diverge widely between studies as indicated by high heterogeneity estimates. A major reason for the difficulties establishing clear EMS-disorder associations is likely shortcomings of the existing approach to psychiatric diagnoses in the DSM and ICD systems, especially high co-occurrence and high within-category heterogeneity (Krueger et al., 2005). As a response to these and other problems with the current classification systems (e.g., Kinderman et al., 2017), alternative ways of

diagnosing mental disorders have been recently proposed, including the Hierarchical Taxonomy of Psychopathology (HiTOP; Kotov et al., 2017), the Research Domain Criteria (RDoC; Cuthbert & Insel, 2013), the Psychodynamic Diagnostic Manual (PDM-2; Lingiardi et al., 2015), the Power Threat Meaning Framework (Johnstone & Boyle, in press), and process-based diagnostic systems (Hayes et al., 2020). Future research on EMSs and psychopathology should consider these alternative perspectives on mental disorders.

Another source of variation between studies examining the same diagnoses can be the use of different versions of the YSQ. For example, Moir et al. (2017) found that the placement of the items in the YSQ affected the psychometric properties of the inventory. Groupings of items (as in the YSQ-SF and YSQ-L2) were associated with more response dependence and larger differences between a clinical and a non-clinical group than random presentation of items (Moir et al., 2017). Other differences between the different forms of the YSQ (e.g., long vs. short forms) may also have contributed to diverging results.

For clinicians, the study results suggest that EMSs are prevalent in patients with a broad range of mental disorders. Although the severity of the individual EMSs varied somewhat across disorders in the present investigation, different mental disorders appeared not to be clearly defined by specific EMSs. Thus, EMSs cannot be used as diagnostic markers for mental disorders. However, the assessment of EMSs may aid the understanding of a patient's presenting problems, e.g., EMSs as a personal vulnerability, as a maintaining factor for the reported problems, or as a result of the disorder. Therefore, when developing case conceptualizations, clinicians should be aware of the potential role of EMSs for the individual patient's problems. Clinicians may further consider EMSs as a target for treatment. Studies suggest that ST is effective in changing EMSs (Taylor et al., 2017). Detailed strategies for treating the different EMSs have been developed by Young et al. (2003). Core elements of ST include imagery rescripting to modify the meanings of memories of adverse childhood experiences that led to the development of EMSs, cognitive techniques to challenge the validity of EMSs, behavioral pattern-breaking, and a therapeutic relationship that provides a corrective emotional experience (limited reparenting) (Young et al., 2003).

When discussing the findings of the current study, several limitations have to be taken into account. First, the small number of studies in the meta-analyses of the associations between EMSs and diagnoses warrants caution when interpreting the results. With a small number of studies, the estimate of the between-study variance can be imprecise, and the point estimate of the effect and the confidence interval can be erroneous (Borenstein et al., 2009). Moreover, the small number of studies along with high heterogeneity resulted in large confidence intervals that included 0, increasing the risk of type II error. Thus, it is likely that some associations between EMSs and mental disorders have not been detected in the present investigation. The small number of studies also prevented analyses of publication bias and of potential moderators of the observed effects (e.g., sample characteristics, current vs lifetime diagnosis, version of the YSQ applied) that may

have contributed to high heterogeneity between studies. Following the suggestion by Borenstein et al. (2009), the results of the meta-analyses based on few studies are presented in this report, but their limitations are emphasized. The small number of studies that met the inclusion criteria for this investigation shows a need for more high-quality research in the field. Next, the results can only be interpreted in terms of associations rather than causation since all included studies were based on a cross-sectional design. Thus, while the study findings support the notion that EMSs are related to psychopathology, the proposed causal role of EMSs in the development of psychological problems (Young, 1999) cannot be determined using these studies. Finally, the results of a systematic review and meta-analysis obviously depend on the studies that are included. In the preregistered protocol for the current investigation, inclusion and exclusion criteria were defined. However, in the process of selecting studies, questions arose that were not addressed in the protocol, for example, whether the type of structured interview had to be specified in the paper in order to be included in the current review. It was eventually decided to include studies in which the use of a structured interview was stated even if it was not reported which measure was applied—a decision which influences the results of the present investigation.

In conclusion, the results of the present investigation suggest strong associations between EMSs and mental disorders. Across disorders, the social isolation, negativity/pessimism, defectiveness/shame, and social undesirability schemas were especially elevated in the patient groups compared to healthy controls. Analyses of specific diagnoses showed conceptually meaningful relationships with EMSs. However, high heterogeneity between studies was observed. Clinicians should be attentive to the potential role of EMSs in mental disorders.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s41811-022-00149-7.

Acknowledgements The authors want to thank the authors who generously shared their data for the present study and Anne Christensen for help with the study selection.

Funding Open access funding provided by University of Bergen (incl Haukeland University Hospital)

Declarations

Conflict of Interest The authors declare no competing interests.

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