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Adverse childhood experiences in patients with severe health anxiety: No evidence for an increased frequency compared to patients with obsessive–compulsive disorder

TINE B. GEHRT,[1] MARIE-LOUISE OBERMANN,[2,3] FRUZSINA EVA TOTH[3,4] and LISBETH FROSTHOLM[2,5]

[1]*Center on Autobiographical Memory Research, Aarhus University, Aarhus, Denmark*
[2]*Research Clinic for Functional Disorders, Aarhus University Hospital, Aarhus, Denmark*
[3]*Clinic for OCD and Anxiety Disorders, Aarhus University Hospital, Aarhus, Denmark*
[4]*Regional Psychiatry Unit, Silkeborg Hospital, Central Denmark Region, Silkeborg, Denmark*
[5]*Department of Clinical Medicine, Aarhus University, Aarhus, Denmark*

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Theoretical models of health anxiety emphasize adverse childhood experiences in the development of the disorder, but few studies examine such events in patients with severe health anxiety and the results are difficult to compare across studies. The present study examined adult retrospective reports of illness-related and traumatic childhood experiences in 31 patients with severe health anxiety, 32 non-clinical control participants, and a clinical control group of 33 patients with obsessive–compulsive disorder. No evidence of an increased frequency of adverse childhood experiences in patients with severe health anxiety was found. However, patients with severe health anxiety who had experienced the death of a friend or family member or a major upheaval during childhood, perceived these events as having been more traumatic than the control participants. These findings suggest that biases in how adverse childhood experiences are interpreted or remembered might play a role in severe health anxiety. The findings are discussed in relation to the cognitive behavioral model of health anxiety, and some of the processes in interpretation and memory that could explain how adverse childhood experiences might play a role in the development and maintenance of severe health anxiety are outlined.

Key words: Severe health anxiety, hypochondriasis, obsessive–compulsive disorder, childhood adversity.

Tine B. Gehrt, Center on Autobiographical Memory Research, Aarhus University, Bartholins Allé 11, 8000 Aarhus C, Denmark. E-mail: tgehrt@psy.au.dk

INTRODUCTION

Severe health anxiety is characterized by persistent preoccupations about having or harboring a serious illness. Illness ruminations are easily evoked and are often associated with misinterpreting bodily symptoms or sensations as signs of illness, hence these patients are frequently encountered in medical, and not in mental health, settings (e.g., Abramowitz, Schwartz & Whiteside, 2002; American Psychiatric Association, 2013; Fink, Ørnbøl, Toft, Sparle, Frostholm & Olsen, 2004; WHO, 2019). The etiology of severe health anxiety is debated (e.g., American Psychiatric Association, 2013), but it has been proposed that adverse experiences in childhood – either illness-related or traumatic – could play an important role (e.g., Barsky, Wool, Barnett & Cleary, 1994; Noyes, Stuart, Langbehn, Happel, Longle & Yagla, 2002; Rachman, 2012; Salkovskis & Warwick, 2001).

Symptoms of health anxiety are proposed to occur in adolescence and early adulthood (e.g., American Psychiatric Association, 2013; for a review see Thorgaard, Frostholm & Rask, 2018), making it likely that experiences during this period could precipitate the development of the disorder. Experiences with serious illness in oneself or close others could be such a factor (e.g., Abramowitz *et al*., 2002; American Psychiatric Association, 2013; Rachman, 2012; Warwick & Salkovskis, 1990). According to the cognitive behavioral model of health anxiety, past health-related experiences play a critical role in shaping assumptions about symptoms and illness. These assumptions can be triggered when later encountering health-related events or information, and are perceived as critical to the development of health anxiety. The model does not assume that these illness-related events must have taken place during childhood, but the authors speculate that such early experiences are likely to have occurred (Salkovskis & Warwick, 2001; Warwick & Salkovskis, 1990).

Furthermore, traumatic or highly negative events, such as childhood physical abuse, could also be involved in the development of severe health anxiety. According to the interpersonal model of health anxiety, traumatic and highly negative events in childhood can interfere with the individuals' attachment. Maladaptive attachment styles can influence illness behavior and foster physical complaints and reassurance seeking directed toward health care professionals and close others, thereby resulting in symptoms of health anxiety. The interpersonal model of health anxiety suggests that early illness-related experiences could have similar effects on attachment styles (e.g., Noyes *et al*., 2002).

Surprisingly few studies have examined retrospective reports of illness-related events during childhood and adolescence in adult patients with severe health anxiety. Bianchi (1971) found that patients with disease phobia (i.e., unfounded and persistent fears of having an illness) reported more family illness and more often being weak and sickly during childhood than matched control participants. Barsky *et al*. (1994) showed that participants diagnosed with hypochondriasis[1] reported as children being sick and missing school for health reasons more often than control

participants, but the two groups did not differ for the majority of the assessed event categories. In a similar study, Noyes *et al*. (2002) found that participants with hypochondriasis reported more often having experienced a close friend being seriously ill in childhood and more serious illness or injury in general than control participants, but for the majority of the assessed event categories no group differences were found. Lastly, Weck, Neng, Göller and Müller-Marbach (2014) examined illness-related experiences overall in childhood (0–13 years) and found that patients with hypochondriasis did not report a higher frequency than patients diagnosed with an anxiety disorder or control participants.

For traumatic and highly negative experiences, Barsky *et al*. (1994) found that participants with hypochondriasis reported more traumatic sexual contact, physical violence and major parental upheavals during childhood than control participants. Noyes *et al*. (2002) found that participants with hypochondriasis reported more often having parents and family members with an alcohol or drug problem during childhood and having experienced more traumatic events in general than the control participants. However, no group differences were found for most event categories. Weck *et al*. (2014) found that patients with hypochondriasis reported more childhood emotional abuse, sexual abuse and emotional neglect than control participants, but they did not differ from patients with an anxiety disorder. Finally, Bailer, Witthöft, Wagner, Mier, Diener and Rist (2014) found that patients with hypochondriasis reported more emotional neglect during childhood than control participants, but not compared to patients with depression. Furthermore, patients with hypochondriasis did not differ from control participants on the majority of the assessed event categories. For a more extensive review of the literature also including non-clinical samples, see Thorgaard *et al*. (2018).

Based on the existing studies it is difficult to draw firm conclusions about the role of self-reported experiences with illness-related and traumatic events during childhood in adults with severe health anxiety. There are relatively few studies employing patient populations, and the assessed event categories vary across studies, making it difficult to directly compare results. Even when similar event categories are used findings are often mixed (e.g., experiencing unwanted sexual contact or abuse, for positive findings see Barsky *et al*., 1994; Weck *et al*., 2014, and for negative findings see Bailer *et al*., 2014; Noyes *et al*., 2002). Furthermore, patients with severe health anxiety often do not differ from control participants for the majority of the assessed event categories (e.g., Barsky *et al*., 1994; Noyes *et al*., 2002) and report a decreased or equal level of adverse childhood experiences when compared to other clinical groups (Bailer *et al*., 2014; Weck *et al*., 2014). Hence, the emphasis in theoretical models on adverse childhood experiences, especially concerning illness, in the development of severe health anxiety has been criticized (e.g., Bailer *et al*., 2014; Weck *et al*., 2014).

The present study examines adult retrospective reports of childhood experiences with illness-related and traumatic events in patients with severe health anxiety, a non-clinical control group and a clinical control group of patients with obsessive–compulsive disorder (OCD). We assessed individual event categories as well as the accumulated frequency of the assessed illness-related and traumatic events, respectively. Patients with OCD were chosen as a clinical control group because severe health anxiety was recently included in the group of obsessive–compulsive and related disorders in the ICD-11, and the two disorders are proposed to share similarities in etiology (WHO, 2019).

METHODS

Participants

Thirty-one patients fulfilling the diagnostic research criteria for severe health anxiety (Fink *et al*., 2004) were recruited at the Research Clinic for Functional Disorders, Aarhus University Hospital, Denmark, from March 2016 to September 2016. Clinical assessment was performed using a modified version of the semi-structured psychiatric interview Schedules for Clinical Assessment in Neuropsychiatry (SCAN; WHO, 1998) by trained clinicians.

Thirty-three patients with a principal diagnosis of OCD were recruited at the Clinic for OCD and Anxiety Disorders, Aarhus University Hospital, Denmark, and the OCD association in Denmark. For patients recruited at the Clinic for OCD and Anxiety Disorders, clinical assessment was performed using a modified version of the SCAN (WHO, 1998) or the Anxiety Disorders Interview Scale for DSM-IV (DiNardo, Brown & Barlow, 1994) and diagnoses were in accordance with the diagnostic criteria of the ICD-10 (WHO, 1992). Patients recruited from the OCD association responded to information about the study distributed by the OCD association among their members. Patients with OCD were recruited from May 2016 to September 2017.

Thirty-two control participants were recruited from a database of adults interested in participating in research from May 2016 to December 2016. All control participants self-reported never having received any psychiatric diagnosis.

No a priori power analysis was performed. The sample size was predefined to be a minimum of 30 participants in each group. For participant characteristics, see Table 1.

Procedure

This study was part of a larger online survey. The study was conducted in accordance with current professional ethical guidelines and was reviewed by the local review board at the Center on Autobiographical Memory Research, Aarhus University, Denmark, which found no scientific-ethical considerations that spoke against the implementation of the study. All participants agreed to an informed consent form explaining the nature of the study, as well as issues relating to confidentiality and withdrawal. The main measures presented in this article are non-overlapping with previous publications from this study (Gehrt, Frostholm, Obermann & Berntsen, 2020a; Gehrt, Frostholm, Pallesen *et al*., 2020b; Gehrt *et al*., 2022).[2]

Materials

The Childhood History Questionnaire (Barsky *et al*., 1994) examines illness-related experiences during childhood in oneself and close others. Of the questionnaires seven main items, the first four items are answered in a yes/no format. On the fifth item, participants indicate the number of times they were hospitalized before the age of 16, and the last two items are rated on five-point scale from 1–5.

The Childhood Traumatic Event Scale (Pennebaker & Susman, 1988) examines traumatic events (answered yes/no) experienced before the age of 17 within six domains. If participants indicate having experienced an event, they note the age at which the event took place, and answer two additional questions rated on a scale from one to seven: "If yes, how traumatic was this?" and "If yes, how much did you confide in others about the trauma?"

Table 1. *Group characteristics and mean scores on symptom measures*

	Severe health anxiety	OCD	Control participants	$F(2,93)$	p	η_p^2
Demographics						
N (females)	31 (19)	33 (28)	32 (20)			
Age (*SD*)	40.42 (9.48)[a]	30.82 (10.10)[b]	40.00 (11.44)[a]	8.88	<0.001	0.160
Range	25–66	20–61	27–62			
Years of education (*SD*)	16.45 (3.45)	15.70 (2.48)	17.34 (2.07)	2.98	0.056	0.060
Range	6–23	10–22	13–22			
Symptoms measures						
Health anxiety (*SD*)	28.84 (6.00)[a]	20.64 (8.89)[b]	11.63 (4.40)[c]	51.61	<0.001	0.526
OCD (*SD*)	17.74 (10.49)[a]	36.03 (15.01)[b]	7.03 (6.72)[c]	54.69	<0.001	0.540
Physical symptoms (*SD*)	20.07 (10.83)[a]	18.52 (9.96)[a]	6.16 (4.69)[b]	23.37	<0.001	0.334
Anxiety (*SD*)	14.22 (8.73)[a]	17.39 (6.54)[a]	3.00 (3.06)[b]	43.47	<0.001	0.483
Depression (*SD*)	6.58 (5.40)[a]	11.42 (5.90)[b]	2.81 (3.35)[c]	24.15	<0.001	0.342

Notes: OCD = Obsessive–compulsive disorder; *SD* = Standard deviation; η_p^2 = partial eta squared.
[a,b,c]Dissimilar superscripts indicate that scores in the same row are significantly *different* according to a Bonferroni adjusted post hoc test.

Symptoms of health anxiety were assessed with the Whiteley index seven-item version (Conradt *et al*., 2006; Fink, Ewald, Jensen *et al*., 1999) and symptoms of OCD with the Obsessive–Compulsive Inventory – revised (Foa, Huppert, Leiberg *et al*., 2002). Lastly, physical, depressive and anxiety symptoms were assessed with subscales from the Symptom Check List – revised (Christensen, Fink, Toft, Frostholm, Ørnbøl & Olesen, 2005; Derogatis, 1983).

Data analysis

Data was analyzed using SPSS version 26 (IBM Corp., 2019). Questions answered yes/no were analyzed with chi-squared tests with Bonferroni adjusted post hoc tests based on the adjusted standardized residual. All other items were analyzed with individual analysis of variance (ANOVA) with Bonferroni adjusted post hoc tests. All *p*-values are two-tailed.

RESULTS

Means and test statistics for all items of the Childhood History Questionnaire (Barsky *et al*., 1994) and the Childhood Traumatic Event Scale (Pennebaker & Susman, 1988) are reported in Tables 2 and 3, respectively. Below, we focus on statistically significant findings.

Illness-related childhood experiences

Statistically significant group differences were found for two event categories of the Childhood History Questionnaire (Barsky *et al*., 1994). A chi-squared test showed an effect of group for having experienced illness that resulted in a permanent problem during childhood. The post hoc tests showed no significant group differences (ps > 0.027; corrected threshold: $p \leq 0.017$), but compared to the other groups, patients with OCD reported a numerically higher frequency of having experienced illness that resulted in a permanent problem during childhood. Furthermore, an ANOVA demonstrated an effect of group for reporting having been absent from school due to illness as a child. Patients with OCD reported having been absent from school more frequently than the other groups (ps < 0.035), while patients with severe health anxiety did not differ from the control participants ($p = 1.00$) (Table 2).

An index of exposure to illness-related events was calculated by summing the first four items of the Childhood History Questionnaire (0 = no, 1 = yes). An ANOVA showed an effect of group, $F(2, 93) = 3.73$, $p = 0.028$, $\eta_p^2 = 0.07$ (health anxiety: mean = 0.74, *SD* = 0.93; OCD: mean = 1.24, *SD* = 1.22; controls: mean = 0.59, *SD* = 0.80). Patients with OCD reported a higher overall exposure to illness-related events during childhood than the control participants ($p = 0.032$), but patients with severe health anxiety differed from neither of the other groups (ps > 0.147).

Traumatic childhood experiences

One statistically significant result was found for a main item of the Childhood Traumatic Event Scale (Pennebaker & Susman, 1988). A chi-squared test showed an effect of group for having experienced a major upheaval between one's parents before the age of 17. Patients with OCD reported having experienced this more frequently ($p = 0.005$), while patients with severe health anxiety reported having experienced this less frequently ($p = 0.011$) (Table 3).

For additional questions related to main items of the Childhood Traumatic Event Scale (Pennebaker & Susman, 1988), three significant group differences were found. Patients with severe health anxiety having experienced the death of a friend or family member, reported that this experience had been more traumatic than the control participants ($p = 0.044$), whereas patients with OCD differed from neither of the other groups (ps < 0.069). Furthermore, patients with severe health anxiety reported being significantly older than patients with OCD when experiencing this event ($p = 0.029$), whereas the scores of the control participants differed from neither of the other groups (ps > 0.217). Participants in both patient groups who had experienced a major upheaval perceived as having shaped their life, reported this event as being more traumatic than the control participants (ps < 0.017), but the scores of the patient groups did not differ ($p = 1.00$) (Table 3).

An index of overall exposure to traumatic events was calculated by summing the six yes/no items of the Childhood Traumatic Event Scale (0 = no, 1 = yes). An ANOVA showed no statistically significant effect of group, $F(2, 93) = 1.83$, $p = 0.167$, $\eta_p^2 = 0.04$ (health anxiety: mean = 1.29, SD = 1.27; OCD: mean = 1.93, *SD* = 1.54; control: mean = 1.53, *SD* = 1.53).

Table 2. *Results from the childhood history questionnaire*

	Severe health anxiety (n = 31)		OCD (n = 33)		Controls (n = 32)		Chi-square			ANOVA			
	Yes (%)	Mean (*SD*)	Yes (%)	Mean (*SD*)	Yes (%)	Mean (*SD*)	χ^2	p	W	F	df	p	η_p^2
1. Were you often sick as a child?	5 (16.1%)		10 (30.3%)		18 (56.3%)		4.88	0.087	0.226				
2. As a child did you have any illness resulting in a permanent problem?	1 (3.2%)		8 (24.2%)		4 (12.5%)		6.08	0.048	0.252				
3. Was there a family member that you remember always complaining about their health?	10 (32.3%)		8 (24.2%)		5 (15.6%)		2.39	0.302	0.158				
4. Did someone in your family get extra attention because of a health problem?	7 (22.6%)		15 (45.5%)		7 (21.9%)		5.55	0.062	0.240				
4a. *Was this person sick for >6 months?*	6 (19.4%)		15 (45.5%)		7 (21.9%)		2.30	0.316	0.155				
5. How many times were you hospitalized before the age of 16?		3.81 (17.87)		1.67 (3.65)		0.59 (0.80)				0.78	2,93	0.462	0.016
6. How worried were your parents about your health? (1 = not worried enough, 5 = Overly worried)		3.06 (0.63)		2.94 (0.83)		2.97 (0.54)				0.30	2,93	0.745	0.006
7. How often were you absent from school due to illness in your childhood? (1 = never, 5 = very often)		2.29[a] (0.86)		2.82 [b] (0.88)		2.13[a] (0.71)				6.32	2,93	0.003	0.120

Notes: OCD = Obsessive–compulsive disorder; *SD* = Standard deviation; $W = \sqrt{\frac{\chi^2}{N}}$; η_p^2 = partial eta squared.
[a,b]Dissimilar superscripts indicate that scores in the same row are significantly *different* according to a Bonferroni adjusted post hoc. test.

DISCUSSION

We examined adult retrospective reports of illness-related and traumatic experiences in childhood and adolescence in patients with severe health anxiety, a non-clinical control group and a clinical control group of patients with OCD. We found no evidence of an increased frequency of adverse childhood experiences in patients with severe health anxiety, but compared to the control participants, patients with severe health anxiety perceived events concerning the death of a friend or family member or a major upheaval that had shaped their life during childhood or adolescence as having been more traumatic.

When placing the present findings within the existing literature, two overall patterns emerge. For the frequency of traumatic childhood experiences reported by severe health anxiety patients compared to control participants, the findings are generally mixed, for example in relation to childhood experiences with emotional abuse (for positive findings, see Weck *et al*., 2014, and for negative findings, see Bailer *et al*., 2014), parental upheavals, separation or divorce (for positive findings, see Barsky *et al*., 1994, and for negative findings see Bailer *et al*., 2014; Noyes *et al*., 2002; present study), as well as the accumulated frequency of traumatic events (for positive findings, see Noyes *et al*., 2002, and for negative findings see Bailer *et al*., 2014; present study). For the frequency of illness-related experiences during childhood and adolescence, studies generally find no differences between patients with severe health anxiety compared to control participants for most event categories, for example in relation to childhood experiences with own serious illness or injury (Barsky *et al*., 1994; Noyes *et al*., 2002; present study), chronic illness or disability (Barsky *et al*., 1994; Noyes *et al*., 2002) or the accumulated frequency of illness-related experiences in childhood and adolescence (Weck *et al*., 2014; the present study). Although there currently is no firm evidence that patients with severe health anxiety experience more adverse events during childhood and adolescence compared to other groups, only few studies have examined this and it might be premature to entirely rule out such events as precipitating factors. Future studies could explore if the adverse events reported by severe health anxiety patients differ in certain characteristics from events reported by other groups, for example in their duration, and if reported events happened to someone else it might be important to take into account who this was (e.g., friend, sibling, aunt) and how close the individual was with this person.

Based on the negative and mixed findings in the existing literature, the cognitive behavioral model of health anxiety has been criticized for emphasizing the role of early illness-related experiences in the development and maintenance of symptoms of severe health anxiety (e.g., Bailer *et al*., 2014; Weck *et al*., 2014). However, the model does not explicitly propose that these events happen *more often* in the lives of patients with severe health anxiety, but that they use these experiences to make inferences about illness that come into play when encountering new health-

Table 3. *Results from the childhood traumatic event scale*

	Severe health anxiety		OCD		Controls		Chi-squared			ANOVA			
	Yes (%)	Mean (*SD*)	Yes (%)	Mean (*SD*)	Yes (%)	Mean (SD)	χ^2	*p*	*W*	*F*	df	*p*	η_p^2
Death of a friend or family member	13 (41.9%)		15 (45.5%)		16 (50.0%)		0.42	0.812	0.066				
Age		13.69[a] (1.65)		10.00[b] (4.96)		12.38 (3.16)				3.87	2, 41	0.029	0.159
Traumatic		4.92[a] (2.14)		4.73 (1.71)		3.19[b] (1.64)				4.13	2, 41	0.023	0.168
Confide in others		2.69 (2.14)		2.93 (2.30)		2.94 (1.81)				0.07	2, 40	0.930	0.004
Major upheaval between parents	4[x] (12.9%)		16 [x] (48.5%)		9 (28.1%)		9.70	0.008	0.318				
Age		8.00 (4.00)		7.25 (3.86)		10.00 (5.55)				1.09	2, 25	0.351	0.080
Traumatic		3.75 (2.50)		4.27 (1.94)		3.67 (2.06)				0.27	2, 25	0.763	0.021
Confide in others		2.50 (3.00)		2.19 (1.42)		2.67 (1.32)				0.25	2, 26	0.778	0.019
Traumatic sexual experience	4 (12.9%)		5 (15.2%)		3 (9.4%)		0.50	0.778	0.072				
Age		8.67 (4.04)		8.00 (6.12)		8.36 (4.41)				0.03	2, 8	0.975	0.006
Traumatic		4.75 (2.06)		5.80 (1.79)		4.67 (2.31)				0.43	2, 9	0.664	0.087
Confide in others		4.25 (2.50)		2.60 (2.61)		2.33 (1.53)				0.74	2, 9	0.505	0.141
Victim of violence (non-sexual)	6 (19.4%)		4 (12.1%)		4 (12.5%)		0.84	0.657	0.094				
Age		9.25 (4.35)		10.00 (6.08)		7.00 (6.22)				0.29	2, 8	0.757	0.067
Traumatic		5.83 (1.33)		6.50 (0.58)		5.00 (0.82)				2.10	2, 11	0.169	0.277
Confide in others		3.00 (2.28)		3.50 (2.65)		1.75 (0.50)				0.76	2, 11	0.490	0.122
Major upheaval that shaped the individual's life	10 (32.3%)		19 (57.6%)		11 (34.4%)		5.27	0.072	0.234				
Age		11.38 (4.37)		10.56 (4.31)		8.00 (5.50)				1.46	2, 34	0.246	0.079
Traumatic		6.20[a] (1.23)		6.11[a] (1.18)		4.18[b] (2.27)				6.15	2, 36	0.005	0.255
Confide in others		3.60 (1.84)		3.11 (2.30)		3.10 (1.91)				0.21	2, 35	0.816	0.012
Extreme illness or injury	3 (9.7%)		5 (12.9%)		6 (18.8%)		1.05	0.591	0.105				
Age		6.00 (1.00)		9.00 (8.25)		7.67 (4.80)				0.24	2, 11	0.790	0.042
Traumatic		4.67 (2.08)		5.40 (1.52)		3.50 (1.52)				1.88	2, 11	0.198	0.255
Confide in others		4.00 (3.00)		3.00 (1.87)		3.00 (2.00)				0.25	2, 11	0.784	0.043

Notes: OCD = Obsessive–compulsive disorder; *SD* = Standard deviation; $W = \sqrt{\frac{\chi^2}{N}}$; η_p^2 = partial eta squared.

[a,b]Dissimilar superscripts indicate that scores in the same row are significantly *different* according to a Bonferroni adjusted post hoc test.

[x]Scores are significantly different from the expected count according to a Bonferroni adjusted post hoc tests.

related information (Salkovskis & Warwick, 2001; Warwick & Salkovskis, 1990). That is, how these events are subsequently interpreted and remembered is deemed the important factor, not the tendency to report having experienced more adverse childhood experiences. This is consistent with other theoretical conceptions of health anxiety (e.g., Rachman, 2012) and a speculation, although not specific to health anxiety, that if biases in retrospective reports of adverse events in childhood exist, they likely stem from the way memories of these experiences are rehearsed and influenced by subsequent cognitive processes (Hardt & Rutter, 2004). This is also in line with our view of the current findings as indicating biases in the interpretation of adverse childhood experiences in patients with severe health anxiety. Below we speculate on some of the processes in interpretation and memory that could help explain how adverse childhood experiences might play a role in the development and maintenance of severe health anxiety.

Not everyone who experiences a negative life event will subsequently perceive this as a central reference point in their life story. Some will remember negative events perfectly well, but do not use them to structure their life or to generate expectations for future events. Having the memory of a negative event being central to one's identity and life story is a deviation from the normal pattern seen in healthy adults and is associated with adverse psychological outcomes (for a review, see Gehrt *et al*., 2018). Event centrality could be an important component of the tendency for patients with severe health anxiety to use past health-related experiences to make inferences about illness when presented with new health-related information proposed by the cognitive behavioral model of health anxiety (Salkovskis & Warwick, 2001; Warwick & Salkovskis, 1990). Future studies should examine if patients with severe health anxiety perceive adverse childhood experiences as more central to their identity and life story compared to non-clinical or other clinical groups.

Like many other mental disorders, health anxiety is found to be associated with the personality trait neuroticism, which involves frequent and intense experiences of negative emotions (for reviews, see Hollifield & Finlay, 2014; Kotov, Gamez, Schmidt & Watson, 2010). Neuroticism has been associated with a biased interpretation of negative past events (e.g., Gehrt *et al*., 2018) and negative cognitive biases in general (Pang & Wu, 2021). Future research should examine if neuroticism might contribute to biases in the interpretation of adverse childhood experiences in patients with severe health anxiety, perhaps by augmenting the negative emotions associated with these events or the perception of them as central to one's identity and life story.

One way in which early illness-related experiences are explicitly proposed to exert their influence on the development and maintenance of severe health anxiety, both by the cognitive behavioral model of health anxiety (Salkovskis & Warwick, 2001; Warwick & Salkovskis, 1990) and other theoretical approaches like social learning (e.g., Mabe *et al*., 1988), is by biasing perceptions of and behaviors toward illness. Such perceptions are often operationalized as illness perceptions, referring to how a person cognitively and emotionally responds to current health threats. Patients with severe health anxiety are found to have more negative illness perceptions than control participants (e.g., Thorgaard, Frostholm, Walker *et al*., 2017), but it remains to be tested if the experience of adverse childhood events plays a role in shaping patient's illness perceptions.

Taken together, a picture of severe health anxiety as a disorder marked by complex mechanisms is emerging, where adverse childhood experiences together with other cognitive, behavioral and social factors, influence the development and maintenance of symptoms. Future research on how these processes interact will advance our understanding of how symptoms of severe health anxiety develop and are maintained.

Although it was not the focus of the study, we briefly elaborate on the findings in relation to patients with OCD, which in the present study reported being more absent from school and having experienced a major upheaval between their parents more frequently than the other groups, as well as a higher overall exposure to illness-related events than the control participants. These findings indicate that patients with OCD might have experienced more adverse childhood experiences, which is in line with previous studies (for reviews, see Brander, Pérez-Vigil, Larsson & Mataix-Cols, 2016; Ou, Li, Zheng *et al*., 2021). Furthermore, a recent meta-analysis showed that greater experience with adverse childhood events was associated with more severe symptoms of OCD and depression in OCD patients (Ou *et al*., 2021). Also, there is some evidence that negative life experiences coincide with the onset of OCD symptoms, and therefore might play a special role in the development the disorder (Brander *et al*., 2016). Overall, the findings indicate that the experience of adverse events in childhood might be important for OCD symptomatology.

The present study has limitations. The sample size is small and no a priori power calculation was performed. Future studies should consider basing their sample size on a priori power calculations. Also, we used adult retrospective reports of childhood experiences, and these reports can be influenced by factors such as present mood, forgetting, or individuals as a child simply not being aware of certain things. But as longitudinal data is often not available, a cross-sectional design is typically employed and constitutes a good second-best option, as it is less time-consuming and more cost-effective (for a review, see Hardt & Rutter, 2004). Furthermore, the indexes of illness-related and traumatic childhood experiences, respectively, were based on a relatively small number of events. We used the event categories of established questionnaires employed in previous studies, but future studies could assess a wider range of event categories. Lastly, it might be viewed as a limitation that participants completed the included questionnaires online (as opposed to paper/pencil). However, this method of data collection is increasingly employed in psychological research, it is cost-effect and very flexible for participants (for a review, see Ward, Clark, Zabriskie & Morris, 2014).

In conclusion, we did not find evidence that adult patients with severe health anxiety had experienced illness-related or traumatic events in childhood more often than non-clinical control participants or patients with OCD, but patients with severe health anxiety having experienced certain event categories perceived these events as having been more traumatic, indicating that processes in interpretation and memory could be an important factor in how adverse childhood experiences contribute to the

development and maintenance of severe health anxiety. However, the literature on adverse childhood experiences in patients with severe health anxiety is sparse, and it might be premature to completely rule out that the frequency or certain characteristics of such events do play a role in the development or maintenance of the disorder.

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ENDNOTES

[1] Severe health anxiety (Fink *et al*., 2004) is termed hypochondriasis in the ICD-11 (WHO, 2019) and the DSM-IV (American Psychiatric Association, 2000) as well as some earlier versions of these diagnostic classification systems.

[2] The deviation in sample size between this study and previous publications from this data collection is due to missing data on the main measures of the present study by one patient with severe health anxiety.

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