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ORIGINAL CONTRIBUTION

Hoarding in children and adolescents with obsessive–compulsive disorder: prevalence, clinical correlates, and cognitive behavioral therapy outcome

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Abstract

Hoarding, common in pediatric obsessive–compulsive disorder (OCD), has specific clinical correlates and is associated with poor prognosis. However, there are few studies of hoarding in pediatric OCD. This study estimates the occurrence of hoarding symptoms in a sample of children and adolescents with OCD, investigating possible differences in demographic and clinical variables between pediatric OCD with and without hoarding symptoms. Furthermore, the study investigates whether hoarding symptoms predict poorer treatment outcomes after cognitive behavioral therapy (CBT). The study sample comprised 269 children and adolescents with OCD, aged 7–17 years, from Denmark, Sweden, and Norway, who were all included in the Nordic long-term obsessive–compulsive disorder Treatment Study. All had an OCD diagnosis according to the DSM-IV and were treated with 14 weekly sessions of manualized, exposure-based CBT. Hoarding symptoms and OCD severity were assessed with the Children's Yale–Brown Obsessive–Compulsive Scale and group differences in treatment outcome were analyzed using linear mixed-effect modelling. Seventy-two patients (26.8%) had one or more symptoms of hoarding. Comorbid tic disorders ($p=0.005$) and indecision ($p=0.024$) were more prevalent among those with hoarding symptoms than those without hoarding symptoms. In addition, youth with hoarding symptoms had a different OCD symptom profile. Having symptoms of hoarding did not affect CBT outcome ($p=0.933$). Results from the study suggest that CBT is equally effective for those with and without hoarding-related OCD.

Keywords Obsessive-compulsive disorder · Hoarding · Cognitive behavioral therapy · Treatment · Pediatric · NordLOTS

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Introduction

Obsessive–compulsive disorder (OCD) is a debilitating psychiatric disorder with a prevalence rate between 0.25% and 4% [1–4]. Left untreated, OCD often continues into adulthood, significantly impairing daily functioning and reducing quality of life [5, 6]. Cognitive behavioral therapy (CBT) is recommended as first-line treatment for OCD in children and adolescents [7–11].

The classification of hoarding as a sub-category of OCD was recently revised. In the fifth edition of the DSM [12], hoarding is classified as a disorder in its own right, based on research showing that hoarding can present independently from OCD or any other neurological or psychiatric disorder. According to the DSM-5, the cardinal feature of hoarding disorder is persistent difficulty discarding or parting with possessions, regardless of their actual value. However, when symptoms are attributed, as a direct consequence, to typical

obsessions or compulsions, such as avoidance of harm or feelings of incompleteness, hoarding is considered OCD-related and should not be diagnosed as hoarding disorder [12]. The prevalence rate of hoarding disorder in children is not established but has been found to be 2% in an adolescent population [13], and 2–5% in adults [14, 15]. Hoarding disorder usually begins before the age of 20 [16].

Hoarding symptoms are usually mild during childhood and become more severe with age [16, 17] Compared to other types of OCD symptoms, hoarding symptoms are less likely to follow an episodic course and more likely to be constant or worsening [18]. Some previous studies have investigated symptoms of hoarding in children and adolescents with OCD, finding them present in 19–30% of cases [19–21]. Hoarding is traditionally considered difficult to treat [22]. Therefore, the study of hoarding in OCD and especially examination of the treatment of hoarding in children and adolescents with OCD are crucial to prevent the symptoms from escalating and becoming severely debilitating [23].

Clinical correlates of OCD-related hoarding

Hoarding symptoms in children and adolescents with OCD have been associated with reduced insight [19, 24]. A recent mega-analysis that also included the sample used in this study, found 11.1% of youth with OCD to have poor or absent insight [25]. Hoarding symptoms have also been associated with indecision [20, 24, 26], and earlier OCD onset [20, 26]. Furthermore, hoarding symptoms in children and adolescents with OCD are associated with more comorbidities compared to children and adolescents with non-hoarding symptoms, such as anxiety [19, 20, 24, 26, 27], Tourette and Tic disorders [20], and symptoms of ADHD [19, 26, 28], although inconsistent. Symptoms of hoarding also correlate with ADHD independent of OCD [28]. Some studies have linked hoarding symptoms to autism spectrum disorders [27, 29], but one study found that patients in an OCD control group without autism symptoms were just as likely to endorse hoarding or repeating and ordering symptoms as were patients with OCD and comorbid autism symptoms [30].

A study consisting of a mixed sample of children and adults with OCD reported that across all ages, patients' highest Y-BOCS severity score was almost two points higher in the hoarding group compared to those without hoarding symptoms [24]. Another study found that hoarding symptoms in children and adolescents with OCD predicted higher lifetime severity of OCD symptoms [20].

Hoarding symptoms in pediatric and adult OCD have been shown to correlate with OCD symptoms such as symmetry, repeating, counting, and ordering [19, 20, 24, 31]; however, it is unclear whether this correlation is independent of comorbidities, such as tics.

Treatment outcome in OCD-related hoarding

In general, effective treatments for OCD, namely CBT and SSRIs, seem to be less effective in addressing the symptoms of obsessive–compulsive hoarding [32, 33]. However, some modifications to CBT specifically to address hoarding disorder in adults seem promising (which includes graded exposure to non-acquiring behavior and training in sorting, discarding, and cognitive restructuring) [33], but this has not been documented in younger samples. In younger children, hoarding with neither OCD nor another comorbid disorder may not lead parents to seek treatment, possibly because parents can influence a child's hoarding behavior to some degree and because children have limited means to acquire certain items [34].

A 2014 meta-analysis showed a 50% poorer treatment response rate in OCD patients with hoarding symptoms compared to OCD patients without hoarding symptoms, independent of age and treatment type [22]. However, this meta-analysis included four OCD treatment studies of children and adolescents, all with small sample sizes, and only two of these evaluated behavioral interventions [22], and the remaining two were based on combined intervention [35] and pharmacotherapy [36]. A study that assessed 45 children 9 years after treatment showed that for those with hoarding as the primary symptom, OCD tended to persist into early adulthood [37]. Studies with larger samples are needed to evaluate the effect of hoarding symptoms on treatment outcome in children and adolescents.

The present study aimed: (1) to estimate the occurrence of hoarding symptoms in a sample of children and adolescents with OCD, (2) to investigate possible differences in demographic and clinical variables between those children and adolescents with and without symptoms of hoarding, and (3) to estimate whether the presence of hoarding symptoms affected the treatment outcome of manualized CBT.

We expected hoarding symptoms to occur frequently in children and adolescents with OCD [19–21], further expecting that patients with hoarding symptoms would be characterized by reduced insight [19, 24], higher levels of indecision [20, 24, 26], earlier onset [20, 26], more severe OCD symptoms [20, 24], and more OCD symptoms related to symmetry, repeating, counting, and ordering [19, 20, 24, 31]. Regarding comorbidity, we expected patients with OCD and hoarding symptoms to have higher levels of anxiety [19, 20, 24, 26, 27], tics [20], and ADHD symptoms [19, 26, 28]. As earlier research has been inconclusive regarding autism spectrum disorder and hoarding symptoms [27, 29, 30], no hypothesis was generated in that respect. Finally, we

expected that patients with OCD and hoarding symptoms would have less favorable treatment outcomes [22].

Methods

Participants

A total of 269 children and adolescents aged 7–17 years, recruited from Denmark, Sweden, and Norway between September 2008 and June 2012, were included in the Nordic long-term obsessive–compulsive disorder treatment study (NordLOTS) [38]. They were eligible for inclusion from a total of 767 children and adolescents that were originally screened for participation where of 491 met the inclusion criteria for assessment [38]. Included patients were referred from community health centers, general practitioners and in many cases by parents contacting the clinics directly. Inclusion criteria were an OCD diagnosis based on DSM-IV criteria as assessed with the Kiddie Schedule for Affective Disorders and Schizophrenia (K-SADS-PL), a CY-BOCS total severity score ≥ 16, and no treatment with CBT or effective doses of SSRIs (> 50 mg) six months prior to the start of the study. Exclusion criteria were kept to a minimum. However, patients with an autism spectrum disorder (except Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS) or suffering from another psychiatric disorder with higher treatment priority than OCD (for example serious depression with suicidality or psychosis) were excluded. Patients with ADHD were allowed if pharmacological treatment for ADHD had been stabilized at least 3 months prior to inclusion. Study rationale [39] and inclusion procedures [38] for the NordLOTS are described in detail elsewhere.

Informed consent was obtained from all participants and their parents, and the trial was approved by the Norwegian, Swedish, and Danish Committees for Medical and Health Research Ethics and the Medical Products Agencies.

Measures

Children's Yale–Brown obsessive–compulsive scale (CY-BOCS)

The CY-BOCS is a semi-structured interview used in the present study by an independent evaluator to evaluate OCD severity and symptom presentation. The scale comprises two parts. The first part is a 74-item symptom checklist assessing a broad range of current and past obsessions and compulsions. The second part, a severity scale, consists of 10 questions (five concerning obsessions and five concerning compulsions) that measures severity on a five-point scale, with a total score ranging from 0 to 40 [40]. The CY-BOCS symptom checklist includes one item regarding hoarding obsessions and one item regarding hoarding compulsions as well as two additional items where the clinician can report symptoms of hoarding obsessions and compulsions other than those defined in the checklist. If patients currently had any of these symptoms, they were classified as having hoarding symptoms in this study.

A score of < 16 on the CY-BOCS was used to define a treatment response as this was used in the NordLOTS. This score was originally chosen as it represents a severity level of mild OCD that has been used in several previous studies [41].

Indecision was measured with one item on the CY-BOCS (item 13), based on a Likert scale from 0 = no indecision to 4 = very indecisive. We measured insight by item no. 11 on the CY-BOCS (item no. 11). Insight is measured on a four-point scale (0 = excellent insight, 1 = good insight, 2 = fair insight, 3 = poor insight, = absent insight)."

The CY-BOCS has demonstrated reliability and validity in samples of children with OCD [42, 43]. In the NordLOTS, the intra-class correlation coefficients (ICC) of inter-rater agreement were as follows: obsessions ICC = 0.94 (95% CI 0.85–0.97), compulsions ICC = 0.87 (95% CI 0.67–0.93), and total score ICC = 0.92 (95% CI 0.78–0.97) [41].

Kiddie schedule for affective disorders and schizophrenia (K-SADS-PL)

K-SADS-PL is a diagnostic, semi-structured interview designed to assess a broad range of child and adolescent mental disorders according to DSM-IV criteria. The interview comprises an introductory interview, a screening interview, and a diagnostic part. Symptoms are scored as one of "not present," "possible," "in remission," or "certain" [44]. K-SADS-PL has been shown to possess good inter-rater reliability (98%) and has a 1–5 week test–retest kappa of 0.80 for all included anxiety diagnoses [44]. The interview has been shown to have good convergent and divergent validity [45, 46]. This study used present diagnoses classified as "certain."

The child obsessive–compulsive impact scale-revised (COIS-R)

COIS-R is a 33-item, self-reported questionnaire designed to assess the psychosocial functioning of children and adolescents in home, school, and social settings and to assess how OCD affects such functioning. Parent and child rating versions are available. Scale items are scored on a four-point Likert scale (0 = not at all, 1 = just a little, 2 = pretty much, and 3 = very much). The scale has moderate to high internal consistency of $\alpha = 0.92–0.94$ and $\alpha = 0.78–0.92$, respectively, for the parent and child versions [47, 48].

Child behavior checklist (CBCL)

The CBCL is used to evaluate child behavioral and emotional problems, as well as social competence. The scale, rated by parents, has 113 items on a three-point scale (0 = not true, 1 = somewhat or sometimes true, and 2 = very or often true). It has been shown to have good psychometric properties across different populations, mean test–retest reliability between 0.95–1.00, and internal consistency from $\alpha = 0.78$ to $\alpha = 0.97$ [49, 50].

The mood and feelings questionnaire (MFQ)

The MFQ is a questionnaire for both parents and children that is used to assess symptoms of depression based on the DSM-III-R. The scale comprises 13 items, scored in total from 0 to 26 [51]. The assessment has sound psychometric properties, and the scale's total score has demonstrated internal consistency of $\alpha = 0.75$ to $\alpha = 0.90$ [50, 52, 53].

Autism spectrum screening questionnaire (ASSQ)

The ASSQ is a parent questionnaire, used to measure symptoms of autism, consists of 27 items rated on a three-point scale (0 = no, 1 = somewhat, and 2 = yes). The scale's total score ranges from 0 to 54 and has an internal consistency of $\alpha = 0.86$ [54]. The instrument has been proven a reliable and valid tool for screening in both clinical and general populations [55, 56]. Good internal consistency has been found for the versions in different languages this study used [57].

Screen for child-anxiety-related emotional disorders (SCARED)

The SCARED is a parent and child questionnaire used to measure symptoms of anxiety based on the DSM-IV, scored from 0 to 82. Its total score has demonstrated internal consistency of $\alpha = 0.92$ for both child- and parent-rated versions [50].

Treatment

The treatment protocol included 14 weekly sessions of exposure-based CBT, with each session lasting approximately 75 min. In eight sessions, individual therapy was given to the child for 45 min, while the remaining time was used with the parents, either alone or with the child. Depending on the child's age or preference, parents could also join for the whole session. In the remaining six sessions, the child and parents were seen together for the full session. Hoarding symptoms were treated according to the same principles as other OCD symptoms. Therapists in the study were child and adolescent psychiatrists, clinical psychologists, or certified psychotherapists with at least five years of clinical experience. Assessments with CY-BOCS and K-SADS-PL were conducted by independent raters which were appropriately trained clinical psychologists, psychiatrists, psychiatric nurse or social worker, to ensure their reliability [38]. Parent-rated assessments were scored by either one or two parents together. Therapy adherence and fidelity were found to be excellent but independent raters were used to assess all outcome measures [38]. The sample and treatment procedure have been described elsewhere [38, 41].

Analysis

The sample was split into two groups based on the presence of hoarding symptoms from the CY-BOCS checklist. Differences in age and OCD severity between the groups were estimated using independent sample t tests. The Mann–Whitney U test was used to compare non-normally distributed data. Group differences in comorbid diagnoses, gender, and national origin were evaluated using Pearson's Chi-square tests.

A linear mixed-effect model (LME) was used to estimate group differences in CBT outcome [58]. CY-BOCS score, measured at baseline, week seven, and week 14, were set as the dependent variable over continuous time, with weeks from baseline, the presence or absence of hoarding symptoms, and interaction of hoarding symptoms with time as fixed effects. The model included a random intercept and linear slope. Whether hoarding symptoms affected response to CBT was estimated by multiple logistic regression, with response defined as CY-BOCS severity score < 16. Age, gender, and hoarding symptom status were included in the logistic regression model.

All analyses were conducted using SPSS version 22 [59], except for the LME model, which was fit using STATA [60]. All tests were two-tailed, and $p < 0.05$ was considered to indicate statistical significance.

Results

According to the CY-BOCS symptom checklist, 72 patients (26.8%) in the sample had one or more symptoms of hoarding, while the remaining 197 had no hoarding symptoms. Twelve patients reported having symptoms of hoarding in the past but reported no current symptoms of hoarding. Hoarding symptoms had no effect on completing CBT ($p = 0.985$). Of the 72 patients with hoarding symptoms, 15 had only compulsions and 12 had only obsessions concerning hoarding; most ($n = 45$) presented with both. Table 1 presents basic demographics, clinical group descriptive statistics, and group differences. Comorbid tic disorders and indecision were more prevalent among those with hoarding

Table 1 Baseline demographic, clinical characteristics and group differences

Characteristics	OCD with hoarding ($n=72$)	OCD without hoarding ($n=197$)	Group difference
Age, M (SD)	12.99 (2.81)	12.76 (2.72)	$t=$-0.608, $p=0.544$[a]
Gender, male (%)	36 (50%)	95 (48.2%)	$\chi^2=0.067$, $p=0.796$[b]
Country, *n*			$\chi^2=0.855$, $p=0.652$[b]
Norway	33 (29.7%)	78 (70.3%)	
Denmark	20 (25.0%)	60 (75.0%)	
Sweden	19 (24.4%)	59 (75.6%)	
CBT completers	65 (90.4%)	178 (90.3%)	$\chi^2=0.000$, $p=0.985$[b]
Age of OCD onset, M (SD)	11.52 (2.93)	11.66 (3.04)	$U=5385.2$, $p=0.700$[c]
Baseline OCD severity, M (SD)	24.88 (4.86)	24.53 (5.19)	$t=$-0.486, $p=0.627$[a]
Baseline severity for obsessions, M (SD)	12.25 (2.82)	12.30 (2.79)	$t=0.128$, $p=0.898$[a]
Baseline severity for compulsions, *M (SD)*	12.63 (2.41)	12.23 (2.78)	$t=-1.060$, $p=0.290$[a]
Insight (CY-BOCS), M (SD)	1.08 (1.00)	1.13 (0.97)	$U=6746.0$, $p=0.655$[c]
Indecision (CY-BOCS), M (SD)	1.28 (1.13)	0.95 (1.09)	$U=5793.0$, $\mathbf{p=0.024}$[c]
COIS-R parent, M (SD)	25.25 (19.53)	25.72 (18.12)	$U=5331.0$, $p=0.728$[c]
COIS-R child, M (SD)	19.29 (13.67)	19.80 (14.10)	$U=6208.0$, $p=0.690$[c]
CBCL internalizing, M (SD)	16.29 (8.50)	15.23 (9.25)	$U=5289.0$, $p=0.193$[c]
CBCL externalizing, M (SD)	9.31 (8.66)	8.82 (7.74)	$U=5834.5$, $p=0.711$[c]
MFQ parent, M (SD)	7.30 (6.25)	6.44 (5.37)	$U=6143.5$, $p=0.645$[c]
MFQ child, M (SD)	7.05 (5.01)	6.23 (4.74)	$U=5884.0$, $p=0.298$[c]
ASSQ total, M (SD)	8.72 (9.24)	6.67 (5.86)	$U=5846.0$, $p=0.168$[c]
ASSQ motor/ticks/OCD, M (SD)	3.49 (3.03)	2.45 (2.15)	$U=5266.5$, $\mathbf{p=0.013}$[c]*
ASSQ autistic style, M (SD)	1.71 (2.46)	1.44 (1.81)	$U=6407.5$, $p=0.637$[c]
ASSQ social difficulties, M (SD)	2.82 (4.10)	2.49 (3.02)	$U=6493.0$, $p=0.905$[c]
SCARED parent, M (SD)	21.60 (12.94)	20.23 (13.70)	$U=5995.0$, $p=0.415$[c]
SCARED child, M (SD)	23.37 (11.44)	21.32 (13.14)	$U=5814.0$, $p=0.197$[c]
Comorbid disorders (KSADS-PL), *n* (%)			
Depressive disorders	2 (2.8%)	2 (1.0%)	$\chi^2=0.243$, $p=0.622$[b]
Anxiety disorders	19 (26.4%)	33 (16.8%)	$\chi^2=3.141$, $p=0.076$[b]
Tic disorders	21 (29.2%)	28 (14.2%)	$\chi^2=7.914$, $\mathbf{p=0.005}$[b]*
ODD/CD	1 (1.4%)	9 (4.6%)	$\chi^2=1.489$, $p=0.222$[b]
ADHD	10 (13.9%)	14 (7.1%)	$\chi^2=2.985$, $p=0.084$[b]

Significant outcome is marked with bold

OCD Obsessive–Compulsive Disorder, *M* Mean, SD Standard Deviation, *CY-BOCS* children's Yale–Brown obsessive–compulsive scale, *COIS-R* the child obsessive–compulsive impact scale, *CBCL* child behavior checklist, *MFQ* the mood and feelings questionnaire, *ASSQ* autism spectrum screening questionnaire, *SCARED* screen for child-anxiety-related emotional disorders, *KSADS-PL* kiddie schedule for affective disorders and schizophrenia, *ODD* oppositional deviant disorder, *CD* conduct disorder, *ADHD* attention deficit hyperactivity disorder

[a]Independent samples *t* test

[b]Pearson's Chi-square test

[c]Mann–Whitney *U* test

symptoms compared to those without hoarding symptoms ($p=0.005$ and $p=0.024$, respectively). In addition, those with hoarding symptoms scored significantly higher on the ASSQ motor/tics subscale ($p=0.013$). No other measures differed significantly between the two groups although ADHD and anxiety disorder showed a trend toward significance ($p=0.084$ and $p=0.076$, respectively). OCD patients with hoarding symptoms had significantly more OCD symptoms in all CY-BOCS checklist categories except contamination obsessions, sexual obsessions, magical obsessions, and mental compulsions (Table 2).

The observed mean reduction in OCD severity after treatment, measured with CY-BOCS, was 13.01 (SD=8.44) for the non-hoarding group and 13.50 (SD=7.87) for the hoarding group. LME analysis ($\chi2$ (5) = 641.66, $p<0.001$) did not show a significant difference in OCD severity reduction at posttreatment between groups ($p=0.933$), indicating that having hoarding symptoms did not affect CBT outcome

Table 2 Differences in OCD symptoms, n (%)

CY-BOCS symptom category	OCD with hoarding n = 72 (%)	OCD without hoarding *n* = 197 (%)	Group difference (Chi square, *p* value)
Contamination obsessions	51 (70.8)	120 (60.9)	2.240, $p = 0.134$
Aggressive obsessions	57 (79.2)	95 (48.2)	20.543, $\mathbf{p < 0.001}$
Sexual obsessions	7 (9.7)	24 (12.2)	0.313, $p = 0.576$
Magical obsessions	31 (43.1)	62 (31.5)	3.128, $p = 0.077$
Somatic obsessions	30 (41.7)	57 (28.9)	3.907, $\mathbf{p = 0.048}$
Religious obsessions	27 (37.5)	36 (18.3)	10.867, $\mathbf{p = 0.001}$
Symmetry obsessions	41 (56.9)	56 (28.4)	18.599, $\mathbf{p < 0.001}$
Miscellaneous obsessions	58 (86.6)	105 (53.3)	16.405, $\mathbf{p < 0.001}$
Washing compulsions	57 (79.2)	131 (66.5)	4.022, $\mathbf{p = 0.045}$
Checking compulsions	57 (79.2)	109 (55.3)	12.679, $\mathbf{p < 0.001}$
Repeating compulsions	54 (75.0)	82 (41.6)	23.497, $\mathbf{p < 0.001}$
Counting compulsions	32 (44.4)	51 (25.9)	8.510, $\mathbf{p = 0.004}$
Symmetry/ordering compulsions	49 (68.1)	57 (28.9)	33.798, $\mathbf{p < 0.001}$
Magical compulsions	34 (47.2)	51 (25.9)	11.103, $\mathbf{p = 0.001}$
Involve others compulsions	55 (76.4)	115 (58.4)	7.356, $\mathbf{p = 0.007}$
Mental compulsions	34 (47.2)	76 (38.6)	1.630, $p = 0.202$
Miscellaneous compulsions	58 (80.6)	115 (58.4)	11.302, $\mathbf{p = 0.001}$

Significant outcome is marked with bold

OCD Obsessive–compulsive disorder, CY-BOCS children's Yale–Brown obsessive–compulsive scale

(Fig. 1). However, there was a significant within-group difference in both groups (13.19 points ($p < 0.001$) and 13.29 points ($p < 0.001$) for the non-hoarding and hoarding groups, respectively).

When measuring outcome as a treatment response (CY-BOCS < 16), the logistic regression model ($\chi 2$ [3] = 8.16, $p = 0.043$), which also included age and gender, suggested that hoarding did not predict outcome [OR (CI) 0.64 (0.33–1.27), $p = 0.204$]. In the same model, age predicted treatment response [OR (CI) 0.90 (0.80–1.00), $p = 0.048$], while gender did not [OR (CI) 1.57 (0.88–2.81), $p = 0.125$].

Discussion

As expected, hoarding symptoms were frequently present (26.8%, $n = 72$) in the sample, supporting previous pediatric OCD studies that found rates of hoarding symptoms between 19% and 30% [19–21]. Hoarding symptoms may therefore develop at an early age and should be addressed in pediatric OCD populations.

Contrary to our hypothesis, the present study did not support earlier findings indicating lower insight in hoarding-related OCD compared to OCD without hoarding symptoms [19, 24]. Why remains unclear; one possibility is that insight may worsen with age in those patients whose hoarding symptoms continue to progress and become more severe, but the mean age of the sample in the study by Storch et al. [19], was slightly higher than in the present study. Consistent with previous studies [20, 24, 26], our study suggest that children and adolescents with hoarding symptoms have significantly higher levels of indecision. Unlike insight, indecision may precede hoarding symptoms, as indecision is thought to contribute to the development of hoarding [24]. Although the hoarding group in our sample tended to have earlier OCD onset, this difference was not the significant result some previous studies have reported [20, 26].

The results confirmed neither significantly elevated levels of anxiety disorders nor significantly elevated levels of ADHD among children and adolescents with OCD and hoarding symptoms, although a trend in that direction may be seen ($p = 0.076$ and $p = 0.084$ for anxiety disorders and ADHD, respectively). These comorbid disorders were found at relatively low rates in our sample, perhaps explaining these null findings. The fact that we analyzed anxiety disorders as a single group rather than individual diagnoses may also have an effect on the outcome as previous studies have not found differences for all types of anxiety [20]. Regarding ADHD, results from previous studies are inconsistent. One study found symptoms, but not diagnoses of ADHD to be higher in hoarding-related OCD [28], one found no difference in ADHD diagnoses between groups [19]. The study finding a significant difference in ADHD diagnoses between samples was based on relatively small sample sizes that could have affected the results [26]. Additionally, there were no group differences found regarding the CBCL

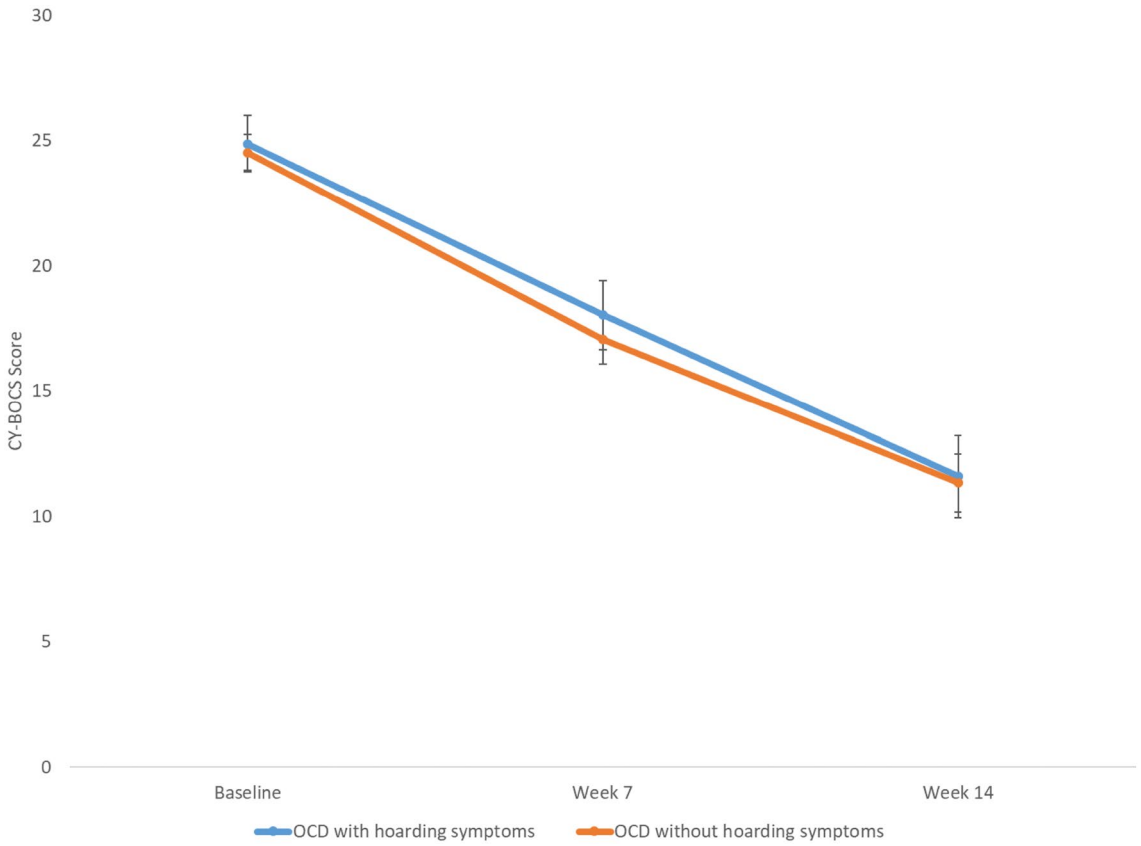

Fig. 1 Estimated reduction in OCD severity for hoarding and non-hoarding OCD groups during 14 weeks of cognitive behavioral therapy, with 95% confidence intervals

internalizing/externalizing scales and the SCARED, indicating that anxiety and externalizing (i.e., ADHD) behavioral differences were also absent at the symptom level, which strengthens the null-difference findings regarding treatment outcome. On the other hand, and in support of previous findings [20], tic disorders were more common among the group with OCD and hoarding symptoms. Regarding autism, those with OCD and hoarding did not have a higher ASSQ total score and autistic style subscale, but patients with hoarding symptoms scored higher on the ASSQ subscale of motor/tics/OCD. This may be related to the items concerning tics on this scale and could indicate a higher rate of tics in this group.

In line with hypotheses and confirming results from previous studies [19, 20, 24, 31], in the present study OCD patients with hoarding symptoms had significantly more symptoms of OCD (based on the CY-BOCS checklist), especially symptoms of symmetry/ordering, repeating, counting. Hoarding has been associated with these symptoms in several previous factor analyses [61]. Only four symptom dimensions were less frequent: (1) contamination obsessions, (2) sexual obsessions, (3) magical obsessions; and (4) mental compulsion. It is unclear why those with hoarding show a trend to have more symptoms of the remaining dimensions.

Contrary to hypothesis, OCD severity and OCD-related impairment were not greater in the OCD group with hoarding symptoms. In addition, the between-group differences in the reduction of OCD severity during treatment was non-significant ($p = 0.933$). Hoarding symptoms also did not predict CBT response. In short, the presence of hoarding symptoms seemed to influence neither OCD severity nor CBT outcome in our sample. Possible explanations for these differences between the results of the present and previous studies could be due to the use of different diagnostic instruments. The K-SADS-PL was used to assess comorbidity in this study while the anxiety disorders interview schedule (ADIS) is commonly used in other studies. In addition, hoarding symptoms were rated with the CY-BOCS rather than with a separate instrument that could have provided more detail about the hoarding symptoms and their severity.

Insight has previously been identified as a predictor of treatment outcome [62] and correlated with low age and ADHD [25], and finding no difference in outcome, age and ADHD between groups in this study seems to support these results. The results presented here therefore suggest

that CBT is also a helpful treatment for OCD with hoarding symptoms, in addition to OCD in general. Further studies should focus on how patient level of insight may affect treatment outcome independent of hoarding symptoms.

This study has several strengths. The sample size is large, the sample was well-defined by a comprehensive assessment of both OCD and comorbidity, treatment was manualized, and the sample received no medication for OCD during CBT. Limitations of this study include that the CY-BOCS was used to assess hoarding symptoms, and CY-BOCS includes relatively few hoarding-related items and cannot distinguish between mild and severe hoarding symptoms. It is possible that those with severe hoarding might respond differently to treatment compared to those with less severe hoarding or another explanation. Our sample consisted of children and adolescents with OCD and therefore our results cannot extend to children with hoarding disorder without OCD. Finally, the homogeneity of the Scandinavian sample limits the generalizability of its results to other, more diverse populations.

Conclusion

More than a fourth of children and adolescents with OCD included in the NordLOTS had one or more symptoms of hoarding. Those with hoarding symptoms more often had comorbid tic disorders, more often had problems with decision making, and had a different OCD symptom profile. In contrast to previous studies, findings of the present study suggest that OCD severity and CBT outcome are not affected by the presence of hoarding symptoms, confirming that the treatment response is similar in OCD with and without hoarding symptoms.

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Compliance with ethical standards

Conflict of interest Dr. Ivarsson has served on the speaker's bureau of Shire Sweden. All remaining authors report no biomedical financial interests or potential conflicts of interest.

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