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Changes in harm avoidance and incompleteness across group CBT for OCD and their relationship with symptom change

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Abstract

Background: Obsessive-compulsive disorder (OCD) symptoms are hypothesized to be driven by two core motivations: harm avoidance and incompleteness. While cognitive-behavioural therapy (CBT) is an effective treatment for OCD, many posit that OCD presentations characterized by high incompleteness may be harder to treat. The relationship between the core motivations and treatment outcomes remains to be further explored.

Aims: To investigate if harm avoidance and incompleteness decrease across group CBT and to examine the relationship between treatment outcomes and both baseline and changes in harm avoidance and incompleteness throughout treatment.

Method: A naturalistic sample of 65 adult out-patients with OCD completed self-report questionnaires measuring OCD symptom severity and the core motivations before, during, and after 12 weeks of group CBT for OCD.

Results: Harm avoidance and incompleteness scores significantly decreased from pre- to post-treatment. Pre-treatment harm avoidance and incompleteness levels did not predict post-treatment symptom severity, but changes in the core motivations throughout treatment were significant predictors of treatment outcome. Specifically, reductions in harm avoidance across treatment and reductions in incompleteness early in treatment, were associated with better treatment outcomes.

Conclusions: Participants who completed group CBT for OCD experienced modest reductions in the core motivations thought to maintain OCD symptoms and these changes predicted better outcomes. However, pre-treatment levels of harm avoidance and incompleteness do not appear to moderate treatment outcome.

Keywords: cognitive behavioural therapy; harm avoidance; incompleteness; not just right experiences; obsessive-compulsive disorder; treatment outcome

Introduction

Obsessive-compulsive disorder (OCD) affects approximately 1–3% of people (Kessler *et al.*, 2012; Ruscio *et al.*, 2010). Without treatment, individuals with OCD often experience chronic symptoms, significant impairment in functioning, and reduced quality of life (American Psychiatric Association, 2013; Macy *et al.*, 2013). The first-line psychological treatment for OCD is cognitive behavioural therapy (CBT) with exposure and response prevention (ERP; National

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Institute for Health and Clinical Excellence, 2005) and studies have demonstrated its efficacy (McKay *et al.*, 2015) and effectiveness (Ferrando and Selai, 2021). However, many patients who complete treatment do not achieve symptom remission or experience a significant treatment response (Simpson *et al.*, 2006). Therefore, there have been efforts to determine what factors contribute to and predict treatment response (e.g. Keeley *et al.*, 2008; Raffin *et al.*, 2009).

One avenue has been to investigate if the clinical presentation of OCD affects treatment outcomes. Given that OCD has a heterogeneous presentation, there have been efforts to categorize the various obsessions and compulsions (Calamari *et al.*, 1999; Calamari *et al.*, 2004; Leckman *et al.*, 1997). OCD presentations are commonly categorized based on overt symptom presentations, such as contamination obsessions/decontamination compulsions, doubting obsessions/checking compulsions, unacceptable thoughts/mental compulsions, and symmetry obsessions/ordering compulsions (McKay *et al.*, 2004). However, symptom-based subtyping has unreliably advanced our understanding of which OCD presentations demonstrate poor treatment outcomes. There is some evidence that when hoarding (which are no longer conceptualized as part of OCD) or unacceptable thoughts/mental compulsions are the primary concern, individuals have attenuated outcomes compared with other OCD symptom presentations (Mataix-Cols *et al.*, 2002; Rufer *et al.*, 2006; Starcevic and Brakoulias, 2008; Williams *et al.*, 2014). However, other studies have not found significant differences in treatment outcomes for unacceptable thoughts (Abramowitz *et al.*, 2003; Chase *et al.*, 2015). Additionally, there are larger discussions in the literature regarding the issues with categorical diagnostic approaches to mental health (including OCD symptom categorization) and the move towards transdiagnostic approaches to understanding clinical presentations (e.g. Dalgleish *et al.*, 2020). Symptom-based categorization also does not account for the heterogeneity in the underlying processes motivating and maintaining OCD symptoms. For example, an individual with contamination obsessions might engage in excessive handwashing to prevent themselves/others from getting sick, whereas someone else might be doing so because they do not feel completely clean. By shifting the focus from *what* overt symptoms someone with OCD experiences to *why* the obsessions and compulsions are occurring, we can develop a new perspective to understand treatment response.

The Core Dimensions Model of OCD states that two core motivations underlie OCD symptoms – harm avoidance (HA) and incompleteness (INC; Summerfeldt, 2004; Summerfeldt *et al.*, 2014). HA is the motivation to engage in compulsions to prevent a potential feared consequence or decrease the probability of a negative event and is often accompanied by emotions such as anxiety or fear (e.g. ‘My books need to be arranged a certain way to prevent my mom from getting in a car crash’). INC is the motivation to engage in compulsions to counteract an internal sense of discomfort, described as feeling like something is ‘not just right’, often accompanied by emotions such as tension and feeling discontented or stuck (e.g. ‘My books need to be arranged a certain way to feel complete’). It is believed that HA (i.e. attempting to prevent harm) and INC (i.e. reducing subjective feelings of internal discomfort) in combination, and to varying degrees, are the underlying motivational factors driving compulsions.

Many studies support the validity of the HA and INC motivations in OCD. Confirmatory factor analyses support that HA and INC are separate constructs in non-clinical and clinical samples, despite being significantly correlated (Pietrefesa and Coles, 2008; Summerfeldt *et al.*, 2014). HA and INC have consistently correlated with OCD symptoms (e.g. Belloch *et al.*, 2016; Pietrefesa and Coles, 2008), and INC has predicted obsessive-compulsive symptoms, even after controlling for HA (Taylor *et al.*, 2014).

INC is more specific to OCD than HA and is useful for discriminating between those with OCD and those with anxiety disorders or depression (Ecker *et al.*, 2014; Ghisi *et al.*, 2010). Although INC can be present to varying extents in many individuals with OCD and throughout the general population, high or problematic levels of INC are associated with increased OCD severity, higher rates of co-morbidity, lower functioning and quality of life, and increased rates of unemployment and disability compared with those with little or no current INC (Belloch

et al., 2016; Sibrava *et al.*, 2016). Therefore, it is important to examine if INC levels impact treatment outcomes and better understand whether existing OCD treatments are adequately addressing this underlying motivation.

Cognitive behavioural models of OCD emphasize catastrophic misinterpretations of the significance of one's intrusive thoughts, causing fear or distress which prompts the performance of compulsions in attempt to reduce distress and prevent perceived feared consequences (Rachman, 1997; Rachman, 1998; Salkovskis, 1985; Salkovskis, 1989). Consistent with this, CBT for OCD typically involves ERP where obsessions are purposefully and repeatedly triggered to practise refraining from compulsions to learn that the feared outcome does not come true, resulting in fear extinction over time. Treatment can also involve cognitive strategies to challenge threat-related distorted beliefs about the likelihood of negative events, the importance of thoughts, and inflated sense of responsibility. The applicability of these treatment components to HA OCD presentations is clear, but their application to INC presentations remains to be better understood. Given that INC is not associated with a feared consequence and instead compulsions are motivated to reduce the discomfort of the experience, fear habituation/extinction through ERP or modifying threat-related cognitive biases through cognitive techniques may not be as directly applicable.

Early indirect evidence suggested that OCD presentations motivated by INC may be less likely to respond to treatment. For example, patients with OCD who did not endorse feared consequences were less likely to benefit from ERP treatment than those who did endorse feared consequences (Foa *et al.*, 1999). However, some recent research has provided a more hopeful outlook for OCD presentations characterized by INC and not just right experiences (NJREs). INC and NJREs are closely related and the terms have been used interchangeably in this line of research (e.g. Coles and Ravid, 2016). Whereas INC is conceptualized as a trait-like construct, NJREs may represent fluctuating state expressions of INC (Belloch *et al.*, 2016; Summerfeldt *et al.*, 2014). Coles and Ravid (2016) found that treatment led to significant reductions in HA and INC, significantly fewer NJREs, and less NJRE distress. A meta-analysis found that INC levels had significant but modest improvements throughout treatment (Schwartz, 2018). It was also suggested that unless current treatments are explicitly tailored to INC, they may not sufficiently target INC (Schwartz, 2018).

Furthermore, the implications of baseline HA and INC motivations on OCD treatment outcomes are not well understood. In children with OCD, higher baseline levels of INC, but not HA, predicted poorer treatment outcomes (Cervin and Perrin, 2021). This has yet to be investigated in adults. It is also important to investigate if and when changes in the underlying core motivations of OCD are associated with treatment outcomes. This would help us understand if the underlying motivations maintaining OCD are mediators of CBT outcome. Additionally, it may prompt ideas about how to better tailor treatments for OCD or what strategies to emphasize in treatment and when. Cervin *et al.* (2020) found that change in INC, but not HA, was related to pre- to post-treatment change in OCD severity for children with OCD. To our knowledge, this has not been investigated in an adult sample.

The purpose of this study was to examine if core motivations of OCD (i.e. HA and INC) significantly decrease across treatment and are associated with treatment outcomes in adults who completed group CBT for OCD. Specifically, we investigated (a) if pre-treatment levels of the HA and INC motivations are significant predictors of post-treatment OCD outcomes, and (b) if changes in HA and INC throughout treatment (including changes early and later in treatment) were associated with post-treatment OCD outcomes. Based on previous studies, we hypothesized that the HA and INC motivations would significantly decrease from pre- to post-treatment. Given the general discourse that OCD presentations characterized by high levels of INC may not respond as well to existing treatments and previous research (e.g. Cervin and Perrin, 2021), we hypothesized that higher pre-treatment levels of INC would predict poorer post-treatment OCD outcomes; however, we believed that higher pre-treatment levels of HA would not be a significant predictor of treatment outcome. Finally, because the core motivations are thought to maintain OCD symptoms we hypothesized that decreases in HA and INC would be associated with better outcomes.

Table 1. Sample demographics

Variable	<i>n</i>	
Age, mean (<i>SD</i>)	65	37.84 (12.87)
Gender (% women) ^a	65	72.3%
Relationship status (% in relationship/married)	57	61.4%
Education level (% completed college/university)	60	78.3%
Ethnicity (% White) ^b	60	91.6%
Employment status (% employed)	60	73.3%

Due to the nature of the retrospective database analysis, full demographic data were not available for all participants; *n* represents sample sizes of available data for each variable;

^a26.2% self-reported as men, and 1.5% self-reported as non-binary;

^b6.7% self-reported as Asian, and 1.7% self-reported as other (Guyanese).

Method

Participants

Participants were 65 treatment-seeking adult out-patients at a specialized anxiety and related disorders clinic in Ontario, Canada. All participants had a confirmed diagnosis of OCD and OCD was the primary mental health concern when they were referred to group CBT for OCD treatment. To ensure that participants had clinically significant symptoms of OCD when starting treatment, only those with a pre-treatment Yale-Brown Obsessive-Compulsive Scale (YBOCS) score >12 were retained in the sample.¹ A YBOCS score of ≤12 has been commonly used to define symptom remission (e.g. Mataix-Cols *et al.*, 2016; Simpson *et al.*, 2006); by including participants with a score >12 we retained those with more mild yet clinically significant OCD presentations. The participants represent a naturalistic treatment-seeking sample, therefore participants were not excluded based on factors such as additional diagnoses, medication status,² or age. Twenty-two (33.8%) participants had no additional diagnoses, 21 (32.3%), 12 (18.5%), six (9.2%), and four (6.2%) participants had one, two, three and four additional diagnoses, respectively. The most common additional diagnoses were generalized anxiety disorder (33.9%), major depressive disorder (21.5%), social anxiety disorder (18.5%), and persistent depressive disorder (10.8%). See Table 1 for a summary of the study sample demographics.

Procedure

Participants were referred to the clinic by a healthcare professional (e.g. primary care physician). All participants received a diagnostic assessment from a trained mental health clinician according to the 5th edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*; American Psychiatric Association, 2013). A total of 55.4% (*n* = 36) were assessed using the Diagnostic Assessment and Research Tool (McCabe *et al.*, 2017; Schneider *et al.*, 2022) and 44.6% (*n* = 29) received an assessment through a psychiatric consultation which consists of a comprehensive diagnostic assessment with an experienced psychiatrist. Participants were referred for and completed group CBT for OCD. Self-report measures were administered electronically as part of regular treatment procedures before, during, and after treatment via Research Electronic Data Capture (REDCap; Harris *et al.*, 2009; Harris *et al.*, 2019). The study questionnaires were part of a larger battery of measures completed by participants. The data were collected from January 2019 to August 2022.

¹The authors acknowledge that a YBOCS score of ≥16 is the typical cut-off score for inclusion in clinical research. A cut-off score of >12 was decided in this naturalistic study as all participants were required to have a diagnosis of OCD and we did not want to exclude those with milder presentations. Four participants in our sample had a pre-YBOCS score >12 but <16.

²Medication status was not routinely collected and therefore is not available for this study.

Treatment

All participants included in this sample completed group CBT for OCD. The 12-week manualized treatment protocol was developed at our clinic based on several widely used CBT treatment guides and protocols for OCD (e.g. Antony *et al.*, 2007; Foa *et al.*, 2012) and emphasized ERP with additional cognitive strategies to address underlying OCD-relevant beliefs. Participants received 12 weekly 2-hour group sessions that focused on psychoeducation about OCD and CBT, creation of an exposure hierarchy, in-session ERP, review and troubleshooting of exposures completed between sessions, and exercises designed to challenge beliefs (e.g. responsibility pie). The initial sessions focused on psychoeducation, ERP began early in treatment (i.e. by the third or fourth session), cognitive techniques were added by session 6, and both skills were continued throughout treatment; session 12 reviewed skills and discussed how to maintain gains and prevent relapse. Although not explicitly mentioned in the treatment manual, INC and NJREs were integrated into the treatment discourse as examples of the range of affective responses associated with symptoms at the therapists' discretion.

Groups consisted of approximately 8–12 patients and were led by two to three clinicians. Clinicians had graduate-level or post-professional training in CBT and included at least one senior clinician with extensive training in CBT for OCD. Graduate-level clinicians received weekly supervision from a senior psychologist.

Participants included in this study completed treatment, which was defined as having attended ≥ 8 sessions and attended at least one of sessions 10–12. Participants who completed treatment between January 2019 and December 2020 received treatment in-person ($n = 17$, 26.2%). Due to the COVID-19 pandemic, those who attended treatment between January 2020 and April 2020 received hybrid (i.e. both in-person and virtual treatment via videoconference) treatment ($n = 3$, 4.6%), and those who completed treatment between May 2020 and August 2022 received virtual treatment ($n = 45$, 69.2%). Studies using data from our clinic have shown no significant differences in outcomes of group CBT for OCD delivered face-to-face or via videoconference (Milosevic *et al.*, 2022) and therefore all participants were merged for analyses. See the Supplementary material for additional analyses that support that there were no significant effects of treatment modality on the results of this current study.

Measures

Yale-Brown Obsessive-Compulsive Scale-Self-report (YBOCS-SR; Baer et al., 1993; Goodman et al., 1989)

The YBOCS-SR is a 10-item measure of OCD severity. Items assessing the time spent, interference, distress, resistance, and control of obsessions and compulsions over the last 7 days are rated on a 5-point scale from 0 (none) to 4 (extreme). Total scores range from 0 to 40, with higher scores reflecting greater severity. The YBOCS-SR has demonstrated excellent internal consistency, test–retest reliability, and good convergent validity with other OCD measures and the interviewer-administered version of the YBOCS (Baer *et al.*, 1993; Federici *et al.*, 2010; Steketee *et al.*, 1996) as well as discriminant validity (Ólafsson *et al.*, 2010). The internal consistency coefficients for the YBOCS-SR total score in this study were $\alpha = .78$ at pre-treatment and $\alpha = .94$ at post-treatment.

Obsessive-Compulsive Trait Core Dimensions Questionnaire (OC-TCDQ; Summerfeldt et al., 2014)

The OC-TCDQ is a 20-item self-report measure assessing the HA (10 items; e.g. 'Even if harm is very unlikely, I feel the need to prevent it at any cost') and INC (10 items; e.g. 'I feel driven to re-do or prolong activities or tasks until they feel "just right"') motivations on a 5-point Likert-type scale from 0 (never applies to me) to 4 (always applies to me). The HA and INC subscale scores range from 0 to 40. The OC-TCDQ has demonstrated good psychometric properties including high

internal consistency, and strong structural and convergent validity (Coles *et al.*, 2005; Summerfeldt *et al.*, 2014). The internal consistency coefficients for both the HA and INC subscales were $\alpha = .92$ at pre-treatment and $\alpha = .94$ at post-treatment.

Statistical analyses

Analyses were conducted using SPSS (version 23.0) and R v4.3.1 (R Core Team, 2023). The analysis is a completers-only analysis³ and complete pre- and post-treatment data were available for all measures. Paired-sample *t*-tests were used to analyse the statistical significance of pre- to post-treatment changes in the self-report measures administered. The effect size of these changes is represented by Cohen's *d*.

To examine the relationship between pre-treatment levels of the HA and INC motivations and treatment outcome, a series of hierarchical linear mixed models predicting post-treatment OCD severity (YBOCS-SR) were fit with the fixed effect of pre-treatment OCD severity (YBOCS-SR) and the simple random effect of OCD group entered in block 1 and pre-treatment levels of HA and INC (OC-TCDQ) entered as fixed effects in block 2. These regression models examined whether pre-treatment levels of the core motivations predict the severity of OCD symptoms at post-treatment while controlling for the severity of OCD symptoms at pre-treatment. Overall hierarchical model comparisons and tests of individual predictors were performed with likelihood ratio tests (LRTs), with mixed models being fit using the R v4.3.1 (R Core Team, 2023) package lme4 v1.1-34 (Bates *et al.*, 2015) or glmmTMB v1.1.7 (Brooks *et al.*, 2017) in the case of a singular fit with lme4.

To examine whether changes in HA and INC over treatment are predictive of OCD treatment outcomes, change scores were calculated for HA and INC (i.e. time point 2 score subtracted from time point 1 score; therefore, negative scores indicate reductions in scores over time). First, we fit a series of hierarchical linear mixed models to examine whether the change scores in HA and INC from pre- to post-treatment are predictive of post-treatment OCD severity, while controlling for pre-treatment OCD severity. To understand when changes in HA and INC are predictive of treatment outcomes we conducted a set of analyses with early change (i.e. change from pre- to mid-treatment) and late change (i.e. change from mid- to post-treatment) in HA and INC as predictors in the models. Ten participants did not complete the mid-treatment questionnaires and therefore the early and late change analyses have a sample size of 55 participants. Independent samples *t*-tests indicated that these 10 participants did not differ from the 55 participants who completed the questionnaires at all time points on any of the baseline clinical measures (all $p > .05$).

All assumptions of the statistical tests described above were met. The Holm-Bonferroni correction method (Holm, 1979) was subsequently applied to the 4 series of hierarchical linear mixed-effects models to adjust the family-wise error rate for multiple comparisons to determine if findings held.

Results

Pre- to post-treatment changes in OCD symptoms and motivations

Table 2 shows the means (and standard deviations), paired *t*-test values, and effect sizes for all study measures pre- and post-treatment. Participants experienced large significant decreases in OCD symptom severity. Additionally, the HA and INC motivations significantly decreased from pre- to post-treatment, with small to medium effect sizes.

³A random sample of 30 treatment non-completers from our clinic was compared with our current sample using independent samples *t*-tests and we found no significant differences on any of the baseline clinical measures (i.e. YBOCS-SR, OC-TCDQ; all $p > .05$).

Table 2. Means (standard deviations) and paired sample *t*-test comparisons between self-report questionnaires pre- and post-CBT for OCD (*n* = 65)

Measure	Mean (SD) Range		<i>t</i>	d.f.	<i>p</i>	<i>d</i>
	Pre-treatment	Post-treatment				
YBOCS-SR	22.62 (4.90) 13–34	16.00 (7.28) 3–33	9.25	64	<.001	1.15
OC-TCDQ: HA	24.23 (9.73) 0–39	22.05 (9.67) 2–40	2.91	64	.005	0.36
OC-TCDQ: INC	24.08 (9.56) 0–39	21.94 (9.23) 0–40	2.58	64	.012	0.32

CBT, cognitive behavioural therapy; YBOCS-SR, Yale-Brown Obsessive-Compulsive Scale- Self-Report; OC-TCDQ, Obsessive-Compulsive Trait Core Dimensions Questionnaire; HA, harm avoidance; INC, incompleteness.

Do pre-treatment HA and INC scores predict treatment outcome?

The first model, which only included pre-treatment YBOCS-SR scores as a fixed effect and OCD treatment group as a random effect, indicated that pre-treatment OCD severity was significantly associated with post-treatment OCD severity ($\beta = .616$, $SE = .0987$, $LRT \chi^2_1 = 30.65$, $p < .0001$). However, the second model, which additionally included pre-treatment HA and INC scores did not show significant improvement from the first model ($LRT \chi^2_2 = .536$, $p = .765$). Pre-treatment levels of HA ($\beta = -.016$, $SE = 0.11$, $LRT \chi^2_1 = .039$, $p = .84$) and INC ($\beta = .071$, $SE = .11$, $LRT \chi^2_1 = .53$, $p = .46$) were not significant predictors of post-treatment OCD severity after controlling for pre-treatment OCD severity. This finding remained non-significant after correcting for multiple comparisons. Although pre-treatment HA and INC scores were correlated, $r(63) = .311$, $p = .01$, the collinearity statistics (variance inflation factor [VIF] values < 2 and tolerance values $> .8$) were within acceptable limits.

Does change in HA and INC predict treatment outcome?

Pearson correlations

The correlations between the change scores for YBOCS-SR (total, obsessions, compulsions) and OC-TCDQ (HA and INC) throughout treatment were examined (see Table 3). Changes in HA and INC across treatment (including early and late in treatment) had moderate to strong correlations. Pre- to post-treatment changes in HA and INC were both significantly correlated with changes in self-reported OCD symptom severity across treatment. Early treatment change in INC, but not HA, was significantly correlated with changes in OCD symptom severity across treatment. Late treatment change in HA, but not INC, was significantly correlated with changes in OCD symptom severity (total and compulsions, not obsessions).

Pre- to post-treatment change in HA and INC

Adding the predictors of pre- to post-treatment change in HA and INC was associated with a significant improvement in model fit over the model including only pre-treatment OCD severity and a random effect of OCD group ($LRT \chi^2_2 = 19.78$, $p < .0001$). Pre-treatment OCD severity ($\beta = .49$, $SE = .089$, $LRT \chi^2_1 = 24.51$, $p < .0001$) and change in HA ($\beta = .32$, $SE = .11$, $LRT \chi^2_1 = 7.67$, $p = .0056$), but not INC ($\beta = .15$, $SE = .11$, $LRT \chi^2_1 = 1.85$, $p = .17$), were significant predictors of post-treatment OCD severity. This finding remained significant after correcting for multiple comparisons.

Table 3. Pearson correlations for YBOCS-SR (total, obsessions, and compulsions) and OC-TCDQ (HA and INC) change scores throughout treatment

		Pre- to post-treatment change (<i>n</i> = 65)		Pre- to mid-treatment change (<i>n</i> = 55)		Mid- to post-treatment change (<i>n</i> = 55)	
		HA	INC	HA	INC	HA	INC
		.62**		.48**		.51**	
Pre- to post-treatment change	YBOCS-SR Total	.44**	.40**	.15	.37**	.29*	.05
	YBOCS-SR Obsessions	.29*	.29*	.12	.29*	.16	.04
	YBOCS-SR Compulsions	.41**	.38*	.05	.32*	.37**	.06

YBOCS-SR, Yale-Brown Obsessive-Compulsive Scale-Self-Report; OC-TCDQ, Obsessive-Compulsive Trait Core Dimensions Questionnaire; HA, harm avoidance; INC, incompleteness. * $p < .05$, ** $p < .01$.

Early treatment change in HA and INC

Adding the predictors of pre- to mid-treatment change in HA and INC was associated with a significant improvement in model fit over the model including only pre-treatment OCD severity and a random effect of OCD group (LRT $\chi^2_2 = 8.76$, $p = 0.013$). Pre-treatment OCD severity ($\beta = .58$, $SE = .096$, LRT $\chi^2_1 = 28.00$, $p < .0001$) and early change in INC ($\beta = .32$, $SE = .11$, LRT $\chi^2_1 = 7.38$, $p = .0066$), but not HA ($\beta = -.027$, $SE = .11$, LRT $\chi^2_1 = .056$, $p = .81$), were significant predictors of post-treatment OCD severity. This finding remained significant after correcting for multiple comparisons.

Late treatment change in HA and INC

Adding the predictors of mid- to post-treatment change in HA and INC was associated with a significant improvement in model fit over the model including only pre-treatment OCD severity and a random effect of OCD group (LRT $\chi^2_2 = 7.30$, $p = 0.026$). Pre-treatment OCD severity ($\beta = .53$, $SE = .10$, LRT $\chi^2_1 = 22.29$, $p < .0001$) and late change in HA ($\beta = .33$, $SE = .12$, LRT $\chi^2_1 = 7.15$, $p = 0.0075$) but not INC ($\beta = -.12$, $SE = .12$, LRT $\chi^2_1 = 1.10$, $p = 0.29$) were significant predictors of post-treatment OCD severity. However, late treatment change in HA did not remain a significant predictor when the p -values were adjusted for multiple comparisons.

Table 4 summarizes the findings from the series of hierarchical linear mixed effects models presented above.

Discussion

This study examined changes in the core motivations of OCD in participants who completed group CBT for OCD and their relationship to treatment outcomes. Results indicated that participants who completed treatment experienced significant reductions in HA and INC, the motivations that are believed to maintain OCD symptoms. This was consistent with our hypothesis and previous research (Cervin *et al.*, 2020; Coles and Ravid, 2016; Schwartz, 2018). The observed small to medium effect sizes for the pre- to post-treatment changes in HA and INC are similar to the effect sizes seen in previous studies. A meta-analysis found that INC improved modestly but significantly over treatment with medium effect sizes (Schwartz, 2018). However, when limiting the analysis to studies that used the OC-TCDQ, large effect sizes were typically found, but it was noted that most of these studies also tailored treatments to INC (Schwartz, 2018). Given that we found small to medium effect sizes for INC using the same measure, the differences in effect sizes are likely because we did not specifically tailor treatment to INC. This perhaps

Table 4. Summary of results from series of hierarchical linear mixed effects models

Analysis	Did fit of model improve by adding HA and INC?	Predictors	
		HA	INC
Do pre-treatment HA and INC scores predict treatment outcome?	No (LRT $\chi^2_2 = .536, p = .765$)	No ($\beta = -.016, SE = 0.11, LRT \chi^2_1 = .039, p = .84$)	No ($\beta = .071, SE = .11, LRT \chi^2_1 = .53, p = .46$)
Does change in HA and INC predict treatment outcome?			
Change across treatment (pre- to post-treatment)	Yes (LRT $\chi^2_2 = 19.78, p < .0001$)	Yes ($\beta = .32, SE = .11, LRT \chi^2_1 = 7.67, p = .0056$)	No ($\beta = .15, SE = .11, LRT \chi^2_1 = 1.85, p = .17$)
Early change (pre- to mid-treatment)	Yes (LRT $\chi^2_2 = 8.76, p = 0.013$)	No ($\beta = -.027, SE = .11, LRT \chi^2_1 = .056, p = .81$)	Yes ($\beta = .32, SE = .11, LRT \chi^2_1 = 7.38, p = .0066$)
Late change (mid- to post-treatment)	Yes ^a (LRT $\chi^2_2 = 7.30, p = 0.026$)	Yes ($\beta = .33, SE = .12, LRT \chi^2_1 = 7.15, p = 0.0075$)	No ($\beta = -.12, SE = .12, LRT \chi^2_1 = 1.10, p = 0.29$)

Pre-treatment OCD severity (YBOCS-SR) was always a significant predictor in the models. *p*-values displayed for improvement of model fit are before the Holm-Bonferroni method was applied to the models to correct for multiple comparisons.

^aThe improvement in the fit of the late change model by adding in the predictors of HA and INC was no longer significant after the Holm-Bonferroni correction was applied.

indicates that larger changes in INC can be observed if treatments are tailored to it, but this needs to be further investigated. Tailoring treatments to INC could involve providing psychoeducation about INC and NJREs, clinicians being aware of the role of INC and addressing this throughout treatment such as conducting exposures that focus on experiencing and learning to tolerate the associated discomfort (Coles and Ravid, 2016; Summerfeldt, 2004). Given the smaller effect sizes, when compared with the large effect sizes seen for changes in OCD symptom severity and to when treatment is tailored to INC, there is likely room to improve how CBT for OCD targets the underlying motivations, which remains to be further explored.

Pre-treatment levels of HA and INC were not significant predictors of OCD treatment outcomes. These findings were partially contrary to our hypothesis that higher levels of INC, but not HA, predict treatment resistance. Our result is inconsistent with the findings of Cervin and Perrin (2021) that a high baseline level of INC in children with OCD was a predictor of poorer treatment outcomes. Cervin and Perrin (2021) used the clinician-administered Obsessive-Compulsive Core Dimensions Interview (OC-CDI; Summerfeldt *et al.*, 2014) while we used the self-report OC-TCDQ, which may have affected results. The OC-CDI may be more sensitive to levels of INC. It is also possible that INC is harder to treat in children than adults. It is difficult to know whether the difference in findings is due to a methodological difference or a true difference. Our finding is encouraging because it suggests that increased baseline levels of INC are not necessarily reliable predictors of poorer treatment outcomes in adults.

Changes in HA and INC across treatment were positively correlated with change in OCD severity. However, when change in HA and INC were included in the same model to account for covariances, only change in HA across treatment was predictive of lower post-treatment OCD symptom severity. This is contrary to Cervin *et al.* (2020) where changes in INC, and not HA, were associated with changes in OCD severity. However, a significant proportion of participants in that study did not engage in ERP and thus did not receive gold-standard treatment (Cervin *et al.*, 2020). Given the relevance of ERP to HA this may account for the difference in findings between the studies. Overall, because these are the first studies to investigate the relationship between

changes in the core motivations of OCD to changes in OCD severity, and the mixed findings to date, further research is warranted.

We were also interested in exploring *when* changes in HA and INC predict positive symptom change. Interestingly, early changes in INC (but not HA) and late changes in HA (but not INC), were associated with better treatment outcomes. Importantly, the late treatment change finding did not remain significant when corrected for multiple comparisons. These findings may relate to when treatment components are introduced and emphasized throughout treatment. Early in treatment, clinicians typically educate patients on the importance of learning to tolerate distress (i.e. unpleasant emotions and sensations) without engaging in compulsions. Considering that INC is the motivation related to engaging in compulsions to counteract internal discomfort, learning to tolerate distress may be particularly relevant and underlie the importance of early changes in INC on improved treatment outcomes. Furthermore, early symptom improvement in CBT for OCD is a significant predictor of treatment response (e.g. Kropf *et al.*, 2017) and our finding may be another indicator of this. Changes in HA across treatment may be associated with improved treatment outcomes because the crucial learning that comes from the disconfirmation of feared outcomes may require the accumulation of evidence after several weeks of engaging in exposures (including more challenging exposures typically conducted later in treatment) and challenging distorted beliefs. This is the first study to our knowledge to investigate if and when changes in the core motivations are associated with group CBT for OCD outcomes in an adult clinical OCD sample.

Our results provide evidence for the relationship between the underlying core motivations of OCD and group CBT for OCD treatment outcomes. Although CBT models and treatment have traditionally appeared more congruent with a HA conceptualization of OCD, INC has an important role in the maintenance and treatment of OCD. This study adds to the small yet growing body of literature that has found that both HA and INC motivations can be reduced with treatment. Our methodology does not allow for causal conclusions therefore it will be important to investigate if changes in the core motivations cause changes in OCD severity. This would allow for a better understanding of what treatment strategies to focus on to facilitate symptom change and when clinicians should focus on these strategies. For example, if our findings were replicated in a randomized controlled trial (RCT) study where the active treatment condition involves explicitly targeting the core motivations it may suggest that clinicians should encourage changes in HA over the entire treatment period, while early in treatment it may be particularly important to encourage changes in INC to maximize reductions in OCD symptom severity. Clinically this may involve a very strong emphasis of learning to tolerate uncomfortable feelings and sensations early in treatment, perhaps even providing explicit coaching on managing discomfort.

This study focused on HA and INC as the core motivations of OCD as identified by Summerfeldt and colleagues in the core dimensions model of OCD (Summerfeldt, 2004; Summerfeldt *et al.*, 2014). It must be noted that disgust is another core feature in several presentations of OCD, particularly in contamination symptoms (e.g. Bhikram *et al.*, 2017; Cisler *et al.*, 2010; Melli *et al.*, 2015), with implications for treatment outcomes (e.g. Athey *et al.*, 2015; Cervin and Perrin, 2021; Ludvik *et al.*, 2015). Future studies may find it useful to investigate disgust along with HA and INC to broaden understanding of the motivations contributing to OCD presentations. Additionally, it is important to remember that OCD behaviours can be motivated by more than one motivation at a time (e.g. 'I wash my hands because I don't want to contract an illness, but I also wash them until the ritual feels complete').

The findings should be interpreted within the context of the study's limitations, which also suggest directions for future research. Our data were from a naturalistic sample of adult out-patients who completed group CBT at a specialized clinic within a Canadian hospital and was relatively homogenous and non-diverse. The extent to which these findings generalize to other treatment settings and more diverse populations is unknown. Future studies should investigate these findings in different treatment settings, including individual CBT, and with diverse

individuals to better understand the generalizability of the conclusions. Given the naturalistic nature of our study, there are aspects of the methodology that lack control and limit the strength of our conclusions. For example, the DART was only administered to part of our sample due to the assessment process in our clinic. Although the psychiatric assessments were thorough, and all participants had a confirmed diagnosis of OCD, a standardized assessment method minimizes bias introduced by variations in data collection procedures. Additionally, the participants' medication status was not routinely collected for this study, nor was it an exclusion criterion. Given that concurrent medication can impact treatment outcomes, medication information should be collected and reported to provide additional context to the results.

Additionally, the results are based entirely on self-report measures which relied on participants' subjective interpretations and may introduce biases. Future studies may wish to include clinician-administered measures such as the YBOCS, the OC-CDI, or the Brown Incompleteness Scale (BINCS; Boisseau *et al.*, 2018) to allow for trained professionals to use their clinical judgement to assess responses and account for contextual factors. For example, the OC-CDI assesses how HA and INC apply to the various symptoms an individual endorses and may allow for a more wholistic understanding and scoring of the core motivations involved in one's OCD presentation (see Summerfeldt *et al.*, 2014 for more information about the OC-CDI). Using the OC-CDI in future studies would also help indicate if the results found in this study are consistent across the methods of measuring the core dimensions.

Our study also only included those who completed treatment and the questionnaires. This allowed us to understand the relationship between the core dimensions and treatment response for those who complete treatment as indicated. However, the drawbacks to this approach include that the results may not generalize to those who are less treatment-compliant and can introduce selection bias that may overstate the benefit of group CBT for reducing the core motivations. However, given that there were no significant differences in the questionnaires of interest at baseline between a random sample of treatment non-completers and completers, it is unlikely that baseline HA and INC levels strongly predict treatment non-completion.

We examined the core dimensions as continuous scores in a naturalistic sample; we did not select cases demonstrating relative extremes on either dimension. Such design would allow more definitive conclusions about the treatment implications of OCD presentations highly characterized by INC and is a consideration for future research. OCD presentations on the extremes of the core dimensions continuum (i.e. very high INC/very low HA, and vice versa) may be relatively uncommon, therefore future research might oversample individuals who strongly endorse one dimension. However, there is not an agreed-upon way to define extreme groups for the core dimensions (see Bragdon and Coles (2017) and Sibrava *et al.* (2016) for examples of how high INC has been defined) and this will need to be further investigated and defined.

An RCT with an active treatment (where the core motivations are explicitly targeted) and control condition is warranted given the mixed results to date. Such a study would aid in understanding whether changes in the core motivation are causing improved treatment outcomes. Collecting information on medication status, participant attendance, and homework completion would help to better understand what contributes to treatment outcomes. Including questionnaires at theoretically based measurement time points would also provide a detailed understanding of how the core dimensions are changing during the various treatment components and thus would provide more guidance on how treatment can be tailored to optimize outcomes. Future studies may also want to collect post-treatment follow-up data to investigate whether the core dimensions differentially predict sustained treatment gains. Overall, further research is needed before strong conclusions can be made about the relationship between the core motivations and OCD treatment outcomes.

In conclusion, participants who completed group CBT for OCD experienced significant but modest reductions in HA and INC, the core motivations that drive OCD symptoms. Decreases in the core motivations throughout treatment were predictive of improved treatment outcomes, but

when these changes occur may be important to consider. This study adds to the growing body of research highlighting the important insights that can be gained from investigating OCD treatment response through the lens of the motivations that underlie the symptoms.

Supplementary material. The supplementary material for this article can be found at <https://doi.org/10.1017/S1352465824000274>

Data availability statement. The data that supports the findings of this study are available from the corresponding author, K.R., upon reasonable request due to privacy/ethical restrictions.

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