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Predictors of outcome in self-guided internet-delivered cognitive-behavior therapy for obsessive-compulsive disorder: A preliminary investigation

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Abstract

Internet-delivered cognitive-behavioral therapy (ICBT) is an effective treatment for obsessive-compulsive disorder (OCD). ICBT can be delivered in a self-guided or clinician-guided format. While a literature is emerging on the predictors of response to clinician-guided ICBT, there is a lack of research examining the predictors of response to self-guided ICBT. The aim of the present study was to examine predictors of outcome in a large sample of participants with OCD who commenced a self-guided ICBT intervention. One hundred and fifty-seven participants (M_{age} = 34.82; SD = 10.49; 78% female) were included in the study. Regression analyses were conducted to determine clinical and demographic predictors of (1) post-treatment symptom severity and (2) a clinically meaningful treatment response for both the intention-to-treat (ITT) and completer samples. The regression models significantly predicted posttreatment outcome for both the ITT ($F_{(8, 148)}$ = 15.844, p < .001) and completer sample ($F_{(8, 101)}$ = 5.929, p < .001), explaining 46% and 34% of the variance respectively. Higher baseline OCD severity,

younger age, experiencing higher contamination or symmetry symptoms, and a history of past treatment were all found to be significantly associated with higher post-treatment severity in the ITT sample. In the completer sample only higher baseline OCD severity and severity of harm-related obsessions and checking compulsions was significantly associated with higher posttreatment severity. When predicting treatment response the regression models for both the ITT and completer sample were nonsignificant.

KEYWORDS
cognitive-behavioral therapy, obsessive-compulsive disorder, OCD, predictors

1 | INTRODUCTION

Obsessive-compulsive disorder (OCD) is a chronic mental health condition (Melkonian et al., 2022) that is characterized by unwanted intrusive thoughts and time-consuming compulsive behaviors (American Psychiatric Association, 2022). Internet-delivered cognitive behavior therapy (ICBT) has been shown to be efficacious when delivered in both a clinician-guided (Andersson et al., 2012; Kyrios et al., 2018; Lundström et al., 2022; Mahoney et al., 2014; Wootton et al., 2013) and self-guided (Lundström et al., 2022; Wootton et al., 2014, 2019, 2024) format. There is also preliminary evidence to suggest that both clinician-guided and self-guided ICBT is effective for OCD when delivered as part of routine care (Flygare et al., 2022; Luu et al., 2020; Wootton et al., 2021). Clinician-guided ICBT, but not self-guided ICBT, has also been shown to be as effective as face-to-face CBT (Lundström et al., 2022). However, not all participants with OCD who complete ICBT respond well to treatment.

A number of studies have now investigated predictors of outcome in clinician-guided ICBT for OCD. For example, in the largest study to date, which included 101 participants, Andersson et al. (2015) examined whether symptom severity, symptom subtype, working alliance, and presence of disgust symptoms predicted treatment outcome. This study found that higher pretreatment OCD severity, presence of disgust symptoms, and lower levels of working alliance with the therapist predicted higher OCD severity at posttreatment (Andersson et al., 2015). These variables combined predicted approximately 40% of the variance in posttreatment outcome. At 24-month follow up the only variable that remained a significant predictor of outcome was pretreatment symptom severity (Andersson et al., 2015), with those with more severe OCD symptoms at pretreatment also having higher severity scores at follow-up.

Diefenbach et al. (2015) also examined predictors of outcome in a smaller sample of 24 individuals who completed clinician-guided ICBT for OCD. In this study, the authors examined whether baseline OCD symptom severity, baseline depressive symptoms, motivation to change, engagement with treatment, and executive functioning predicted treatment outcome at posttreatment. The study found that of the hypothesized predictors only motivation to change (i.e., willingness to reduce avoidance behaviors on the readiness ruler; Simpson et al., 2012) and engagement in treatment, in terms of number of telephone sessions completed were associated with improved treatment outcome. Using these two variables the authors were able to accurately classify 88% of responders and nonresponders at posttreatment (Diefenbach et al., 2015).

Wheaton et al. (2021) examined predictors of outcome in another smaller study of 40 participants who had completed clinician-guided ICBT for OCD. In this study, a number of potential predictors were examined including

demographic variables, baseline OCD symptom severity, OCD symptom duration, age of symptom onset, avoidance, insight, symptom subtype, comorbidity, use of medication, and past treatment for OCD. Of these variables baseline symptom severity, avoidance behaviors, a history of past treatment for OCD were related to less improved outcome at posttreatment. These significant variables combined predicted approximately 50% of the variance in posttreatment outcome (Wheaton et al., 2021).

In summary, there is emerging evidence that clinicians and researchers may be able to predict who will respond best to ICBT for OCD. However, to date, there are currently only a small number of studies that have explored predictors of outcome for ICBT, and most of these were underpowered, and all used a clinician-guided ICBT treatment. Self-guided ICBT has a number of advantages over clinician-guided ICBT including reduced costs and anonymity, which is significant given treatment costs, as well as shame/embarrassment/stigma are key barriers to accessing treatment for OCD (Gentle et al., 2014; Marques et al., 2010). Previous research has also found that increased privacy and anonymity is a primary motivator for individuals with OCD using ICBT (Wootton et al., 2011). Self-guided ICBT may also be an important first step in future stepped-care models for OCD, thus reliably identifying predictors of outcome may help to develop algorithms that can be used to advise consumers on suitable treatment options based on empirically determined profiles.

As such, the aim of the current study was to examine the predictors of outcome for self-guided ICBT. Based on the existing literature (e.g., Andersson et al., 2015; Diefenbach et al., 2015; Wheaton et al., 2021) it was hypothesized that age, baseline OCD symptom severity, baseline depression severity, and past psychological treatment would predict treatment outcome in self-guided ICBT for OCD. Specifically, those with older age, had higher baseline OCD and depression symptom severity, and who a history of past psychological treatment would result in less improved outcomes in self-guided ICBT for OCD. The hypotheses around symptom subtype were exploratory in nature given previous studies examining this question have used alternative symptom subtype classification methods to the current study.

2 | METHOD

2.1 | Design

The present study used data from a previously published randomized controlled trial (RCT) (Wootton et al., 2019) and two open trials Study 1 ($N = 16$) and Study 2 ($N = 28$) (Wootton et al., 2014) investigating the efficacy of self-guided ICBT for OCD. In the RCT (Wootton et al., 2019), both the immediate treatment group ($N = 64$) and control group after they commenced treatment ($N = 49$) were included in the present study. Each of these studies were approved by the Human Research Ethics Committee of Macquarie University. The studies utilized the same treatment program (with some minor differences across iterations) and had an identical recruitment methodology.

2.2 | Participants

Participants were 157 individuals who participated in one of three previous trials of self-guided ICBT (Wootton et al., 2014, 2019). Participants in these studies were recruited primarily through social media advertising, however, recruitment source was not monitored. On average participants were aged in their 30s ($M = 34.82$; $SD = 10.49$; range 18–64), and had OCD symptoms in the moderate range on the Yale-Brown Obsessive-Compulsive Scale (YBOCS; Goodman, 1989) ($M = 22.16$; $SD = 5.41$). Approximately 59% of participants had clinically relevant depressive symptoms (i.e., a Patient Health Questionnaire (9-item) (Kroenke et al., 2001) of ≥10 and potential co-morbid depressive disorder. Forty-five percent of the sample were on medication for their OCD symptoms and 66% had previously had psychological treatment for OCD. The characteristics of the sample are outlined in Table 1.

TABLE 1 Sample characteristics ($N = 157$).

Demographic variable	N/mean (SD)	%
Age	34.82 (10.49)	-
Gender (% female)	123	78.3
Employment status		
Employed	92	58.6
Unemployed	19	12.1
At home parent	13	8.3
Retired	3	1.9
Registered sick/disabled	8	5.1
Student	22	14.0
Marital status		
Single/never married	69	43.9
Married/de-facto	71	45.2
Divorced/separated	9	5.7
Other	8	5.1
Educational status		
High school	30	19.1
Trade certificate	35	22.3
Tertiary study	92	58.6
Current medication (% yes)	70	44.6
Pretreatment YBOCS	22.16 (5.41)	-
Pretreatment DOCS		
DOCS Contamination	7.05 (5.54)	-
DOCS Harming	8.65 (5.51)	-
DOCS Thoughts	7.93 (5.69)	-
DOCS Symmetry	6.10 (5.32)	-
Pretreatment PHQ-9	11.13 (5.35)	-
≥10	93	59.2
Past psychological treatment	103	65.6

Abbreviations: DOCS, Dimensional Obsessive Compulsive Scale; PHQ-9, Patient Health Questionnaire (9-item); YBOCS, Yale-Brown Obsessive Compulsive Scale.

Information about the inclusion and exclusion criteria are outlined in full in other publications (Wootton et al., 2014, 2019). Briefly, participants were required to (1) be English speaking; (2) be 18 years or older; (3) have regular access to the Internet; (4) score at least a 7 on one of the subscales of the Dimensional Obsessive Compulsive Scale (DOCS) (Abramowitz et al., 2010); and (5) score at least 14 on the YBOCS (self-report version) (Goodman, 1989) at initial assessment. Participants were excluded from the trials if they: (1) had suicidal plans or intention or had a recent history of suicide attempts or deliberate self-harm; (2) had severe depressive symptoms;

(3) had a self-reported history of psychotic illness or bipolar disorder; and (4) were drinking alcohol or using illicit drugs on a daily basis.

2.3 | Measures

Demographic Questionnaire: Participants in each of the trials were asked to provide the following demographic information: (1) age; (2) gender; (3) employment status; (4) marital status; (5) highest level of education; (6) medication status; and (7) whether they had previously received psychological treatment for OCD.

Yale-Brown Obsessive Compulsive Scale (YBOCS) (Goodman, 1989). The YBOCS is a commonly used 10-item scale of OCD symptom severity. Items 1–5 assess the severity of obsessions and items 6–10 the severity of compulsions. While designed as a clinician-administered tool, the self-report version of the scale was used in the present study. Scores on the self-report and clinician-administered versions have been shown to be highly correlated in previous studies (Steketee et al., 1996). A score of 0-13 is considered mild, 14-25 moderate, 26-34 moderate-severe, and 35-40 extreme symptoms (Storch et al., 2015). The self-report YBOCS has demonstrated good internal consistency in other samples (Steketee et al., 1996; Wootton et al., 2011). The internal consistency (Cronbach's α) in the current sample ranged from 0.73 to 0.92 across studies (Wootton et al., 2014, 2019).

Dimensional Obsessive Compulsive Scale (DOCS) (Abramowitz et al., 2010). The DOCS is a 20-item self-report measure assessing the severity of four OCD symptom subtypes including (1) contamination obsessions and washing/cleaning compulsions; (2) responsibility for harm, injury, or bad luck obsessions and checking/reassurance-seeking compulsions; (3) unacceptable obsessional thoughts with mental or neutralizing compulsions; (4) symmetry, incompleteness and exactness obsessions with ordering/arranging or repeating compulsions (Abramowitz et al., 2010). The DOCS demonstrated good psychometric properties in previous samples (Abramowitz et al., 2010; Wootton et al., 2013). The internal consistency (Cronbach's α) in the current sample ranged from 0.86 to 0.93 across studies (Wootton et al., 2014, 2019).

Patient Health Questionnaire–9 item (PHQ-9) (Kroenke et al., 2001). The PHQ-9 is a 9-item self-report questionnaire assessing depressive symptoms. A score of equal to or greater than 10 indicates clinically significant symptoms of major depressive disorder (Kroenke et al., 2001; Levis et al., 2019). The scale is widely used and has demonstrated good psychometric properties in previous samples (Kroenke et al., 2001; Titov et al., 2011) although recent studies indicate it may overestimate cases of depression (Titov & Andersson, 2022). The internal consistency (Cronbach's α) in the current sample ranged from 0.78 to 0.89 across studies (Wootton et al., 2014, 2019).

All of the measures were delivered via a secure online platform and were administered at pretreatment, midtreatment, and posttreatment.

2.4 | Treatment

The ICBT treatment is outlined in full in other publications (Wootton et al., 2014, 2019). Briefly, the treatment consisted of five online modules delivered over 8 weeks (however in one of the open trials [N = 28] a six-module, 10 weeks course was delivered where the exposure and response prevention module was divided in two and delivered over 2 weeks; all content was otherwise identical). The modules are focused on (1) psychoeducation; (2) behavioral experiments; (3); behavioral activation/arousal reduction; (4) exposure and response prevention, and (5) relapse prevention. The lessons are released according to a predetermined schedule and participants cannot read the subsequent lesson until the previous lesson is complete and cannot read ahead. Participants are sent an automated email when a lesson is available or when they've missed a lesson. Participants are provided with homework tasks to complete between each lesson, however the homework is not entered into the system or monitored by a clinician. Each lesson takes approximately 30 min to complete and participants are encouraged to practice the homework

tasks for an additional hour per day. Participants did not have any contact with a clinician at any point during the assessment or treatment. Symptoms are measured at posttreatment, however participants continue to have access to the treatment materials for an additional 6 months.

2.5 | Statistical methods

Differences on key demographic and symptom variables were examined between the four samples [i.e., treatment group from Wootton et al. (2019), control group from Wootton et al. (2019) after commencing treatment, Study 1 and Study 2 from Wootton et al. (2014) to ensure it was suitable to combine participants in to one group. For these analyses continuous variables were examined using a one-way analysis of variance (ANOVA) and categorical variables were examined using chi-square.

Symptom improvement was analyzed in two ways: (1) posttreatment YBOCS score and (2) and treatment response (defined as a 35% reduction in symptoms; consistent with the recommendations of Mataix-Cols et al., 2016). To calculate whether the variables of interest (i.e., age, symptom subtype, baseline OCD symptom severity, baseline depression severity, and past psychological treatment) predicted posttreatment YBOCS score a standard (forward entry) multiple linear regression was performed. To calculate whether the variables of interest predicted treatment response a stepwise binary logistic regression was used. Age, symptom subtype (i.e., baseline scores on each of the four DOCS subscales), baseline OCD symptom severity (i.e., YBOCS pretreatment score), baseline depression severity (i.e., PHQ-9 total score) were all continuous variables. Past psychological treatment was a dichotomous variable with no previous psychological treatment coded as a 0 and experience of previous psychological treatment coded as 1. The regressions were conducted on both the ITT and completer samples. When the participant did not complete posttreatment questionnaires data was imputed using last observation carried forward. Effect size (Cohen's f^2) is reported, along with the squared semi-partial correlation coefficients (sr^2) for each of the individual predictors. Effect sizes were interpreted according to Cohen (1992) where an f^2 and sr^2 of 0.02, 0.15, and 0.35 is considered small, medium, and large respectively. All analyses were performed on SPSS Version 28 (IBM Inc.). Using sample size calculations outlined in Tabachnick and Fidell (2014) ($N \geq 50 + 8$ m), a minimum sample size of 114 is required for each regression (with 8 predictors), a value that was exceeded in the current study.

3 | RESULTS

3.1 | Assessment of sample differences

There were no significant differences between the samples on demographic variables including age ($F_{(3, 153)} = 0.77$, $p = .510$), gender (χ^2 (3, $N = 157$) = 2.94, $p = .401$), employment status (χ^2 (15, $N = 157$) = 9.21, $p = .866$), marital status (χ^2 (9, $N = 157$) = 8.13, $p = .522$) or current medication use (χ^2 (3, $N = 157$) = 4.11, $p = .250$). There was no significant differences between the samples on scores on the self-report measures at pretreatment including the YBOCS ($F_{(3, 153)} = 0.82$, $p = .486$), DOCS contamination subscale ($F_{(3, 153)} = 2.44$, $p = .066$), DOCS harming subscale ($F_{(3, 153)} = 0.82$, $p = .487$), DOCS thoughts subscale ($F_{(3, 153)} = 2.02$, $p = .114$), DOCS symmetry subscale ($F_{(3, 153)} = 0.85$, $p = .468$), or PHQ-9 total score ($F_{(3, 153)} = 1.18$, $p = .320$). There were also no significant differences between the samples on the proportion of patients with a likely comorbid depressive disorder (χ^2 (3, $N = 157$) = 2.38, $p = .498$) or proportion of patients who had previously received psychological treatment (χ^2 (3, $N = 157$) = 3.93, $p = .269$). There was a statistically significant difference between the samples on educational status (χ^2 (6, $N = 157$) = 26.79, $p < .001$) with those in the treatment group of the RCT (Wootton et al., 2019) having a lower proportion of individuals with a trade certificate (compared to individuals in the control group and open trial

2) and higher proportion of participants with a tertiary qualification (compared to the control group and open trial 1). However, given this was not a key variable we considered it appropriate to combine the samples from each of the studies.

3.2 | Treatment adherence

Fifty-five of the 157 participants (35%) did not complete the posttreatment questionnaires. There were no significant differences between those who completed the questionnaires and those that did not on demographic variables including employment status (χ^2 (5, $N = 157$) = 5.58, $p = .350$), marital status (χ^2 (3, $N = 157$) = 2.78, $p = .427$), educational status (χ^2 (2, $N = 157$) = 2.29, p .318) or current medication use (χ^2 (1, $N = 157$) = 3.45, $p = .06$). There was no significant differences between the groups on scores on the pretreatment YBOCS ($t_{(155)} = -1.66$, $p = .05$), DOCS harming subscale ($t_{(94.93)} = -0.84$, $p = .201$), DOCS thoughts subscale ($t_{(155)} = -1.13$, $p = .134$), DOCS symmetry subscale ($t_{(155)} = -1.53$, $p = .064$), or PHQ-9 total score ($t_{(155)} = -1.64$, $p = .052$). There were also no significant differences between the groups on the proportion of patients with a likely comorbid depressive disorder (χ^2 (1, $N = 157$) = 1.36, $p = .244$) or proportion of patients who had previously received psychological treatment (χ^2 (1, $N = 157$) = 1.06, $p = .304$).

There was a statistically significant difference between the groups on demographic variables including age ($t_{(143.96)} = 3.50$, $p < .001$), gender (χ^2 (1, $N = 157$) = 5.76, $p = .016$), and DOCS contamination subscale ($t_{(94.57)} = -1.73$, $p = .043$). Those who did not complete the posttreatment questionnaires were more likely to be younger ($M_{age} = 31.31$; SD = 7.93) compared to those who completed the questionnaires ($M_{age} = 36.71$; SD = 11.23). Women (39.8%) were more likely than men (17.6%) to not complete the questionnaires and individuals who did not complete the questionnaires had a higher baseline mean score on the DOCS contamination scale ($M = 8.15$; SD = 6.16) compared with those who did complete the questionnaires ($M = 6.46$; SD = 5.11).

3.3 | Assumption testing

For the multiple linear regression, the analysis of standardized residuals indicated that there were no outliers and the dependent variable (posttreatment YBOCS score) was normally distributed ($W_{(157)} = 0.992$, $p = .559$). The P-P plot indicated normally distributed standardized residuals. On the scatterplot of standardized residuals none of the variables fell outside the tolerance and Cook's distance was less than 1 indicating that the assumption of homogeneity of variance and linearity was met. None of the correlations between the predictor variables exceed $r = .70$ indicating that there was no evidence of multicollinearity.

3.4 | Predictors of posttreatment YBOCS

3.4.1 | Intent to treat sample

Table 2 outlines the unstandardized regression coefficient (B), unstandardized standard error (SE) (as well as the 95% confidence interval), standardized regression coefficient (β) and p-values for both the ITT sample and completer sample. For the ITT sample the multiple linear regression was significant ($F_{(8, 148)} = 15.844$, $p < .001$) with approximately 46% of the variance explained by the predictors ($R^2 = 0.461$; Adjusted $R^2 = 0.432$), representing a large global effect size ($f^2 = 0.85$). The YBOCS baseline score was significantly different from zero ($B = 0.63$, $p < .001$, $sr^2 = 0.17$, medium effect) indicating that for each additional posttreatment YBOCS score there was a 0.63 increase in baseline YBOCS score. Age was significantly different from zero ($B = -0.09$, $p = .024$, $sr^2 = 0.02$, small effect)

TABLE 2 Multiple linear regression analysis predicting posttreatment YBOCS Score.

Variable	*B*	SE	95% CI		*β*	*p* value	sr^2
Intent to treat sample (*N* = 157)							
			Lower	*Upper*			
Baseline OCD severity	0.63	0.09	0.45	0.81	.50	<.001	0.17
Age	−0.09	0.04	−0.17	−0.01	−.14	.024	0.02
DOCS (Contamination)	0.16	0.08	0.00	0.31	.13	.049	0.01
DOCS (Checking)	0.09	0.09	−0.08	0.27	.08	.296	0.00
DOCS (Thoughts)	0.12	0.08	−0.05	0.28	.10	.168	0.01
DOCS (Symmetry)	0.18	0.09	0.01	0.35	.14	.038	0.02
Baseline depression severity	−0.05	0.08	−0.21	0.12	−.04	.568	0.00
Past psychological treatment	1.81	0.90	0.04	3.58	.13	.045	0.02
Completer sample (*N* = 102)							
Baseline OCD severity	0.412	0.133	0.147	0.676	.320	.003	0.07
Age	−0.069	0.050	−0.169	0.030	−.124	.169	0.01
DOCS (Contamination)	0.101	0.112	−0.122	0.325	.082	.370	0.01
DOCS (Checking)	0.285	0.125	0.036	0.534	.232	.025	0.04
DOCS (Thoughts)	0.156	0.108	−0.058	0.370	.133	.151	0.02
DOCS (Symmetry)	0.194	0.119	−0.041	0.430	.157	.105	0.02
Baseline depression severity	−0.088	0.110	−0.306	0.130	−.073	.424	0.01
Past psychological treatment	1.322	1.136	−0.935	3.578	0.102	.248	0.01

Abbreviations: DOCS, Dimensional Obsessive-Compulsive Scale; OCD, obsessive-compulsive disorder; sr^2, squared semi-partial correlation coefficient.

indicating that each additional YBOCS posttreatment score corresponded to a decrease in age of 0.09 years. The DOCS contamination subscale score ($B = 0.16$, $p = .049$, $sr^2 = 0.01$, small effect) and DOCS symmetry subscale score ($B = 0.18$, $p = .038$, $sr^2 = 0.02$, small effect) were significantly different from zero indicating that for each additional posttreatment YBOCS score there was a 0.16 and 0.18 increase in DOCS contamination and DOCS symmetry scores respectively at baseline. Finally, the past treatment variable was also significantly different from zero ($B = 0.1.81$, $p = .045$, $sr^2 = 0.02$, small effect) indicating that for each additional point on the YBOCS at posttreatment there was a 1.81 increased likelihood that the participant had received previous psychological treatment. The DOCS checking subscale, DOCS thoughts subscale, and baseline depression severity were nonsignificant predictors.

3.4.2 | Completer sample

For the completer sample (i.e., those who completed the posttreatment questionnaires) the multiple linear regression was significant ($F_{(8, 101)} = 5.929$, $p < .001$) with approximately 34% of the variance explained by the predictors ($R^2 = 0.338$; Adjusted $R^2 = 0.281$), representing a large global effect size ($f^2 = 0.72$). The YBOCS baseline score was significantly different from zero ($B = 0.41$, $p = .003$, $sr^2 = 0.07$, small effect) indicating that for each additional posttreatment YBOCS score there was a 0.41 increase in baseline YBOCS score. The DOCS harming

subscale score ($B = 0.29$, $p = .025$, $sr^2 = 0.04$, small effect) was significantly different from zero indicating that for each additional posttreatment YBOCS score there was a 0.29 increase in DOCS harming scores at baseline. Age, DOCS contamination subscale, DOCS thoughts subscale, DOCS symmetry subscale, baseline depression severity, and past psychological treatment were nonsignificant predictors in the completer sample.

3.5 | Predictors of treatment response at posttreatment

3.5.1 | Intent to treat sample

Thirty of the 157 (19.1%) participants in the ITT sample met criteria for treatment response (i.e., a 35% reduction in symptoms). A forced entry binary logistic regression was performed to explore the relationship between the identified predictors and likelihood of achieving treatment response. This model was not statistically significant (χ^2 (8, $N = 157$) = 13.70, $p = .088$). The unstandardized regression coefficient (B), unstandardized standard error (SE), p-values, odds ratio (and 95% CI of odds ratio) are reported in Table 3. The overall variance in the odds of improvement, accounted for by the model was approximately 14% using the Nagelkerke R^2. While the overall

TABLE 3 Binary logistic regression analysis predicting posttreatment response status.

Variable	*B*	SE	*Exp(β)*	Lower	Upper	*p* Value
Intent to treat sample (*N* = 157)						
Constant	−3.48	1.23	0.03	-	-	.006
Age	0.05	0.02	1.05	1.01	1.09	.029
DOCS (Contamination)	−0.06	0.04	0.94	0.87	1.02	.161
DOCS (Checking)	−0.01	0.04	1.00	0.91	1.09	.910
DOCS (Thoughts)	−0.06	0.04	0.94	0.87	1.02	.159
DOCS (Symmetry)	−0.03	0.05	0.97	0.89	1.06	.497
Baseline OCD severity	0.07	0.05	1.07	0.97	1.18	.184
Baseline depression severity	−0.05	0.04	1.05	0.97	1.15	.250
Past psychological treatment	−1.01	0.45	0.37	0.15	.89	.027
Completer sample (*N* = 102)						
Constant	−3.317	1.511	0.036	-	-	.028
Age	0.032	0.023	1.033	0.987	1.081	.165
DOCS (Contamination)	−0.024	0.049	0.977	0.887	1.076	.632
DOCS (Checking)	−0.048	0.054	0.953	0.858	1.060	.375
DOCS (Thoughts)	−0.070	0.047	0.932	0.849	1.023	.137
DOCS (Symmetry)	0.000	0.053	1.000	0.901	1.110	.997
Baseline OCD severity	0.090	0.059	1.094	0.975	1.227	.125
Baseline depression severity	0.050	0.048	1.051	0.956	1.156	.300
Past psychological treatment	−0.615	0.498	0.540	0.204	1.434	.216

Abbreviations: DOCS, Dimensional Obsessive-Compulsive Scale; OCD, obsessive-compulsive disorder.

model was nonsignificant age was a significant predictor ($B = 0.05$; $p = .029$) indicating that as age increased so too did the likelihood of meeting the criteria for treatment response. Past psychological treatment was also a significant predictor ($B = -1.01$; $p = .027$) indicating that those with past psychological treatment were less likely to meet criteria for treatment response at posttreatment compared to those who were treatment naïve.

3.5.2 | Completer sample

Twenty-seven of the 102 (26.5%) participants in the completer sample met criteria for treatment response (i.e., a 35% reduction in symptoms). A forced entry binary logistic regression was performed to explore the relationship between the identified predictors and likelihood of achieving treatment response. This model was not statistically significant (χ^2 (8, $N = 102$) = 9.70, $p = .286$). The unstandardized regression coefficient *(B)*, unstandardized standard error (SE), *p*-values, odds ratio (and 95% CI of odds ratio) are reported in Table 3. The overall variance in the odds of improvement, accounted for by the model was approximately 13% using the Nagelkerke R^2. None of the hypothesized variables significantly predicted treatment response in the completer sample.

4 | DISCUSSION

The aim of the current study was to examine potential predictors of outcome in self-guided ICBT. Based on the existing literature (e.g., Andersson et al., 2015; Diefenbach et al., 2015; Wheaton et al., 2021) it was hypothesized that age, symptom subtype, baseline OCD symptom severity, baseline depression severity, and past psychological treatment would predict treatment outcome in self-guided ICBT for OCD. We specifically hypothesized that those older in age, with higher baseline OCD and depression symptom severity at baseline and who had a history of past psychological treatment would result in less improved outcomes in self-guided ICBT for OCD. The hypotheses around symptom subtype were exploratory in nature. In this study treatment outcome was examined in two ways. First, we investigated predictors of posttreatment YBOCS score, and second, we examined predictors of treatment response (i.e., a 35% reduction in YBOCS). Our hypotheses were partially supported.

When examining the predictors of posttreatment YBOCS score the regression for both the ITT and completer sample were significant. In the ITT sample, age, symptom subtype (DOCS contamination and DOCS symmetry), baseline OCD symptom severity, and past psychological treatment significantly predicted posttreatment YBOCS severity, explaining approximately 46% of the variance. However, in the completer sample only baseline OCD symptoms severity and DOCS checking subscale significantly predicted posttreatment YBOCS severity (explaining approximately 34% of the variance). When examining predictors of treatment response, both the ITT and completer models were nonsignificant, and this is likely due to the small number of participants who met the stringent response criteria (19% in the ITT sample and 26.5% in the completer sample). This is the first study to examine predictors of outcome in self-guided ICBT, and these findings provide preliminary support for some potential predictor variables. However, it is important for this work to be replicated in other samples and contexts. It is also important for future research to extend on these findings as only basic demographic and symptom data was included in the present study, and other more salient predictors may be found.

Age was a significant predictor of posttreatment YBOCS score and posttreatment remission. In both cases, increased age was associated with improved treatment outcome. This result is inconsistent with other studies that have examined age as a potential predictor of treatment outcome (i.e., Wheaton et al., 2021) and found no relationship, or found that treatment responders were significantly younger than non-responders (Seol et al., 2016). While preliminary, this finding has important clinical implications, as ICBT is generally considered by clinicians to be suitable for younger patients (Sinclair et al., 2013). This finding indicates that self-guided ICBT can be used across

the lifespan, as long as the patient has basic computer literacy and access to a computer and reliable internet (as was required for participating in the current study).

Symptom subtype was a significant predictor of posttreatment YBOCS in the ITT sample. Specifically, those with higher baseline contamination and symmetry scores had a higher YBOCS score at posttreatment. In the completer sample those with higher baseline checking scores had a higher YBOCS at posttreatment. These results are inconsistent with Andersson et al. (2015) Wheaton et al. (2021) who found that symptom subtype was unrelated to YBOCS score at posttreatment. However, symptom subtype has been assessed using a variety of measures across studies, which may account for this discrepant finding. For example, in the present study, the DOCS (Abramowitz et al., 2010) was used, whereas Andersson et al. (2015) and Wheaton et al. (2021) used the Obsessive-Compulsive Inventory-Revised (Foa et al., 2002). Another possibility is that the relationship between symptom subtype at baseline and overall symptom improvement may be specific to the ICBT intervention used in this particular study. As such, the relationship between symptom presentation and outcome in self-guided ICBT requires further research. It is encouraging that individuals with the unacceptable obsessional thoughts with mental or neutralizing compulsions subtype of symptoms did not perform poorly compared to other subtypes, as it is possible that individuals with these symptoms may be more likely to utilize self-guided ICBT given the higher levels of shame/stigma that individuals with this category of symptoms often report (Weingarden & Renshaw, 2015).

Baseline OCD severity was a significant predictor of posttreatment YBOCS. The existing literature on baseline OCD severity has been inconsistent with some studies indicating that baseline OCD severity is related to outcome in ICBT for OCD (Kyrios et al., 2018; Wheaton et al., 2021), while others have not found this to be the case (Andersson et al., 2015; Diefenbach et al., 2015; Seol et al., 2016). It is possible that baseline symptom severity may be related to outcome in self-guided treatments to a greater extent than clinician-guided treatments, however, this is the first study to examine predictors of outcome in self-guided ICBT for OCD, and thus, this research question requires further investigation. It is also possible however that those with higher baseline scores severity scores at pretreatment will continue to have higher YBOCS scores at posttreatment, but that this does not affect treatment response status, which is arguably the more important outcome variable. It will be important to examine this variable in the future to elucidate the relationship between baseline severity and outcome.

Baseline depression symptoms was not a significant predictor of posttreatment YBOCS scores or treatment remission at posttreatment. This is consistent with previous research in this field (Diefenbach et al., 2015; Seol et al., 2016; Wheaton et al., 2021). To date there are currently no studies that have indicated that pretreatment depressive symptoms have any bearing on outcome in ICBT treatments, whether self-guided or guided. However, it is important to highlight that one of the exclusion criteria for entry in to these studies was a score of more than 20 (Wootton et al., 2019) or 22 (Wootton et al., 2014) on the PHQ-9 (Kroenke et al., 2001). Therefore, it is important for future research to ascertain whether the outcome is replicated when patients with a greater range of depressive symptoms are included in the trial.

Past psychological treatment significantly predicted higher posttreatment YBOCS scores and response status, indicating that those with a history of past treatment had more severe symptoms at posttreatment and were less likely to respond to the treatment. This finding is consistent with Wheaton et al. (2021), who found similar outcomes for past CBT for OCD treatment. This finding has important implications for stepped-care treatments for OCD, whereby those who are presenting for treatment for the first time should be given a low-intensity ICBT treatment rather than a more expensive face-to-face treatment. Those who don't respond may then be offered face-to-face (or other high-intensity treatment options).

While the results of the current study are promising and represent the only study to date that has examined the predictors of outcome for self-guided ICBT for OCD, there are a number of limitations that should be acknowledged. First, participants in this study self-reported symptoms of OCD, and were not diagnosed with a structured diagnostic interview. Therefore, it is not clear if the findings can be generalized to those with DSM-5 or ICD-11 diagnosed OCD.

Second, the majority of participants were female (78%) and while females are significantly more likely to meet criteria for OCD compared to males (Kessler et al., 2012), the difference in this study is more pronounced than what would be expected. It is worth highlighting that a high proportion of female participants is commonly seen in ICBT interventions for OCD (Lundström et al., 2022; Olofsdotter Lauri et al., 2022; Schröder et al., 2020), as well as other disorders (Fogliati et al., 2016; Titov et al., 2008), and it is possible that ICBT is a more appealing treatment option for women than men, however, this requires further research.

Third, all outcome measures were self-report in nature and may not be an accurate representation of symptom severity. Therefore, future research would benefit from the addition of clinician-administered assessment tools. We also calculated remission in this study based on the recommendations of Mataix-Cols et al. (2016) and future research may wish to examine predictors of other outcomes, such as treatment remission.

Finally, the participants in this study had taken part in three different clinical trials, and while recruitment and methodology was similar across studies there were some minor differences. For instance, one of the treatment groups received a six-lesson course (delivered over 10 weeks), while all other participants received a five-lesson course (delivered over 8 weeks). These minor variations may introduce noise in the data and may result in predictors not being adequately identified. As the field moves forward it is important for these findings to be replicated to enhance our understanding of the variables that may predict outcome for self-guided ICBT for OCD. It is also important to examine other predictors of outcome including predictors of treatment drop out and treatment remission.

The results of the present study indicate that age, symptom subtype, baseline OCD symptom severity, and treatment naiveté may be important predictors of treatment outcome in self-guided ICBT. As this is the first study to examine predictors of outcome in self-guided ICBT it is important that these findings are replicated in future studies. To inform dissemination efforts for ICBT for OCD it is important for future studies to also examine other important variables, such as predictors of dropout, and predictors of treatment remission. Identifying who is likely to drop out of treatment and who is unlikely to achieve remission has important implications for the dissemination of self-guided ICBT for OCD in the community.

AUTHOR CONTRIBUTIONS

Bethany Wootton originally collected the data along with Prof. Nickolai Titov and Blake F. Dear. The current project idea was devised by A/Prof Wootton. Data analysis was performed by Bethany Wootton. The first draft of the manuscript was written by Bethany Wootton. Revisions were made based on the feedback of all other authors. All authors read and approved the final manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Deidentified data will be made available to other researchers upon reasonable request pending ethical approval. The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ETHICS STATEMENT

This is a secondary data analysis. The original data collection was approved by the Macquarie University Human Research Ethics Committee.

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