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Efficacy of a prevention program for postpartum obsessive–compulsive symptoms

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ABSTRACT

Obsessive–Compulsive Disorder (OCD) has emerged as a common and impairing postpartum condition. Prospective studies have identified psychological vulnerabilities for the emergence of postpartum obsessive–compulsive symptoms (OCS), including general anxiety symptoms, pre-existing OCS, and specific cognitive distortions. The identification of these factors makes feasible the development of prevention programs that could reduce the impact of postpartum OCS. The present investigation examined a cognitive–behavioral prevention program using a randomized, double blind, controlled trial. Expecting mothers in their 2nd or 3rd trimester with an empirically established, malleable risk factor for postpartum OCS received either the prevention program ($N = 38$) or a credible control program ($N = 33$), both of which were incorporated into traditional childbirth education classes. Results revealed that at 1 month, 3 months, and 6 months postpartum, the prevention program was associated with significantly lower levels of obsessions and compulsions than was the control condition (all p 's < 0.05). Group differences remained significant even after controlling for baseline OCS and depression symptoms. Those in the prevention condition also reported decreasing levels of cognitive distortions, in contrast to the control condition (p 's < 0.05). Results support the potential utility of incorporating a CBT-based OCS prevention program into childbirth education classes.

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1. Introduction

Although much research has focused on maternal depression during the perinatal (pregnancy and the first postpartum year) period (Godfrey, 2005; Logsdon et al., 2006; Robertson et al., 2004), our understanding of perinatal anxiety disorders is still in the nascent stages. This is unfortunate given that anxiety disorders as a group are the most prevalent of all psychiatric conditions (Kessler et al., 2005), and *perinatal* maternal anxiety in particular is associated with a number of adverse maternal and developmental repercussions including: over-activation of the maternal endocrine system, low birth weight (Lou et al., 1994; Mulder et al., 2002), postpartum depression (Ahmad et al., 1994; Sutter-Dallay et al., 2004), reduced communication with the infant (Field et al., 2005), behavioral inhibition, and insecure mother–infant attachment (Coplan et al., 2005; Manassis et al., 1995). These adverse consequences, considered along

with the high prevalence of perinatal maternal anxiety problems (Heron et al., 2004), attest to the need for developing and testing effective prevention and treatment programs.

Obsessive–compulsive disorder (OCD) is among the most common postpartum anxiety disorders (Abramowitz et al., 2003b; Ross and McLean, 2006), and as such, is a desirable target for prevention or treatment. OCD occurs in approximately 2% of the general population (American Psychiatric Association, 1994) and has been identified as one of the top ten leading causes of disability world-wide (Dupont, 1993; Lopez and Murray, 1998). Although much less is known about OCD during the perinatal period, there is a growing consensus among researchers and clinicians that postpartum obsessive–compulsive symptoms (OCS) represent a serious problem that is under-identified, with many women not receiving needed services (Furray et al., 2010). Research to-date has revealed that OCS frequently occur during the perinatal period and can range in severity from mild to extremely impairing (Abramowitz et al., 2003a; Zambaldi et al., 2009). In addition, both pregnancy and childbirth have been found to trigger onset of OCD or exacerbation of OCS (Abramowitz et al., 2003b; Furray et al., 2010). Up to 40% and

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30% of females with OCD report symptom onset during the perinatal period (Williams and Koran, 1997) and the postpartum (Buttolph and Hollander, 1990; Labad et al., 2005), respectively. A recent study in a small sample of women at 1 month postpartum found that 31% reported subclinical OCS (Chaudron and Nirodi, 2010). Relatively little empirical work has focused on the downstream consequences of OCS for both the parent and child; however, in addition to causing the mother extreme distress, postpartum OCS can also influence the type of care an infant receives, family relationships and interactions, as well as increase the risk for developing further psychiatric disorders such as depression (Abramowitz et al., 2003b).

Given these data, there is a need to substantially reduce the personal, developmental and financial impact of OCD, particularly if vulnerable females can be identified during pregnancy and if an effective OCD prevention program can be developed and implemented. Longitudinal studies have identified antenatal factors that prospectively predict increases in postpartum OCS, including (a) higher levels of anxiety, (b) higher levels of pre-existing (non-clinical) OCS, and (c) the presence of certain cognitive distortions (e.g., the belief that “bad” thoughts are equivalent to bad actions) (Abramowitz et al., 2003a, 2006). These variables represent identifiable psychological vulnerabilities to perinatal OCD and raise the possibility that at-risk individuals can be identified. The identification of potentially malleable vulnerability factors is necessary for the development of a prevention program (Kraemer et al., 2001) that could in turn demonstrably reduce the impact of postpartum OCD and OCS.

Cognitive-behavioral models of OCD (Salkovskis et al., 1998) and postpartum OCS (Fairbrother and Abramowitz, 2007) posit that symptoms arise when normally occurring, negative intrusive thoughts (e.g., unwanted thoughts of harm befalling the infant) are misinterpreted as highly significant and threatening based on faulty beliefs about the importance of such thoughts (e.g., “If I think this, it is likely to happen”) and the need to control them (e.g., “I should never have any bad thoughts about the infant”) (Larsen et al., 2006). Compulsive rituals (e.g., checking on the infant) subsequently develop with the function of reducing anxiety and controlling the unwanted thoughts, but instead maintain the obsessional fear by preventing the natural extinction of obsessional anxiety. Research indicates that about 70% of postpartum women report unwanted infant-related intrusive thoughts (Abramowitz et al., 2003a), and two prospective studies found that the presence of antenatal dysfunctional beliefs predicts more severe obsessions and compulsions in the postpartum, over and above depression, general anxiety, and pre-existing OCS (Abramowitz et al., 2006, 2007).

Cognitive behavior therapy (CBT) is one efficacious treatment for OCD, and includes techniques such as exposure, response prevention, and cognitive therapy (Foa et al., 1998). CBT is thought to work by correcting cognitive distortions and weakening urges to perform anxiety-reducing rituals (McLean et al., 2001). The knowledge of empirically supported interventions for reducing both symptoms and vulnerabilities, in combination with the identification of malleable risk factors, presents the opportunity for considering targeted prevention programs (Feldner et al., 2004). The aim of the present investigation was to develop and test the efficacy of a prevention program based on CBT principles for postpartum OCS. Specifically, expecting mothers with an empirically established, malleable risk factor for postpartum OCS—obsessive beliefs—received either a CBT prevention program or a credible control program, both of which were incorporated into traditional childbirth education classes. We hypothesized that compared to the control condition, the prevention program would be associated with lower OCS and lower scores on obsessive beliefs (e.g., importance of thoughts and the need to control them) at one

month postpartum. We also hypothesized that symptom reduction would be maintained in the prevention condition across 6 months postpartum, and that these findings would be specific to OCS by statistically controlling for baseline depression symptoms.

2. Methods

2.1. Participants

The sample consisted of 71 expecting mothers who were followed from their 2nd or 3rd trimester of pregnancy into the postpartum at two sites: Florida State University in Tallahassee, FL (FSU $n = 33$) and the University of North Carolina at Chapel Hill (UNC $n = 38$). Participants were recruited from local OB/Gyn clinics, as well as print and online advertisements in the respective communities. In total, 306 women were screened: 217 did not meet inclusion/exclusion criteria and 18 declined to participate in the classes. The primary reasons for declining to participate were (1) not being able to attend the groups due to scheduling difficulties and (2) choosing a program that was either recommended by, or affiliated with the participant's OB/Gyn. All participants met the following criteria: (a) identified as psychologically vulnerable to OCD, defined by a score of 139 or greater (1.25 SD above the community mean) on the Obsessive Beliefs Questionnaire, (b) age 18–65; (c) married or living with a partner; and (d) expecting their first child. Participants were excluded if they met criteria for past or current OCD, psychotic disorders, bipolar disorder, and/or current alcohol/substance abuse or dependence. Diagnoses were determined using the Structured Clinical Interview for DSM-IV (SCID).

The sample's mean age was 27.3 years ($SD = 4.2$), and 47 (66%) of the mothers were in their 2nd trimester. Participants endorsed the following ethnicities: Caucasian (74.6%), African–American (16.9%), mixed/other (8.4%). Four participants completed the prenatal childbirth education classes with a female partner; three with a female relative due to the father's absence, and one with her same-sex partner. The remainder of the sample completed the classes with the father of the child. The mean household income was \$64,000.

2.2. Procedures and prevention program

The study design was a prospective, double (participant and evaluator) blinded, randomized controlled trial. Participants and their partners were randomly assigned to either the prevention program ($n = 38$) or control ($n = 33$) condition, both of which were incorporated into a traditional childbirth education (CBE) program. The CBE + prevention (*prevention*) and CBE + control (*control*) programs were delivered in 6 weekly group sessions prior to childbirth. Each site enrolled 6 group cohorts. Participants were followed for 6 months after the birth of their child to assess the long-term effects of the prevention program. Assessments were conducted by trained, doctoral level graduate students before the first class (i.e., diagnostic interview), at the conclusion of the group, 1 month postpartum, 3 months postpartum and 6 months postpartum. All postpartum interviews were conducted over the telephone so as to reduce burden on the participants.

The basic CBE program consisted of 6 weekly 1.5 h group meetings and covered a range of topics, including the stages of labor, newborn characteristics, and birthing techniques. At each site, a registered nurse certified in CBE delivered this portion of the classes. At the conclusion of each weekly CBE topic, a 30 min session was added that addressed material relevant to either the *prevention* or *control* condition. This latter portion of the class was delivered by trained study personnel (e.g., a psychology graduate student) from either the FSU or UNC site. The *control* condition

consisted of psycho-education about general anxiety and the specific anxiety disorders. Participants were provided with a brief overview of symptoms, prevalence data, and associated demographics for the DSM anxiety disorders. Because these presentations were shorter than those in the *prevention* condition, participants were also shown a series of 6 short videos that told the perinatal stories of several couples. The *prevention* condition was derived from the cognitive-behavioral model of OCD (Rachman, 1997, 1998) and included the following components: (class 1) education about postpartum anxiety and OCS (e.g., description of symptoms; prevalence; difference between OCS and postpartum depression or psychosis); (class 2) education about the cognitive model of emotion and how OCS fit in this model, with a focus on the repercussion of misinterpreting intrusive thoughts; (classes 3 & 4) instruction in cognitive restructuring of dysfunctional “obsessive” beliefs (e.g., identification of beliefs, process of challenging these beliefs, and how to modify them into more realistic beliefs); (class 5) instruction in using behavioral experiments and exposure techniques as a way of testing and modifying faulty beliefs, and (class 6) review and wrap-up. Particular emphasis was placed on addressing beliefs about the importance of, and need to control, intrusive thoughts about the infant. All of the class modules were manualized (Timpano and Abramowitz, 2011),¹ and all classes were video-taped and 25% were reviewed by the principal investigators to ensure adherence.

2.3. Assessment of depression, OCD related beliefs, and OCS

Depressive symptoms were assessed using the Edinburgh Postnatal Depression Scale (EPDS), a reliable self-report scale that validly assesses the presence and severity of postnatal depressive symptoms (Cox et al., 1987). The EPDS was completed at baseline, post-class, and all three postpartum assessments.

The Obsessive Beliefs Questionnaire (OBQ) was used to assess dysfunctional beliefs associated with OCD and OCS. The OBQ is a 44-item self-report instrument and has been found to possess good validity and reliability (OCCWG, 2005; Tolin et al., 2003). In addition to a total score, three factor analytically derived subscales are used, including (1) overestimates of responsibility for, and threat of harm (responsibility/threat), (2) importance and control of intrusive thoughts (importance/control), and (3) perfectionism and the need for certainty (perfectionism/certainty). Given that the CBE-P condition specifically targeted beliefs in the importance/control domain, OBQ analyses were completed using the subscale scores. The OBQ was administered at baseline, post-class, and the 3 and 6 month postpartum assessments.

Baseline OCS were assessed using the Dimensional Obsessive–Compulsive Scale (DOCS). The DOCS (Abramowitz et al., 2010a) is a 20-item reliable and valid self-report scale that measures the severity of four empirically established dimensions of OCS: contamination, responsibility for harm and mistakes, unacceptable thoughts, and symmetry/completeness in clinical and non-clinical samples.

The presence and severity of postpartum OCS was examined using a semi-structured clinical interview, which included the Postpartum Thoughts and Behaviors Checklist (PTBC) and the Yale–Brown Obsessive–Compulsive Scale (YBOCS). The PTBC (Abramowitz et al., 2006) is a modified version of the YBOCS symptom checklist, and consists of 32 common postpartum intrusive thoughts or obsessions (e.g., thoughts about SIDS) and 14 behavioral and mental compulsions (e.g., frequently checking on the baby). The symptoms are grouped into 8 categories and

participants were scored as either endorsing a category or not. The severity of these symptoms was then rated using the 10-item YBOCS (Goodman et al., 1989a,b), which yields a total score, in addition to two subscale scores for obsessions and compulsions. The PTBC and YBOCS were administered at all three postpartum assessments by trained evaluators blind to treatment condition.

2.4. Statistical analyses

All analyses were conducted using the SPSS 16.0 software package. A 2-tailed significance level of 0.05 was chosen a priori. Demographic and pregnancy-related variables between groups were compared using *t*-tests and chi-square tests. To examine the effects of group on continuous outcome variables (OBQ, EPDS, and YBOCS) we analyzed between-group differences using analysis of variance (ANOVA). For the primary outcome measure (YBOCS), we also used analysis of covariance (ANCOVA) to control for baseline OCS and depression symptoms. Within-group differences across the different time-points were examined using paired-sample *t*-tests. Differences in the PTBC were assessed using the chi-square test. Primary analyses were conducted with completers; however, an additional set of intent-to-treat analyses was conducted to rule-out potential drop-out effects. Prior to the primary data analyses, data screening was performed. This included descriptive statistics to check for data-entry errors, and identification of outliers. No gross violations were detected.

3. Results

3.1. Study population and baseline values

All 71 participants completed the *prevention* or *control* programs; however, only 58 (*prevention* = 33 and *control* = 25) completed the 1 month postpartum assessment, 50 (*prevention* = 31 and *control* = 19) the 3 month postpartum assessment, and 49 (*prevention* = 29 and *control* = 20) the 6 month postpartum assessment. Comparisons of completers and non-completers revealed no differences on any demographic or baseline psychological factors considered (all *p*'s > 0.10). Participants in the two conditions did not differ from one another on any demographic variables considered, including age, ethnicity, education, and marital status (all *p*'s > 0.10). Baseline levels of psychological variables are summarized in Table 1. Participants in the *prevention* group did not differ from those in the *control* group in pre-intervention levels of obsessive beliefs, depressive symptoms, or OCS (all *p*'s > 0.10).

3.2. Pregnancy and delivery-related factors

In the overall sample, 80% reported that this was their first pregnancy, and 10% endorsed having had fertility issues. In total, 72 infants were born, 30 of which were female. The two groups did not differ from one another on any delivery-related variables,

Table 1
Baseline scores on psychological variables.

M (SD)	Prevention (n = 38)	Control (n = 33)	<i>t</i> Statistic	<i>p</i> Value
Age	26.90 (3.6)	27.80 (4.8)	−0.88	0.37
OBQ	172.70 (32.5)	166.64 (21.29)	0.92	0.36
EPDS	7.30 (5.10)	6.34 (4.63)	0.83	0.41
DOCS	9.30 (9.11)	6.60 (6.01)	1.46	0.15

Note. Prevention = Childbirth education plus prevention program; control = Childbirth education plus control; OBQ = Obsessive beliefs questionnaire; EPDS = Edinburgh postpartum depression scale; DOCS = Dimensional obsessive–compulsive scale.

¹ A copy of the prevention program manual is available from the authors.

including: obstetric complications, mode of delivery (c-section or vaginal delivery), use of pain management, sex of baby, or premature delivery (all p 's > 0.10). At 1 month postpartum 79% of the prevention group and 76% of the control group reported breastfeeding their infants ($X^2 = 5.08, p < 0.08$).

3.3. Change in depressive symptoms and obsessive beliefs

The two groups did not differ significantly at any postpartum time point on levels of depressive symptoms (all ANOVA p 's > 0.10). Within-group analyses also revealed that there were no changes in depressive symptoms from baseline to 6 months postpartum (all p 's > 0.10). Similarly, the two groups did not demonstrate any between or within-group differences in the responsibility/threat or perfectionism/certainty subscales of the OBQ. In contrast, analyses (ANOVAs) of the importance/control OBQ subscale revealed group differences (Fig. 1). Specifically, the prevention group had significantly lower scores at every post-class and postpartum assessment than the control group (all p 's < 0.01). Within-group analyses demonstrated that while the prevention group maintained an initial decrease in scores following the classes, the control condition evidenced a modest, yet significant increase following the birth of the baby (Fig. 1).

3.4. Assessment of postpartum OCS

Table 2 summarizes the percentage of each group that endorsed any given PTBC category at each of the three postpartum assessments. Among both groups, thoughts about accidents (e.g., "thoughts about a neighbor's dog attacking the baby") were the most frequently reported types of postpartum intrusive thoughts. The least frequently endorsed category of intrusive thoughts was sexual thoughts (e.g., "a thought about the baby's genitals"). Chi-square analyses revealed that the two groups did not differ from one another on endorsement rate in any of the categories, at any of the three assessment time-points (all p 's > 0.10).

3.5. Assessment of postpartum OCS severity

The prevention group had significantly lower YBOCS total scores than the control group at all three postpartum assessments, controlling for baseline OCS and depression scores (Fig. 2). Examination of Cohen's d revealed a small-medium intervention effect at 1 month postpartum, and a medium-large intervention effect at 3 and 6 months postpartum (Table 3). At all three time-points, the control group reported mild, yet clinically significant levels of OCS (YBOCS > 8; Goodman et al., 1989a). In contrast, the prevention

Table 2
Percent endorsement of PTBC categories across 3 postpartum assessments.

PTBC category	mo pp	Prevention	Control	X ²	p value
Suffocation	1	70.6%	76.0%	0.21	0.64
	3	71.0%	52.6%	1.72	0.19
	6	36.7%	57.1%	2.09	0.15
Violence	1	51.4%	68.0%	1.65	0.20
	3	48.4%	36.8%	0.64	0.43
	6	26.7%	30.0%	0.07	0.80
Accidents	1	82.4%	80.0%	0.05	0.82
	3	74.2%	84.2%	0.69	0.41
	6	76.7%	75.0%	0.02	0.89
Losing the baby	1	44.1%	36.0%	0.39	0.53
	3	45.2%	47.4%	0.02	0.88
	6	56.7%	45.0%	0.65	0.42
Contamination	1	55.9%	64.0%	0.39	0.53
	3	48.4%	57.9%	0.43	0.51
	6	60.0%	52.4%	0.29	0.59
Sexual	1	11.8%	12.0%	0.00	0.98
	3	9.7%	10.5%	0.01	0.92
	6	6.7%	5.0%	0.06	0.81
Illness	1	26.5%	23.1%	0.09	0.76
	3	16.1%	15.0%	0.01	0.91
	6	20.0%	20.0%	0.00	1.00
Compulsions	1	91.4%	82.1%	1.21	0.27
	3	77.4%	85.0%	0.44	0.51
	6	83.3%	90.0%	0.44	0.51

Note: PTBC = Postpartum thoughts and behaviors checklist; mo pp = month(s) postpartum; prevention = Childbirth education plus prevention program; control = Childbirth education plus control.

condition had subclinical levels across the postpartum assessments. Within-group analyses revealed that although the control group did not show any changes across time, the prevention group had significantly lower YBOCS scores at 6 months postpartum compared to 1 month postpartum ($t = 2.77, p < 0.01$). A similar pattern of results emerged when the YBOCS obsessions and compulsions subscale scores were considered separately (Table 3).

We next conducted a 2 (condition: prevention and control group) × 4 (time: baseline, 1 month postpartum, 3 month postpartum, 6 month postpartum) mixed model ANOVA to examine changes in OCS severity from baseline across the postpartum period. Because the YBOCS was not administered at baseline, we standardized the baseline DOCS scores and the three YBOCS postpartum scores, and used the standardized scores in our analysis. Findings revealed a significant time × condition interaction (Fig. 3),

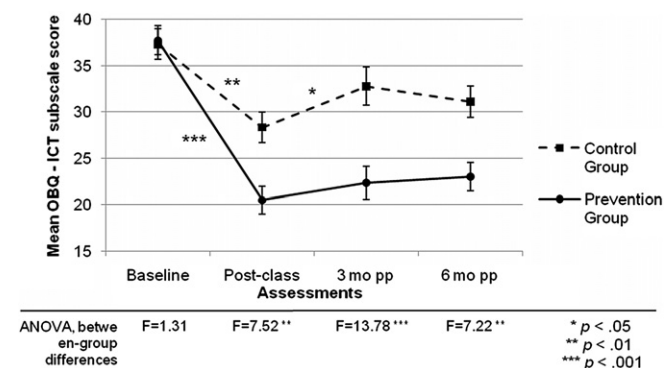


Fig. 1. Mean levels of the importance and control of thoughts OC beliefs across assessments.

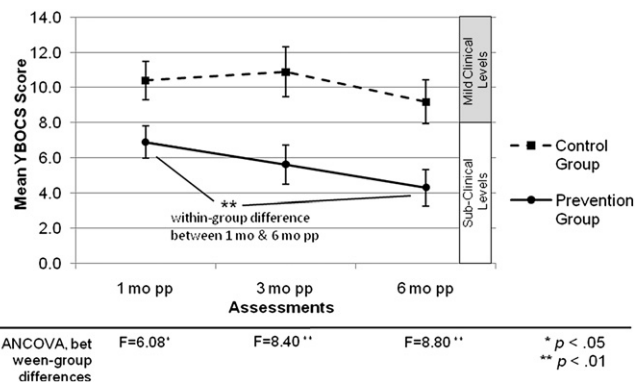


Fig. 2. Mean levels of OCS severity across postpartum assessments, controlling for baseline OCS and depression symptoms. Both between and within-group differences are depicted.

Table 3
Mean OCS across postpartum assessments and magnitude of treatment effect.

	1 mo pp		3 mo pp		6 mo pp	
	Mean (SD)	<i>d</i>	Mean (SD)	<i>d</i>	Mean (SD)	<i>d</i>
YBOCS		0.41		0.68		0.73
Prevention	7.27 (4.87)		5.90 (5.00)		4.45 (4.16)	
Control	9.68 (6.74)		10.42 (8.03)		8.65 (6.93)	
YBOCS-obs		0.39		0.62		0.70
Prevention	3.29 (2.42)		2.84 (2.27)		2.17 (1.76)	
Control	4.36 (3.03)		4.68 (3.46)		4.00 (3.24)	
YBOCS-comp		0.31		0.67		0.71
Prevention	4.21 (3.09)		3.06 (3.08)		2.34 (2.64)	
Control	5.32 (4.02)		5.74 (4.71)		4.65 (3.80)	

Note. mo pp = month(s) postpartum; YBOCS = Yale-brown obsessive–compulsive scale; obs = obsessions subscale score; comp = compulsions subscale score; prevention = Childbirth education plus prevention program; control = Childbirth education plus control.

$F(1, 34) = 4.83, p < 0.01$. Simple effect analyses were conducted to examine the form of this interaction. ANOVA analyses revealed that the groups did not differ at baseline; however, significant group differences emerged during the postpartum period (Fig. 3). Specifically, we found that the *prevention* group endorsed fewer OCS during the postpartum, compared to the *control* group.

3.6. Intent-to-treat analysis

We conducted follow-up intent-to-treat analyses using the last observation carried forward (Mazumdar et al., 1999). The pattern of effects was identical to those observed in our completer analyses.

4. Discussion

The current investigation represents the first example of a prevention program designed specifically to target postpartum OCS. Results provide support for the utility of incorporating a CBT-based prevention program into a traditional CBE curriculum. Our intervention falls in-line with a recent psycho-educational program developed by Fisher et al. (2010), which was found helpful in preventing general mood, anxiety and adjustment disorders in the postpartum. That program did not target specific anxiety symptoms, but the findings speak to the general amenability of the perinatal population for prevention efforts. Our investigation suggests that a more targeted prevention program packaged into a CBE course is both feasible and practical: two important considerations for any prevention work (Dozois, 2004).

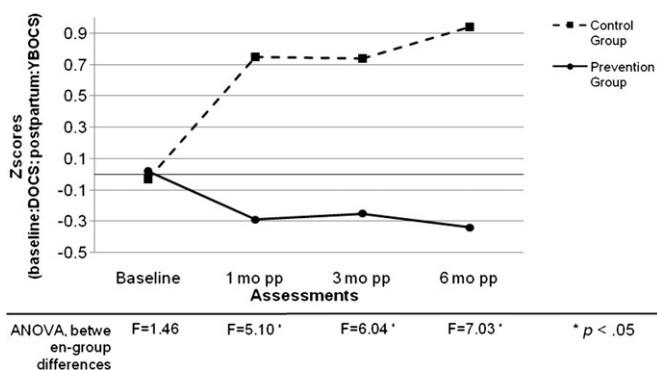


Fig. 3. A 2 (condition) \times 4 (time) mixed ANOVA to examine changes in OCS severity across assessments.

We used an indicated prevention program design (Feldner et al., 2004), meaning that our intervention focused on a subsyndromal risk factor (i.e., obsessive beliefs) for obsessions and compulsions. Results demonstrated that relative to a credible control condition, our prevention program reduced levels of this risk factor, specifically with respect to the primary target; that is, beliefs regarding the importance of thoughts and the need to control them. Examination of our OCS outcome measure supported our hypothesis that the prevention program would reduce the degree to which OCS developed during the postpartum period. Although, as expected, both groups endorsed comparable levels of the incidence of common postpartum obsessions and compulsions as measured by the PTBC, the two groups differed significantly in the severity of these symptoms. The YBOCS severity indices capture time spent on symptoms, the distress and impairment associated with them, and the ability to control obsessions/compulsions. We can therefore conclude that despite experiencing postpartum intrusive thoughts, participants in the *prevention* group were not as distressed by them; perhaps as a result of the differential reduction in obsessive beliefs. Finally, we found that these effects were specific to OCS, since between-group differences remained significant after controlling for baseline depression symptoms.

Although some authors have reported marked decreases in OCS following childbirth (Uguz et al., 2007), this was not the case for our *control* group. While the *prevention* group evidenced continued decreases in the severity of OCS, participants in the *control* group reported relatively stable OCS across the 6 month postpartum period with YBOCS scores consistently within the mild yet clinically significant range of symptoms (Goodman et al., 1989a). One explanation for the difference in findings may be cultural. The investigation by Uguz et al. (2007) was conducted in Turkey, and they hypothesized that the decrease in symptoms might be attributed to increased levels of social support and decreased levels of stressors following the birth of the baby. Other research has suggested that pregnancy and the postpartum period is associated with an adverse impact on the new mother's physical and emotional health (Miller and Sollie, 1980; Schytt and Hildingsson, 2011), and in the United States it is not always typical for extended family to assist as extensively during the postpartum period as in other cultures.

Our approach to prevention in the present research focused exclusively on psychological factors. Yet given that dysfunctional cognitions only partially predict postpartum OCS (e.g., Abramowitz et al., 2006), additional work is needed to elucidate other factors involved in the development of this problem. Certain biological factors, for example, have been proposed given that pregnancy and the postpartum are marked by fluctuations in hormones (Steiner et al., 2003), brain morphology (Kim et al., 2010), and certain genetic polymorphisms (Costas et al., 2010). If biological markers of postpartum OCS could be identified, this might allow for better detection of candidates for prevention programs such as that examined in our investigation.

The present study used a prospective, randomized, controlled-trial design, which was meant to stringently evaluate the effects of our prevention program. One limitation, however, was that there was no assessment of the degree to which participants implemented the techniques included in the *prevention* program. We are therefore not able to speak to whether the reduction in symptoms stems from the use of cognitive restructuring, exposure techniques, or the OCS specific psycho-education. The intervention may also have been effective by reducing levels of obsessive beliefs. We found that although the *prevention* condition maintained lowered OBC levels, the *control* condition experienced a slight increase in obsessive beliefs following the birth of the baby. Future research should examine specific mechanisms by which change may have

occurred. Another limitation is that symptoms of depression were ascertained by self-report. A closer inspection of these symptoms is warranted, given the overlap between OCS and depression symptoms. Multiple reports have pointed to the possibility that these two constructs may represent a spectrum of perinatal psychiatric symptoms (Abramowitz et al., 2010b; Austin et al., 2007; Miller et al., 2006). In fact, OCD was the only anxiety disorder predictive of false-positives for depression in one recent study (Mauri et al., 2010). A final limitation is that we did not assess factors relevant to social support and the relationship between parents. An investigation by Iles et al. (2011) demonstrated that both perceived support and attachment patterns play a role in posttraumatic stress symptoms and depression during the postpartum period. The same processes may be important in the generation of OCS, particularly as family members are often implicated in the completion of compulsions or are impacted by excessive reassurance seeking on the part of the affected relative (Albert et al., 2010).

Given the significant personal and societal burden associated with OCD (Lopez and Murray, 1998), and in particular, perinatal OCD (Fairbrother and Abramowitz, 2007), it is striking that very little attention has been given to the prevention of these symptoms. The present investigation represents a seminal step in our efforts to enhance traditional therapies and develop new avenues to prevent OCD. The identification of vulnerable mothers during the perinatal period offers a unique opportunity to directly target specific and, importantly, modifiable risk factors. Future research should consider additional risk factors that could be targeted, as well as the beneficial effects prevention programs may have on the global functioning of mother and child. The prevention program described in the current report is relatively inexpensive and viable, and lowering OCS using a cognitive and behavioral intervention may reduce the need for psychotropic medications during the perinatal period (Oberlander et al., 2006). Future research may consider more stream-lined methods for identifying at-risk mothers, and also the possibility of training CBE instructors to deliver the CBT curriculum.

Conflict of interest

Authors Timpano, Schmidt, Mitchell, Abramowitz, & Mahaffey have no conflicts of interest.

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Contributors

Authors Timpano, Abramowitz, and Schmidt designed the study and wrote the protocol. Authors Mahaffey and Mitchell helped with data collection efforts and acted as project coordinators. Author Timpano wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

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