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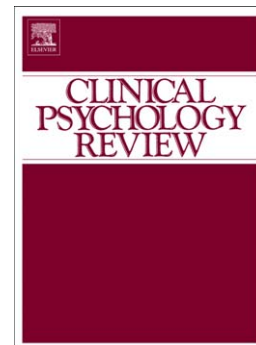
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A Meta-Analysis of Family Accommodation and OCD Symptom Severity

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Abstract

Family accommodation in obsessive-compulsive disorder (OCD) is characterized by myriad behaviors, such as modifying family routines, facilitating avoidance, and engaging in compulsions to reduce obsessional distress. It has been linked to various deleterious outcomes including increased functional impairment and poorer treatment response for OCD. Although extant literature suggests a linear relationship between family accommodation and OCD symptom severity, the magnitude and statistical significance of this association has been inconsistent across studies, indicating that moderators may be influencing this relationship. The present study examined this relationship using meta-analytic techniques, and investigated sample-dependent (age, gender, comorbid anxiety/mood disorders) and methodological (administration method and number of items used in family accommodation measure, informant type, sample size, publication year) moderators. Forty-one studies were included in the present meta-analysis, and the overall effect size (ES) for the correlation between family accommodation and OCD symptom severity was moderate ($r = .42$). Moderator analyses revealed that the number of items on the family accommodation scale moderated the ES. No other sample-dependent or methodological characteristics emerged as moderators. In addition to being the first systematic examination of family accommodation moderators, these results highlight the moderate relationship between family accommodation and OCD severity that is influenced by measurement scales. Findings may be used to guide clinical care and inform future investigations by providing a more nuanced understanding of family accommodation in OCD.

Keywords: Meta-analysis, OCD, family, accommodation, moderators, correlation

A Meta-Analysis of Family Accommodation and OCD Symptom Severity

Obsessive-compulsive disorder (OCD) is an impairing psychiatric disorder characterized by obsessions and/or compulsions (American Psychiatric Association, 2013) that affects an estimated 1-2% of youth (Geller, 2006; Zohar, 1999) and 1% of adults (Crino, Slade, & Andrews, 2005; Ruscio, Stein, Chiu, & Kessler, 2010; Subramaniam, Abidin, Vaingankar, & Chong, 2012). Obsessions are characterized by repeated intrusive thoughts, impulses, or images that cause distress, such as worries about contact with contaminated items or ego-dystonic impulses to harm a loved one. Alternatively, compulsions are ritualistic behaviors or mental acts that serve to alleviate obsessional distress, such as repetitive hand washing and avoidance of sharp objects. Collectively, the deleterious effects of OCD are often experienced across various areas of life, including impairment in academic, occupational, and social domains (Piacentini, Bergman, Keller, & McCracken, 2003; Storch, Larson, et al., 2010; Storch et al., 2014). Given the unique nature of OCD and the involvement of family members with the symptomology (Black, Gaffney, Schlosser, & Gabel, 1998), family life is particularly impacted (Valderhaug & Ivarsson, 2005). Consequently, there has been a rise in interest regarding family accommodation in OCD, a salient phenomenon occurring within a majority of the affected families (Calvocoressi et al., 1995; Lebowitz, Scharfstein, & Jones, 2014; Peris et al., 2008; Ramos-Cerqueira, Torres, Torresan, Negreiros, & Vitorino, 2008; Shafran, Ralph, & Tallis, 1995; Stewart et al., 2008; Storch et al., 2007).

Family Accommodation in OCD

Family accommodation can manifest in various forms including modifying family routines, engaging in the patient's compulsions, and facilitating avoidance of OCD triggers

(Calvocoressi et al., 1995). For instance, a parent or partner may engage in excessive hand washing rituals to assuage the patient's contamination fears, or excessively reassure the patient that the stove is turned off and the house will not burn down. Although family members often engage in these behaviors in hopes of attenuating OCD-related distress and mitigating the time occupied by symptoms (Calvocoressi et al., 1999; Storch, Björgvinsson, et al., 2010), symptom accommodation maintains the OCD symptomology by disallowing the individual with OCD to face their feared situations. As such, when these behaviors are targeted in treatment, reductions in family accommodation precede reductions in OCD symptom severity and functional impairment (Piacentini et al., 2011), highlighting the temporal mechanisms involved with family accommodation and OCD symptoms. When not addressed, accommodation results in a negative reinforcement cycle, in which patients are more likely to continue engaging in avoidance and compulsive behaviors and are concurrently prevented from developing more adaptive appraisals and behaviors to cope with their OCD-related distress. Indeed, family accommodation operates contrary to goals of exposure and response prevention, the first-line treatment for OCD (American Academy of Child and Adolescent Psychiatry, 2012; McGuire et al., 2015). Consequently, it is not surprising that these accommodating behaviors have been linked to treatment refractoriness (Merlo, Lehmkuhl, Geffken, & Storch, 2009; Peris et al., 2008; Renshaw, Steketee, & Chambless, 2005; Storch et al., 2007). Additionally, given the continued enmeshment of family members with the OCD symptomology, family accommodation has also been linked to negative family outcomes, such as a poorer general functioning, organization, and harmony (Albert et al., 2010; Amir, Freshman, & Foa, 2000; Ferrao et al., 2006; Futh, Simonds, & Micali, 2012; Maina, Saracco, & Albert, 2006; Peris et al., 2008; Steketee & Van Noppen, 2003). Considering the impairing nature of family accommodation on both patients and families

(Caporino et al., 2012; Storch, Larson, et al., 2010), it is imperative to clarify its purported relationships with pertinent variables, as it may not be appropriate to assume a consistent relationship across all contexts. By investigating potential factors that may modulate this association, relevant variables that may impact this relationship can be elucidated and incorporated into treatment and research considerations as indicated.

Given the clinical relevance of family accommodation, various methods of assessment have been created to examine the presence and frequency of these behaviors. In sum, 2 clinician-rated versions and 3 respondent self-reported versions of the Family Accommodation Scale exist to date. Depending on the version of the measure, the timeframe either captures the frequency of the accommodating behaviors over the past week or over the past month. Additionally, the number of items used to calculate the total severity score varies, but most versions of the measure assess family accommodation through 9, 12, or 13 items. For a more comprehensive outline of the different measures of family accommodation, please see Wu et al. (2015).

Despite its clinical salience, there is only one literature review on family accommodation and OCD in existence (Lebowitz, Panza, Su, & Bloch, 2012). In this review, Lebowitz et al. (2012) qualitatively described the epidemiology of family accommodation, the relationship between family accommodation and OCD symptom severity, the impact of family accommodation on treatment outcomes, and the importance of targeting accommodation in therapy. The authors also observed that there were discrepant reports regarding the association between OCD symptom severity and family accommodation across studies; although some studies have found robust associations (e.g., Pinto, Van Noppen, & Calvocoressi, 2012; Storch et al., 2007), other reports have failed to find a significant relationship between these two

constructs (Peris et al., 2008). Discrepancies across reports may be accounted for by a variety of study characteristics that are either sample-dependent (e.g., age; Lebowitz et al., 2012) and/or influenced by study methodology (e.g., clinician-rated versus self-report measure). Clarifying the relationship between family accommodation and OCD symptom severity is important for determining if the level of symptom accommodation is truly commensurate with the severity of the symptomology.

Given the disparate associations between family accommodation and OCD reported across individual studies ($r = .08 - .82$), it is important to synthesize empirical evidence to better understand this relationship. Meta-analyses provide a quantitative synthesis of studies and provide a more powerful examination of moderators than individual studies alone (Bloch, 2014). To date, only one meta-analysis has examined the relationship between OCD severity and family accommodation. Strauss, Hale, and Stobie (2015) included 14 studies in their study and found a medium-sized correlation ($r = .35$) between OCD symptom severity and family accommodation. Although this meta-analysis serves as an important preliminary investigation, its search strategy resulted in a relatively limited number of included studies. Additionally, this meta-analysis did not include any unpublished data, preventing them from detecting bias related to the file drawer effect (Rosenthal, 1979). Indeed, Strauss et al. (2015) did not include data from a considerable number of published studies (~30) that included the variables of interest (e.g., family accommodation, OCD symptom severity), as many of these studies required further queries to the respective researchers in order to obtain the specific correlation between family accommodation and OCD symptom severity. Moreover, moderators of the relationship between family accommodation and OCD severity were not reported, which precludes the ability to examine variables that may influence this relationship. Specifically, examining potential

moderators may clarify the considerable discrepancy between observed values, inform clinical care, and provide a more nuanced understanding of this phenomenon.

Present Study

Based on these identified gaps in the literature, the purpose of this meta-analysis was to identify a summary effect of the correlation between family accommodation and OCD symptom severity; considering extant findings, a positive correlation is expected between these variables. Given the importance of moderators, this meta-analysis will also examine potential sample-dependent (e.g., age) and methodological (e.g., family accommodation measure) moderator variables to determine their effects on this relationship.

Sample-Dependent Moderators. First, as the association between family accommodation and OCD symptom severity may be influenced by age (Lebowitz et al., 2012), this meta-analysis will examine whether this relationship is moderated by age (i.e., adult [≥ 18 years old] versus pediatric [< 18 years old] samples). Specifically, family accommodation may be more prominent in pediatric samples, and many treatments tailored for pediatric OCD specifically target family accommodation (Freeman et al., 2012; Lebowitz, 2013; Lewin et al., 2014). Although this highlights the salience of family accommodation in samples of youth, there are comparatively less investigations conducted within adult samples, providing less clarity on the relationship between family accommodation and OCD symptom severity in this age group. Second, given previous findings demonstrating the positive association between the patients' comorbid anxiety and depressive symptoms and heightened family accommodation (Caporino et al., 2012; Flessner et al., 2009; Wu, Lewin, Murphy, Geffken, & Storch, 2014), clinical diagnoses of comorbid anxiety and mood disorders will also be examined as potential moderators of this relationship. With the previously reported relationship, it is possible that

these comorbidities may lead to even higher levels of accommodation, necessitating additional attention and modifications in order to attenuate disorder-related distress. Third, this study will explore whether gender influences the relationship between OCD symptom severity and family accommodation. Although some studies investigating OCD have not found a gender difference for family accommodation (Albert et al., 2010; Flessner et al., 2009), gender differences exist more broadly in OCD (Castle, Deale, & Marks, 1995; Labad et al., 2008; Mathis et al., 2011). For instance, the age of onset typically occurs earlier in males, and certain symptom dimensions present in the respective genders relatively more frequently. As females have a higher tendency to display contamination-related symptoms (Labad et al., 2008; Mathis et al., 2011), this may be linked to higher levels of family accommodation, as the contamination dimension is the only symptom cluster that has been positively correlated with accommodating behaviors (Stewart et al., 2008; Wu et al., 2014). Additionally, gender differences have also been found within pediatric anxiety disorders (Lebowitz et al., 2013), in which parents of girls accommodated significantly more than parents of boys.

Methodological Moderators. This study will also investigate four methodological moderators. First, the type of measure (i.e., clinician-report versus self-report) used for assessing family accommodation will be examined as a potential moderator. For the purposes of this study, any measure completed directly by the respondent and not through a clinician will be designated as a “self-report” measure (this includes self-report measures filled out by the relative of the individual with OCD, as well as the individual with OCD). In the only study to date that has used both a clinician-rated and a relative self-report measure for family accommodation, Pinto et al. (2012) found that the clinician-rated measure had a slightly (though non-significantly) higher correlation with OCD symptom severity than the self-report measure.

Second, depending on the number of items used from the family accommodation scale (which often corresponds with what version of the scale is used; see Wu et al. (2015) for a detailed review), differential correlations may be achieved. For instance, versions of the Family Accommodation Scale (Calvocoressi et al., 1995) that only score the items directly related to accommodating behaviors (thus excluding items referring to emotional and behavioral consequences of accommodating) are expected to be more directly, and highly related, to OCD symptom severity. Given the heterogeneity in the usage of family accommodation scales, it is possible that the format of administration and the version of the family accommodation scale used may elicit different correlations when considering the conglomerate of studies. Third, the informant used for the family accommodation measure will also be investigated, as the type of relative (e.g., parent versus significant other) accommodating the patient with OCD may result in differential accommodations. As such, differences between informants that are parents, significant others, or “other” (e.g., adult child, sibling, roommate, etc.) will be examined. For instance, developmental and phenomenological differences may impact the level and types of accommodations (e.g., completing schoolwork) in place. Fourth, given the potential for effect sizes to differ based on study characteristics, the sample size and publication year will be explored as potential moderators (Levine, Asada, & Carpenter, 2009; Wood & Eagly, 2009).

Method

Selection of Studies

Potential studies for inclusion in the meta-analysis were searched and obtained up to September 20, 2015 and evaluated by two personnel. Studies must have included objective, quantitative measures of both family accommodation and OCD symptom severity; studies solely presenting qualitative descriptions of family accommodation in OCD were excluded (e.g.,

Lebowitz, Vitulano, & Omer, 2011). Studies investigating family accommodation outside of OCD were discarded. Case report/series with sample sizes smaller than 10 were excluded based on the hierarchy of evidence in research (Haidich, 2010) and the propensity for correlations in small sample sizes to result in spurious findings and noise. Studies must also have been reported in English in order to meet inclusion criteria for the meta-analysis.

Articles were extracted from PubMed, PsycInfo, and ProQuest Dissertations & Theses Databases with the following search terms for OCD and family accommodation: *obsessive-compulsive disorder* and *OCD*, crossed with *accommodat** and *family, parent, relative, caregiver, and sibling*. Studies resulting from the initial search were vetted through careful reviews of the abstract. If the study appeared appropriate for inclusion, the body of the manuscript was reviewed to confirm eligibility for inclusion in the meta-analysis. Only studies meeting all inclusion criteria were included in the final analyses. References of review articles and eligible studies were examined to capture other published and forthcoming/unpublished research.

Coding of Study Variables

Each of the selected studies were coded and evaluated based on the following variables: (1) effect size (r); (2) age of sample; (3) gender (percentage of male participants); (4) percentage of participants with a comorbid anxiety disorder; (5) percentage of participants with a comorbid mood disorder; (6) family accommodation measure (i.e., clinician-report versus self-report); (7) number of items used to assess family accommodation (i.e., 9 items, 12 items, 13 items, or “other” for all other versions); (8) informant for family accommodation measure (i.e., % parent, significant other, or other); (9) sample size; (10) publication year; and (11) type of publication (i.e., published or unpublished). Study investigators were contacted whenever possible to

request the above information if it was not available in published form. A total of 32 unique investigators were contacted up to two times in an attempt to obtain missing data; each investigator was informed of the purpose of the present meta-analysis and was provided a list of variables that were necessary for the meta-analysis (e.g., correlation between OCD symptom severity and family accommodation) but were not reported in the respective publications.

As some studies were expected to use more than one type of measure for OCD symptom severity, an *a priori* preference was placed on the gold-standard clinician-administered interview (i.e., [Children's] Yale-Brown Obsessive Compulsive Scale; Goodman et al., 1989; Scahill et al., 1997) over other alternatives (e.g., Obsessive-Compulsive Inventory - Revised, Clinical Global Impression; Foa et al., 2002; Guy, 1976). Similarly, as some studies were also expected to use more than one type of measure for family accommodation (e.g., Pinto et al., 2012; Wu et al., 2015), an *a priori* preference was placed on the study's primary outcome measure as defined by the study authors. If the study was designed to be a treatment outcome or other type of prospective study, only baseline data were coded.

The study principal investigator (M.S.W.) and a trained research assistant (C. M.) both coded 100% of the studies included in the meta-analysis, resulting in a reliability check on all of the data. Inter-rater agreement was evaluated for categorical and continuous variables using the kappa coefficient and intraclass correlation coefficient (ICC), respectively. Any disagreements in the coding were resolved through discussion and final consensus.

Statistical Analyses

All data were analyzed through Comprehensive Meta-Analysis (CMA; Borenstein, Hedges, Higgins, & Rothstein, 2005).

Pearson Correlation Coefficient (r). The Pearson correlation coefficient (r) was employed as the effect size for the meta-analysis. When calculating the summary effect in CMA, all correlation coefficients (r) were transformed to Fisher's z scale (Fisher, 1970) for analyses. Thereafter, they were converted back to the correlation coefficients to facilitate comparability and interpretation. Based on anchors delineated by Cohen (1988), effect sizes of .10, .30, and .50 were considered small, medium, and large, respectively. A positive r value would indicate that higher levels of OCD symptom severity would be associated with increased levels of family accommodation. Conversely, a negative r value would indicate that higher levels of OCD symptom severity would be associated with lower levels of family accommodation (and vice versa).

Random-Effects Model and Moderator Analyses. A random-effects model was employed, as there was anticipated to be natural variations in the effect sizes underlying each study based on different characteristics (Borenstein, Hedges, Higgins, & Rothstein, 2009). Additionally, utilizing a random effects model will allow the results to be generalizable beyond the selected studies in the meta-analysis (Borenstein et al., 2009). Moderators were examined using a method-of-moments meta-regression and analog to ANOVA for continuous and categorical moderators, respectively. Heterogeneity was assessed using visual inspection of the forest plot, the Q statistic, and I^2 statistic. The Q statistic considers the ratio between the observed between-study variation and the within-study error, and the I^2 statistic examines the observed between-study variance and determines the proportion that is accounted for by true heterogeneity (Borenstein et al., 2009). Specifically, the I^2 value ranges from 0 to 100%, with lower values indicating that the observed variance is likely spurious and larger values suggesting that there are more substantive reasons for the observed variance (Borenstein et al., 2009). As

such, larger I^2 values lend more bases for conducting moderator analyses to determine potential sources of variance. Higgins, Thompson, Deeks, and Altman (2003) proposed preliminary benchmarks of 25%, 50%, and 75% to represent “low,” “moderate,” and “high” values of I^2 .

Publication Bias and Sensitivity Analyses. There is a bias in favor of publishing studies that report significant results and/or bigger effect sizes (Borenstein et al., 2009; Dickersin, 1990; Easterbrook, Gopalan, Berlin, & Matthews, 1991), resulting in potential differences in effect sizes between unpublished (e.g., theses, dissertations, unpublished datasets) and published studies. For the purposes of this study, published studies that included the variables of interest (e.g., family accommodation, OCD symptom severity) but needed queries to extract results relevant to the meta-analysis (e.g., correlations) were still coded as “published” studies. Publication bias was assessed using the following methods: visual examination of the funnel plot, Egger's test for bias, and the *Fail-safe N*. If publication bias is present, it will be detected by visual inspection of the funnel plot and Egger's test for bias (Egger, Smith, Schneider, & Minder, 1997). If there is no publication bias, the studies are expected to fall symmetrically above and below the mean effect size, suggesting that any sampling error would be random (Borenstein et al., 2009).

Through the *Fail-safe N*, the analysis determines how many “missing” studies would be needed to reduce the cumulative effect to either a trivial value or statistical nonsignificance. The method employed by Orwin (1983) is preferred over the *Fail-safe N* by Rosenthal (1979), as the former approach allows researchers to specify the value of the overall effect to one that would no longer be considered substantive, rather than automatically setting it at zero, placing more emphasis on substantive significance rather than statistical significance (Borenstein et al., 2009).

Given the guidelines reported by Cohen (1988), anything with a small effect size of .10 or lower was considered trivial.

Duval and Tweedie's *Trim and Fill* (Duval & Tweedie, 2000) was also utilized to determine the magnitude of the bias and estimate what the effect size would be without any bias (Borenstein et al., 2009). The *Trim and Fill* method estimates the unbiased effect size through an iterative process; it removes extreme, positively biased small studies one by one, creating a symmetric funnel plot, and fills the original studies back in and imputes a mirror image to adjust the variance.

Results

Included Studies

An initial search of the literature elicited 326 potential studies for inclusion in the meta-analysis. Figure 1 outlines the steps and rationale for inclusion and exclusion of studies. Appendix A displays the 41 studies that met full inclusion criteria for the meta-analysis, which resulted in a total sample of 2,509 participants. The total sample included in the meta-analysis had a mean age of 20.45 years and was 50% male.

Inter-Rater Reliability for Coding Study Characteristics

There was excellent agreement for all categorical (κ s = 0.95 – 1.00) and continuous variables (ICCs = 0.95 – 1.00). All disagreements were subsequently conferred to reach a 100% consensus.

Association between Family Accommodation and OCD Symptom Severity

The random effects meta-analysis identified a medium positive effect for the correlation between family accommodation and OCD symptom severity, $r = .42$, 95% CI [.36, .47], $z = 13.00$, $p < .001$. This indicates that higher levels of OCD symptom severity are associated with

increased family accommodation (Figure 2). Visual inspection of the forest plot, Q statistics, and I^2 statistics indicated the presence of significant heterogeneity, $Q(40) = 100.70, p < .001, I^2 = 60.28$. All studies used the C/Y-BOCS to measure symptom severity except for 4 studies (1 CY-BOCS self-report, 1 Y-BOCS self-report, 1 CY-BOCS parent-report, and 1 Y-BOCS-II).

Moderators

Sample-Dependent Moderators. When examining the effect of age, both pediatric ($k = 26, r = .44, 95\% \text{ CI } [.37, .51], z = 10.34, p < .001$) and adult ($k = 15, r = .38, 95\% \text{ CI } [.29, .46], z = 7.92, p < .001$) studies exhibited significant moderate effects separately. Although accommodation appeared to be descriptively larger among pediatric OCD studies, there was no statistically significant difference in the relationship between family accommodation and OCD severity by categorical age groups, $Q(1)_{btwn} = 1.36, p = .24$. When examining mean participant age, there was no statistically significant effect of age ($\beta = -0.002, SE = 0.003, z = -0.82, p = .41$). Taken together, these results suggest that age does not have a statistically significant effect on the relationship between OCD symptom severity and family accommodation.

When examining the influence of comorbid disorders, neither the percentage of participants with comorbid anxiety disorders ($k = 27, \beta = -0.06, SE = 0.20, z = -0.31, p = .76$) nor mood disorders ($k = 31, \beta = 0.02, SE = 0.18, z = 0.10, p = .92$) significantly influenced the relationship between family accommodation and OCD symptom severity. Finally, the percentage of male participants did not statistically significantly influence the relationship between OCD symptom severity and family accommodation, $\beta = 0.35, SE = 0.33, z = 1.06, p = .29$.

Methodological Moderators. When examining differences in raters, both clinician-rated family accommodation ($k = 19, r = .46, 95\% \text{ CI } [.36, .55], z = 8.39, p < .001$) and self-

report rated family accommodation ($k = 21$, $r = .39$, 95% CI [.32, .45], $z = 10.28$, $p < .001$) identified a moderate effect for the relationship between OCD symptom severity and family accommodation. Although the effect for clinician ratings was slightly larger than self-report ratings, there was no statistically significant difference between response measurement types, $Q(1)_{btwn} = 1.46$, $p = .23$.

When investigating the number of items (i.e., 9 items, 12 items, 13 items, or “other”) used to calculate the total score on the family accommodation measure, there was a statistically significant difference between the different versions of the measure, indicating that there were differential relationships between OCD symptom severity and family accommodation based on this variable, $Q(3)_{btwn} = 11.55$, $p < .01$. Interestingly, family accommodation measures that used 9 items ($k = 3$, $r = .53$, 95% CI [.40, .64], $z = 6.98$, $p < .001$) and the “other” measures ($k = 4$, $r = .52$, 95% CI [.33, .67], $z = 4.79$, $p < .001$) appeared to have larger effects relative to the 12-item ($k = 11$, $r = .32$, 95% CI [.26, .38], $z = 9.27$, $p < .001$) and 13-item measures ($k = 23$, $r = .42$, 95% CI [.34, .50], $z = 8.70$, $p < .001$). However, there was only a statistically significant difference in the correlation between OCD symptom severity and family accommodation when comparing studies that used the 12-item measure and the 9-item measure, $Q(1)_{btwn} = 7.88$, $p < .01$. Indeed, the 12-item measure did not differ from the 13-item ($Q(1)_{btwn} = 3.49$, $p = .06$) or “other” measure ($Q(1)_{btwn} = 3.63$, $p = .06$), the 9-item measure did not differ from the 13-item ($Q(1)_{btwn} = 2.00$, $p = .16$) or “other” measure ($Q(1)_{btwn} = 0.02$, $p = .88$), and the 13-item measure did not differ from the “other” measure ($Q(1)_{btwn} = 0.84$, $p = .36$).

The informant responding to the family accommodation measure did not have an impact on the relationship between family accommodation and OCD symptom severity when considering the percentage of parents ($k = 38$, $\beta = 0.14$, $SE = 0.12$, $z = 1.17$, $p = .24$), significant

others ($k = 38, \beta = -0.17, SE = 0.15, z = -1.16, p = .25$), and “other” ($k = 38, \beta = -0.08, SE = 0.21, z = -0.41, p = .68$) informants. Lastly, neither the sample size ($\beta = -0.001, SE = 0.001, z = -1.95, p = .05$) nor the year of study publication ($\beta = 0.01, SE = 0.01, z = 0.87, p = .39$) emerged as statistically significant moderators of the relationship between OCD symptom severity and family accommodation.

Publication Bias and Sensitivity Analyses

Upon visual inspection of the funnel plot (Figure 3), the studies were generally observed to fall symmetrically around the mean. However, Egger’s test for bias was significant ($p = .02$), suggesting that publication bias may be present. Using Duval and Tweedie’s *Trim and Fill* procedure, one study was imputed to the right of the mean effect, eliciting an unbiased effect size of $r = .40, 95\% CI [.36, .43]$. Using the Rosenthal’s *Fail-safe N* (Rosenthal, 1979), there would need to be 4,395 unretrieved studies with a null relationship between OCD severity and family accommodation to make the current identified relationship nonsignificant ($p > .05$). Using Orwin’s *Fail-safe N* (Orwin, 1983), 129 unretrieved studies with a mean correlation of 0 would be needed to bring the summary effect below .10. There were no statistically significant differences in overall effect sizes between published ($k = 38, r = .43, 95\% CI [.37, .48], z = 12.47, p < .001$) and unpublished studies ($k = 3, r = .31, 95\% CI [.17, .44], z = 4.21, p < .001$), $Q(1)_{bwn} = 2.35, p = .13$, indicating that publication status does not affect the relationship between family accommodation and OCD symptom severity considerably.

Discussion

This meta-analysis provides support for a medium effect size for the correlation between family accommodation and OCD symptom severity, suggesting that increased symptomology is associated with higher levels of accommodating behaviors. The effect size for this correlation is

comparable to the effect size found in Strauss et al. (2015), albeit slightly larger ($r = .42$ versus $r = .35$). Although it is unclear which direction of causality is present, the relationship is likely bidirectional. On one side, more accommodating behaviors are expected to surface when a patient presents with more severe OCD symptomology; these actions are often performed in an effort to facilitate day-to-day functioning, mitigate distress, and/or give into requests by the affected individual (Calvocoressi et al., 1999; Storch, Björgvinsson, et al., 2010). Alternatively, family accommodation may, in turn, contribute to more severe symptomology, as it maintains the anxiety vis-à-vis a negative reinforcement cycle (Rudy & Zavrou, 2016). Taken collectively, these findings highlight the significant relationship between family accommodation and OCD symptom severity, supporting the importance of decreasing these maladaptive behaviors and symptoms in order to break the detrimental cycle and improve patient functioning (Piacentini et al., 2011).

Surprisingly, no sample-dependent variables moderated the relationship between family accommodation and OCD symptom severity. First, age did not affect the correlation when it was examined as either a categorical variable (pediatric versus adult) or a continuous variable (mean age), which is consistent with previous findings (Stewart et al., 2008; Storch et al., 2007). The observed correlation within pediatric samples was relatively higher than that of adult samples, though they were not statistically significantly different. However, there may still be clinical considerations to take into account, such as the potential phenomenological differences that occur when considering accommodations for youths versus adults (Stewart et al., 2008). For instance, youths may be more apt to have tasks (e.g., chores, homework) completed for them due to their developmental stage, and adults may elicit accommodation in other areas (e.g., taking on financial responsibilities). Nevertheless, family accommodation ostensibly occurs with

individuals with OCD, making it an important phenomenon to recognize and address regardless of the patient's age.

Neither the percentage of comorbid anxiety disorders nor mood disorders moderated the correlation between OCD symptom severity and family accommodation. This is somewhat surprising, given previous studies that linked these comorbid symptoms to heightened family accommodation (Caporino et al., 2012; Flessner et al., 2009; Wu et al., 2014). It is possible that a certain level of accommodation is already occurring within patients with OCD and their families, making it difficult for comorbid anxiety and/or mood disorders to elicit significantly higher levels of accommodation. Indeed, individuals with anxiety disorders and individuals with OCD elicit comparable levels of family accommodation (Lebowitz, Scharfstein, et al., 2014), so there may also be substantial overlap in the accommodating behaviors. However, as there is a considerable amount of variability within anxiety disorders, more nuanced investigations are warranted. Specifically, certain characteristics of one anxiety disorder and/or anxiety-related constructs (e.g., separation anxiety in children, anxiety sensitivity in adult OCD; Wu & Storch, in preparation) may result in greater accommodation relative to other conditions. As such, future studies should seek to clarify the potential differences between different anxiety disorders and related constructs with family accommodation.

As gender was not related to family accommodation in previous pediatric and adult OCD studies (Albert et al., 2010; Calvocoressi et al., 1999; Flessner et al., 2009; Storch et al., 2007), it is not surprising that gender was not a statistically significant moderator. Previous findings of gender differences in family accommodation within pediatric anxiety disorders may not extend to OCD (Lebowitz et al., 2013). Overall, this suggests that family accommodation is a common phenomenon in females and males, and gender does not modulate the relationship between OCD

symptom severity and family accommodation. However, given the potential gender differences in OCD symptom clusters (Labad et al., 2008; Mathis et al., 2011), it may be fruitful for future meta-analyses to directly examine whether specific symptom clusters are related to differing levels of family accommodation (Stewart et al., 2008; Wu et al., 2014).

When considering methodological factors that may moderate the relationship between family accommodation and OCD symptom severity, only one statistically significant moderator emerged. Specifically, only the number of items used from the different versions of the Family Accommodation Scale impacted the strength of the association between OCD symptom severity and accommodating behaviors. The 9-item version of the family accommodation measure assesses accommodations occurring over the past month, which allows for greater variability and higher endorsements of these behaviors, as a majority of the relatives accommodate daily (Calvocoressi et al., 1995; Peris et al., 2008; Ramos-Cerqueira et al., 2008; Shafran et al., 1995; Stewart et al., 2008; Storch et al., 2007). Contrarily, the 12-item version of the measure assesses behaviors that occurred exclusively in the past week; these reports on family accommodation may be more influenced by situational factors and can be dependent upon the timing of the assessment (Wu et al., 2015), potentially resulting in relatively lower correlations. Taken together, the type of family accommodation measure used and also the number of items extracted from the measure can impact the strength of the correlation between OCD symptom severity and family accommodation. As such, researchers and clinicians are encouraged to consider what is of interest (e.g., the actual accommodating behaviors and/or the consequences from accommodating) and utilize a standardized measure to facilitate comparability across studies.

No other methodological variables emerged as statistically significant moderators of the relationship between OCD symptom severity and family accommodation. The format of

administering the family accommodation measure (clinician-rated versus self-report) did not change the relationship. Although Pinto et al. (2012) found slightly different correlations when using a self-rated version versus a clinician-rated version of the measure, the difference was not statistically significant, which also supports the amalgamated findings yielded from the meta-analysis. Additionally, the type of informant responding to the family accommodation items did not moderate the relationship either. As such, comparable levels of accommodation appear to occur regardless of the type of relative. However, there may still be clinically important and phenomenological differences in the accommodation (Stewart et al., 2008), as mentioned before when considering pediatric versus adult OCD. Sample size and publication year also failed to emerge as statistically significant moderators, indicating that the correlation between OCD symptoms severity and family accommodation has remained fairly stable across varied sample sizes and years.

These results should be interpreted within several limitations. First, all correlational data compiled for the meta-analysis were cross-sectional in nature. As such, limited inferences of causality can be garnered, and future studies would benefit from utilizing longitudinal data to establish the directionality of the effects. Second, the present meta-analysis excluded manuscripts that were not composed in English, excluding a small number of international samples. This may have limited the generalizability of the findings and the ability to establish findings cross-culturally, though there were ultimately only 6 studies excluded for this reason. Third, given that significant heterogeneity was observed within each age group, there may be potentially unexplored factors that can moderate the relationship between OCD symptom severity and family accommodation. For instance, OCD symptom clusters (Lebowitz et al., 2012), age of accommodating relatives (Calvocoressi et al., 1999; Van Noppen & Steketee,

2009), and additional types of patient-level data (Bloch, 2014), such as other types of comorbid disorders (e.g., disruptive behavior disorders; Lebowitz, Storch, MacLeod, & Leckman, 2014; Storch et al., 2012), would be important to investigate. Fourth, future studies are encouraged to conduct moderator analyses within subgroups (e.g., age groups) to determine if there are factors that may influence this correlation within these samples. Fifth, the power to detect certain moderators may have been limited given the study to moderator ratio (Borenstein et al., 2009). Given that this was the first meta-analysis to examine moderators, these findings should be interpreted with some caution and serve to incite further examinations.

Conclusions

Family accommodation is a salient phenomenon that negatively impacts both the individual with OCD and the family. Because the extant literature has produced mixed findings, the present study sought to identify the strength of the association between family accommodation and OCD severity and to determine whether sample-dependent characteristics or methodological factors influenced the association between family accommodation and OCD symptom severity. Building from the preliminary meta-analysis conducted by Strauss et al. (2014), the present study included approximately three times the amount of studies (inclusive of their 14 studies), incorporated unpublished studies and datasets to account for possible file drawer concerns, and examined potential moderators of this relationship. The effect size for this association in the present meta-analysis was medium in size, reflecting the positive relationship between OCD symptom severity and accommodating behaviors. Only the number of items used from various versions of the Family Accommodation Scale emerged as a statistically significant moderator, indicating the importance of selecting a standardized measure to facilitate comparability and interpretability. As this relationship is clarified, these findings and future

studies can elucidate a more nuanced understanding of family accommodation in OCD and guide therapeutic interventions accordingly.

ACCEPTED MANUSCRIPT

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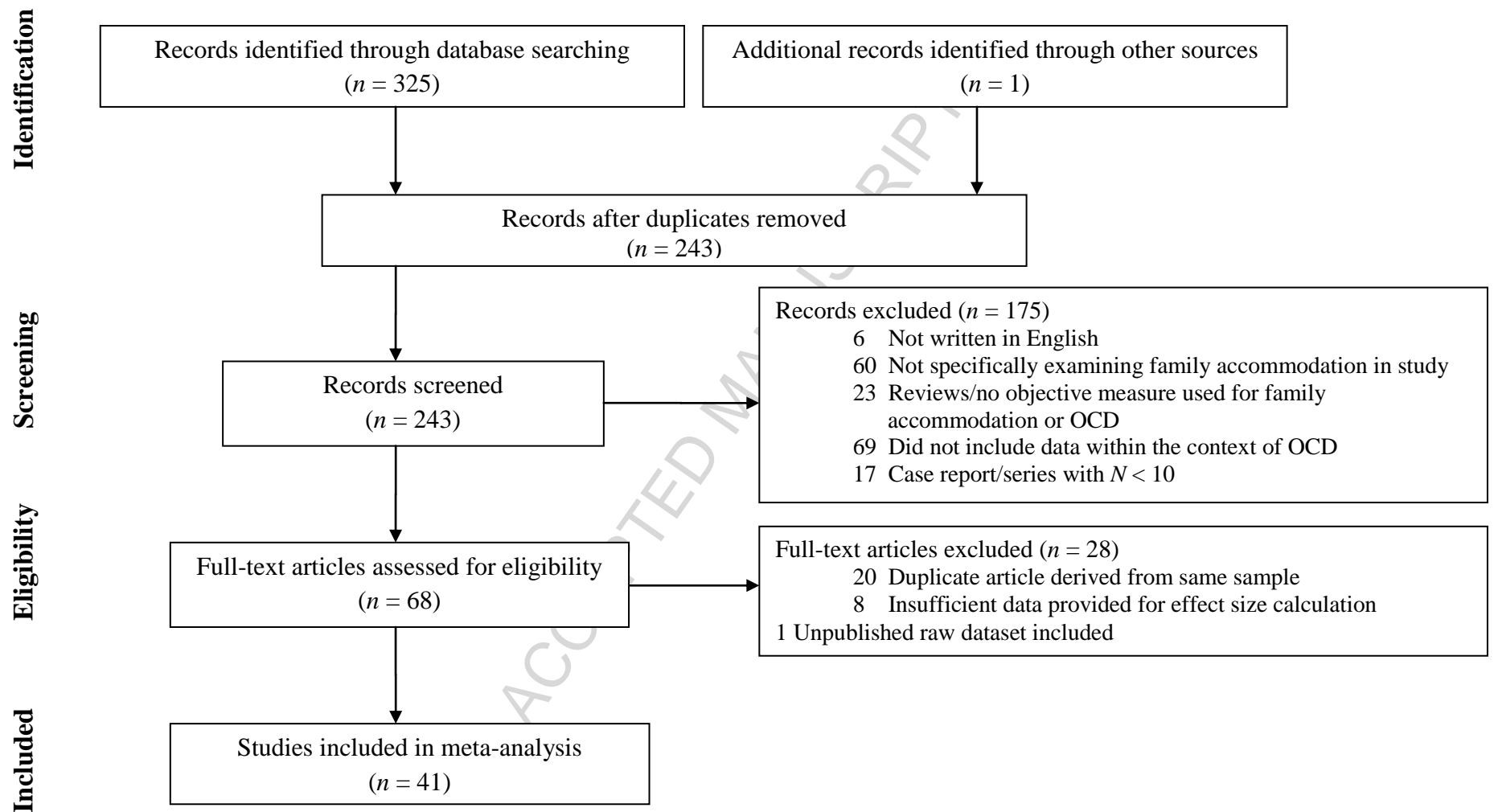


Figure 1. Flow Chart for Study Exclusion/Inclusion in Meta-Analysis.

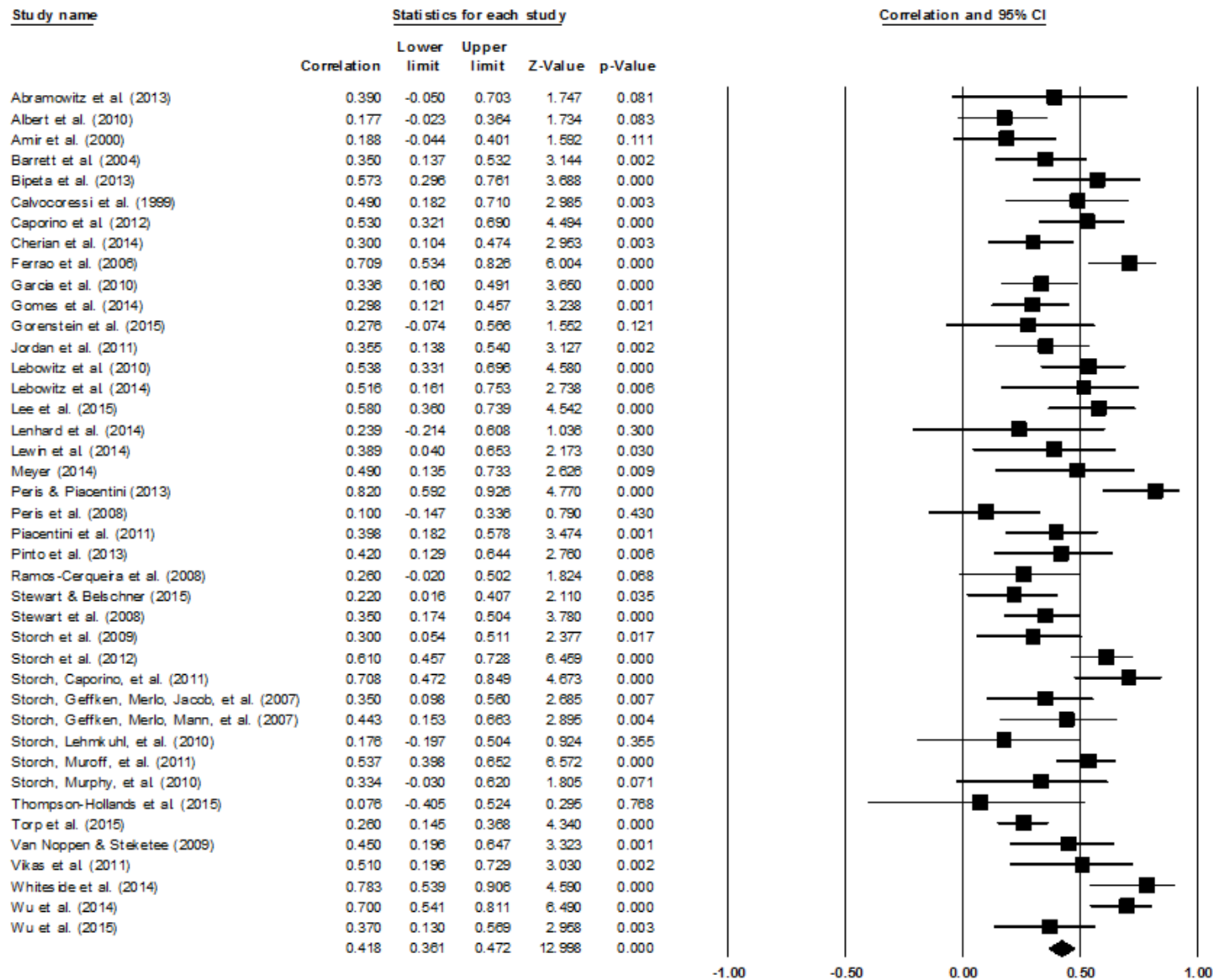


Figure 2. Forest Plot for the Correlation between OCD Symptom Severity and Family Accommodation.

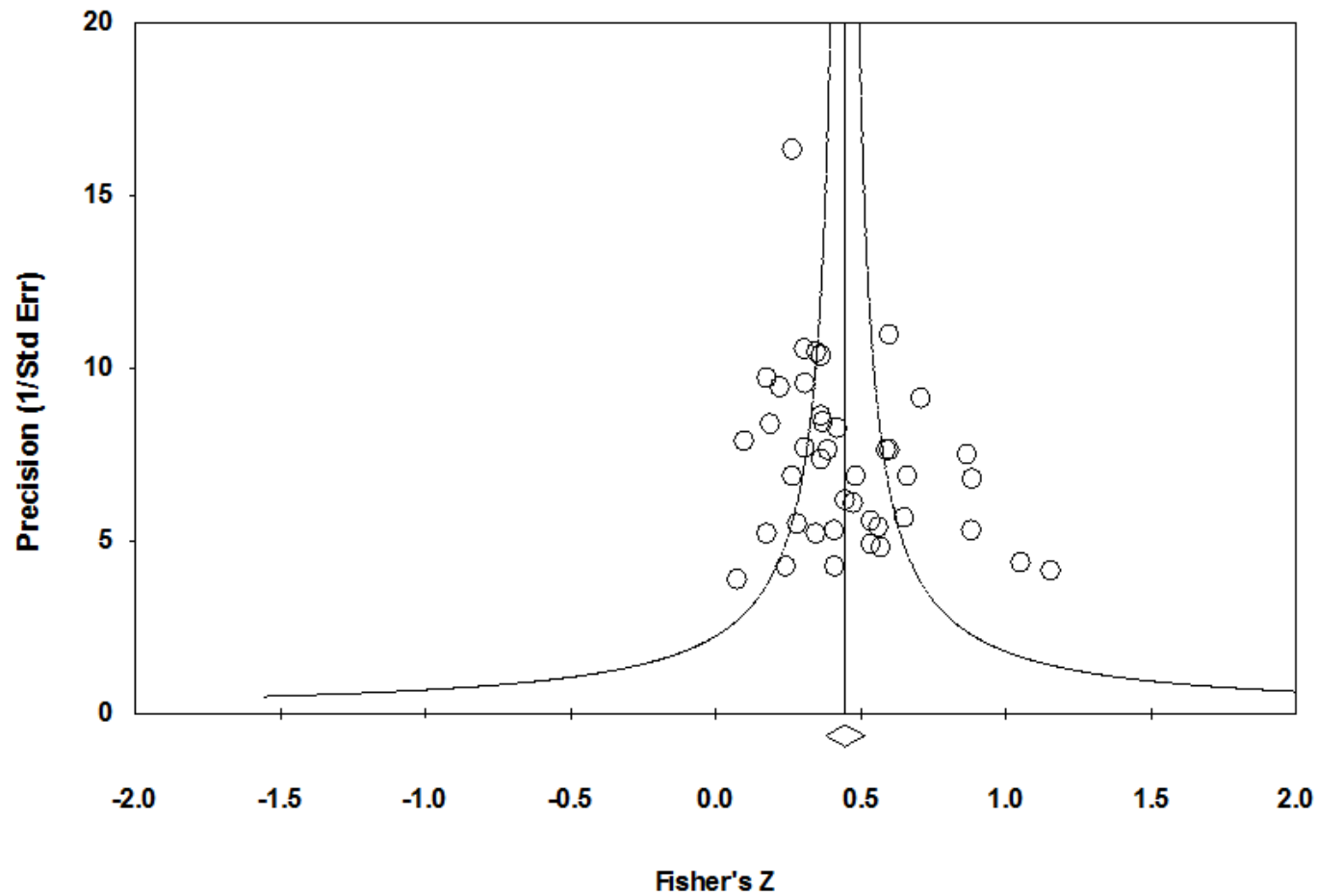
Funnel Plot of Precision by Fisher's Z

Figure 3. Funnel Plot of the Effects.

Appendix A

List of Studies and Coded Variables for Meta-Analysis

<u>Article Information</u>			<u>Demographics</u>				<u>Effect Size</u>	<u>Family Accommodation Measure Information</u>					<u>Comorbidities</u>	
Article Name	Publication Year	Published/Unpublished	Sample Size	Age Group	Mean Age	Gender (% Male)	Correlation	# of Items	S/R vs. Clinician	Relative - % Parent	Relative - % Sig. Other	Relative - % Other	% Anxiety Disorder Diagnosis	% Mood Disorder Diagnosis
Abramowitz et al.	2013	Pub	21	Adult	33.81	0.05	0.39	13	S/R	0	1	0	NA	0.13
Albert et al.	2010	Pub	97	Adult	35.60	0.51	0.18	13	Clinician	0.57	0.34	0.09	0.17	0.46
Amir et al.	2000	Pub	73	Adult	27.62	0.64	0.19	13	S/R	0.55	0.40	0.01	NA	0.10
Barrett et al.	2004	Pub	77	Ped	11.87	0.49	0.35	12	S/R	0	0	1	0.79	0.05
Bipeta et al. Calvocoressi et al.	2013 1999	Pub Pub	35 34	Ped Adult	13.11 30.50	0.54 0.50	0.57 0.49	12 12	S/R Clinician	1 0.44	0 0.56	0 0	0.14 NA	0.32 NA
Caporino et al.	2012	Pub	61	Ped	11.61	0.61	0.53	9	Clinician	1	0	0	0.30	0.12
Cherian et al.	2014	Pub	94	Adult	27.60	0.55	0.30	13	Clinician	0.48	0.39	0.11	0.22	0.29
Ferrao et al.	2006	Pub	49	Adult	38.47	0.45	0.71	Other	Clinician	0.41	0.37	0.22	0.43	0.69
Garcia et al.	2010	Pub	112	Ped	11.78	0.50	0.34	13	S/R	1	0	0	0.61	0.05
Gomes et al. Gorenstein et al.	2014 2015	Pub Pub	114 33	Adult Ped	40.50 12.9	0.38 0.42	0.30 .28	12 13	Clinician Clinician	0.27 1	0.51 0	0.22 0	0.61 0.90	0.54 0.15
Jordan et al.	2011	Unpub	74	Ped	11.86	0.46	0.36	13	S/R	0.97	0	0.03	NA	NA
Lebowitz et al.	2014	Pub	61	Ped	13.10	0.61	0.54	9	S/R	1	0	0	0.58	0.19
Lebowitz et al.	2014	Pub	26	Ped	12.07	0.46	0.52	9	S/R	1	0	0	0.26	0.21
Lee et al.	2015	Pub	50	Adult	35.89	0.30	0.58	13	S/R	0.68	0.16	0.16	NA	NA
Lenhard et al.	2014	Pub	21	Ped	14.40	0.38	0.24	12	S/R	1	0	0	0.71	0.10
Lewin et al.	2014	Pub	31	Ped	5.80	0.71	0.39	13	Clinician	1	0	0	0.71	0
Meyer Peris & Piacentini	2014 2013	Unpub Pub	27 20	Ped Ped	12.03 12.5	0.52 0.55	0.49 0.82	12 13	S/R Clinician	1 1	0 0	0 0	0.52 NA	0.11 NA
Peris et al.	2008	Pub	65	Ped	12.30	0.62	0.10	13	S/R	1	0	0	NA	NA
Piacentini et al.	2011	Pub	71	Ped	12.20	0.37	0.40	13	S/R	0.99	0	0.01	0.47	0.04

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Pinto et al. Ramos- Cerqueira et al.	2013	Pub	41	Adult	41.80	0.43	0.42	Other	S/R	0.37	0.54	0.09	0.25	0.44
Stewart et al. Stewart & Belschner	2008	Pub	50	Adult	36.50	0.44	0.26	13	NA	0.38	0.5	0.1	NA	0.52
Storch, Geffken	2008	Pub	110	Adult	30.80	0.53	0.35	12	S/R	NA	NA	NA	NA	0.71
Merlo, Jacob, et al.	2015	Unpub	92	Ped	13.7	0.55	0.22	12	S/R	0.98	0	0.02	0.36	0.12
Storch, Geffken, Merlo, Mann, et al.	2007	Pub	57	Ped	12.99	0.51	0.35	13	Clinician	1	0	0	NA	NA
Storch et al.	2007	Pub	40	Ped	13.30	0.45	0.44	13	S/R	1	0	0	0.40	0.18
Storch et al.	2012	Pub	86	Ped	11.12	0.56	0.61	13	Clinician	1	0	0	0.44	0.21
Storch et al. Storch, Caporino, et al.	2009	Pub	62	Ped	12.56	0.50	0.30	13	S/R	0.98	0	0.02	0.19	0.26
Storch, Lehmkuhl, et al.	2011	Pub	31	Ped	11.10	0.61	0.71	13	Clinician	1	0	0	0.29	0.06
Storch, Muroff, et al.	2010	Pub	30	Ped	13.40	0.50	0.18	13	Clinician	1	0	0	0.37	0.27
Storch, Murphy, et al.	2011	Pub	123	Ped	13.00	0.62	0.54	13	Clinician	1	0	0	NA	NA
Thompson- Hollands et al.	2010	Pub	30	Ped	12.20	0.63	0.33	13	S/R	1	0	0	0.23	0.1
Torp et al. Van Noppen & Steketee	2015	Pub	18	Adult	35.44	0.33	0.08	12	Clinician	0.22	0.72	0.06	0.67	0.56
Vikas et al. Whiteside et al.	2015	Pub	269	Ped	12.80	0.51	0.26	12	Clinician	1	0	0	0.19	0.04
Wu et al.	2009	Pub	50	Adult	42.00	0.46	0.45	12	Clinician	0.26	0.68	0.06	NA	0.26
Wu et al.	2011	Pub	32	Adult	29.87	0.56	0.51	Other	Clinician	NA	NA	NA	0	NA
Wu et al.	2014	Pub	22	Ped	12.59	0.68	0.78	13	Clinician	1	0	0	0.50	0.21
Wu et al.	2014	Pub	59	Ped	13.37	0.58	0.70	13	S/R	1	0	0	NA	NA
Wu et al.	2015	Pub	61	Adult	32.57	0.44	0.37	Other	S/R	NA	NA	NA	NA	NA

Note. Pub = Published; Unpub = Unpublished (e.g., dissertation/thesis); S/R = Self-Report; S.O. = Significant Other; NA = Not Available or Not Applicable.

Appendix B

List of Studies Included in the Meta-Analysis but Not within the Manuscript Text

- Abramowitz, J. S., Baucom, D. H., Boeding, S., Wheaton, M. G., Pukay-Martin, N. D., Fabricant, L. E., . . . Fischer, M. S. (2013). Treating obsessive-compulsive disorder in intimate relationships: a pilot study of couple-based cognitive-behavior therapy. *Behavior Therapy, 44*(3), 395-407. doi: 10.1016/j.beth.2013.02.005
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- Cherian, A. V., Pandian, D., Bada Math, S., Kandavel, T., & Janardhan Reddy, Y. C. (2014). Family accommodation of obsessional symptoms and naturalistic outcome of obsessive-compulsive disorder. *Psychiatry Research, 215*(2), 372-378. doi: 10.1016/j.psychres.2013.11.017
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- Gorenstein, G., Gorenstein, C., de Oliveira, M. C., Asbahr, F. R., & Shavitt, R. G. (2015). Child-focused treatment of pediatric OCD affects parental behavior and family environment. *Psychiatry Research*, 229(1-2), 161-166. doi: 10.1016/j.psychres.2015.07.050
- Jordan, C. (2011). An investigation of treatment history of pediatric obsessive compulsive disorder and predictors of treatment received (Doctoral dissertation). Retrieved from <http://ufdc.ufl.edu/UFE0042706/00001>
- Lee, E., Steinberg, D., Phillips, L., Hart, J., Smith, A., & Wetterneck, C. (2015). Examining the effects of accommodation and caregiver burden on relationship satisfaction in caregivers of individuals with OCD. *Bulletin of the Menninger Clinic*, 79(1), 1-13. doi:
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- Lenhard, F., Vigerland, S., Andersson, E., Ruck, C., Mataix-Cols, D., Thulin, U., . . . Serlachius, E. (2014). Internet-delivered cognitive behavior therapy for adolescents with obsessive-compulsive disorder: an open trial. *PLoS One*, 9(6), e100773. doi:
10.1371/journal.pone.0100773
- Meyer, J. (2014). The development of the child accommodation scale (Doctoral dissertation). Retrieved from <http://search.proquest.com/docview/1657428041?accountid=14745>
- Peris, T. S., & Piacentini, J. (2013). Optimizing treatment for complex cases of childhood obsessive compulsive disorder: a preliminary trial. *Journal of Clinical Child and Adolescent Psychology* 42(1), 1-8. doi: 10.1080/15374416.2012.673162
- Stewart, S. E., & Belschner, L. (2015). *UBC Pediatric OCD Program Registry*. Unpublished raw data.

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randomized clinical trial of a brief family intervention to reduce accommodation in obsessive-compulsive disorder: a preliminary study. *Behavior Therapy*, 46(2), 218-229. doi: 10.1016/j.beth.2014.11.001

Torp, N. C., Dahl, K., Skarphedinsson, G., Thomsen, P. H., Valderhaug, R., Weidle, B., . . .

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Vikas, A., Avasthi, A., & Sharan, P. (2011). Psychosocial impact of obsessive-compulsive

disorder on patients and their caregivers: A comparative study with depressive disorder. *International Journal of Social Psychiatry*, 57(1), 45-56. doi: 10.1177/0020764009347333

Whiteside, S. P., McKay, D., De Nadai, A. S., Tiede, M. S., Ale, C. M., & Storch, E. A. (2014).

A baseline controlled examination of a 5-day intensive treatment for pediatric obsessive-compulsive disorder. *Psychiatry Research*, 220(1-2), 441-446. doi: 10.1016

Highlights

- This meta-analysis synthesized an overall effect size (ES) across 41 studies.
- The ES for family accommodation and OCD symptom severity was $r = .42$.
- This is the first meta-analysis to examine purported moderators of this ES.
- The number of items used in the family accommodation measure moderated ES.
- Despite adequate power, no sample-dependent variables significantly moderated ES.