

## New Directions in the Cognitive-Behavioral Treatment of OCD: Theory, Research, and Practice

Jonathan S. Abramowitz

Shannon M. Blakey

Lillian Reuman

Jennifer L. Buchholz

University of North Carolina at Chapel Hill

The beneficial effects of cognitive-behavioral interventions (particularly exposure and response prevention) for OCD are among the most consistent research findings in the mental health literature. Nevertheless, even after an adequate trial, many individuals experience residual symptoms, and others never receive adequate treatment due to limited access. These and other issues have prompted clinicians and researchers to search for ways to improve the conceptual and practical aspects of existing treatment approaches, as well as look for augmentation strategies. In the present article, we review a number of recent developments and new directions in the psychological treatment of OCD, including (a) the application of inhibitory learning approaches to exposure therapy, (b) the development of acceptance-based approaches, (c) involvement of caregivers (partners and parents) in treatment, (d) pharmacological cognitive enhancement of exposure therapy, and (e) the use of technology to disseminate effective treatment. We focus on both the conceptual/scientific and practical aspects of these topics so that clinicians and researchers alike can assess their relative merits and disadvantages.

**Keywords:** OCD; CBT; exposure and response prevention; inhibitory learning; ACT

Address correspondence to Jonathan Abramowitz, Ph.D., Department of Psychology and Neuroscience, University of North Carolina at Chapel Hill, Campus Box 3270 (Davie Hall), Chapel Hill, NC 27599; e-mail: [jabramowitz@unc.edu](mailto:jabramowitz@unc.edu).

0005-7894/© 2018 Association for Behavioral and Cognitive Therapies. Published by Elsevier Ltd. All rights reserved.

CHARACTERIZED BY (a) *obsessions*—persistent intrusive unwanted thoughts, images, or doubts that provoke anxiety and distress—and (b) *compulsions*—repetitive or ritualistic behaviors or thoughts performed deliberately to neutralize the distress associated with obsessions, untreated obsessive-compulsive disorder (OCD) generally follows a deteriorating course (Pinto, Mancebo, Eisen, Pagano, & Rasmussen, 2006). Moreover, people with OCD often have diminished quality of life (Jacoby, Leonard, Riemann, & Abramowitz, 2014; Subramaniam, Soh, Vaingankar, Picco, & Chong, 2013), as do their caregivers (Ramos-Cerqueira, Torres, Torresan, Negreiros, & Vitorino, 2008). Still, OCD is under-recognized in mental health settings, in part because its symptoms often manifest as private experiences, but also because patients may be reluctant to disclose what they perceive as shameful or embarrassing thoughts and behaviors. Accordingly, the mean time from symptom onset to initial treatment can be as long as 8 years (Altamura, Buoli, Albano, & Dell’Osso, 2010). Of the less than half of individuals with OCD who receive diagnosis-specific therapy, fewer than 10% receive evidence-based treatment (Torres et al., 2007).

Substantial evidence supports the efficacy and effectiveness of cognitive behavioral therapy (CBT) as the first-line treatment of OCD. A comprehensive meta-analysis reported large effect sizes (ES) in favor of CBT across comparisons with control treatments at posttreatment (e.g., = 1.39), and moderate effects at follow-up (ES = .43; Olatunji, Davis, Powers, & Smits, 2013). The specific CBT interventions receiving the strongest support are *exposure* (planned and repeated systematic confrontation with external and

internal obsessional cues) and *response prevention* (abstaining from compulsive rituals), the use of which dates back more than half a century (Meyer, 1966). Contemporary treatment protocols include (a) a few sessions of treatment planning and psychoeducation about the symptoms of OCD, (b) systematic repeated and prolonged exposure to feared stimuli both in vivo and using imaginal techniques, and (c) strategic elimination of rituals (response prevention). Typically, treatment entails 12 to 16 weekly (or more frequent) sessions of supervised exposure and response prevention (ERP) along with “homework practices” between sessions.

Consistent findings indicate that ERP is more effective than other psychological interventions (Lindsay, Crino, & Andrews, 1997) and medication (Foa et al., 2005) for OCD, with large effect sizes (e.g., 2.49 and 0.92 respectively). Indeed, the majority of those who complete a program of ERP experience at least some symptom relief either alone or in combination with serotonin reuptake inhibitor medications (Abramowitz, Taylor, & McKay, 2009). Nevertheless, even after an adequate trial, about half of patients endorse impairing residual symptoms. This reality has prompted clinicians and researchers to look for ways to improve the conceptual and practical aspects of ERP, as well as look for augmentation strategies. Accordingly, our goal in the present article is to review recent developments and directions in the psychological treatment of OCD. These advances include the application of inhibitory learning approaches to ERP, the development of acceptance-based approaches for OCD, greater involvement of caregivers in ERP, pharmacological enhancement of ERP, and the use of technology to disseminate effective treatment.

### Application of the Inhibitory Learning Model of Exposure to OCD

One recent development in the treatment of OCD (and anxiety-related disorders in general) is the consideration of inhibitory learning models of exposure therapy. Traditional accounts of the mechanisms underlying the efficacy of exposure/ERP emphasize *emotional processing*—the idea that (a) repeated and prolonged exposure corrects fear-based associations leading to fear extinction (the type of learning that occurs during exposure), and (b) habituation of fear within and between exposure sessions is an index of such learning (e.g., Foa & Kozak, 1986). Research on learning and memory, however, supports neither assertion very strongly (Arch & Abramowitz, 2015; Craske et al., 2008). Thus, an updated inhibitory learning framework, which draws on experimental animal

and human research on basic learning processes, has been proposed for understanding and implementing exposure (e.g., Craske et al., 2008).

Such research indicates that exposure does not result in “unlearning” or the “correction” of fear-based associations, rather it facilitates the generation of new safety-based associations. This means that following exposure trials, a feared stimulus is associated with both its original (danger) meaning *and* its new inhibitory (safety) meaning. Thus, the aim of exposure therapy from an inhibitory learning framework is to help patients generate and strengthen inhibitory associations relative to older, fearful associations. Although not altogether incongruous with emotional processing accounts, the inhibitory learning model is distinct in that it rejects the emphasis on fear *reduction* (habituation) during exposure, focusing instead on short-term fear *tolerance* and the longer-term extinction of fear through the disconfirmation of threat-based expectations (Craske et al., 2008).

### CLINICAL APPLICATION

There are a number of more or less specific clinical strategies for maximizing ERP outcomes by optimizing inhibitory learning (discussed in detail in Jacoby & Abramowitz, 2016; but see also Abramowitz & Arch, 2014; and Arch & Abramowitz, 2015), and these converge to facilitate two critical treatment goals: the (a) violation of negative expectancies, and (b) generalization of inhibitory associations across multiple contexts. In this section we present an overview of the strategies clinicians can use to address these aims. The reader is also referred to a recent ERP treatment manual written from this perspective (Abramowitz & Jacoby, 2015).

#### *Violating Negative Expectancies*

This refers to the discrepancy between a patient’s anticipated consequence of an exposure task (e.g., becoming ill after touching a toilet) and the actual consequence (e.g., not becoming ill). Strong inhibitory associations may be generated by maximally violating a patient’s fear-based predictions for harm (Rescorla & Wagner, 1972). To this end, clinicians might try to maximize the likelihood that patients will be “pleasantly surprised” by the nonoccurrence of their feared catastrophe by deliberately orchestrating opportunities for feared outcomes that are unlikely or impossible (e.g., causing “bad luck” by writing certain numbers), or at least tolerable (e.g., feeling uncertain). Specifically, clinicians could capitalize on the element of surprise by encouraging a patient to conduct an exposure to a feared stimulus at a greater level of intensity, duration, or frequency than the patient believes would be “safe.”

A second strategy to generate inhibitory associations involves combining multiple fear cues during exposure to “deepen” extinction learning (Rescorla, 2006). In practice, this might involve helping a woman who fears murdering her baby to (a) conduct imaginal exposure to stabbing her infant, then (b) engage in *in vivo* exposure to holding a knife near her sleeping baby, and finally (c) engage in exposure to holding a knife near her sleeping baby *while imagining stabbing the baby*.

#### *Decontextualizing Inhibitory Associations*

For ERP to be maximally effective, safety learning must also be generalized by violating negative expectancies in a variety of contexts. This is because inhibitory associations are context-specific, such that if safety is learned in Context A, it may not necessarily be recalled in Context B. Accordingly, exposure tasks should be deliberately conducted under various conditions, be they stimuli-specific (e.g., a door knob versus the floor), geographic (e.g., the trash can at home versus a public restroom trash can), interpersonal (e.g., with the therapist versus alone), affective (e.g., when calm versus when already anxious), or physiological (e.g., when relaxed versus caffeinated).

#### RELEVANT RESEARCH EVIDENCE

The clinical recommendations described here are based on a large body of experimental research (for a review see Jacoby & Abramowitz, 2016), yet most of this work has been with animals or nonclinical human samples. Moreover, although some translational research has been conducted in the context of panic disorder and specific phobias, no studies have applied the inhibitory learning model to ERP for OCD to date. Therefore, although inhibitory learning-based recommendations are derived from an empirically based theoretical model, the translation of inhibitory learning principles to ERP for OCD awaits empirical testing.

#### Acceptance and Commitment Therapy

Another recent development in the treatment of OCD has been the application of acceptance and commitment therapy (ACT). Grounded in functional contextualism and Relational Frame Theory (RFT), ACT (Hayes, Strosahl, & Wilson, 2011) is an experiential approach to psychotherapy that shares philosophical assumptions with behaviorism and suggests that the context (e.g., historical, situational) in which behavior evolves is useful for predicting and changing psychological events. Events with a similar form may serve different functions; for example, washing one’s hands is only conceptualized as a compulsion in OCD when

considered in relation to the presence of obsessions, the client’s history, and the function of the washing. ACT sessions typically involve metaphorical discussions of these concepts with “homework” suggestions to supplement what has been discussed. Functional contextualism judges therapies according to the degree to which they improve valued living (which is individually defined) as opposed to psychological symptoms (as defined by a measure or diagnostic manual).

RFT, a psychological theory of human language, suggests that humans relate to stimuli based on more than just direct experience (e.g., better/worse; Hayes, Barnes-Holmes, & Roche, 2001). The process of responding to one stimulus in terms of other stimuli is *relational framing*, and relational frames affect how one experiences and responds to stimuli. This language-based, relational responding may also help to offer a functional account of “rule-governed behavior” (e.g., specifying rules or contingencies), which is common in OCD and is exemplified by obsessional thoughts that engender specific unnecessary contingencies such as avoidance and compulsive rituals.

Accordingly, ACT aims to foster *psychological flexibility*—being present in the moment without becoming entangled in private (i.e., mental or physiological) experiences such as thoughts and emotions—and a simultaneous willingness to experience unwanted private events (e.g., obsessional thoughts, anxiety). In the context of OCD, the goal of ACT is to help the patient strive toward what is important and meaningful to them despite the presence of unwanted thoughts, anxiety, and urges to perform compulsions. This is accomplished through acceptance (embracing private experiences without trying to change them), cognitive defusion (seeing obsessions as experiences rather than as *rules*), awareness of the present moment (nonjudgmentally attending to the present), self-as-context (developing perspective as someone who *experiences* fears versus *being* one’s fears), values (motivating one’s therapeutic work towards meaningful areas of life), and committed action (moving in the direction of one’s values). As with ERP from an inhibitory learning perspective, ACT does not emphasize the habituation of anxiety.

#### CLINICAL APPLICATION

On its own, ACT does not include explicit ERP techniques, yet it has much in common with ERP, including the goals of broadening the patient’s engagement with feared stimuli and improving quality of life. Accordingly, we have developed an ACT-based ERP program (Twohig et al., 2015) that aims to (a) foster willingness to experience and

respond flexibly in the presence of obsessions, anxiety, and uncertainty; (b) recognize thoughts and feelings as neither right nor wrong (i.e., “cognitive defusion”); and (c) help the patient move toward what they value in their life. This program makes use of numerous ACT metaphors that are discussed in the context of OCD and its treatment, as we describe next. More details of this approach can be found in [Twohig et al. \(2015\)](#).

#### *Fostering Willingness*

Willingness, in this context, refers to being open to “experiencing your own experience” without trying to change, avoid, or escape it. Patients are helped, through discussion, to understand the goal of treatment as developing a healthier (e.g., more peaceful) relationship to OCD-related thoughts and anxiety. For example, the patient might imagine herself as hosting a party to which she has invited her entire neighborhood and then someone she doesn’t like (“a Jerk”) has shown up at her door. The jerk represents situations, thoughts, and feelings associated with OCD, and the patient spends her time guarding the door and trying to keep the Jerk from coming in and ruining her party. In doing so, however, she is missing out on all the fun of the party (which represents her life). Treatment focuses on learning to welcome the Jerk into the party even though she doesn’t care for him and doesn’t like that he is there. This could lead to discussions about being willing to have obsessional thoughts, anxiety, and feelings of uncertainty even though they are unpleasant. ERP will create opportunities to practice “letting the Jerk into the party.”

#### *Defusing From Thoughts and Feelings*

Metaphors are also used to help shift the patient away from rigidly evaluating obsessional thoughts and other OCD-related private experiences as facts (e.g., “dangerous,” “immoral,” etc.), and instead to simply observe these experiences and decide for him- or herself how much weight to give them. An exemplary metaphor is a game of chess with its two opposing teams. One team’s pieces represent obsessional thoughts and anxiety, the other’s pieces represent feelings of safety and being in control. The therapist can point out that the two opposing teams are actually both within the patient; in other words, as soon as the patient chooses a team, he or she is fighting him- or herself and therefore cannot win the game. The therapist and patient can discuss how things would be different if the patient assumed the role of *chess board* instead of one of the teams. As the board, one is in contact with the pieces (noticing them and remaining aware of what they are doing), but the outcome of the game is not

important. ERP presents opportunities to practice “being the board.”

#### *Moving Toward Values in Life*

The therapist can help the patient think of obsessional thoughts and anxiety as a swamp with mud, quicksand, foul smells, and even strange animals. On the other side of the swamp is a better quality of life. The patient can avoid going into the swamp altogether, but then she is not heading toward the things that are important to her. Engaging in ERP means learning how to handle whatever comes up while moving through this swamp. The patient is choosing to enter the swamp for a reason—the point of ERP is not only to provoke discomfort, but to move closer to what one wants out of life (i.e., one’s values).

#### RELEVANT RESEARCH EVIDENCE

[Twohig and colleagues \(2010\)](#) compared the effectiveness of eight sessions of ACT to progressive relaxation training (with no in-session exposure) in a randomized clinical trial for OCD. ACT involved no explicit ERP instructions, although between sessions, patients engaged in values-based “behavioral commitments” (e.g., pursuing a meaningful activity without engaging in compulsions) without reference to explicit goals of anxiety reduction. ACT produced superior OCD symptom reduction relative to relaxation at posttreatment and at follow-up, with between-group effect sizes of 0.77 and 0.62, respectively. Notably, both of the aforementioned studies lacked an explicit test of in-session exposure, as the ACT interventions focused on (a) changing the psychological function of the obsession from something threatening to simply another cognitive event, and (b) planning behavioral commitments that involved following one’s values and practicing willingness to experience obsessions.

Most recently, our group has been working with Michael Twohig and colleagues at Utah State University on a two-site randomized controlled study comparing ACT-based ERP (as described above) to standard habituation-focused ERP. We have hypothesized that incorporating ACT will increase the efficacy and tolerability of, and engagement with ERP over the traditional approach, yet this trial continues as of this writing and we look forward to disseminating the results when they are available.

#### Couple-Based CBT for Adults

Cognitive-behavioral models of OCD view obsessions as resulting from the misinterpretation of common, unwanted, intrusive thoughts as highly important or threatening (e.g., [Rachman, 1997, 1998](#)). The individual then tries to control or reduce



obsessional anxiety using compulsive rituals and avoidance behavior. Yet although these anxiety-reduction strategies might work temporarily, they prevent one from learning that obsessional thoughts and stimuli are objectively safe, thus completing a vicious cycle that maintains OCD. Recently, however, the field has begun to more carefully consider OCD from an interpersonal perspective, finding a bi-directional association: OCD symptoms often lead to a strain on intimate relationships, and aspects of the relationship contribute to the maintenance of OCD.

For example, within close interpersonal relationships (e.g., marriage), a nonaffected partner might (albeit inadvertently) maintain his or her loved one's OCD symptoms by "helping" with avoidance and rituals (e.g., checking or providing reassurance for the patient; [Calvocoressi et al., 1999](#)). Such *symptom accommodation* can occur among relationally distressed as well as nondistressed couples, and might be performed either to prevent the OCD sufferer from becoming overly anxious (or hostile), or simply as a way of expressing care and concern within the relationship. Interpersonal factors also impact OCD symptoms when avoidance and rituals give rise to relationship conflict, which elevates stress and exacerbates OCD symptoms. Finally, couples might also struggle with chronic relationship discord unrelated to OCD (e.g., financial or childcare concerns) that increases stress and worsens obsessions and compulsions (e.g., [Abramowitz, Baucom, Wheaton, et al., 2013](#)).

#### RELEVANT RESEARCH EVIDENCE AND CLINICAL APPLICATION

The bi-directional association between OCD symptoms and relationship functioning leads to the hypothesis that for patients in intimate relationships, ERP could be enhanced by involving the partner in treatment and addressing the ways in which relationship factors maintain OCD (e.g., [Chambless & Steketee, 1999](#)). A handful of early studies examined "partner assisted" ERP for OCD, reporting somewhat mixed results. [Mehta \(1990\)](#), for example, found that including a partner (or other family member) as a coach during ERP was more effective than when ERP did not involve such a coach. In a similarly designed study, however, [Emmelkamp, de Haan, and Hoogduin \(1990\)](#) found no between-group differences. Earlier still, [Emmelkamp and De Lange \(1983\)](#) had reported that partner-assisted ERP was more effective at posttest, but not at 1-month follow-up. It is difficult to draw strong conclusions from these older studies as they suffered from various methodological limitations such as suboptimal implementation of ERP

(e.g., there was no therapist-supervised exposure), often resulting in substandard outcomes study-wide. Moreover, involvement of the partner was limited to helping only with exposure tasks, and couples were not helped to reduce accommodation behaviors or improve maladaptive communication patterns.

To address these limitations, we ([Abramowitz, Baucom, Boeding, et al., 2013](#)) developed a more comprehensive couple-based ERP program focusing on communication training, partner-assisted exposure, and reducing accommodation. We describe this 16-session program in detail further below. In a trial of 16 couples who received this treatment, we found a large within-group effect size on OCD symptoms at post-treatment ( $ES = 2.68$ ) that was maintained at 12-month follow-up ( $ES = 2.42$ ). Moreover, these changes were notably larger than comparable individual ERP-based treatment (e.g., [Vogel, Stiles, & Gotestam \[2004\]](#) reported a 12-month follow-up within-group effect sizes of 2.06). Partners also evidenced medium to large reductions in their level of accommodation of OCD symptoms and showed improvement in their own levels of distress and relationship satisfaction and functioning (e.g., better communication, less criticism; [Belus, Baucom, & Abramowitz, 2014](#)).

Comprehensive couple-based ERP begins with an assessment of the patient's OCD symptoms, along with identifying ways the couple has structured their environment so as to accommodate OCD symptoms. Next, the conceptual model of OCD and rationale for ERP are presented to both partners to increase patience and hopefulness, and reduce misunderstanding and criticism. Many partners find ERP counterintuitive and must learn that their role is to help the patient confront anxiety rather than escape from it. Loved ones are then taught how to assist with exposure therapy by serving as a coach and helping the patient "get through" the obsessional anxiety, as opposed to trying to alleviate this distress.

The patient and partner are also taught two types of communication skills to help them complete exposure practices as a team. The first skill involves "sharing thoughts and feelings" (i.e., emotional expressiveness training), in which the partners are taught how to discuss with one another *how they feel* (as opposed to offering solutions) during exposure while also listening effectively to each other. The second skill involves learning how to make decisions as a team regarding implementing exposure tasks and resisting rituals.

The process of doing partner-assisted exposure is broken down into four phases. The first phase involves discussing and clarifying the specifics of the exposure task and identifying potential concerns or obstacles. The patient also specifies how s/he would

like the coach to help out with the exercise. The second phase involves starting the exposure task, sharing thoughts and feelings about the experience, and providing praise for the patient's hard work. Partners are taught to resist the temptation to distract the patient or provide reassurance (or any other anxiety-reduction strategies), but also not to force their loved one into doing exposure. The third phase includes how to manage getting through the point during exposure when anxiety becomes heightened. The fourth phase is completion of the exposure and incorporates an evaluation of the experience and praise for the patient's hard work.

When symptom accommodation is present, treatment also focuses on changing such interaction patterns. Following education about accommodation and its effects, the patient and partner use decision-making skills to gradually build exposure-type experiences (instead of accommodation) into daily life; for example, resuming the use of rooms in the house that had been off limits. Because removing accommodation can inadvertently alter the relationship between partners, it is important also to find new ways for them to show love, care, and concern for each other outside the context of OCD.

Finally, some couples experience broad relationship distress that needs to be addressed within the context of treatment because it can (a) serve as a chronic stressor that exacerbates OCD symptoms and (b) attenuate the two individuals' ability to work together as a team within treatment. In such cases, using couple or family interventions (e.g., communication training) to optimize family and relationship functioning more broadly is a necessary part of the treatment of OCD.

### Family-Based CBT for Youth

As with adults in intimate relationships, parents of youth with OCD may become involved in accommodation and frequent arguing about the senselessness of obsessions and compulsions (Lebowitz et al., 2013). Parental accommodation may include performing rituals for the child, "helping" with avoidance, making excuses for missing school, and doing extra loads of laundry because of the need for cleanliness. Moreover, as in romantic contexts, the relationship between OCD symptoms and family involvement is bi-directional. Accordingly, including a parent in CBT may augment individual therapy outcomes for youth and help to address the family context more broadly, which can in turn promote a healthier environment for maintaining treatment gains in the long term.

### CLINICAL APPLICATION

Similar to working with adult couples in which one partner has OCD, parents may learn skills (e.g.,

psychoeducation, self-monitoring, and response prevention) to minimize accommodation behavior (Lebowitz, Omer, Hermes, & Scahill, 2014). Education about the nature and treatment of OCD and family involvement in maintaining OCD is essential, as many parents are not aware of these consequences. For example, parents can be given information about common OCD symptoms, the cognitive-behavioral model, and what to expect from treatment. Parents can also be given a rationale for ERP and guidelines for supervising exposure. Notably, many parents of youth with OCD suffer with anxiety themselves and may harbor concerns about exposure-related anxiety having detrimental effects. This may underlie accommodation of the child's OCD symptoms in an effort to protect him or her from "too much" anxiety. Education about the harmlessness of anxiety (i.e., the fight or flight system) is often useful to allay such concerns. Indeed, family accommodation must be actively targeted from the beginning of treatment and within exposure practices. Parents are coached on alternative ways of handling requests for accommodation, such as negotiating, ignoring, and how to provide more helpful (nonritualistic) answers to reassurance-seeking questions.

Family-based CBT can also address communication skills, which are often poor within families affected by OCD. Skills in how to share thoughts and feelings and also problem-solve are critical for decreasing family accommodation and facilitating the completion of ERP assignments. Additionally, parents are taught to reinforce their children's engagement in and completion of ERP tasks so that children will gradually approach exposure situations independently.

CBT for youth with OCD warrants a number of additional clinical considerations. Unlike in adult intimate relationships, parents usually have control over the distribution of resources (e.g., time, parental attention, money) to their children, and thus have (more or less) leverage that they can use to encourage participation in treatment (especially among youth who do not view OCD as a problem) and abstinence from compulsive rituals at home. Accordingly, teaching parents how to recognize and use such leverage using contingency management skills, for example, as opposed to resorting to arguments and power struggles, can be beneficial.

Additionally, given varying levels of maturity and insight, children may not be able to articulate their experiences with OCD; thus, parents are often tasked with interpreting their child's experiences, seeking appropriate treatment, and communicating with the treatment team. Second, given that youth may have a limited understanding of the future or ability to anticipate future rewards, engaging in

anxiety-provoking exposure exercises for eventual long-term benefits may be confusing. Therefore, parental support and involvement is vital for facilitating perseverance with more difficult tasks. Third, compliance with ERP may be difficult for young children who are either not socialized to complete regular homework or require significant supervision from a parent. For these reasons, parental inclusion in CBT for youth with OCD is important.

Kendall (2011) identified three unique roles for parental involvement in CBT for anxious youth, such as those with OCD. Parents can be involved as (a) consultants who provide information to the therapist, (b) collaborators who provide information to the therapist, aid the child with learning new skills as a “coach” throughout treatment, and assist with exposures, or (c) co-clients who jointly work on skills to manage their own anxiety.

#### RELEVANT RESEARCH EVIDENCE

A number of studies have examined CBT interventions for pediatric OCD that include parental involvement; however, research evidence is mixed. Although family-based CBT is superior to individual and family-based relaxation training, with medium to large between-group effect sizes ranging from 0.42 to 0.84 (Freeman et al., 2014; Piacentini et al., 2011), among youth with OCD of varying ages, other studies have not found “enhanced” effects of family-based CBT in comparison to individual CBT. Thus, there are no clear statistically significant differences with regard to treatment outcome between the two. Ultimately, both individual and family-based CBT seem to be the most promising treatments for pediatric OCD, and decisions about the extent to which parental involvement is important is left to clinical judgment based on the child’s presentation of OCD, the nature of the family involvement, and characteristics of the caregivers to be involved (e.g., parental anxiety).

#### Pharmacological Enhancement of Exposure Therapy

In clinical practice, pharmacotherapy (e.g., serotonin reuptake inhibitors; SRIs) and CBT are often combined to treat OCD, yet pharmacotherapy does not appear to meaningfully add to the effectiveness of ERP monotherapy (Romanelli, Wu, Gamba, Mojtabai, & Segal, 2014). SRIs are also associated with several adverse effects and increased risk of relapse after discontinuation (Maina & Bogetto, 2001). To address this concern, some investigators have turned toward a new form of combination treatment: pairing CBT with pharmacological cognitive enhancers such

as D-cycloserine (DCS), yohimbine hydrochloride, and methylene blue (Williams, Davis, Powers, & Weissflog, 2014). Rather than directly reduce OCD symptoms, cognitive enhancers are thought to facilitate the effects of exposure by acting upon specific brain regions and neurocircuitry implicated in fear learning and extinction (Davis & Myers, 2002; Singewald, Schmuckermair, Whittle, Holmes, & Ressler, 2015) that are recruited during ERP.

The most well-studied and promising of these agents is DCS, a partial agonist of the glutamatergic N-methyl-D-aspartate (NMDA) receptor in the amygdala (which is involved in fear conditioning and extinction). In addition to documenting its safety and low risk of side effects, animal and human research suggest that DCS acts as a memory enhancer by facilitating the consolidation and reconsolidation of extinction learning achieved during exposure (e.g., Norberg, Krystal, & Tolin, 2008). In other words, DCS may augment exposure in the short- and long-term by making fear extinction more efficient and generalizable to novel contexts (Chasson et al., 2010; McGuire et al., 2015). Accordingly, supplementing successful exposures during OCD treatment with DCS might serve to reduce the number of exposure trials required to achieve even more durable corrective learning.

A second potential benefit of augmenting CBT with DCS regards treatment attrition and dropout (e.g., Kushner et al., 2007; Storch et al., 2010). For example, if reductions in symptom severity occur earlier in treatment, patients might be more likely to complete a full course of exposure. This is because (a) longer treatment duration is often associated with increased treatment cost and opportunities for scheduling or logistic conflicts (e.g., difficulties finding childcare), and (b) early treatment gains can mitigate prognostic pessimism. Moreover, by reducing the length of time required for successful CBT, DCS might indirectly increase access to an empirically supported yet underutilized treatment. That is, if individual cases require less provider time due to more efficient extinction trials, therapists may progress more quickly through their caseload and begin treating patients who would otherwise still be on a clinic waitlist.

#### RELEVANT RESEARCH EVIDENCE AND CLINICAL APPLICATION

Although research on combined DCS and CBT for OCD is nascent, DCS shows promise as an adjunctive pharmacological tool—at least under certain conditions. Ressler and colleagues (2004) first investigated DCS-supplemented exposure therapy in the treatment of acrophobia. Since then, findings

from additional studies of combined DCS and exposure therapy for other anxiety disorders converge to suggest that DCS does indeed augment exposure's therapeutic effects (Mataix-Cols et al., 2017). Trials restricted to OCD patient samples, however, yield less consistent findings.

Several placebo-controlled trials investigating the effects of adding DCS to exposure-based CBT for OCD have been published to date (Andersson et al., 2015; de Leeuw, van Meegen, Kahn, & Westenberg, 2017; Farrell et al., 2013; Kushner et al., 2007; Mataix-Cols et al., 2014; Storch et al., 2007, 2010, 2016; Wilhelm et al., 2008). Some studies show significant benefit of adding DCS to exposure on OCD symptoms at individual assessment waves (e.g., midtreatment, posttreatment, or follow-up), whereas others do not. Effect sizes in these studies ranged from -0.19 (i.e., in favor of placebo; Storch et al., 2007) to 0.89 (Kushner et al., 2007). Mixed results may be due to methodological differences between these studies related to CBT delivery (e.g., number of sessions, intersession interval, degree of success of the exposure trial) and DCS administration (e.g., dosage, timing of drug administration relative to the exposure). In addition, most of these studies recruited small samples, with total sample sizes ranging from 17 to 128 (treatment group sizes ranged 8 to 64), with all studies but one (Andersson et al., 2015) enrolling fewer than 40 total participants. Accordingly, some have speculated that statistical analyses were underpowered to detect hypothesized effects (Andersson et al., 2015; Mataix-Cols et al., 2017).

Another potential explanation for divergent findings relates to participants' concurrent antidepressant medication use. For instance, Andersson and colleagues (2015) reported exploratory analyses that detected a significant interaction between DCS and antidepressants, such that DCS only augmented the efficacy of exposure among patients who were not also taking antidepressant medications. As previously stated, it is common practice for OCD patients to take antidepressant medications (e.g., serotonin reuptake inhibitors); therefore, clinical researchers should consider separating patients who are and are not taking antidepressant medications in future DCS trials in order to more precisely elucidate the effects of DCS on exposure-based CBT for OCD. Future work identifying the optimal administration procedures of DCS (e.g., how many, at what dose, at what time relative to an exposure trial, with what percent of exposure trials, at what point during exposure therapy) in order to maximize CBT's efficiency would also be helpful.

DCS may only be obtained via medical prescription by a registered physician or nurse practitioner. Published research trials suggest that DCS may be

most beneficial when administered shortly (1 to 5 hours) before or after successful exposure trials in minimal dosages (approximately 50 mg/day for adults and 0.7 mg/kg/day for youth; Mataix-Cols et al., 2017; Storch et al., 2016). There is also evidence to suggest that the additive benefits of DCS to exposure-based CBT dissipate after several successful exposure sessions, perhaps due to desensitization of NMDA receptors (e.g., Williams et al., 2014) and/or ceiling effects due to exposure's substantial effectiveness (Chasson et al., 2010). Because research on the direct and indirect effects of pharmacological cognitive enhancers on exposure's efficacy is novel and associated with mixed findings, there are no clear guidelines for the incorporation of cognitive enhancers to augment exposure-based CBT for OCD. Therefore, it would be imprudent for clinicians to introduce pharmacological cognitive enhancers as adjuncts to CBT for OCD at this time.

### Internet, Telehealth, and Smartphone Application Delivery of CBT

As alluded to at the beginning of this article, the majority of individuals with OCD neither seek help nor receive the appropriate or adequate treatment. One explanation for this is a shortage of well-trained OCD therapists within the health care system, resulting in long waiting lists and leaving many impaired individuals untreated or inadequately treated (Mataix-Cols & Marks, 2006). Stigma, cost, and a lack of accurate information about OCD treatment are additional barriers to care. Thus, innovative delivery formats that increase accessibility without compromising efficacy are gaining popularity. Internet, telehealth, and smartphone application (app) platforms show considerable promise for improving treatment dissemination by creating low-cost and efficient alternatives to traditional face-to-face therapy.

### RELEVANT RESEARCH EVIDENCE AND CLINICAL APPLICATION

Internet-based CBT (ICBT) with therapist support has demonstrated efficacy for several psychiatric conditions including depression, social anxiety disorder, and panic disorder (Andersson, Carlbring, Berger, Almlöv, & Cuijpers, 2009). However, few studies have empirically examined ICBT for OCD. Andersson and colleagues (2012) conducted a randomized controlled trial investigating the efficacy of an ICBT program for OCD that gave patients access to self-help modules and an online therapist. They found that ICBT led to larger improvements relative to the attention control group, with a large effect size of 1.12. CBT delivery methods that utilize telephone and web-camera communication have also



demonstrated efficacy. In a systematic review, [Tumur, Kaltenthaler, Ferriter, Beverley, and Parry \(2007\)](#) found that “BT Steps,” a self-help book and a touchtone telephone system that provided automated guidance, consistently led to symptom reduction ( $ES = 0.84$ ) and demonstrated acceptability and feasibility. [Storch and colleagues \(2011\)](#) conducted a waitlist controlled randomized trial of family-based CBT delivered via web-camera (W-CBT) to children and adolescents with OCD. Those receiving W-CBT improved on all OCD-related outcome measures relative to the waitlist control group, with a large between-groups  $ES$  of 1.36; and 56% of individuals in the W-CBT group met remission criteria. This preliminary study suggests that W-CBT may be useful in reducing OCD symptoms in children and adolescents. Further, in a case series of six outpatient clients with OCD, [Vogel et al. \(2012\)](#) found that 15 sessions of CBT delivered by teleconference and cell phone led to considerable improvement in symptoms at both posttreatment and follow-up. All six patients rated the treatment format as acceptable. Combined ICBT and phone guidance may enhance outcomes, as evidence suggests that brief phone support provided by a clinician improves adherence to computerized OCD treatment and leads to larger symptom reduction ([Kenwright, Marks, Graham, Franses, & Mataix-Cols, 2005](#)).

The rapid growth in smartphone use has led to the development of apps for behavioral health that include symptom assessment, psychoeducation, resource location, and progress tracking ([Luxton, McCann, Bush, Mishkind, & Reger, 2011](#)). One such app is the Mayo Clinic Anxiety Coach, which was designed to deliver CBT for anxiety disorders and OCD through assessment, psychoeducation, and treatment modules. Case examples suggest that Anxiety Coach enhances treatment of pediatric OCD ([Whiteside, Ale, Vickers Douglas, Tiede, & Dammann, 2014](#)). Additional apps have been developed for OCD assessment and treatment, but they have not yet established empirical support ([Ameringen, Turna, Khalesi, Pullia, & Patterson, 2017](#)). For example, iTunes offers a mobile Y-BOCS assessment and OCD treatment app based on ERP principles. Although neither have been formally validated, the latter is currently being studied at Brown University.

CBT delivered through Internet-based programs, telehealth, and smartphone apps can reduce barriers to care and improve the efficiency of dissemination. As evidenced by the studies noted above, technology can be used in various ways to augment traditional therapy. Some programs have been developed to replace face-to-face therapy entirely, whereas others are used to supplement traditional care (e.g., in a

psychiatric clinic). [Mataix-Cols and Marks \(2006\)](#) proposed a stepped care model for the treatment of OCD, in which individuals with less complex symptoms receive immediate access to self-guided treatment, freeing up time for experienced therapists to work with more complex cases face-to-face. By reducing the time clinicians spend with each patient, more people can receive effective treatment without increasing therapist burden or health care costs. For example, therapists in the trial conducted by [Andersson et al. \(2009\)](#) spent an average of 129 minutes per participant over the 10-week intervention period, which is substantially lower than time spent in face-to-face CBT. Future research is necessary to determine the optimal amount of therapist contact for patients with OCD.

Additional research is warranted to identify patient characteristics associated with treatment adherence and outcome. Regarding treatment expectations, [Wootton et al. \(2011\)](#) found that only 22% of patients believed that online therapy would improve their symptoms substantially. This suggests that some patients may be unwilling to incorporate technology into treatment, and additional efforts may be necessary to disseminate findings about the effectiveness of innovative OCD interventions. Despite potential challenges and limitations, the integration of technology and behavioral health is an exciting step towards improving access and adherence to evidence-based treatments for OCD.

### Summary and Conclusions

Prior to the 1960s, OCD was considered an intractable condition, which speaks volumes about the psychoanalytic/psychodynamic approaches that were used as first-line interventions during that time. With the recognition that behavioral techniques such as ERP were not harmful and could be effective in the short- and long-term (e.g., [Meyer, 1966](#)), researchers and clinicians around the world have worked for more than 50 years to turn this condition into a highly treatable one. Still, even the most effective psychological treatments are imperfect. Yet notwithstanding the room for improvement, it is arguably the lack of availability of properly trained, qualified treatment providers that remains the most formidable barrier to effective treatment for many people with OCD. Accordingly, dissemination remains a top priority.

Precisely because we have an empirically supported set of interventions, it is important to continue to develop ways to improve the treatment of OCD. In this article we have discussed a number of exciting advances toward this end. The shift in emphasis away from using exposure therapy as a means of anxiety *reduction*, and toward anxiety

tolerance or acceptance, that characterize the inhibitory learning approach and ACT-based ERP promises to breathe new life into a treatment paradigm that is too often rejected by clinicians and their patients. Given that loved ones (i.e., parents and partners/spouses) frequently find themselves involved (whether voluntarily or not) with loved ones' OCD symptoms, the judicious participation of such caregivers in treatment as coaches, cheerleaders, and supervisors seems valuable.

Advances in how we understand the neuroscience of extinction learning, and how it can be enhanced pharmacologically, also provide exciting directions for augmenting ERP. Although we still have much to elucidate regarding the precise methodology to optimize this approach, it appears there is reason for optimism regarding the use of DCS. Finally, the development and testing of online and mobile platforms for the delivery of CBT for OCD returns our discussion to the topic of dissemination. Although a smartphone app or computer interface might not completely replace in-person, supervised ERP, these advances promise to bring many aspects of efficacious treatment programs (e.g., assessment, education, self-supervised exposure) to those who are unable to find or afford a qualified treatment provider. We look forward to the next 50 years of developments in this exciting and constantly evolving field.

#### Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

#### References

- Abramowitz, J. S., & Arch, J. J. (2014). Strategies for improving long-term outcomes in cognitive behavioral therapy for obsessive-compulsive disorder: Insights from learning theory. *Cognitive and Behavioral Practice*, 21, 20–31. <https://doi.org/10.1016/j.cbpra.2013.06.004>
- 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. <https://doi.org/10.1016/j.beth.2013.02.005>
- Abramowitz, J. S., Baucom, D. H., Wheaton, M. G., Boeding, S., Fabricant, L. E., Paprocki, C., & Fischer, M. S. (2013). Enhancing exposure and response prevention for OCD: A couple-based approach. *Behavior Modification*, 37(2), 189–210. <https://doi.org/10.1177/0145445512444596>
- Abramowitz, J. S., & Jacoby, R. J. (2015). *Obsessive-Compulsive Disorder in Adults, in the series Advances in Psychotherapy: Evidence-Based Practice*. Boston, MA: Hogrefe Publishing.
- Abramowitz, J. S., Taylor, S., & McKay, D. (2009). Obsessive-compulsive disorder. *The Lancet*, 374(9688), 491–499. [https://doi.org/10.1016/S0140-6736\(09\)60240-3](https://doi.org/10.1016/S0140-6736(09)60240-3)
- Altamura, A. C., Buoli, M., Albano, A., & Dell'Osso, B. (2010). Age at onset and latency to treatment (duration of untreated illness) in patients with mood and anxiety disorders: A naturalistic study. *International Clinical Psychopharmacology*, 25(3), 172–179. <https://doi.org/10.1097/YIC.0b013e3283384c74>
- Ameringen, M., Turna, J., Khalesi, Z., Pullia, K., & Patterson, B. (2017). There is an app for that! The current state of mobile applications (apps) for DSM-5 obsessive-compulsive disorder, posttraumatic stress disorder, anxiety and mood disorders. *Depression and Anxiety*, 34, 526–539. <https://doi.org/10.1002/da.22657>
- Andersson, E., Enander, J., Andrén, P., Hedman, E., Ljótsson, B., Hursti, T., et al. (2012). Internet-based cognitive behaviour therapy for obsessive-compulsive disorder: a randomized controlled trial. *Psychological Medicine*, 42(10), 2193–2203. <https://doi.org/10.1017/S0033291712000244>
- Andersson, E., Hedman, E., Enander, J., Djurfeldt, D. R., Ljótsson, B., Cervenka, S., ... Rück, C. (2015). d-Cycloserine vs Placebo as Adjunct to Cognitive Behavioral Therapy for Obsessive-Compulsive Disorder and Interaction With Antidepressants: A Randomized Clinical Trial. *JAMA Psychiatry*, 72(7), 659–667. <https://doi.org/10.1001/jamapsychiatry.2015.0546>
- Andersson, G., Carlbring, P., Berger, T., Almlöv, J., & Cuijpers, P. (2009). What makes internet therapy work? *Cognitive Behaviour Therapy*, 38(S1), 55–60. <https://doi.org/10.1080/1650670902916400>
- Arch, J. J., & Abramowitz, J. S. (2015). Exposure therapy for obsessive-compulsive disorder: An optimizing inhibitory learning approach. *Journal of Obsessive-Compulsive and Related Disorders*, 6, 174–182. <https://doi.org/10.1016/j.jocrd.2014.12.002>
- Belus, J. M., Baucom, D. H., & Abramowitz, J. S. (2014). The effect of a couple-based treatment for OCD on intimate partners. *Journal of Behavior Therapy and Experimental Psychiatry*, 45(4), 484–488. <https://doi.org/10.1016/j.jbtep.2014.07.001>
- Calvocoressi, L., Mazure, C. M., Kasl, S. V., Skolnick, J., Fisk, D., Vegso, S. J., ... Price, L. H. (1999). Family accommodation of obsessive-compulsive symptoms: instrument development and assessment of family behavior. *The Journal of Nervous and Mental Disease*, 187(10), 636–642. <https://doi.org/10.1097/00005053-199910000-00008>
- Chambless, D. L., & Steketee, G. (1999). Expressed emotion and behavior therapy outcome: a prospective study with obsessive-compulsive and agoraphobic outpatients. *Journal of Consulting and Clinical Psychology*, 67(5), 658–665. <https://doi.org/10.1037/0022-006X.67.5.658>
- Chasson, G. S., Buhlmann, U., Tolin, D. F., Rao, S. R., Reese, H. E., Rowley, T., ... Wilhelm, S. (2010). Need for speed: Evaluating slopes of OCD recovery in behavior therapy enhanced with d-cycloserine. *Behaviour Research and Therapy*, 48(7), 675–679. <https://doi.org/10.1016/j.brat.2010.03.007>
- Craske, M. G., Kircanski, K., Zelikowsky, M., Mystkowski, J., Chowdhury, N., & Baker, A. (2008). Optimizing inhibitory learning during exposure therapy. *Behaviour Research and Therapy*, 46(1), 5–27. <https://doi.org/10.1016/j.brat.2007.10.003>
- Davis, M., & Myers, K. M. (2002). The role of glutamate and Gamma-Aminobutyric acid in fear extinction: Clinical implications for exposure therapy. *Biological Psychiatry*, 52(10), 998–1007. [https://doi.org/10.1016/S0006-3223\(02\)01507-X](https://doi.org/10.1016/S0006-3223(02)01507-X)
- de Leeuw, A. S., van Megen, H. J. G. M., Kahn, R. S., & Westenberg, H. G. M. (2017). d-cycloserine addition to exposure sessions in the treatment of patients with obsessive-compulsive disorder. *European Psychiatry*, 40, 38–44. <https://doi.org/10.1016/j.eurpsy.2016.06.011>
- Emmelkamp, P. M., de Haan, E., & Hoogduin, C. A. (1990). Marital adjustment and obsessive-compulsive disorder. *The British Journal of Psychiatry: The Journal of Mental Science*, 156, 55–60. <https://doi.org/10.1192/bjp.156.1.55>

- Emmelkamp, P. M., & de Lange, I. (1983). Spouse involvement in the treatment of obsessive-compulsive patients. *Behaviour Research and Therapy*, 21(4), 341–346. [https://doi.org/10.1016/0005-7967\(83\)90002-5](https://doi.org/10.1016/0005-7967(83)90002-5)
- Farrell, L. J., Waters, A. M., Boschen, M. J., Hattingh, L., McConnell, H., Milliner, E. L., ... Storch, E. A. (2013). Difficult-to-treat pediatric obsessive-compulsive disorder: feasibility and preliminary results of a randomized pilot trial of D-cycloserine-augmented behavior therapy. *Depression and Anxiety*, 30(8), 723–731. <https://doi.org/10.1002/da.22132>
- Foa, E. B., & Kozak, M. J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin*, 99(1), 20–35. <https://doi.org/10.1037/0033-2909.99.1.20>
- Foa, E. B., Liebowitz, M. R., Kozak, M. J., Davies, S., Campeas, R., Franklin, M. E., ... Tu, X. (2005). Randomized, placebo-controlled trial of exposure and ritual prevention, clomipramine, and their combination in the treatment of obsessive-compulsive disorder. *The American Journal of Psychiatry*, 162(1), 151–161. <https://doi.org/10.1176/appi.ajp.162.1.151>
- Freeman, J., Sapyta, J., Garcia, A., Compton, S., Khanna, M., Flessner, C., ... Franklin, M. (2014). Family-based treatment of early childhood obsessive-compulsive disorder: The Pediatric Obsessive-Compulsive Disorder Treatment Study for Young Children (POTS Jr)—A randomized clinical trial. *JAMA Psychiatry*, 71(6), 689–698. <https://doi.org/10.1001/jamapsychiatry.2014.170>
- Hayes, S. C., Barnes-Holmes, D., & Roche, B. (2001). *Relational frame theory: A post-Skinnerian account of human language and cognition*. New York: Springer Science & Business Media.
- Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (2011). *Acceptance and commitment therapy, second edition: The process and practice of mindful change*. New York: Guilford Press.
- Jacoby, R. J., & Abramowitz, J. S. (2016). Inhibitory learning approaches to exposure therapy: A critical review and translation to obsessive-compulsive disorder. *Clinical Psychology Review*, 49, 28–40. <https://doi.org/10.1016/j.cpr.2016.07.001>
- Jacoby, R. J., Leonard, R. C., Riemann, B. C., & Abramowitz, J. S. (2014). Predictors of quality of life and functional impairment in Obsessive-Compulsive Disorder. *Comprehensive Psychiatry*, 55(5), 1195–1202. <https://doi.org/10.1016/j.comppsy.2014.03.011>
- Kendall, P. C. (2011). *Child and Adolescent Therapy, Fourth Edition: Cognitive-Behavioral Procedures*. New York: Guilford Press.
- Kenwright, M., Marks, I., Graham, C., Franes, A., & Mataix-Cols, D. (2005). Brief scheduled phone support from a clinician to enhance computer-aided self-help for obsessive-compulsive disorder: Randomized controlled trial. *Journal of Clinical Psychology*, 61(12), 1499–1508. <https://doi.org/10.1002/jclp.20204>
- Kushner, M. G., Kim, S. W., Donahue, C., Thuras, P., Adson, D., Kotlyar, M., ... Foa, E. B. (2007). D-cycloserine augmented exposure therapy for obsessive-compulsive disorder. *Biological Psychiatry*, 62(8), 835–838. <https://doi.org/10.1016/j.biopsych.2006.12.020>
- Lebowitz, E. R., Omer, H., Hermes, H., & Scahill, L. (2014). Parent Training for Childhood Anxiety Disorders: The SPACE Program. *Cognitive and Behavioral Practice*, 21(4), 456–469. <https://doi.org/10.1016/j.cbpra.2013.10.004>
- Lebowitz, E. R., Woolston, J., Bar-Haim, Y., Calvocoressi, L., Dauser, C., Warnick, E., ... Leckman, J. F. (2013). Family accommodation in pediatric anxiety disorders. *Depression and Anxiety*, 30(1), 47–54. <https://doi.org/10.1002/da.21998>
- Lindsay, M., Crino, R., & Andrews, G. (1997). Controlled trial of exposure and response prevention in obsessive-compulsive disorder. *The British Journal of Psychiatry: The Journal of Mental Science*, 171, 135–139. <https://doi.org/10.1192/bjp.171.2.135>
- Luxton, D. D., McCann, R. A., Bush, N. E., Mishkind, M. C., & Reger, G. M. (2011). mHealth for mental health: Integrating smartphone technology in behavioral health-care. *Professional Psychology: Research and Practice*, 42(6), 505. <https://doi.org/10.1037/a0024485>
- Maina, G., & Bogetto, F. (2001). Relapses after discontinuation of drug associated with... : International Clinical Psychopharmacology. *International Clinical Psychopharmacology*, 16, 33–38.
- Mataix-Cols, D., Fernández de la Cruz, L., Monzani, B., Rosenfield, D., Andersson, E., Pérez-Vigil, A., ... Thuras, P. (2017). D-Cycloserine augmentation of exposure-based cognitive behavior therapy for anxiety, obsessive-compulsive, and posttraumatic stress disorders: A systematic review and meta-analysis of individual participant data. *JAMA Psychiatry*, 74(5), 501. <https://doi.org/10.1001/jamapsychiatry.2016.3955>
- Mataix-Cols, D., & Marks, I. M. (2006). Self-help with minimal therapist contact for obsessive-compulsive disorder: a review. *European Psychiatry*, 21(2), 75–80. <https://doi.org/10.1016/j.eurpsy.2005.07.003>
- Mataix-Cols, D., Turner, C., Monzani, B., Isomura, K., Murphy, C., Krebs, G., & Heyman, I. (2014). Cognitive-behavioural therapy with post-session d-cycloserine augmentation for paediatric obsessive-compulsive disorder: pilot randomised controlled trial. *The British Journal of Psychiatry*, 204(1), 77–78. <https://doi.org/10.1192/bjp.bp.113.126284>
- McGuire, J. F., Piacentini, J., Lewin, A. B., Brennan, E. A., Murphy, T. K., & Storch, E. A. (2015). A meta-analysis of cognitive behavior therapy and medication for child obsessive-compulsive disorder: Moderators of treatment efficacy, response, and remission. *Depression and Anxiety*, 32(8), 580–593. <https://doi.org/10.1002/da.22389>
- Mehta, M. (1990). A comparative study of family-based and patient-based behavioural management in obsessive-compulsive disorder. *The British Journal of Psychiatry: The Journal of Mental Science*, 157, 133–135. <https://doi.org/10.1192/bjp.157.1.133>
- Meyer, V. (1966). Modification of expectations in cases with obsessional rituals. *Behaviour Research and Therapy*, 4, 273–280. [https://doi.org/10.1016/0005-7967\(66\)90023-4](https://doi.org/10.1016/0005-7967(66)90023-4)
- Norberg, M. M., Krystal, J. H., & Tolin, D. F. (2008). A meta-analysis of d-cycloserine and the facilitation of fear extinction and exposure therapy. *Biological Psychiatry*, 63(12), 1118–1126. <https://doi.org/10.1016/j.biopsych.2008.01.012>
- Olatunji, B. O., Davis, M. L., Powers, M. B., & Smits, J. A. J. (2013). Cognitive-behavioral therapy for obsessive-compulsive disorder: A meta-analysis of treatment outcome and moderators. *Journal of Psychiatric Research*, 47(1), 33–41. <https://doi.org/10.1016/j.jpsychires.2012.08.020>
- Piacentini, J., Bergman, R. L., Chang, S., Langley, A., Peris, T., Wood, J. J., & McCracken, J. (2011). Controlled comparison of family cognitive behavioral therapy and psychoeducation/relaxation training for child obsessive-compulsive disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, 50(11), 1149–1161. <https://doi.org/10.1016/j.jaac.2011.08.003>
- Pinto, A., Mancebo, M. C., Eisen, J. L., Pagano, M. E., & Rasmussen, S. A. (2006). The Brown Longitudinal Obsessive Compulsive Study: Clinical features and symptoms of the sample at intake. *The Journal of Clinical Psychiatry*, 67(5), 703–711.
- Rachman, S. J. (1997). A cognitive theory of obsessions. *Behaviour Research and Therapy*, 35(9), 793–802. [https://doi.org/10.1016/S0005-7967\(97\)00040-5](https://doi.org/10.1016/S0005-7967(97)00040-5)



- Rachman, S. J. (1998). A cognitive theory of obsessions: Elaborations. *Behaviour Research and Therapy*, 36(4), 385–401. [https://doi.org/10.1016/S0005-7967\(97\)10041-9](https://doi.org/10.1016/S0005-7967(97)10041-9)
- Ramos-Cerqueira, A. T. de A., Torres, A. R., Torresan, R. C., Negreiros, A. P. M., & Vitorino, C. N. (2008). Emotional burden in caregivers of patients with obsessive-compulsive disorder. *Depression and Anxiety*, 25(12), 1020–1027. <https://doi.org/10.1002/da.20431>
- Rescorla, R. A. (2006). Deepened extinction from compound stimulus presentation. *Journal of Experimental Psychology: Animal Behavior Processes*, 32(2), 135–144.
- Rescorla, R. A., & Wagner, A. R. (1972). A theory of Pavlovian conditioning: variations in the effectiveness of reinforcement and non-reinforcement. In A. H. Black, & W. F. Prokasy (Eds.), *Classical conditioning II: Current research and theory* (pp. 64–99). New York: Appleton-Century-Crofts.
- Ressler, K. J., Rothbaum, B. O., Tannenbaum, L., Anderson, P., Graap, K., Zimand, E., ... Davis, M. (2004). Cognitive enhancers as adjuncts to psychotherapy: Use of D-Cycloserine in phobic individuals to facilitate extinction of fear. *Archives of General Psychiatry*, 61(11), 1136–1144. <https://doi.org/10.1001/archpsyc.61.11.1136>
- Romanelli, R. J., Wu, F. M., Gamba, R., Mojtabai, R., & Segal, J. B. (2014). Behavioral therapy and serotonin reuptake inhibitor pharmacotherapy in the treatment of obsessive-compulsive disorder: A systematic review and meta-analysis of head-to-head randomized controlled trials. *Depression and Anxiety*, 1–12. <https://doi.org/10.1002/da.22232>
- Singewald, N., Schmuckermair, C., Whittle, N., Holmes, A., & Ressler, K. J. (2015). Pharmacology of cognitive enhancers for exposure-based therapy of fear, anxiety and trauma-related disorders. *Pharmacology & Therapeutics*, 149, 150–190. <https://doi.org/10.1016/j.pharmthera.2014.12.004>
- Storch, E. A., Caporino, N. E., Morgan, J. R., Lewin, A. B., Rojas, A., Brauer, L., ... Murphy, T. K. (2011). Preliminary investigation of web-camera delivered cognitive-behavioral therapy for youth with obsessive-compulsive disorder. *Psychiatry Research*, 189(3), 407–412. <https://doi.org/10.1016/j.psychres.2011.05.047>
- Storch, E. A., Merlo, L. J., Bengtson, M., Murphy, T. K., Lewis, M. H., Yang, M. C., ... Goodman, W. K. (2007). D-cycloserine does not enhance exposure-response prevention therapy in obsessive-compulsive disorder. *International Clinical Psychopharmacology*, 22(4), 230–237. <https://doi.org/10.1097/YIC.0b013e32819f8480>
- Storch, E. A., Murphy, T. K., Goodman, W. K., Geffken, G. R., Lewin, A. B., Henin, A., ... Geller, D. A. (2010). A preliminary study of D-cycloserine augmentation of cognitive-behavioral therapy in pediatric obsessive-compulsive disorder. *Biological Psychiatry*, 68(11), 1073–1076. <https://doi.org/10.1016/j.biopsych.2010.07.015>
- Storch, E. A., Wilhelm, S., Sprich, S., Henin, A., Micco, J., Small, B. J., ... Geller, D. A. (2016). Efficacy of augmentation of cognitive behavior therapy with weight-adjusted d-Cycloserine vs placebo in pediatric obsessive-compulsive disorder: A randomized clinical trial. *JAMA Psychiatry*, 73(8), 779–788. <https://doi.org/10.1001/jamapsychiatry.2016.1128>
- Subramaniam, M., Soh, P., Vaingankar, J. A., Picco, L., & Chong, S. A. (2013). Quality of life in obsessive-compulsive disorder: impact of the disorder and of treatment. *CNS Drugs*, 27(5), 367–383. <https://doi.org/10.1007/s40263-013-0056-z>
- Torres, A. R., Prince, M. J., Bebbington, P. E., Bhugra, D. K., Brugha, T. S., Farrell, M., ... Singleton, N. (2007). Treatment seeking by individuals with obsessive-compulsive disorder from the British psychiatric morbidity survey of 2000. *Psychiatric Services (Washington, D.C.)*, 58(7), 977–982.
- Tumur, I., Kaltenthaler, E., Ferriter, M., Beverley, C., & Parry, G. (2007). Computerised cognitive behaviour therapy for obsessive-compulsive disorder: a systematic review. *Psychotherapy and Psychosomatics*, 76(4), 196–202. <https://doi.org/10.1159/000101497>
- Twohig, M. P., Abramowitz, J. S., Bluett, E. J., Fabricant, L. E., Jacoby, R. J., Morrison, K. L., ... Smith, B. M. (2015). Exposure therapy for OCD from an acceptance and commitment therapy (ACT) framework. *Journal of Obsessive-Compulsive and Related Disorders*, 6, 167–173. <https://doi.org/10.1016/j.jocrd.2014.12.007>
- Twohig, M. P., Hayes, S. C., Plumb, J. C., Pruitt, L. D., Collins, A. B., Hazlett-Stevens, H., & Woidneck, M. R. (2010). A randomized clinical trial of acceptance and commitment therapy versus progressive relaxation training for obsessive-compulsive disorder. *Journal of Consulting and Clinical Psychology*, 78(5), 705–716. <https://doi.org/10.1037/a0020508>
- Vogel, P. A., Launes, G., Moen, E. M., Solem, S., Hansen, B., Haaland, A. -T., & Himle, J. A. (2012). Videoconference-and cell phone-based cognitive-behavioral therapy of obsessive-compulsive disorder: a case series. *Journal of Anxiety Disorders*, 26(1), 158–164. <https://doi.org/10.1016/j.janxdis.2011.10.009>
- Vogel, P. A., Stiles, T. C., & Gotestam, K. G. (2004). Adding cognitive therapy elements to exposure therapy for obsessive compulsive disorder: A controlled study. *Behavioural and Cognitive Psychotherapy*, 32, 275–290. <https://doi.org/10.1017/S1352465804001353>
- Whiteside, S. P., Ale, C. M., Vickers Douglas, K., Tiede, M. S., & Dammann, J. E. (2014). Case examples of enhancing pediatric OCD treatment with a smartphone application. *Clinical Case Studies*, 13(1), 80–94. <https://doi.org/10.1177/1534650113504822>
- Wilhelm, S., Buhlmann, U., Tolin, D. F., Meunier, S. A., Pearlson, G. D., Reese, H. E., ... Rauch, S. L. (2008). Augmentation of behavior therapy with D-cycloserine for obsessive-compulsive disorder. *The American Journal of Psychiatry*, 165(3), 335–341. <https://doi.org/10.1176/appi.ajp.2007.07050776>
- Williams, M. T., Davis, D., Powers, M., & Weissflog, L. (2014). Current trends in prescribing medications for obsessive-compulsive disorder: Best practices and new research. *Directions in Psychiatry*, 34, 247–259.
- Wootton, B. M., Titov, N., Dear, B. F., Spence, J., Andrews, G., Johnston, L., & Solley, K. (2011). An Internet administered treatment program for obsessive-compulsive disorder: A feasibility study. *Journal of Anxiety Disorders*, 25(8), 1102–1107. <https://doi.org/10.1016/j.janxdis.2011.07.009>

RECEIVED: August 23, 2017

ACCEPTED: September 4, 2017

AVAILABLE ONLINE: September 14, 2017