

A neuropsychiatric review of pediatric obsessive-compulsive disorder: etiology and efficacious treatments

Adam B Lewin
Eric A Storch
Gary R Geffken
Wayne K Goodman
Tanya K Murphy

Department of Psychiatry, University
of Florida, Gainesville, FL, USA

Abstract: Pediatric obsessive-compulsive disorder (OCD) is a chronic neuropsychiatric condition associated with broad impairments in functioning. This paper outlines current etiological theories of OCD, providing a review of neuroanatomical, neurochemical, neuroimmunological, and cognitive-behavioral explanations. Subsequently, first-line treatment modalities are discussed (serotonin reuptake inhibitors [SRIs] and cognitive-behavioral therapy [CBT] with exposure and response prevention [E/RP]) in the context of recent pharmacological, CBT, and combined trials.

Keywords: OCD, pediatric, etiology, treatment, serotonin reuptake inhibitors, cognitive behavioral therapy

Pediatric obsessive-compulsive disorder (OCD) is an impairing neurobehavioral disorder that is generally highly responsive to treatment. OCD is associated with frontal-subcortical dysfunction, specifically in the cortical-striatal-thalamo-cortical (CSTC) loops that integrate motoric and cognitive functioning. One of the most common childhood psychiatric illnesses (Stewart et al 2004), data from recent epidemiological studies suggest that lifetime prevalence rates of OCD among pediatric populations range between 1% and 4% (Flament et al 1988; Douglass et al 1995; Zohar 1999). Recent estimates suggest that 50%–80% of cases have a childhood onset (Millet et al 2004). Although OCD is less common in younger children, dramatic increases in prevalence occur during adolescence (Heyman et al 2001), with a bimodal age of onset distribution, the initial peak incidence occurring prepuberty and the second in early adulthood (Pauls et al 1995). There is a male predominance (3:2, male:female ratio; Geller 1998) and earlier age of onset for males (Swedo et al 1989a). Recent data suggest high rates of comorbid mood, anxiety, attention-disruptive behavior (eg, attention deficit hyperactivity disorder [ADHD], oppositional defiant disorder [ODD]), and tic disorders (Geller et al 2003a; POTS 2004).

OCD is characterized by the presence of obsessions (persistent and intrusive thoughts, ideas, impulses, or images that result in anxiety) and/or compulsions (repetitive or ritualistic behaviors or mental acts that reduce or prevent anxiety in response to the obsessive thought) that cause distress, are time-consuming, or interfere with age-appropriate functioning (APA 2000). Expression of OCD in youth is similar to that in adulthood, with the exception that children are not required to view their OCD symptoms as bizarre and unrealistic. Notably, children may not even view their symptoms as unpleasant (AACAP 1998; Geffken et al 2005). Obsessions and compulsions are generally linked; compulsions function as behavioral or mental actions that serve to reduce anxiety elicited by obsessions. Common obsessions and compulsions in children include worries about harm to self or others, fears of

Correspondence: Eric A Storch
Department of Psychiatry, University of
Florida, Box 100234, Gainesville,
FL 32610, USA
Tel +1 352 392 3611
Fax +1 352 846 1455
Email estorch@psychiatry.ufl.edu.

contamination, the need for exactness and order, and religious–moralistic concerns (Swedo et al 1989a). Common compulsions–rituals include washing–decontamination rituals (excessive hand washing, showering, or bathing), confessing, checking–reassurance-seeking, ordering–arranging, praying, and avoidance.

Etiology

Prior to discussing efficacious treatments, a review of neuroanatomical (structural and functional), biochemical, autoimmune–neuroimmunological, and cognitive–behavioral etiologies of OCD are presented to provide the correspondence of these mechanisms to the pathophysiology of OCD and treatment modalities. To date, data suggest that abnormal brain serotonin metabolism is a key factor in OCD: serotonin is believed to mediate the expression of OCD symptoms. Research also suggests that disturbance in the frontal–limbic (thalamic)–basal ganglia system, areas of the brain associated with procedural learning and implicit memory, may relate to OCD symptoms. (The basal ganglia include the striatum [which includes the caudate nucleus, putamen, and nucleus accumbens].) It is believed that overactivity in the orbito–prefrontal cortex may lead to fastidiousness, excessive concerns, and meticulousness (Rauch et al 1998). Further, disruption to the head of the caudate nucleus may impair filtering of information entering the frontal cortex (Kozak and Foa 1997). Overall, it is believed that in patients with OCD, there is disruption to the system that (1) filters information (eg, intrusive thoughts) from reaching the consciousness and (2) mediates stereotyped–automated behaviors (Rauch et al 1998). The following section provides a review in greater detail.

Neuroanatomical

The neurobiology of OCD is associated with abnormalities in components of the frontal–subcortical circuitry. These circuits are believed to link the cortex to areas of the brain involved in the initiation of behavioral responses that are implemented with minimal conscious attentiveness (Saxena et al 2001). Moreover, these corticostriatal systems filter preconscious cognitions and mediate stereotyped behaviors – dysfunction or overactivity of these systems may explain intrusive cognitions and ritualized behaviors associated with OCD (Rauch et al 1998). More specifically, feedback loops involving orbitofrontal cortex, striatum, thalamus, and the basal ganglia (ie, the CSTC circuit) may mediate intrusive thoughts and repetitive behaviors (Saxena et al 1998; Szeszko et al 2004). Disruption of this feedback system may

lead to symptoms consistent with OCD. Structural imaging studies lend support for this neurobiological model. For example, data from volumetric magnetic resonance imaging (MRI) suggested that patients with OCD had smaller globus pallidus volumes than normal controls and increased anterior cingulate gyrus gray matter (Szeszko et al 2004). Rosenberg and Keshavan (1998) also found increased volume of the anterior cingulate gyrus among pediatric OCD patients. Thalamic volumes have been identified to be larger among pediatric patients with OCD relative to controls (Gilbert et al 2000). Kim et al (2001) identified increased gray matter densities in both the cortex and subcortical areas of adult patients with OCD, especially the left orbitofrontal cortex. This finding suggesting that this region’s role in inhibitory motor control may be linked to patients with OCD having difficulties resisting rituals (Kim et al 2001).

Functional neuroimaging techniques have also been utilized and have implicated the cortical–striatal pathway (consisting of the orbitofrontal cortex and the caudate nucleus) in the pathogenesis of OCD (Rauch and Baxter 1998). Functional MRI (fMRI) has implicated hyperactivity in the anterior cingulate cortex with symptoms consistent with OCD (eg, overmonitoring of one’s actions and behaviors; Ursa et al 2003). Further, Kim et al (2001) suggested that hyperfunctioning of these circuits may increase gray matter density observed in volumetric studies. This is consistent with functional neuroimaging studies using positron emission tomography (PET) (Swedo et al 1989b; McGuire et al 1994; Rauch et al 1994). However, increased glucose metabolism identified in the globus pallidus, caudate nucleus, and putamen may be inconsistent with volumetric studies showing reduced volume of these structures (Kim et al 2001). Giedd et al (2000) reported increased volume of the basal ganglia (eg, caudate, putamen, and globus pallidus). Overall, a recent meta-analysis of functional neuroimaging identified that differences in the left orbitogyrus and in the right head of the caudate were the most consistent markers in distinguishing patients with OCD from controls (Whiteside et al 2004).

Biochemical

Neurochemical models complement neurobiological findings from imaging studies implicating serotonin in the expression of symptoms (Gilbert et al 2000). Although primary support for neurochemical models of OCD are by the efficacy of serotonin reuptake inhibitors (SRIs) (see Flament and Bisserbe 1997; Grados et al 1999; Dougherty et al 2002), they must be taken in the context of

neuroanatomical data (Rauch et al 1998). Specifically, serotonergic medications modulate serotonin neurotransmission within the frontal cortex–thalamocortical circuits in a way that could explain their therapeutic effectiveness as antiobsessional (Baxter et al 1996; Rauch et al 1998). For example, Baxter et al (1992) found (using PET) decreased thalamic glucose metabolism in adult patients with OCD after selective serotonin reuptake inhibitor (SSRI) treatment with fluoxetine. In patients with pediatric-onset OCD, PET revealed a significant decrease in orbitofrontal regional cerebral glucose metabolism following SRI therapy with either clomipramine or fluoxetine (Swedo et al 1992). The decreased orbitofrontal glucose metabolism was associated with reductions of OCD symptoms (Swedo et al 1992). Volumetric MRI studies have identified decreased thalamic volumes among pediatric patients with OCD following treatment with paroxetine (Gilbert et al 2000).

However, Zohar et al (2000) suggested that the serotonergic hypothesis is not sufficient in explaining the biochemistry of OCD. Evidence suggests that the dopaminergic system may also be involved in the pathophysiology of OCD (Goodman et al 1990). For example, differences in the dopaminergic system in the caudate and putamen have been identified in patients with OCD (Denys et al 2004; van der Wee et al 2004). These studies suggest the role of the neurotransmitter dopamine in the pathogenesis of OCD. The glutamatergic system has also been linked to OCD. Recent research in adolescents with OCD identified significantly reduced glutamate concentrations in the anterior cingulate compared with that in healthy controls (Rosenberg et al 2004).

PANDAS and neuroimmunological–autoimmune etiologies

Autoimmune factors have also been implicated in the pathogenesis of pediatric OCD. Swedo et al. (1998) coined the term Pediatric Autoimmune Neuropsychiatric Disorders Associated with Streptococcus (PANDAS) – a malfunction in the immune system associated with the onset and progression of neuropsychiatric disorders such as OCD and Tourette’s disorder. Historic and recent literature suggests that pediatric OCD is more prevalent among patients with Sydenham’s chorea (SC) that occurs secondary to an autoimmune reaction to Group A β -hemolytic streptococcus (GAS). This autoimmune response to GAS cross-reacts with epitopes (sites on an antigen that interact with specific antibodies) on the basal ganglia, resulting in motor and

behavioral disturbances (Bronze and Dale 1993). Moreover, Swedo (1994) reported that a subset of patients with pediatric OCD presented with several characteristics of SC but lacked choreiform movements and other central manifestations of rheumatic fever. Diagnostic criteria for PANDAS include: (1) the presence of OCD and/or a tic disorder; (2) prepubertal onset of these symptoms (age 3 years to puberty); (3) episodic–sawtooth course of symptom severity or abrupt onset; (4) an association with GAS (eg, a history of rheumatic fever, positive streptococcus throat culture); and (5) neurological abnormalities such as motoric hyperactivity or adventitious movements (Swedo et al 1998).

It is believed that the autoimmune response to GAS in PANDAS results in inflammation of the basal ganglia that is similar to the mechanism in SC (Leonard and Swedo 2001; Murphy et al 2004). Studies have found increased antineuronal antibody binding to basal ganglia tissue in SC patients that correlate with symptom severity (Husby et al 1976; Kotby et al 1998). Patients with a propensity to produce high levels of proinflammatory cytokines in response to GAS may exhibit more severe clinical manifestations (ie, more intense OCD or tic disorder symptoms) (Leckman et al 2005). Further, new research supports antibody-mediated neuronal cell signaling in the pathogenesis of SC (Kirvan et al 2003). Potential mechanisms by which autoantibodies cause clinical manifestations in PANDAS include direct stimulation or blockade of receptors in the basal ganglia, or immune complexes promoting inflammation of these brain regions; studies have found that increased antineuronal antibody binding to basal ganglia tissue in SC patients correlates well with symptom severity (Husby et al 1976; Kotby et al 1998). Overall, the acquired basal ganglia dysfunction following the GAS autoimmune reaction may result in neuropsychiatric and behavioral symptoms consistent with pediatric OCD including: chorea, tics, obsessions, compulsions, and hyperactivity (Kurlan and Kaplan 2004). In addition to PANDAS, there are other noteworthy variants of pediatric OCD. For example, OCD with a strong family aggregation of Tourette’s disorder may constitute an alternative expression of the familial OCD phenotype (Grados et al 2001). Research suggests putative differences in pathophysiology between the patients with OCD and Tourette’s disorder compared with patients with OCD without Tourette’s (eg, in addition to the serotonergic neurotransmitter system, dopamine and endogenous opioids have been implicated in patients with OCD and Tourette’s disorder (Petter et al 1998). Neuroimaging studies suggest

the role of the corticostriatal circuits in these patients (Coffey et al 1998).

Cognitive–behavioral

Behavioral accounts of the etiology of OCD are based on two stages (Mowrer 1939, 1960): (1) acquisition of fear and avoidance via classical conditioning, and (2) maintenance via operant conditioning (Dollard and Miller 1950; Franklin and Foa 2002). First, a neutral stimulus or event becomes associated with a feared or unpleasant stimulus. By virtue of this association, the neutral stimulus becomes conditioned to elicit distress. This process can include both physical stimuli (eg, specific locations, contaminated items) and mental events (eg, dangerous thoughts; Franklin and Foa 2002). Subsequently, behaviors that function to reduce distress associated with the conditioned stimulus develop. These behaviors (ie, compulsions or rituals) are operantly maintained via a negative-reinforcement paradigm, because they temporarily ameliorate the distress associated with obsessive thoughts. Over time, these behaviors persist and become excessive; the reduction in anxiety following a compulsive behavior precipitates an increase in future reliance on compulsive behaviors.

Cognitive models are also considered central to the etiology of OCD (OCCWG 1997; Salkovskis 1999). Salkovskis (1999) posits that *appraisals* of intrusive thoughts, images, and impulses, rather than their occurrences, characterize OCD. For example, obsessional patterns develop if intrusive thoughts are interpreted to indicate responsibility for causing (or failing to prevent) harm to self or others. In general, obsessions can be inductively reduced to six intrusive belief patterns commonly misappraised among patients with OCD: (1) exaggerated sense of responsibility; (2) overvalued importance of thoughts; (3) inflated concern about the importance of controlling one's thoughts; (4) overestimation of threat; (5) intolerance of ambiguity–uncertainty; and (6) perfectionism (OCCWG 1997). Salkovskis (1999) suggested a circular pattern of intrusive thoughts→misappraisals→distress-neutralizing behaviors→increased intrusive thoughts. In other words, patients with OCD attempt to neutralize intrusive thoughts (eg, a misperceived threat or responsibility) via motor or cognitive rituals, avoidance, and reassurance-seeking behavior. This prevents the disconfirmation of the patient's fears and facilitates proliferation of the anxiety – future cognitive intrusions are more likely followed by continued misappraisal.

Evidence for neurobiological changes following cognitive–behavioral interventions is inconclusive. For example, studies have identified metabolic changes in the thalamus and the caudate nucleus following cognitive–behavioral therapy (CBT) in adult patients with OCD (Baxter et al 1992). Contradictory findings were reported in another study in children with OCD following a 12-week course of CBT (Benazon et al 2003).

Although further etiological research is essential, overall, the extant neuroimaging and psychopharmacological studies combine to provide compelling support for neurobiological abnormalities in patients with OCD (Flament and Bisslerbe 1997). Behavioral and cognitive etiologies are not inconsistent with these findings: individuals with neurochemical, neuroimmunological, or neurostructural abnormalities may be predisposed to behavioral conditioning. Neuroimaging studies have identified changes in the corticostriatal system associated with both symptom provocation and following effective treatment with both SRIs and CBT (Rauch and Baxter 1998). Further, the neuropsychiatric syndrome associated with PANDAS proposes acquired dysfunction of the basal ganglia – and integral structure in the CSTC circuit (implicated in neurostructural and functional assessments). These advances in neuroimaging, neurochemistry, and neuroimmunology can elucidate the mechanisms of both OCD symptom expression and behavioral–pharmacological treatments (Breiter and Rauch 1996; Grados and Riddle 2001).

Effective interventions

The two empirically supported treatment modalities for pediatric OCD are: pharmacotherapy with an SSRI or SRI and CBT with exposure and response prevention (E/RP). CBT or CBT with concurrent pharmacotherapy using an SSRI is considered the first-line treatment for pediatric OCD (AACAP 1998; March et al 2001; Dougherty et al 2002; POTS 2004).

Pharmacotherapy

The efficacy of pharmacotherapy for OCD in pediatric populations has been demonstrated in several controlled trials with SRIs and SSRIs. The most researched SRI in the treatment of pediatric OCD is the tricyclic antidepressant (TCA) clomipramine (AACAP 1998; Grados and Riddle 2001). In a double-blind, 8-week, placebo-controlled study of clomipramine, DeVeaugh-Geiss et al (1992) found that 60% of pediatric patients showed significant improvement.

Patients treated with clomipramine reported a 37% mean reduction in OCD symptoms compared with 8% for the placebo group (as assessed using the Children's Yale-Brown Obsessive-Compulsive Scale [CYBOCS, Scahill et al 1997]). In another, 10-week controlled trial, Flament et al (1985) found a significant difference between clomipramine and placebo, 75% of pediatric patients showing at least moderate improvement. Other research found that clomipramine was superior to the noradrenergic reuptake inhibiting TCA desipramine (Leonard et al 1989). This crossover trial found that 64% of patients who initially received clomipramine during their first treatment showed relapse of OCD symptoms during desipramine treatment (Leonard et al 1989). Overall, a recent meta-analysis of pharmacotherapy trials in children identified clomipramine to be significantly superior over SSRIs in reducing OCD symptoms (Geller et al 2003b). Nevertheless, the risk profile, adverse effects, and required EKG and blood-level monitoring associated with TCAs (eg, antiadrenergic, anticholinergic, and antihistaminergic adverse effects) are of concern with clomipramine (AACAP 1998; Geller 1998; Grados et al 1999).

More recently, a multitude of placebo-controlled trials has demonstrated the efficacy of SSRIs. In a 20-week, double-blind, placebo-controlled trial of the SSRI fluoxetine in children and adolescents with OCD, 44% reductions in OCD symptoms were reported (Riddle et al 1992). A 13-week controlled trial conducted by Geller et al (2001) also demonstrated the efficacy of fluoxetine, with 55% of patients treated with fluoxetine rated as much or very much improved. Another, 16-week, placebo-controlled trial of fluoxetine in children reported that 57% of patients demonstrated significant improved ratings on the CGI (Liebowitz et al 2002). Several open trials also present favorable findings for the use of fluoxetine for pediatric OCD (see Geller 1998 for a review).

Data also support the use of the SSRI sertraline for the treatment of pediatric OCD. March et al (1998) conducted a 12-week, multicenter, randomized, placebo-controlled trial in children and adolescents with OCD. Forty-two percent of patients receiving sertraline were rated as much or very much improved. Further, in a 52-week, open-label extension of the previous study, 71% of children (ages 6–12 years) and 61% of adolescents (ages 13–18 years) demonstrated 25% decreases on the CYBOCS and were rated as much/very much improved (Cook et al 2001). More recently, another multisite, randomized, controlled trial found that 21.4% of pediatric patients entered clinical remission

(defined as CYBOCS ≤ 10) following a 12-week course of sertraline (POTS 2004).

Finally, controlled trials have found the SSRIs fluvoxamine and paroxetine to be efficacious and well-tolerated treatments for children and adolescents with OCD. Riddle et al (2001) found that 42% of patients responded to fluvoxamine (based on a 25% reduction on the CYBOCS) while participating in a 10-week, multicenter, placebo-controlled trial. A recent 10-week, placebo-controlled trial of paroxetine for pediatric patients with OCD found that 61% of patients responded to medication (based on a 25% reduction in the CYBOCS) (Geller et al 2004). In an open-label trial of paroxetine for pediatric OCD ($n=335$), 71% of patients demonstrated clinical improvement (defined by a rating of much or very much improved) (Geller et al 2003a). It is noteworthy that the response rate for patients with a diagnosis of OCD (75%) was significantly greater than for patients with comorbid psychopathology, eg, ADHD (56%), tic disorder (53%), and ODD (39%). Overall, patients with any one comorbid condition had an average response rate of 68% to paroxetine; patients with any two or three co-occurring conditions averaged 63% and 59% rates of response (Geller et al 2003a).

Overall, clinically significant reductions in OCD symptomology have been documented in children and adolescents using SSRIs, including fluoxetine, sertraline, fluvoxamine, and paroxetine, with a relatively minimal side-effect profile (compared with clomipramine). Based on these findings, SSRIs are the consensus first-line medication for pediatric OCD (Grados and Riddle 2001; Liebowitz et al 2002; Geller et al 2003b; POTS 2004). Although there are no controlled comparisons between these medications in children, research suggests that the SSRIs are equally efficacious in children and the specific choice should be based on the patient's medical history, concomitant medications, and the adverse-events profile (Snider and Swedo 2000; Geller et al 2003b). Poor clinical response to one SSRI is not necessarily predictive of failure with other SSRIs, suggesting adequate trials of multiple SSRIs may be indicated before augmentation (AACAP 1998). Significant clinical response is unlikely within the first few weeks of an SSRI – generally, 10–12 weeks at adequate dosage is necessary to fully evaluate the efficacy of the medication (AACAP 1998).

In pediatric cases that are unresponsive to CBT and trials with multiple SSRIs, second-line pharmacological treatments include augmentation (Dougherty et al 2002). Grados and Riddle (2001) discuss five augmentation

approaches for refractory pediatric OCD including: (1) typical neuroleptics (eg, haloperidol and pimozide); (2) atypical neuroleptics (eg, olanzapine, risperidone, and quetiapine); (3) lithium and buspirone; (4) clomipramine; and (5) benzodiazepines (eg, clonazepam). In the adult OCD treatment literature, numerous agents have been used in combination with SRIs for patients whose symptoms have not been reduced in monotherapy. For example, a limited number of controlled trials and case series in adults support the augmentation of SRI pharmacotherapy with either low doses of the dopamine antagonist haloperidol or the benzodiazepine clonazepam (for reviews, see Geller 1998; Dougherty et al 2002). Unlike the adult literature, however, there is a paucity of empirical data supporting augmentation strategies for pediatric OCD. Additionally, significant undesirable side-effects should be considered prior to prescribing neuroleptics and benzodiazepines in children. Two pediatric case-series suggest that SSRI augmentation with clomipramine resulted in marked improvement, but this combination requires diligent blood, EKG, and side-effect monitoring (Simeon et al 1990; Figueroa et al 1998). Lithium carbonate, buspirone, and clonidine have generally not been efficacious augmentation strategies for treatment-refractory OCD in adults (see Grados and Riddle 2001 for a review). There is preliminary support for SSRI augmentation with atypical antipsychotics for refractory OCD in adult patients. For example, an 8-week, double-blind, placebo-controlled trial was performed to determine the efficacy of risperidone augmentation in adults with treatment-resistant OCD (Hollander et al 2003). Forty percent of patients responded to augmentation with risperidone, although a small sample size limits the generalization of these findings. Two recent meta-analyses of off-label use of neuroleptics (haloperidol, risperidone, olanzapine, and quetiapine; Sareen et al 2004) and atypical neuroleptics (risperidone, olanzapine, and quetiapine; Fountoulakis et al 2004) in adults with OCD suggest that initial findings from open-trials, controlled trials, and case-series are promising despite a need for substantial further research. A recent open trial of mirtazapine in adults with OCD resulted in a 53.3% response rate (Koran et al 2005a). Preliminary data suggest the potential efficacy of opioids as alternative therapies for treatment-resistant OCD in adults using oral morphine (Koran et al 2005b) and tramadol hydrochloride (Goldsmith et al 1999). Finally, the OCD subtype etiologically related to Tourette's disorder (see above) may require combined therapy of serotonin-reuptake

inhibitors plus neuroleptics or other augmentation strategies (see Miguel et al 2003 for a review).

Given recent concern regarding the safety of SSRIs in children, we will outline medications currently approved by the United States Food and Drug Administration (FDA) for pediatric use: sertraline (not under age 6 years), fluoxetine (not under 7), and fluvoxamine–paroxetine (not under 8). The TCA clomipramine is also FDA approved for children age 10 and older. On October 15 2005, the FDA issued a Black Box Warning for antidepressant medications to alert health care providers to an increased risk of suicidality (suicidal thinking and behavior) in children and adolescents being treated with these agents. In light of this warning, increased attention to symptoms of depression among pediatric patients being treated with antidepressant medications appears warranted. This should include formal assessment of suicidal ideation before and throughout the course of pharmacological treatment. This Black Box Warning may suggest a need for expedited research on other classes of medications (see above; eg, atypical neuroleptic). An additional implication of this warning may be to attempt an adequate trial of the cognitive-behavioral therapy (the other first-line treatment for pediatric OCD; see below) prior to pharmacological intervention.

Cognitive–behavioral therapy

The efficacy of CBT in children has been demonstrated in numerous open trials (March et al 1994; Franklin et al 1998; Thienemann et al 2001; Benazon et al 2002; Piacentini et al 2002) and three controlled trials (de Hann et al 1998; Barrett et al 2004; POTS 2004). Indeed, treatment response rates in the extant CBT trials was quite high, ranging from 57% to 88% (Bolton et al 1995; Franklin et al 1998; Benazon et al 2002; Piacentini et al 2002; Barrett et al 2004). Preliminary data also support the use of CBT for PANDAS (Storch et al 2004). Further, unlike pharmacotherapies (for which relapse is not uncommon when medication is discontinued) treatment gains from CBT commonly endure after therapy is completed (AACAP 1998). In contrast, CBT with E/RP for OCD is distinguished from other “talk-therapies” with no supported efficacy in the extant literature. Generally, no demonstrated effects for play-based, supportive, insight-oriented, relaxation, psychoanalytic, and psychodynamic therapies have been identified for the treatment of pediatric OCD (AACAP 1998; March and Mulle 1998; March et al 2001; Franklin and Foa 2002; Piacentini and Langley 2004). Aspects of CBT for OCD

are discussed below; treatment manuals are available for further detail, eg Lewin et al (2005); March and Mulle (1998).

Efficacious CBT protocols consist of exposure (placing the patient in situations that elicit anxiety related to their obsessions), response prevention (detering the compulsive or ritualistic behaviors, which may serve to reduce or avoid anxiety, from occurring), and cognitive therapy (training the patient to identify and reframe anxiety-provoking cognitions) (Lewin et al 2005). Prior to beginning E/RP, education about OCD is provided to both the patient and family (often in context of a story for young children). It is explained to the patient and his/her family that compulsions–rituals–avoidance are (1) ineffective at reducing anxiety in the long term; (2) interfere with normal functioning; and (3) prevent the child from developing more effective strategies for coping with anxiety. Specifically, because compulsive behaviors–rituals actually function to reduce anxiety in the short term (and make the child feel better, albeit temporarily), these behaviors are more likely to be used the next time an obsessive thought occurs (Franklin and Foa 2002).

Also at this phase of treatment, a “fear-hierarchy” is developed. The hierarchy consists of situations the patient avoids or for which the patient would find it difficult to inhibit compensatory overt or mental rituals. The therapist assists the family and patient to develop a list of stimuli–situations that would elicit a range of symptoms from mild discomfort to incapacitating anxiety in the child (if compensatory compulsions–rituals are prevented). The child is then instructed to rate how anxiety provoking each situation would be, on a scale of 0 (no anxiety) to 100 (extreme anxiety). The hierarchy consists of situations the patient avoids or for which the patient finds it difficult to inhibit rituals. Subjective units of disturbance scales (SUDS) with a narrower range (eg, 0–10) may be more appropriate for younger children with OCD who might have difficulty selecting from a wide range. March and Mulle’s (1998) fear thermometer can be helpful in establishing SUDS ratings with younger children.

Next, the therapist and child begin hierarchy-based E/RP according to stimuli identified on the patient’s fear-hierarchy (typically starting at the least-distressing situation and progressing up the hierarchy during subsequent sessions). E/RP involves gradual exposure to anxiety-provoking stimuli while refraining from rituals (Meyer 1966); the procedure is based on the assumption that

compulsions are performed to reduce and/or avoid anxiety associated with obsessions (ie, obsessions and compulsions are functionally related; Franklin and Foa 2002). The E/RP exercise provides the patient with objective experiences to contradict the inaccurate expectations that motivate rituals (Foa and Kozak 1996). During E/RP exercises, the *exposure* component relies on the gradual attenuation of anxiety after sufficient duration or contact with a feared stimulus (March et al 2001). Successive exposures with the feared stimulus result in both decreased elevations in anxiety and more rapid attenuation of distress. The *response-prevention* component is based on the assumption that rituals–compulsions function to reduce anxiety in the short term. However, the short-term escape–avoidance of anxiety actually maintains–increases the likelihood of compulsive behavior as well as continued distress via negative reinforcement. Therefore, individuals with OCD rely on rituals–avoidance to mitigate distress and never habituate to anxiety. Therefore, the function of E/RP is for the individual to terminate the negative reinforcement paradigm (ie, ending the compulsive behavior–avoidance) so that anxiety can be reduced via habituation instead of by rituals. In sum, treatment should include concurrent E/RP. Taken together, these treatment components teach youth with OCD that (1) the anxiety they experience in response to OCD-triggers will come down on its own without having to resort to rituals and (2) that even without rituals, the occurrence of the dreaded outcome is highly unlikely.

In addition to E/RP, adjunctive cognitive strategies are utilized with pediatric patients. Salkovskis (1999) outlined an OCD-specific form of cognitive therapy with adults, which may be applied to children. However, younger children, and those with impaired cognitive functioning, receive fewer and less sophisticated cognitive components to treatment due to developmental and cognitive limitations. A child’s age, cognitive functioning, and insight into the nature of his/her OCD is paramount in determining the direction of treatment, as introduction of cognitive components of therapy depends on the child’s developmental level and insight. Cognitive techniques include *cognitive restructuring* (eg, teaching the patient to challenge anxiety-provoking thoughts and/or the necessity of performing compulsive behaviors). In other words, the patient should construct and validate alternative, less threatening explanations for intrusive thoughts–images–doubts rather than focusing on disconfirming negative beliefs (Salkovskis 1999). If intrusive thoughts are not negatively interpreted, they are less likely to be viewed as significant. Despite the

utility of cognitive restructuring for children with OCD along with E/RP, clinicians must be ever-alert to the possibility that a “re-framed” thought can become a ritual for a child with OCD. For example, during therapy a child is taught to restructure fears about using a public toilet, such as, “It’s okay to sit on the toilet – I won’t get sick.” However, it is not uncommon for children to replace a ritual with a mental ritual (eg, needing to repeat the aforementioned statement) in order to reduce anxiety, thus maintaining OCD. Teaching children coping phrases and self-talk (eg, “I can beat my OCD!” or “It may be hard, but I can do it”) can assist children to manage obsessions but may be less likely to become replacement rituals. March and Mulle (1998) outline examples of self-talk strategies.

Although CBT for OCD is typically conducted via weekly 1-hour sessions (eg, March et al 1994; Benazon et al 2002; Barrett et al 2004; POTS 2004), an alternative CBT format has been utilized for the treatment of refractory pediatric OCD. Intensive cognitive behavioral therapy (I-CBT) for OCD involves techniques similar to traditional CBT with E/RP (Lewin et al 2005). However, the frequency and duration of the sessions are increased from weekly 50-minute sessions to daily 90-minute sessions. Research suggests that prolonged, continuous exposures are superior to shorter, intermittent exposures (Rabavilas et al 1976). Preliminary research supports the use of I-CBT in cases of difficult-to-treat pediatric OCD. In one open trial of I-CBT for refractory pediatric OCD, all five children who participated were treatment responders and showed significant decreases in OCD symptomatology (Storch and Geffken 2004). A noncontrolled trial by Franklin et al (1998) and several case reports (Franklin et al 2001; Storch et al 2004; Storch et al 2005; Fernandez et al in press) also found support for I-CBT. Although a randomized controlled study of I-CBT in adults produced promising results (Abramowitz et al 2003), there has yet to be a controlled trial of I-CBT versus weekly CBT for OCD in children and adolescents.

There are several prognostic indicators of a positive response to CBT for pediatric OCD. First, family involvement is central to the success of CBT for pediatric OCD (Knox et al 1996; Barrett et al 2004). In addition to extinction and differential reinforcement procedures (see Francis 1988; Fernandez et al in press), parents and families can provide substantial emotional and instrumental support with treatment. Other positive indicators include the child’s willingness to cooperate with treatment, the presence of overt rituals, motivation to eliminate rituals–symptoms, developmental level, and the ability to monitor and report

symptoms (March et al 2001). Conversely, several putative factors are associated with a poor response to CBT. These include extensive co-occurring psychiatric conditions (see Geller et al 2003a), impaired cognitive development (eg, developmental delay, mental retardation, and very young children; AACAP 1998); and individuals with poor insight into the senselessness of their obsessions and compulsions (Franklin and Foa 2002). Certain family factors may negatively influence CBT for OCD. For example, parents pushing their children too hard during E/RP (eg, moving up the hierarchy too quickly prior to assignment by the therapist), parents sabotaging exposures and/or being overly punitive (eg, throwing an item the child believes to be contaminated at the child without warning), or parents with OCD or other anxiety disorders themselves. Further research in the area of family factors and treatment outcomes appears warranted. Although children with OCD and Tourette’s disorder are considered to be less responsive to treatment, CBT is considered the first-line treatment for these patients (Miguel et al 2003).

Conclusions

CBT alone or CBT with concurrent SSRI therapy are considered the first-line treatments (POTS 2004). Although there are few controlled comparisons between CBT, medication, and concomitant CBT and SRI in pediatric samples with OCD, CBT was found to be superior to medication alone (clomipramine, de Hann et al 1998; sertraline, POTS 2004). In addition, supplemental CBT has been demonstrated to be effective following unsuccessful fluoxetine treatment for adults with OCD (Kampman et al 2002).

Despite the efficacy of CBT with E/RP, the lack of professionals trained in CBT for OCD is among the greatest barriers to successful treatment (AACAP 1998). This limited access to specialists familiar with empirically supported treatments (eg, CBT with E/RP) may result in the prescription of pharmacotherapy alone and/or other psychotherapies that have not been demonstrated as efficacious (eg, play therapy, psychoanalytical therapy, insight-oriented therapy). For example, in a national survey of 79 clinicians treating pediatric OCD, less than 33% reported using exposure–response prevention (or similar techniques), despite rating CBT as a favorable approach to treatment (Valderhaug et al 2004). Additionally, Heyman et al (2001) found that only 36% of the families of children with OCD had consulted a healthcare practitioner; only 12% of those children were referred for specialized mental health

services. Similarly, Flament et al (1988) found that only 20% of children with OCD were receiving mental health services.

Overall, despite recent advances, considerable further research is needed to bolster etiological and interventional understanding of pediatric OCD. As evidenced by the studies presented in this review, clinical research trials and neurobiological investigations are convergent, not parallel, courses of research. That is, advances in neurochemistry guide pharmacotherapy while the efficacy of CBT might suggest brain structures for more detailed neuroimaging studies.

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