

Cognitive Functions in Patients with Obsessive Compulsive Disorder



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SUMMARY

Aim: This literature review aimed to examine the relationship between cognitive impairment and obsessive-compulsive disorder (OCD). Studies based on neuropsychological testing were prioritized, but those dealing with clinical features, therapy, comorbidity, neuroimaging, and the families of OCD patients were also considered.

Materials and Methods: The literature on cognitive impairment in OCD was reviewed and then the studies evaluating the relationship with these above mentioned findings were discussed.

Results: The clinically most important cognitive impairment in OCD is executive dysfunction, followed by impaired memory. Cognitive impairment has also been observed in the healthy relatives of OCD patients. Findings regarding the effects of comorbidity on cognitive function in OCD patients are inconsistent. Brain imaging studies suggest that frontostriatohalamic dysfunction might occur in OCD.

Conclusion: Executive dysfunction in OCD patients is well documented; however, the precise nature of the relationship between the severity of cognitive dysfunction and the clinical features of OCD are not well understood. Longitudinal family studies that employ both neuropsychological testing and brain imaging are needed to more clearly elucidate the relationship between cognitive dysfunction and OCD.

Keywords: Obsessive-compulsive disorder, cognitive function, memory, attention, executive function

INTRODUCTION

OCD is a unique disorder that shares common characteristics with anxiety disorders and impulse control disorder. OCD is classified as an anxiety disorder characterized by repetitive, intrusive, and undesired thoughts and mental images, and compulsive behaviors. The literature related to cognitive dysfunction in OCD is primarily focused on executive dysfunction. Most psychology studies on OCD have examined information processing bias. OCD researchers analyze cognitive function based on neuropsychology testing and clinical observation in the psychiatry. The present study aimed to review the literature related to cognitive dysfunction in adult OCD patients.

In May 2012 a PubMed search of the English-language literature was performed using the keywords OCD, cognitive

function, cognitive dysfunction, executive dysfunction, and attention. In all, 98 studies on cognitive dysfunction and OCD published after 1990 were reviewed. Symptoms of OCD secondary to antipsychotic medications, the studies comparing cognitive functions in patients with OCD, those with schizophrenia, those with attention deficit-hyperactivity disorder (ADHD), and other anxiety disorders were not included in this review.

Cognitive Functions in OCD

Memory

The literature indicates that OCD patients ineffectively cope with intrusive obsessive thoughts and underlies that catastrophic interpretation of intrusive thoughts, images and impulses have an important role in the obsession etiology

Received: 10.08.2012 - Accepted: 21.03.2013

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DOI: 10.5080/u7172

(Rachman 1998). Tallis (1997) suggested that the repetitive nature of intrusive thoughts and behavior in OCD were partially related to information processing bias. Many OCD patients' obsessions are related to poor memory of performing tasks; obsessive thoughts about whether or not a particular task was performed leads to compulsive checking behavior. The role of information processing bias in such obsessions and the possible role of other specific memory disorders remains to be discerned.

The Rey Auditory Verbal Learning Test (RAVLT) and California Verbal Learning Test (CVLT) are commonly used to assess verbal memory in OCD patients. During the RAVLT a list of 15-16 words, which exceeds immediate memory capacity (5-9 words), is read to the testee, who must then repeat as many of the words as possible. This process is repeated 5 times using the same words. Then, the testee must repeat as many words as possible without having heard the list read again, which measures immediate recall. Performance on these tests is thought to indicate verbal learning ability. For the next 5 minutes other cognitive tests unrelated to verbal learning are administered. The testee is then asked to again repeat as many of the 15-16 words that were read earlier to measure delayed recall. Lastly, the testee is presented a list of words and must select as many words as possible that were read from the original list of 15-16 words, which measures recognition.

No differences were observed in recognition and memory of verbal information between patients with OCD and healthy controls (Tolin et al. 2001, Ceschi et al. 2003, Kıvrıkcık et al 2005), whereas other studies report lower verbal memory performance in patients with OCD (Tallis et al. 1999, Savage et al 2000, Zitterl et al 2001, Tükel et al. 2012). Studies comparing verbal memory performance in healthy individuals and those with subclinical symptoms of OCD reported inconsistent findings.

Recent studies showed that organizational strategy deficiencies in OCD leads to the impression that verbal memory impairment (Deckersbach et al. 2000, Savage et al. 2000, Deckersbach et al. 2005).

The ability to remember semantically related words is lower in OCD patients than in healthy controls due to organizational strategy deficiencies. When OCD patients were asked to remember words according to their meaning, they performed similarly as healthy controls, which indicates that OCD patients have difficulty formulating a strategy rather than implementing one (Deckersbach et al. 2005). Sawamura et al. (2005) developed an improved verbal learning test. The investigators reported that the OCD group analyzed the semantic features of words slower than the control group did. The test was performed using 20 words arranged in 5 categories. The extra time needed to determine the semantic features of words in the OCD group was due to a deficiency in information coding (Sawamura et al. 2005).

The most frequently used visual memory test in OCD patients is the Rey Complex Figure Test (RCFT), which measures both short and long-term memory. During the RCFT the testee is shown a complex geometric figure and asked to copy it (no time limit). Immediately thereafter, the testee is asked to draw the same geometric figure from memory. Penades et al. (2005) reported that patients with OCD display similar performance to healthy control group in the copying task of RCFT but short- and long-term memory tasks's scores of RCFT are lower in OCD patients than in healthy controls (Deckersbach et al 2000a, 2000b, Penades et al 2005). Based on use of the RCFT, OCD patients have difficulty implementing organizational strategies (Savage et al. 1999). Short- and long-term memory problems in OCD patients are associated with inefficient organizational strategies (Deckersbach et al. 2000; Savage et al. 1999, 2000, Shin et al. 2004, Penades et al. 2005). Moritz (2003) reported that comorbid depression in OCD patients negatively affects short- and long-term memory, as measured via RCFT.

Verbal memory performance in OCD patients is lower than in healthy controls, which is thought to be due to a lack of information coding ability. As with the findings related to verbal memory in OCD, those related to visual memory are also consistent. We think that concentrating on more general information can negatively affect memory by misdirecting attention, which is similar to the difficulty OCD patients have implementing organizational strategies observed via RCFT. Poor stimulus inhibition (lack of concentration on task) causes obsessive thoughts that negatively affect verbal and visual memory test performance in OCD patients. As the severity of the clinical symptoms (compulsions) of OCD increases, non-verbal memory performance decreases (Penades 2005).

The orbitofrontal cortex plays a role in organizational strategies used during information coding. Orbitofrontal cortex dysfunction results in executive dysfunction and subsequent memory impairment in OCD (Savage et al.1999, 2000, Deckersbach et al 2000, Penades et al 2005).

Visuospatial ability is indicative of an individual's perception of objects in a defined space. Disorders in visual-spatial functioning in OCD patients have been observed using a variety of tests, including the Money Road Map Test, Hooper Visual Organization Test, RCFT, and Benton Visual Retention Test (Purcell et al.1998a, Savage et al.1999, 2000). Purcell et al. (1998a) compared patients with OCD, patients with depression, patients with panic disorder, and controls, and observed disordered spatial working memory related to visual memory and cognitive functions in the OCD patients.

1a. Meta-memory (feeling-of-knowing)

Meta-memory is the self-evaluation of memory performance (Yalcın and Karakas 2008). Poor meta-memory was reported to play a role in OCD (Tuna et al. 2005). OCD patients

whose primary symptoms are checking compulsions have less confidence in the accuracy of their long-term memory than healthy controls (Tolin et al. 2001; MacDonald et al. 1997; McNally and Kohlbeck 1993). This loss of confidence in memory is related to memory of information associated with obsessions and compulsions, and neutral information. For example, Tuna et al. (2005) reported that poor memory performance based on lists of neutral words, and words related to obsessions and compulsions in OCD patients was associated with poor meta-memory. Tuna et al. (2005) reported that there is an inverse relationship between the severity of OCD symptoms and meta-memory in OCD patients.

In summary, the literature concerning differences in verbal memory performance between OCD patients and healthy controls is inconsistent. Verbal memory performance is different in OCD patients, as they code words during objective verbal memory tests, whereas healthy individuals tend to use an organizational strategy, such as semantic relationships. OCD patients have difficulty formulating an organizational strategy, but are able to implement one once formulated. The inability to formulate an organizational strategy for information coding might be related to executive dysfunction. The clinical significance of these findings is that memory disorders secondary to inability to formulate organizational strategies for information coding and poor metamemory in OCD patients play an important role in the emergence of compulsions.

2. Executive Functions

The neuropsychological profile of OCD suggests that executive dysfunction is the primary problem.

Set shifting is the ability to consider a new concept and suppress a previously used concept that is no longer useful for a particular task (Olley et al. 2007). The most common test of set shifting in OCD is the Wisconsin Card Sorting Test (WCST). Besides the studies that reported poor performance in patients with OCD than in healthy controls healthy controls in WCST (Christensen et al 1992, Okasha et al. 2000, de Geus et al. 2007, Tükel et al. 2012) Some studies reported that OCD patients and healthy controls had similar WCST scores (Gross-Isseroff et al.1996, Moritz et al 2001, 2002, Abbruzzese et al.1995, Fenger et al.2005, Kivircik et al 2005). WCST perseverative error and reply rates in OCD patients are higher than in healthy individuals (Roh et al. 2005). OCD patients have lower WCST scores than healthy controls when card categories are changed and feedback is provided, indicating poor set shifting ability (Bohne et al. 2005). OCD patients require more time and effort than controls to complete the Intradimensional/Extradimensional (ID/ED) Shift Test, which is an analog of WCST (Veale et al. 1996; Purcell 1998b).

Stroop Test and trail making tests findings indicate that cognitive functioning in OCD patients is dysfunctional, as compared to controls (Penades et al 2005)..

The Object Alternation Test (OAT) involves hiding 2 objects, such as coin or token, under a cup and giving feedback to the participant after each trial in order to learn the location of the hidden object (Chamberlain et al. 2005). Patients with OCD had similar WCST scores as healthy controls, but had lower OAT scores (Abbruzzese et al. 1995, 1997 Gross-Isseroff et al. 1996). Similar findings were observed in individuals with subclinical symptoms of OCD (Spitznagel and Suhr 2002). These findings are the result of failure of response inhibition. Differences in the results of these tests are required further researches about set shifting.

The OAT measures decision-altering behaviour, which is dependent upon the ability to inhibit learned rules (Chamberlain et al 2005).

In contrast, Zohar et al. (1999) reported that both WSCT and OAT scores were similar in OCD patients than in healthy controls. OCD patients were reported to perform similarly as controls on the WCST, but they required more time to complete the test and had a higher number of perseverative errors, which might have been due to poor set shifting ability. A higher number of WCST perseverative errors indicates poorer set shifting ability.

The anterior cingulate and orbitofrontal cortex are known to be structurally and functionally involved in OCD (Chamberlain et al. 2005). Additionally, it is thought that some disorders of the dorsolateral prefrontal cortex (PFC) and/or orbitofrontal cortex can be observed via neurophysiological testing.

2a. Verbal fluency

Poor semantic and verbal fluency performance is common among OCD patients, which is considered a sensitive measure of frontal dysfunction in OCD patients (Henry 2006). Verbal fluency (phonemic and semantic) is the focus of contemporary OCD research. The most common test of phonemic verbal fluency is the Controlled Oral Word Association Test (COWAT). For the evaluation of phonemic verbal fluency the testee must produce as many words as possible in a given time (usually 60 s) that begin with a particular letter (K,A,S) in Turkish version of COWAT. Some studies reported that phonemic verbal fluency is intact in OCD patients (Kivircik et al. 2005; Spitznagel and Suhr 2002; Basso et al. 2001; Martinot et al. 1990), whereas another reported that it is problematic (Christensen et al. 1992).

Semantic verbal fluency is evaluated by the production of words with a semantic (categorical) relationship. It has been suggested that OCD patients have disordered semantic verbal fluency (Jurado et al 2001, Lacerda et al 2003, Roh et al 2005).

According to recent research conducted in Turkey, poor phonemic and semantic verbal fluency performance was observed in OCD patients (Tukel et al. 2012). As discussed above, slow processing of semantic features during verbal learning testing is indicative of executive dysfunction in OCD.

2b. Planning

The Hanoi Tower Test (HTT) and London Tower Test (LTT) are the 2 most commonly used tests of problem-solving and planning ability. Schmidtke and et al. (1998) reported similar HTT scores in OCD patients and healthy controls. Veale et al. (1996) and Purcell et al. (1998a, 1998b) did not observe any differences in planning ability between OCD patients and controls, based on LTT. Bohne et al. (2005) reported that OCD patients are able to score well on planning tests, but they spend more formulating and completing their responses. OCD patients spend more time searching for solutions and/or worrying about the next response after they make a mistake (Veale et al. 1996), which might be related to excessive control. Purcell et al. (1998b) studied planning ability in patients with OCD, those with depression, those with panic disorder, and healthy controls using the LTT and reported significantly longer first reaction times in the OCD patients, but no differences in the time to complete the test between the groups, whereas Veale et al. (1996) did observe differences in the time to complete the test between the groups. If motor speed in OCD patients decreases when they obtain feedback related to planning during the test, they are able to carry out attempts that are target-driven related to planning (Purcell et al. 1998b). Tukel et al. conducted a study using the LTT (2012) and reported that planning ability in OCD patients was lower than that in controls, but that OCD patients' first reaction time and time to complete the test did not differ from the controls'. Difficulty making plans is thought to be characteristic of dorsolateral PFC dysfunction, rather than slow information processing.

2c. Motor Inhibition

Response interference (RI) is an inhibitory control mechanism that temporarily slows behavioral responses to environmental stimuli. The most commonly used tests of inhibition processing are go/no-go and stop-signal reaction time (Yazıcı and Yazıcı 2010). During the go/no-go test the testee is expected to provide a response to a stimulus, and subsequently not provide this response to a different stimulus. For example, the testee is seated in front of a computer monitor and must press the right button of a joystick when a plane comes from the right side of the monitor, must press the left button of a joystick when a plane comes from left side of the monitor, and must not press either joystick button when an image of Earth appears on the monitor.

OCD patients were observed to have lower motor response inhibition scores than controls based on the on go/no-go test.

OCD patients had slower reaction times to stop signals and did not inhibit cognitive interference as well as controls at Stroop Test (Penades et al. 2007). In this study the patients exhibited disorders of both motor and cognitive inhibition, but only cognitive inhibition was associated with clinical findings (Penades et al. 2007). In research that used the stop-signal reaction time test to evaluate motor inhibition, both trichotillomania patients and OCD patients had less inefficient motor inhibition than controls (Chamberlain et al. 2006).

These findings suggest that cognitive and motor inhibition dysfunction might play a role in OCD patients' inability to sufficiently inhibit obsessive thoughts and environmental stimuli. They also support the notion that the balance between the excitatory corticothalamic inhibitor and corticostriato-thalamic pathways is altered in OCD patients (Saxena and Rauch 2000).

2d. Decision-Making

Obsessive thoughts and associated compulsive behaviors, and difficulty making decisions are characteristic of OCD. The cognitive component of the decision-making process has yet to be fully understood. The Iowa Gambling Test (IGT) is the most commonly used test for evaluating decision-making ability. IGT findings in OCD patients have been inconsistent. Nielen et al. (2002) reported that long-term risk-taking behavior was similar in the OCD patient and control groups, based on IGT scores, whereas Cavedini et al. (2002) reported that OCD patients exhibited more long-term risk-taking than controls. Response to SSRI's of the OCD patients with a higher rate of risk-taking behavior is poorer than other patient group and response to SSRI's is increased by augmenting with risperidone (Cavedini et al. 2004).

In summary, studies on cognitive functions in OCD patients show that they make more perservative errors and have more set shifting difficulty than healthy controls. It remains unclear if these differences are due to slow cognition, or compulsive behaviors and poor information processing.

3. Are Cognitive Functions in OCD an Endophenotype?

Neuropsychological deficiencies are potential endophenotypic indications. In order to be an endophenotypic indication for OCD cognitive dysfunction must not only occur during symptomatic periods, but also during periods of remission (Rao et al. 2008). When OCD patients undergoing treatment were compared to controls, set shifting ability, response inhibition, and non-verbal memory performance were lower in the OCD group (Rao et al. 2008). These findings are indicative of the role of both the dorsolateral PFC and orbitofrontal cortex in cognitive dysfunction in OCD. Set shifting requires inhibition of learned rules/patterns of behavior, which is related to orbitofrontal and dorsolateral cortex functioning.

3a. Familial studies

Only a limited number of studies have examined the genetic link between cognitive dysfunction and the symptoms of OCD. A study examined planning, verbal fluency, and trail making in the first-degree relatives of autistic patients, first-degree relatives of OCD patients, and healthy controls, and reported poorer executive functioning in the patients' relatives than in the controls based on planning tests only (Delorme et al. 2007). OCD patients and their relatives were reported to have lower motor response inhibition and poorer shifting related to attention, as compared to controls (Chamberlain et al. 2007).

Healthy siblings of OCD patients were reported to have decision-making more difficulties, including committing to decisions after they are made than health control group (Viswanath et al. 2009). These findings are indicative of cognitive dysfunction involving the orbitofrontal cortex. Set shifting, response inhibition, and visuospatial ability are potential endophenotypes of OCD, based on studies on OCD patients and their siblings, and healthy controls (Rajender et al. 2011). Differences in the findings of the studies we reviewed could be due to differences in study design. For instance, Chamberlain et al. (2007) only studied the relatives of OCD patients that had checking and washing compulsions, and Viswanath et al.'s (2009) study population was heterogeneous, as it only included patients from families in which ≥ 2 members were diagnosed as OCD. Visual memory performance was lower in the first-degree relatives of OCD patients and in healthy controls, but verbal memory performance did not differ (Segalas 2010). Based on the reviewed findings, we think that non-verbal memory should be considered a cognitive endophenotype for OCD.

4. The Relationship Between Cognitive Functions and the Clinical Signs of OCD

As OCD is a heterogeneous disorder characterized by multiple obsessions and compulsions, research has focused on differences in cognitive functioning according to the content of compulsions. Comorbid depression in OCD has been studied more extensively than other comorbidities. What follows is a discussion of how OCD and comorbidity affect cognitive functioning.

A study that compared 2 groups of OCD patients with control and washing compulsions reported that only those with control compulsions had deficient cognitive flexibility and inhibition. Inhibition affects general memory, which indicates that an inability to inhibit distracting stimuli results in secondary memory problems (Omori et al. 2007). Non-verbal memory problems and neuropsychological deficiency with organizational strategy are related to symmetry/order and control compulsions in OCD (Jang et al. 2010). Aggression/

control compulsions are associated with low trail-making test performance. Symmetry and order compulsions were also reported to be associated with lower performance on verbal memory and trial-making tests. These findings indicate that some OCD symptoms are related to different or partially overlapped neurocognitive plexus (Hashimoto et al. 2011). Lee and Kwon (2003) classified obsessions into 2 groups: Autogenous and reactive. Autogenous obsessions are thoughts that arise spontaneously (not in response to stimuli) and include themes of sexuality, religion and aggression. Reactive obsessions occur in response to stimuli and include themes of contamination, symmetry, and physical health (Lee and Kwon 2003). OCD patients with autogenous obsessions had lower go/no go test scores than OCD patients with reactive obsessions (Lee et al. 2009). Large-scale studies are needed to identify neuropsychological differences between patients with autogenous and reactive obsessions.

As the severity of depression accompanying OCD increases executive function declines (Basso et al. 2001; Moritz et al. 2001). There is a negative relationship between depression, and anxiety scores and executive dysfunction (Bedard et al. 2009). A study on the effect of comorbid diagnoses on cognitive functions in OCD patients reported that depressive and schizotypal symptoms did not have a negative effect on executive functions (Aycicegi et al. 2003).

OCD patients with schizotypal personality characteristics exhibit orbitofrontal and dorsolateral cortex dysfunction, based on tests (stroop, go/no go test, COWAT) sensitive to both regions. OCD patients without schizotypal personality characteristics perform poorly on orbitofrontal cortex-sensitive tests (Harris and Dinn 2003). Moritz and et al. (2003) reported that only OCD patients with comorbid depression have poor visual memory. An inverse relationship was observed between the severity of OCD symptoms and Object Alternation Test performance in female OCD patients (Zohar et al. 1999). There weren't any differences in intellect, attention, verbal and non-verbal memory, open and procedural learning, visual-structural ability, or cognitive functions between OCD patients treated with selective serotonin reuptake inhibitors (SSRIs) and those that were not (Mataix-Cols et al. 2002). Neurocognitive dysfunction had no effect on the outcome of cognitive behavioral therapy in OCD patients (Moritz et al. 2005).

Cognitive dysfunction in OCD varies according to clinical presentation. Visual memory problems have been observed in OCD patients with control and symmetry compulsions. It remains unknown if particular neurocognitive circuits play a role in particular symptoms of OCD, and will only be clearly discerned following additional detailed study of all OCD symptoms. A limited number of studies have reported that the treatment of OCD has no effect cognitive functions.

5. Cognitive Signs and Neuroimaging Findings in OCD

Research has examined the relationship between structural/functional neuroimaging findings and cognitive functions in OCD. The main problem identified in cognitive neuroimaging research in OCD patients is related to the cortico-striato-thalamocortical circuits (Brennan et al. 2013). Decreases in functioning in the frontal, striatal, temporal, and parietal regions of the brain were observed during administration of various neuropsychological tests (Page et al. 2009).

Studies based on PET observed an inverse relationship between the glucose metabolism rate in the frontal cortex in OCD patients and Stroop Test scores (Martinot et al. 1990). Another study using SPECT reported that there was a positive relationship between blood perfusion in the left inferior frontal cortex and left caudate nucleus, and the number of WCST preservative errors in OCD patients (Lucey et al. 1997). A positive relationship was observed between frontal region and anterior cingulate region blood perfusion, and WCST non-perseverative errors. Regional blood flow in the right thalamus and WCST perseverative errors were inversely related (Lacerda et al. 2003).

Based on fMRI, OCD patients exhibited more activity in the left frontal cortex during verbal fluency testing (that increased with symptom severity) than controls (Pujol et al 1999). In a study on working memory based on the n-back test the only difference in brain activity between the OCD patients and controls was that anterior cingulate cortex activity was greater in the patient group (Van der Wee et al. 2003). In OCD patients the orbitofrontal cortex, insula, and superior temporal gyrus (STG) were observed to play a role in working memory and an increase in brain activity (Ciesielski et al. 2005). Similarly to Ciesielski et al., Nakao et al. (2009) reported an increase in activity in other brain regions as well, including the cuneus, insula, STG, and dorsolateral prefrontal cortex.

A study based on fMRI during the go/no go test, Stroop Test, and switch task reported that there was less brain activity in the orbitofrontal cortex, dorsolateral cortex, and striatal and thalamic regions during the go/no go test and switch task, and in the temporoparietal region during the Stroop Test and switch task in OCD patients than in controls. In addition, brain activity in the cerebellum and posterior brain regions was higher during the Stroop Test in OCD patients than in controls. These findings support the theory that frontostriatothalamic pathway dysfunction is related to inhibited motor and cognitive interference in OCD patients, and that the temporoparietal pathway plays an important role in the abnormalities related to attention (Page et al. 2009). A study that compared OCD patients and healthy controls based on tests of cognitive flexibility reported an increase in dorsal frontal-striatal region activity only in the control group, versus a

decrease in the ventromedial prefrontal cortex, ventral frontal striatal region, and right orbitofrontal cortex activity in the OCD patients (Gu et al. 2008). It might be that poor switch task performance in the OCD patients was related to an imbalance in dorsal frontal-striatal and ventral frontal-striatal pathway activity.

Frontostriatal activity that include main dorsolateral prefrontal cortex and caudate nucleus is lower in OCD patients than in healthy controls during LTT. The possibility of a compensatory increase in brain activity related to short-term memory, such as in the anterior cingulate, ventrolateral prefrontal cortex, and parahippocampal cortex, has been reported in OCD patients. A decrease in dorsal prefrontal-striatal response is related to poor planning ability in OCD patients (Van den Heuvel et al. 2005). Gu et al.'s (2008) findings concerning a decrease in neural plexus activation during neurocognitive testing are in agreement those of Van den Heuvel et al. (2005).

CONCLUSION

Executive dysfunction appears to be the primary cognitive deficiency in OCD patients. Deficiencies related to memory are associated with faulty information processing and poor organizational strategy implementation. Most studies have reported that executive functions, including set shifting, verbal fluency, planning, and decision-making, are similar in OCD patients and controls. In addition, it is known that OCD patients make more perseverative errors, have more difficulty using feedback, and have delayed response during neurocognitive testing, all of which might be related to slow cognition or an increase in compulsive behavior in an effort to avoid making mistakes.

The findings of neuroimaging studies support the existence of dysfunction in the frontostriatothalamic pathway in OCD. Response inhibition and decision-making are cognitive functions that should be the target of future OCD research. Additional research in conjunction with improved neuropsychological testing is essential for improving our understanding of OCD. The nature of cognitive functions in OCD, specifically the relationship between executive dysfunction and clinical features, has become more clearly discerned based on the findings of brain imaging and familial studies. Additional clinical research will help improve our understanding of the cognitive dysfunctions seen in and its treatment.

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