Habit Reversal Training for Obsessive-Compulsive Disorder: A Multiple Case Report

Marieke B.J. Toffolo, Ph.D.^{a*} & Sanjaya Saxena, M.D.^b

^a Department of Psychiatry, University of California San Diego School of Medicine, 9500 Gilman Drive, La Jolla, CA 92093-0957, USA. phone: +1 858-249-1756, email: mtoffolo@ucsd.edu.

^b Department of Psychiatry, University of California San Diego School of Medicine, 9500 Gilman Drive, La Jolla, CA 92093-0957, USA. phone: +1 858-249-1753, email: ssaxena@ucsd.edu.

* Corresponding author.

Acknowledgements, declaration of interest, and role of funding organizations

The authors would like to thank Austin Pavin, Molly Schechter and Katherine Wiedeman for their help with recruitment and assessment of patients. Additionally, the authors declare that there are no conflicts of interest associated with this publication. This work was supported by the Netherlands Organization for Scientific Research [NWO; Project no. 446-15-013, 2016]. The funding source had no involvement in the study design; in the collection, analysis and interpretation of data; in the writing of the report; or in the decision to submit the article for publication.

Abstract

Although exposure and response prevention (ERP) is currently the most effective treatment for obsessive-compulsive disorder (OCD), there are substantial refusal and dropout rates. Therefore, there is a critical need to find ways to make treatments for OCD more acceptable and increase efficacy. This report presents four patients with OCD who received a novel treatment, Habit Reversal Training (HRT). HRT is the treatment of choice for OCD-related disorders such as Trichotillomania, but has not been formally tested for OCD. Based on recent studies showing that excessive habit formation plays an important role in OCD, we examined whether HRT would be an effective and acceptable treatment for OCD. Single case methodology was used to investigate its feasibility, acceptability and preliminary efficacy for OCD treatment. After 9 sessions of HRT over 11 weeks, all four participants showed 32-48% reductions in OCD severity, and three showed a clinically significant treatment response. These gains were largely maintained at 3 months follow-up. All participants rated HRT as a highly acceptable treatment. This suggests that HRT could prove to be an effective, efficient, and acceptable new OCD treatment, with a novel mechanism of action – targeting the habit system.

Keywords: OCD; Habit Reversal Training; compulsive behavior; case series; behavior therapy

Introduction

Obsessive-compulsive disorder (OCD) is marked by the presence of both obsessions (intrusive, frightening thoughts, images, or impulses) and compulsions (repetitive behaviors aimed at controlling the obsession and preventing feared misfortunes; American Psychiatric Association (APA), 2013). It has a lifetime prevalence of 2.3% (Ruscio, Stein, Chiu, & Kessler, 2010) and without adequate treatment, it tends to be chronic.

To date, the most effective treatment for OCD is Exposure and Response Prevention (ERP; Foa, Yadin, & Lichner, 2012). In ERP, patients are exposed to the distressing obsession or situation and instructed to *refrain* from all compulsions that avoid or alleviate the discomfort of the obsession. Through ERP, patients learn that the feared consequences of not performing the compulsions do not occur and that their anxiety will naturally decrease on its own, and/or that they can tolerate this anxiety and distress. However, ERP has important pitfalls. Patients are often unwilling or too anxious to refrain from doing their compulsions, which leads to substantial refusal and dropout rates of 19-43% (e.g., Foa et al., 2005; Ong, Clyde, Bluett, Levin, & Twohig, 2016). A minimum of 35% of patients who complete ERP do not benefit from it (Öst et al., 2015). There is thus a *critical need* to find ways to make OCD treatment more acceptable and increase treatment efficacy.

Earlier attempts at improving the effectiveness of OCD therapy have focused on the contribution of faulty appraisals and beliefs in the pathogenesis of OCD (i.e. Cognitive Therapy; CT). However, recent studies showed that CT itself is at best equally or less effective than ERP in treating OCD (Julien, O'Connor, & Aardema, 2007; Olatunji et al., 2013). Adding CT to ERP, as is done in Cognitive Behavior Therapy (CBT), does seem to have some benefits, as it may lead to lower drop-out rates than ERP alone (Öst et al., 2015). A recent RCT showed that

integrating CT with ERP may improve clinical outcomes (Rector, Richter, Katz, & Leybman, 2018), but other studies showed similar effect sizes for CBT and ERP (Öst et al., 2015).

An alternative route to improving treatment efficacy and acceptability for OCD is to focus more on the response side of the disorder; the compulsions. Recent studies that investigated the habit system as an underlying mechanism of OCD may therefore lead the way to the development of novel, alternative, treatment methods. For instance, Gillan et al. (2011, 2014) showed that patients with OCD over-rely on their habit system, and that excessive compulsive-like, habitual behaviors can develop in patients with OCD in the absence of any prior obsessions. Furthermore, it was demonstrated that patients with OCD have reduced access to and less confidence in their internal states (e.g., what they feel or see), and therefore rely more on external proxies, such as rules and procedures (Lazarov, Liberman, Hermesh, & Dar, 2014). Because patients with OCD may not be able to access their internal states well, they may develop habitual compulsions as external proxies to compensate for this attenuated access. Additionally, because compulsions are often repeated many times, they gradually become more automatic and habitual (Dek, van den Hout, Engelhard, Giele, & Cath, 2015).

Diagnostically, OCD is closely related to other habit disorders. In the latest Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA, 2013), OCD has been placed within the new category of Obsessive-Compulsive and Related Disorders. This category includes other disorders such as “hair-pulling disorder” (trichotillomania)” and “skin-picking (excoriation) disorder”, in which the behavior is also habitual and related to impulse-control deficits. There is also high comorbidity and a strong genetic relationship between OCD and tic disorders (Diniz et al., 2006). Checking and ordering symptoms are frequently found in patients and families with Tourette’s syndrome (Leckman et al., 2003). The role of the habit system in OCD and its

similarity to habit disorders suggests that techniques used to treat habit and tic disorders could be effective for the treatment of OCD as well.

The treatment of choice for these habit disorders is Habit Reversal Training (HRT) (Azrin & Nunn, 1973; Azrin, Nunn, & Frantz, 1980), which is well-established for Tourette's Syndrome, trichotillomania, and excoriation disorder (McGuire et al., 2014; Teng, Woods, & Twohig, 2006; Miltenberger, 2001). This evidence-based treatment consists of making patients more aware of their habitual urges, movements, and behaviors (*awareness training*) and replacing them with a competing response (*competing-response [CR] training*). When translating this to OCD, the habitual acts are the compulsions. Because these are often performed automatically, the patient is not always aware of their triggers. Therefore, awareness training would be expected to enhance insight into the frequency, triggers and urges of compulsions, and CR training should help patients interrupt and resist their compulsions by replacing them with alternative behaviors. Over time, performance of the CR should break the cycle between the urge to do a compulsion and the relief following the compulsion. Thus, in contrast to ERP, which requires patients to completely refrain from habitual behavior (compulsions or avoidance), HRT could help patients to *replace* their compulsions with non-reinforcing behaviors, which ultimately would allow their compulsive urges to fade. This treatment could therefore be more acceptable and tolerable for patients with OCD, because it would reinstate a sense of agency. Moreover, HRT does not require planned exposure exercises that often cause severe anticipatory anxiety, because it focuses on managing compulsions as they occur naturally throughout the day.

Although HRT was developed and validated for other habit disorders decades ago, it was only recently suggested for OCD treatment by leading researchers in the field of impulse-control disorders and habitual behavior (Grant et al., 2016; Gillan, Fineberg, & Robbins, 2017). Only

one case report has been published in which HRT was used for treatment of one patient with refractory OCD (Dillenburg, 2006). Although this patient improved within 12 sessions of HRT over the course of approximately 5 months, it is unclear if she simultaneously continued to receive CBT, and whether there were any changes in her psychotropic medication regimen over the course of treatment that could have influenced the results. Additionally, aside from self-reported frequencies of obsessions and compulsions during the treatment phase and a therapist administered Yale-Brown Obsessive-Compulsive Scale (Y-BOCS, Goodman et al., 1989) at the beginning and end of treatment, no standardized, objective diagnostic, functional, or symptom severity assessments were utilized. Moreover, the CR training described in that case consisted solely of relaxation exercises that the patient performed for 1-2 minutes contingent to an obsession. This is not in line with the standard HRT protocol that recommends more specific and prolonged competing (muscle) responses for each compulsion. Thus, more formal testing of HRT with a standardized protocol and assessments is warranted to examine its efficacy for patients with OCD. Our report describes the treatment protocol and presents a more thorough examination of the feasibility, acceptability, and preliminary efficacy of treating OCD with HRT, using single case series methodology in four patients with OCD. We hypothesized that after 9 sessions of HRT treatment, patients with OCD would show clinically significant decreases in OCD symptom severity and improvement in overall functioning (Y-BOCS decline $\geq 35\%$ and a score of much/very much improved on the Clinical Global Impressions (CGI) Scale [Guy, 1976]). Additionally, we expected that HRT would be highly acceptable for patients with OCD.

Methods

Participants

The protocol was approved by the Institutional Review Board. Informed consent was obtained from all participants before any treatment procedures were performed. Participants were recruited from the university OCD Clinic and through online and local advertisements. They were first screened by telephone for OCD symptoms, comorbid psychiatric disorders, substance abuse/dependence, difficulty reading or understanding written questions or instructions, and developmental disorders, learning disabilities, mental retardation and dementia. Subsequently, participants received a full, face to face psychiatric interview and were assessed with the OCD and Related Disorders module of the Structured Clinical Interview for DSM-5, Research Version (SCID-5-RV; First, Williams, Karg, & Spitzer, 2015) and the Mini-International Neuropsychiatric Interview (MINI; Sheehan et al., 1998). OCD severity was assessed with the Y-BOCS. Anxiety, depression, suicidal ideation/behavior, psychological well-being, and overall functioning were also assessed (see “assessments” below). Participants were included if they met the following criteria: (1) had a DSM-5 diagnosis of OCD as their primary disorder, (2) had overt compulsions (e.g., washing, checking, or other physical rituals), (3) had a Y-BOCS severity score ≥ 16 , (4) were aged 18-75, (5) were not receiving concurrent psychological treatment for OCD, (6) were psychotropic medication-free or on a stable dose for at least 10 weeks prior to starting the study, as well as during the treatment period, (7) had no evidence of psychotic symptoms, active suicidality, severe depression, substance use disorder, or cognitive impairment, and (8) were fluent in the English language.

Case descriptions

Participant 1. The first participant was a 67-year-old married female who described having OCD symptoms from a very young age that amplified when she became a young mother. Her symptoms had worsened over the past 10-15 years, but she had never received any form of psychological or pharmacological treatment for OCD. She did not take any psychotropic medication and had no concurrent comorbid Axis I disorders. Her main obsessions were worries about being responsible for harming others because she was not careful enough. Her compulsive behaviors revolved around driving (avoiding driving herself, persistently scanning the road and mirrors, constantly warning her husband about potential road hazards, and reassurance seeking), preparing food for others (e.g., extra cleaning and hand-washing), and other checking behaviors (e.g., checking the ground, checking that she did not upset someone's environment or hurt anyone, checking the car, and checking pockets or trash before throwing it away).

Participant 2. The second participant was a 19-year-old single male who had OCD since age 10. It started with checking of doors, windows, and light switches, and around age 15, he developed contamination fears. He was diagnosed with OCD and comorbid depression and had received ERP treatment and pharmacotherapy over the past two years with mixed success. However, during the study, he was not in any other psychiatric treatment nor taking psychotropic medication. At the start of treatment he felt like he was at his worst; always scared and hardly able to leave the house. His main obsessions included extreme fear of getting sick or hurt and dying as a consequence. He worried about offending others, and that he would accidentally message people on social media or leave his password in comment sections, and that people would break into his computer or house and come after him. In response to these obsessions, he performed many checking rituals on his computer and around the house, mentally reassured

himself, avoided touching things, and engaged in excessive hand-washing compulsions. Halfway through treatment, he developed new violent and sexual intrusive obsessions that disturbed him immensely. These obsessions caused extensive mental reassurance compulsions and staring at the clock to reassure himself that the events imagined in his obsessions could not have taken place in the time that had passed.

Participant 3. The third participant was a 38-year-old single female who had experienced OCD symptoms for the past four years. There was no current Axis I comorbidity, but she did report recurrent depressive episodes in the past, and had been diagnosed with Anorexia Nervosa from age 11-13. She had seen several psychiatrists, psychotherapists, and counselors in the past but was not on any psychotropic medication or receiving behavioral treatment when she enrolled in the study. After developing chronic, unexplained health issues (fatigue and digestive problems) four years ago, she noticed she was getting more worried in general. After getting into a minor car accident in a parking lot, she developed fears of getting into another accident. Gradually, she developed more obsessions about not being careful enough. In response to these obsessions, she performed checking rituals. During driving, she constantly scanned the road and checked her mirrors and other cars for dents and scratches. She avoided parking close to other cars, checked the parking break repeatedly, and checked around her car for damage. She also checked the front door, many home appliances, and had an extensive checking ritual before going to bed and before leaving home.

Participant 4. The fourth participant was a 38-year-old married female whose OCD symptoms developed around age 10. She was also diagnosed with ADHD and had a history of learning disabilities. During the study, she was taking Escitalopram 50mg daily, Dexamphetamine 20mg daily (for ADHD), and Omeprazole 40 mg daily. She had recently quit

CBT after 3.5 years because she was not making any further progress. Her main obsessions consisted of excessive concerns with right and wrong, the inability to make decisions, and being very sensitive and worried about what others would think or feel. She believed that her words had magical powers, and that not saying or using the right words would cause harm. She feared that she might hurt others with her words or be misunderstood. Her compulsions involved overanalyzing and contemplating every decision, rereading, rewriting, reorganizing, and extensive reassurance seeking.

Treatment

Participants started HRT treatment one week after their baseline assessments. The HRT treatment protocol consisted of 9 individual sessions over 11 weeks and three monthly booster sessions as follow-up. All sessions were one hour and took place at our OCD Research Program. The first seven sessions were weekly, with two-week intervals between sessions 7-8 and 8-9. The protocol was based on the most up-to-date and validated published HRT treatment protocol, Comprehensive Behavioral Intervention for Tics (CBIT; Woods et al., 2008) and modified to be used for OCD compulsions. CBIT consists of HRT, relaxation exercises, and function-based interventions. However, function-based interventions were omitted in the present protocol, because these were not part of the original HRT procedures, and we wanted to isolate HRT efficacy as much as possible. Relaxation exercises were included, because these are usually part of standard HRT protocols (e.g., Azrin et al., 1980; Azrin & Peterson, 1988; Deckersbach, Rauch, Buhlmann, & Wilhelm, 2006; Mouton & Stanley, 1996), especially when dealing with anxiety (Miltenberger, 2001). Furthermore, relaxation exercises could be used as CRs (e.g., deep breathing as a CR for vocal compulsions). It is unlikely that these could have had a confounding

effect, because relaxation techniques in and of themselves are not effective for treatment of OCD (e.g., Greist et al., 2002).

The HRT treatment protocol was manualized with a standardized therapist guide and patient workbook. The first author, served as the therapist for all participants. She has a Ph.D. in Clinical Psychology with training in diverse psychological treatments and ample experience with patients with OCD. She was supervised by the second author, a licensed psychiatrist with over 20 years of experience with treatment of OCD and related disorders, and specific training and research experience in clinical trials, experimental therapeutics, diagnosis, and assessment of OCD and related conditions. Weekly supervision was provided throughout the duration of the study.

The protocol included psychoeducation, relaxation, awareness training, and CR training. Awareness training consisted of the participant giving a very detailed description of each of their compulsions and their antecedents/triggers (“compulsion signal”) and, when possible, a simulation of the compulsion. The “response detection” part of regular awareness training was not possible, because contrary to motor tics, compulsions usually do not happen during the therapy session. Daily monitoring of symptoms was assigned to increase awareness. Subsequently, CR training, the core of HRT, was introduced. A CR is a behavior that a patient can engage in when the urge to do a compulsion appears or soon after the compulsion has started. The CR had to meet the following criteria: (1) the behavior was physically incompatible with the target compulsion, (2) the CR could optimally be maintained for at least one minute, or until the compulsive urge went away or was significantly reduced (decreased by approximately 50%), (3) the CR was socially inconspicuous, and (4) the CR was chosen collaboratively by the therapist and participant. Note that because most compulsions consist of multiple types of

behavior (e.g., “checking the stove” may consist of staring at the stove, wiggling the knobs, and saying, “it is off”), the CR would be focused on all these behaviors (e.g., staring at something else, engaging hands differently, and prevent talking/reviewing). Various CRs existed for different topographies of compulsions, and there was not just one “correct” CR (see Table 1). After selecting the CR, the participant practiced holding it for one minute. They were then instructed to do the CR for one minute or until the urge went away (decreased by 50%; whichever was longer) *each time* that compulsion occurred or they noticed the compulsion signal. At the end of the first minute, they were instructed to “check-in” with the strength of the urge; if this was as strong as or stronger than it was when they started the CR, they were to try to engage in the CR for another minute. Participants were to repeat this process as necessary until the urge had decreased by approximately 50% or had disappeared. It was emphasized that in the beginning it might be very difficult to catch each and every compulsion, and that this was normal. However, participants were encouraged to do the best they could and try to do the CR every time they either started doing that specific compulsion or noticed one of their compulsive signals.

A detailed description of the treatment protocol per session can be found in the appendix.

Table 1

Overview of Competing Responses (CRs) used for different compulsions by each participant

	Compulsions	Competing Responses (CR)
Participant 1		
CR 1	Checking the ground around the car after getting in (e.g., open door or roll down window to check ground, get out of car again, scan ground while backing out)	Sit on hands and stare at glove box (patient is always passenger)

CR 2	Checking the ground/around her when she was outside	Stand still/keep walking (depending on what is appropriate in situation), cross arms, look up and count to 60
CR 3	Extra cleaning/checking (e.g., cleaning while cooking or checking pockets, bags, boxes, etc.)	Clench fists, look away over right shoulder, and count to 60
CR 4	Speaking up or asking for reassurance while driving	Do Deep Breathing backwards (inhale through mouth, exhale through nose). Later changed this to pushing her tongue up to her teeth/palate and staring at dashboard
CR 5	Mentally reviewing “what if thoughts”	Say “stop it” or “shuck it”
CR 6	Asking for reassurance or scanning the room during doctor’s visits	Look at floor or doctor (depending on what is appropriate in situation), push tongue up to palate, and count to 60

Participant 2

CR 1	Checking other people’s behavior (for signs that he may have offended them)	Outside: look straight ahead, keep walking, and count to 60. At home (when person passes the house): look to left corner in living room, stay put, and count to 60. At gym: focus straight ahead, continue with work-out, and count to 60
CR 2	Washing hands/face/mouth after or during handling laundry	Walk to living room, sit on couch, clench fists and count to 60
CR 3	Checking Facebook messages and activity log (later generalized to checking browsing history or YouTube comments)	Open new tab, focus on this and squeeze stress ball. Later added turning around in chair
CR 4	Staring at front door lock and reassuring self that he did not leave the key in the door (later generalized to checking windows, doors and keys)	Turn away from door, stand still or sit down, and clench fists
CR 5	Generalized CR4 to checking windows, all doors and keys	Turn away from object he wants to check, stand still or sit down, and clench fists
CR 6	Mental reviewing and reassurance (in response to violent or sexual obsessions)	Do Progressive Muscle Relaxation.

Participant 3

CR 1	Checking her car after parking	Walk away from the car, look straight ahead, and count to 60
------	--------------------------------	--

CR 2	Checking car mirrors, other cars and bystanders when leaving a parking space	Keep looking forward (focus on road ahead), drive away, and count to 60
CR 3	Checking parking break (checking dashboard lights and shifter repeatedly and verbally reassuring herself)	Look to left door/window, sit on hands, and count to 60. (Later changed to looking to the left, use her phone, and count to 60)
CR 4	Checking things (appliances, door, etc.) around the house before going to bed	Stand still, cross arms, look up at ceiling, count to 60
CR 5	Checking things around the house before leaving	Stand still, cross her arms, look up at ceiling, count to 60
CR 6	Random checks of appliances around the house	Cross arms, look away, and keep walking or sit on hands
Participant 4		
CR 1	Rereading of emails (later generalized to rereading text messages)	Look away over her left shoulder, squeeze hands between her legs, and count backwards from 60
CR 2	Verbal reassurance seeking	Pushing tongue up to palate/front teeth, focusing on “building a mental wall”, and walking away (if appropriate in situation)
CR 3	Compulsions during decision making (mental reviewing and weighing pro’s and con’s, scanning or touching produce/products)	Do an arithmetic problem: start at 1000 and subtract 3. Additionally, look at ground/table and walk away (if appropriate in the situation)
CR 4	Rewriting (later generalized to organizing tasks)	Manipulate a fidget toy, look away, and do arithmetic problem from CR3
CR 5	Mental reviewing of words	Trying to remember childhood phone numbers of friends/family, or focus on Deep Breathing
CR 6	Extensive online researching	Look away, cross arms, and do arithmetic problem.

Assessments

The Y-BOCS and the Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002) were used to assess OCD symptom severity. The CGI scale (Guy, 1976) rated the overall severity of the participant’s disorder and the degree of improvement/worsening of their symptoms relative to baseline (i.e. treatment response). The Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988), the Beck Depression Inventory, Second Edition (BDI-II; Beck,

Steer, & Brown, 1996), and the Columbia Suicide Severity Rating Scale (C-SSRS; Posner et al., 2008) were administered to assess symptoms of anxiety, depression and suicidal ideation/behavior respectively. Impairment/disability and psychological well-being were assessed with the Sheehan Disability Scale (SDS; Sheehan, 1986) and the Schwartz Outcome Scale (SOS-10; Blais et al., 1999).

Assessments were administered by independent raters who were trained at our OCD Research program, and inter-rater reliability was established. The Y-BOCS, C-SSRS, OCI-R, BAI, BDI-II, SDS and SOS-10 were administered at week 0 (baseline), 2, 4, 6, 8, 10 and 12 (post-treatment), and at 1, 2- and 3-months follow-up. The CGI Severity rating was assessed pre and post-treatment, and the CGI Improvement rating was assessed post-treatment.

Treatment acceptability was assessed post-treatment with the Treatment Endorsement and Distress Scale (EDS; Tarrier, Liversidge, & Gregg, 2006). It consists of 10 items rated on a 9-point Likert scale and assesses treatment acceptability on a variety of dimensions (e.g., “HRT is *suitable* for reducing my OCD”, 1 = disagree strongly, 9 = agree strongly). The range is 10 – 90, with the final item “discomfort” scored reversely. The EDS has excellent internal consistency, $\alpha = .93$ (Levy & Radomsky, 2014). Additionally, to gain as much insight into the feasibility of the treatment as possible, the participant’s feedback/perspective regarding the effectiveness and acceptability of HRT as a treatment for their OCD was collected with an open-ended questionnaire post-treatment. This questionnaire consisted of questions regarding (un)helpful components of treatment, what they (dis)liked about the treatment, difficulties implementing CRs, what they learned about their ability to manage compulsions, behavioral changes, and how the treatment influenced their ability to function in social or work-related situations or at home. A minimum of 2 participants had to discuss helpful or unhelpful aspects or

positive or negative consequences of the treatment to be included in the participant perspectives overview (this is similar to the procedure of Ayers, Bratnott, Saxena, & Wetherell, 2012). The feedback was ranked according to how many participants reported it.

Data analysis

Data analyses were conducted in line with established guidelines for single-case research designs (Kazdin, 2011). The primary method of data evaluation for multiple single-case research is based on visual inspection. This entails visually examining the graphed data to describe the data pattern and making inferences about the reliability of change. Visual inspection is generally considered more conservative than using statistical tests, because it relies on very potent and consistent effects that can readily be detected (Kazdin, 2011). In this study, the Y-BOCS total score and separate obsessions and compulsions severity scores were plotted graphically for each participant as primary outcomes (Figure 1). Both the pre and post-treatment scores and the slope of these outcome variables were visually inspected. Significant clinical response was defined as $\geq 35\%$ decline in Y-BOCS score from pre to post-treatment and a rating of “much improved” or “very much improved” on the CGI scale. These criteria were based on recent signal detection analyses by Farris et al. (2013).

Results

OCD symptom severity

At pre-treatment, all participants met DSM-5 criteria for OCD and scored within the moderate to severe symptom severity range (Table 2). Visual inspection of Figure 1 indicated that each participant showed substantial reductions on the overall Y-BOCS over the course of

treatment (32-48% reductions from week 0 to 12), which further decreased or were maintained for three participants at 3 months follow-up (44-82% reductions from week 0 – 3 months follow-up). One participant showed a slight deterioration at follow-up, but scores continued to represent a considerable reduction from pre-treatment (31%). OCD severity scores of participants 1 and 2 showed a gradual slope over the course of treatment, whereas the symptoms of participants 3 and 4 showed a steeper, decreasing slope. When comparing these results with the standardized recovery criteria (Farris et al., 2013), three of the four participants showed a significant clinical response at post-treatment. All four continued with the 3 monthly booster sessions, but because participant 2 did not meet criteria for a significant clinical response at post-treatment, he started additional pharmacological treatment during the follow-up period, as his symptoms warranted this. The other 3 participants did not make any changes in their treatment regimen during the follow-up period. Therefore, further gains in participant 2 could be attributed to the change in medication, even though he continued to implement the HRT procedures.

Clinical Global Impressions

At pre-treatment all four participants rated moderately to severely ill on the CGI-Severity scale. After treatment, participant 2 was still rated markedly ill and showed minimal global improvement. The other 3 participants were rated borderline to mildly mentally ill post-treatment and displayed much to very much improvement compared to their baseline rating.

Figure 1. OCD severity scores for each participant from pre to post-treatment and during 3 months follow-up.

Self-reported OCD, Anxiety and Depression symptoms (OCI-R, BAI, BDI-II; Table 2)

All participants reported substantial decreases in OCD symptoms that remained stable at 3 months follow-up. However, the pre-treatment OCI-R score of participant 1 appeared to be invalid, because it was not in line with her Y-BOCS scores, nor with her verbal report of

symptoms. The treatment also had a positive effect on anxiety and depression symptoms. Two participants showed substantial decreases in anxiety that further improved during the 3 months follow-up and two participants remaining at a (relatively) low level of anxiety during the entire treatment period. Two participants also showed substantial decreases in depression that were maintained during follow-up, and the other two participants remained at a relatively low levels of depression during treatment, which increased somewhat for one participant at 3 months follow-up (this was the same participant who showed some deterioration in OCD severity during follow-up).

Disability/Impairment (SDS)

All participants were less impaired by their symptomatology after treatment. Three of them maintained or extended those gains at follow-up, while one participant deteriorated to his pre-treatment level of impairment.

Psychological Well-Being (SOS-10)

The treatment had mixed effects on psychological well-being. For two participants, overall well-being decreased over the course of treatment. This seemed to be related to an increase in physical problems for participant 1 and an extensive increase in work-related stress for participant 3. At 3 months follow-up, psychological well-being improved for participant 1 but further decreased for participant 3. Participant 2 and 4 showed some improvement in their well-being over the course of treatment, which was extended or maintained at follow-up.

Table 2

Pre-treatment, post-treatment and 3-month follow-up scores per participant on OCD, Anxiety, Depression, Disability/Impairment, and Well-Being

	Y-BOCS	OCI-R	BAI	BDI-II	SDS	SOS-10
Participant 1						
<i>pre-treatment</i>	22	5	0	7	10	54
<i>post-treatment</i>	12	0	1	0	3	38
<i>3 months follow-up</i>	4	0	1	0	0	49
Participant 2						
<i>pre-treatment</i>	38	31	38	31	19	14
<i>post-treatment</i>	26	22	29	17	15	16
<i>3 months follow-up</i>	20	20	26	17	19	25
Participant 3						
<i>pre-treatment</i>	26	22	20	4	9	41
<i>post-treatment</i>	15	9	16	4	0	36
<i>3 months follow-up</i>	18	12	12	10	0	33
Participant 4						
<i>pre-treatment</i>	25	19	16	6	16	46
<i>post-treatment</i>	13	12	15	8	13	50
<i>3 months follow-up</i>	14	11	14	6	10	49

Note. Y-BOCS = OCD severity (range 0 – 40), OCI-R = OCD symptoms (range 0 – 72), BAI = anxiety symptoms (range 0 – 63), BDI-II = depression symptoms (range 0 – 63), SDS = disability/impairment due to symptoms (range 0 – 30), SOS-10 = psychological well-being (range 0 - 60).

Treatment Endorsement/Acceptability

All participants highly endorsed HRT treatment and rated it as a very acceptable treatment on the EDS ($M = 82.00$, $SD = 5.60$; range 77-90).

Participant perspective on HRT efficacy and acceptability

According to the feedback obtained at the end of treatment, the structure of treatment (learning new CRs step by step) and having specific tools to manage compulsions were the most helpful components of treatment. All participants reported feeling more confident and more in control after treatment, and they experienced an increase in their ability to manage their OCD and a decrease in symptoms. Moreover, all participants reported that they were better able to function in daily life. Finally, participants reported that the CR exercises were relatively easy to do, but implementation required diligence and consistency, and the treatment required some time management to accommodate (prolonged) implementation of CRs during activities.

Discussion

These cases indicate that HRT can substantially decrease OCD symptom severity and suggest that treating OCD as a habit disorder may be a promising new approach. All participants showed 32-48% reductions in OCD symptom severity over the course of treatment. Three out of four participants decreased to a mild OCD severity range and showed a clinically significant treatment response. At three months post-treatment, treatment responses were maintained or further improved for three participants, while one showed some signs of relapse. Interestingly, the severity of both obsessions and compulsions decreased to similar degrees, even though the main focus of HRT is on compulsions. Moreover, the treatment had positive effects on overall anxiety, depression, and functional impairment.

Further, all participants fully endorsed HRT as an effective and highly acceptable treatment for their OCD. The EDS acceptability rating for HRT in this study was much higher than the mean acceptability scores for both ERP ($M = 51.30$, $SD = 19.78$) and exposure with

safety behavior ($M = 57.27$, $SD = 17.65$) as shown by Levy and Radomsky (2014). After HRT, participants reported that they had more control over their OCD and felt more confident and empowered by this treatment. Learning specific strategies to manage their OCD on a daily basis was considered particularly helpful. One participant who had previous experience with ERP described HRT as being less stressful and anxiety provoking than ERP, and that they particularly liked “*not having to go out of their way to freak themselves out!*” (with planned exposure exercises).

One may argue that HRT is the same as ERP, because in HRT patients are essentially also being exposed to their feared situations and instructed to refrain from performing compulsions. However, HRT does not use a fear extinction protocol, as it does not use planned, prolonged exposure exercises to elicit anxiety on purpose. Rather, it focuses on managing and replacing compulsions as they occur naturally throughout the day. In HRT, patients select an alternative, competing behavior that they practice doing whenever they experience an urge to perform a compulsion, which helps them to resist giving into the compulsion. In this sense, HRT could be viewed as a tool to help patients manage and eventually eliminate their compulsions in a potentially more tolerable and acceptable way than with ERP.

There are a number of limitations to this study. The first is that the generalizability is low, given the small sample size of only four participants, and the use of only one therapist for treatment delivery. Because of the open trial design, it cannot be ruled out that the observed effects might be attributable to factors other than the active components of treatment. Clinical improvement could have been due to nonspecific treatment factors, such as attention, empathic support, expectations, repeated assessments, or spontaneous recovery. Therefore, future studies should have a larger sample size, a control condition, and multiple therapists. It is unlikely,

however, that the significant clinical improvements in these participants were attributable to spontaneous recovery, given the duration, severity, and chronicity of their OCD symptoms prior to the study. Moreover, the fact that we found substantial and clinically significant treatment responses within such a relatively short treatment duration (9 sessions vs. 14-20 sessions in a typical ERP treatment protocol; e.g., Foa, et al., 2012) suggests that HRT may lead to more rapid response.

There may also be limitations to the effectiveness of HRT in particular groups of patients with OCD, or for particular types of OCD symptoms. For example, it is difficult to address avoidance behaviors with HRT alone, because the competing response to avoiding something is engaging in it, which is basically an exposure exercise. However, most participants in this study started to avoid fewer situations as treatment progressed, because they felt more confidence in their ability to handle these situations. Nonetheless, since avoidance is so prevalent in OCD, a combination of HRT with ERP may be most effective to address remaining avoidance at the end of HRT treatment. Starting OCD treatment with HRT could help patients gain confidence and control over their compulsions, which could in turn increase their willingness to engage in exposure exercises. Future studies should also directly compare the efficacy and acceptability of HRT vs. ERP and investigate whether HRT might be particularly effective for particular symptom dimensions or subtypes of OCD. Potentially, OCD symptoms related to Incompleteness and “not just right experiences” (NJRE; Coles, Frost, Heimberg, & Rhéaume, 2003) could respond better to HRT than symptoms related to Harm Avoidance. Research suggests that harm avoidance is associated with feared consequences and the desire to prevent harm, whereas incompleteness is linked to feelings of discomfort and a desire to perform tasks perfectly or “just right” (Pietrefesa & Coles, 2009). The latter symptom dimension appears to

show the most overlap with Tourette's syndrome (Miguel et al., 2000), for which HRT has been proven to be effective (McGuire et al., 2014). Therefore, HRT may be particularly helpful to promote reallocation of attention away from discomfort (NJRE) and help these patients resist giving into their compulsions and allow them to go about their business.

In summary, this paper presents the first multiple case report of using HRT for treatment of OCD. The results suggest that HRT could prove to be an effective and efficient alternative (or complementary) treatment for this highly debilitating disorder. Moreover, the fact that HRT was endorsed as highly acceptable and may cause less distress and anticipatory anxiety than ERP, because it has the advantage of not requiring planned exposure exercises, could make it easier to implement. Therefore, these outcomes support the further investigation of HRT for OCD in larger, controlled clinical trials.

References

- Abramowitz, J. S., Taylor, S., & McKay, D. (2009). Obsessive-compulsive disorder. *The Lancet*, 374, 491-499. doi:10.1016/S0140-6736(09)60240-3
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Ayers, C. R., Bratiotis, C., Saxena, S., & Wetherell, J. L. (2012). Therapist and patient perspectives on cognitive-behavioral therapy for older adults with hoarding disorder: A collective case study. *Aging & Mental Health*, 16, 915-921. doi:10.1080/13607863.2012.678480
- Azrin, N. H., & Nunn, R. G. (1973). Habit-reversal: A method of eliminating nervous habits and tics. *Behaviour Research and Therapy*, 11, 619-628. doi:10.1016/0005-7967(73)90119-8
- Azrin, N. H., Nunn, R. G., & Frantz, S. E. (1980). Treatment of hairpulling (trichotillomania): a comparative study of habit reversal and negative practice training. *Journal of Behavior Therapy and Experimental Psychiatry*, 11, 13-20. doi:10.1016/0005-7916(80)90045-2
- Azrin, N. H., & Peterson, A. L. (1988). Habit reversal for the treatment of Tourette syndrome. *Behaviour Research and Therapy*, 26, 347-351. doi:10.1016/0005-7967(88)90089-7
- Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology*, 56, 893-897. doi:10.1037/0022-006X.56.6.893
- Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory II*. San Antonio, TX: Psychological Corporation.
- Blais, M. A., Lenderking, W. R., Baer, L., deLorell, A., Peets, K., Leahy, L., & Burns, C.

- (1999). Development and initial validation of a brief mental health outcome measure. *Journal of Personality Assessment*, 73, 359-373. doi:10.1207/S15327752JPA7303_5
- Coles, M. E., Frost, R. O., Heimberg, R. G., & Rhéaume, J. (2003). "Not just right experiences": perfectionism, obsessive–compulsive features and general psychopathology. *Behaviour Research and Therapy*, 41, 681-700. doi:10.1016/S0005-7967(02)00044-X
- Deckersbach, T., Rauch, S., Buhlmann, U., & Wilhelm, S. (2006). Habit reversal versus supportive psychotherapy in Tourette's disorder: a randomized controlled trial and predictors of treatment response. *Behaviour Research and Therapy*, 44, 1079-1090. doi:10.1016/j.brat.2005.08.007
- Dek, E. C., van den Hout, M. A., Engelhard, I. M., Giele, C. L., & Cath, D. C. (2015). Perseveration causes automatization of checking behavior in obsessive-compulsive disorder. *Behaviour Research and Therapy*, 71, 1-9. doi:10.1016/j.brat.2015.05.005
- Dillenburg, K. (2006). Habit reversal training as a treatment for refractory OCD - A case study. *European Journal of Behavior Analysis*, 7, 67-75. doi:10.1080/15021149.2006.11434264
- Diniz, J. B., Rosario-Campos, M. C., Hounie, A. G., Curi, M., Shavitt, R. G., Lopes, A. C., & Miguel, E. C. (2006). Chronic tics and Tourette syndrome in patients with obsessive–compulsive disorder. *Journal of Psychiatric Research*, 40, 487-493. doi:10.1016/j.jpsychires.2005.09.002
- Farris, S. G., McLean, C. P., Van Meter, P. E., Simpson, H. B., & Foa, E. B. (2013). Treatment response, symptom remission and wellness in obsessive-compulsive disorder. *The Journal of Clinical Psychiatry*, 74, 685-690. doi:10.4088/JCP.12m07789
- First M. B., Williams J. B., W, Karg, R. S., & Spitzer, R. L. (2015). *Structured Clinical*

- Interview for DSM-5, Research Version (SCID-5-RV)*. Arlington, VA, American Psychiatric Association.
- Foa, E.D., Huppert, J.D., Leiberg, S., Langner, R., Kichic, R., Hajcek, R., & Salkovskis, P.M. (2002). The Obsessive-Compulsive Inventory: The Development and Validation of a Short Version. *Psychological Assessment*, 14, 485-496. doi:10.1037/1040-3590.14.4.485.
- 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. *American Journal of Psychiatry*, 162, 151-161. doi:10.1176/appi.ajp.162.1.151
- Foa, E. B., Yadin, E., & Lichner, T. K. (2012). *Exposure and Response (Ritual) Prevention for Obsessive-Compulsive Disorder: Therapist Guide - Edition 2*. New York: Oxford University Press.
- Gillan, C. M., Fineberg, N. A., & Robbins, T. W. (2017). A trans-diagnostic perspective on obsessive-compulsive disorder. *Psychological Medicine*, 47, 1528-1548. doi:10.1017/S0033291716002786
- Gillan, C. M., Morein-Zamir, S., Urcelay, G. P., Sule, A., Voon, V., Apergis-Schoute, A., ... Robbins, T. W. (2014). Enhanced avoidance habits in obsessive-compulsive disorder. *Biological Psychiatry*, 75, 631-638. doi:10.1016/j.biopsych.2013.02.002
- Gillan, C. M., Pappmeyer, M., Morein-Zamir, S., Sahakian, B. J., Fineberg, N. A., Robbins, T. W., & de Wit, S. (2011). Disruption in the balance between goal-directed behavior and habit learning in obsessive-compulsive disorder. *American Journal of Psychiatry*, 168, 718-726. doi:10.1176/appi.ajp.2011.10071062
- Gillan, C. M. & Robbins, T. W. (2014). Goal-directed learning and obsessive-compulsive

- disorder. *Philosophical Transactions of the Royal Society B*, 369, 20130475.
doi:10.1098/rstb.2013.0475
- Goodman, W. K., Price, L. H., Rasmussen, S. A., Mazure, C., Fleischmann, R. L., Hill, C. L., ... Charney, D. S. (1989). The Yale-Brown obsessive compulsive scale I: Development, use, and reliability. *Archives of General Psychiatry*, 46, 1006-1011.
doi:10.1001/archpsyc.1989.01810110048007.
- Grant, J. E., Fineberg, N., van Ameringen, M., Cath, D., Visser, H., Carmi, L., ... van Balkom, A. J. (2016). New treatment models for compulsive disorders. *European Neuropsychopharmacology*, 26, 877-884. doi:10.1016/j.euroneuro.2015.11.008
- Greist, J. H., Marks, I. M., Baer, L., Kobak, K. A., Wenzel, K. W., Hirsch, M. J., ... Clary, C. M. (2002). Behavior therapy for obsessive-compulsive disorder guided by a computer or by a clinician compared with relaxation as a control. *The Journal of Clinical Psychiatry*, 63, 138-145. doi:10.4088/JCP.v63n0209
- Guy, W. (1976). Clinical Global Impressions. *ECDEU Assessment Manual for Psychopharmacology, Revised*. National Institute of Mental Health, Rockville, MD.
- Kazdin, A. E. (2011). *Single-case research designs: Methods for clinical and applied settings*. Oxford University Press.
- Lazarov, A., Liberman, N., Hermesh, H., & Dar, R. (2014). Seeking proxies for internal states in obsessive-compulsive disorder. *Journal of Abnormal Psychology*, 123, 695-704.
doi:10.1037/abn0000004
- Leckman, J. F., Pauls, D. L., Zhang, H., Rosario-Campos, M. C., Katsoyich, L., Kidd, K. K., ...

- Cohen, D. J. (2003). Obsessive-compulsive symptom dimensions in affected sibling pairs diagnosed with Gilles de la Tourette syndrome. *American Journal of Medical Genetics Part B: Neuropsychiatric Genetics*, 116, 60-68. doi:10.1002/ajmg.b.10001
- Levy, H. C., & Radomsky, A. S. (2014). Safety behaviour enhances the acceptability of exposure. *Cognitive Behaviour Therapy*, 43, 83-92. doi:10.1080/16506073.2013.819376
- McGuire, J. F., Piacentini, J., Brennan, E. A., Lewin, A. B., Murphy, T. K., Small, B. J., & Storch, E. A. (2014). A meta-analysis of behavior therapy for Tourette syndrome. *Journal of Psychiatric Research*, 50, 106-112. doi:10.1016/j.jpsychires.2013.12.009
- Miguel, E. C., Prado, H. S., Rauch, S. L., Coffey, B. J., Baer, L., Savage, C. R., ...Leckman, J. F. (2000). Sensory phenomena in obsessive-compulsive disorder and Tourette's disorder. *The Journal of Clinical Psychiatry*, 61, 150-156.
- Miltenberger, R. G. (2001). Habit reversal treatment manual for trichotillomania. In D. W. Woods & R. G. Miltenberger (Eds.), *Tic disorders, trichotillomania, and other repetitive behavior disorders: Behavioral approaches to analysis and treatment* (pp. 171-196). Boston: Kluwer Academic.
- Mouton, S. G., & Stanley, M. A. (1996). Habit reversal training for trichotillomania: A group approach. *Cognitive and Behavioral Practice*, 3, 159-182. doi:10.1016/S1077-7229(96)80036-8
- Ong, C. W., Clyde, J. W., Bluett, E. J., Levin, M. E., & Twohig, M. P. (2016). Dropout rates in exposure with response prevention for obsessive-compulsive disorder: What do the data really say?. *Journal of Anxiety Disorders*, 40, 8-17. doi:10.1016/j.janxdis.2016.03.006
- Öst, L. G., Havnen, A., Hansen, B., & Kvale, G. (2015). Cognitive behavioral treatments of

- obsessive-compulsive disorder. A systematic review and meta-analysis of studies published 1993–2014. *Clinical Psychology Review*, 40, 156-169.
doi:10.1016/j.cpr.2015.06.003
- Pietrefesa, A. S., & Coles, M. E. (2009). Moving beyond an exclusive focus on harm avoidance in obsessive-compulsive disorder: behavioral validation for the separability of harm avoidance and incompleteness. *Behavior Therapy*, 40, 251-259.
doi:10.1016/j.beth.2007.08.004
- Posner, K., Brent, D., Lucas, C., Gould, M., Stanley, B., Brown, G., ... Mann, J. (2008). Columbia-suicide severity rating scale (C-SSRS). *New York, NY: Columbia University Medical Center*.
- Rector, N. A., Richter, M. A., Katz, D., & Leybman, M. (2018). Does the addition of cognitive therapy to exposure and response prevention for obsessive compulsive disorder enhance clinical efficacy? A randomized controlled trial in a community setting. *British Journal of Clinical Psychology*. doi:10.1111/bjc.12188
- Ruscio, A. M., Stein, D. J., Chiu, W. T., & Kessler, R. C. (2010). The epidemiology of obsessive-compulsive disorder in the National Comorbidity Survey Replication. *Molecular Psychiatry*, 15, 53–63. doi:10.1038/mp.2008.94
- Sheehan, D. V. (1986). *The anxiety disease*. New York: Bantam.
- Tarrier, N., Liversidge, T., & Gregg, L. (2006). The acceptability and preference for the psychological treatment of PTSD. *Behaviour Research and Therapy*, 44, 1643-1656.
doi:10.1016/j.brat.2005.11.012
- Teng, E. J., Woods, D. W., & Twohig, M. P. (2006). Habit Reversal as a Treatment for Chronic

Skin Picking A Pilot Investigation. *Behavior Modification*, 30, 411-422.

doi:10.1177/0145445504265707

Woods, D. W., Piacentini, J., Chang, S. W., Deckersbach, T., Ginsburg, G. S., Peterson, A. L.,
... Wilhelm, S. (2008). *Managing Tourette Syndrome: A Behavioral Intervention for
Children and Adults*. New York: Oxford University Press.

Appendix

Detailed overview of HRT treatment protocol per session

In Session 1, participants received psychoeducation about OCD in general (diagnostic criteria and demographics), the role of habit behavior in OCD, and the HRT treatment rationale. Self-monitoring was introduced as the first step in awareness training. Throughout treatment, participants were asked to monitor their compulsions on a daily basis. On a monitoring form, participants recorded each compulsion they engaged in, the time of day this occurred, what the triggers or antecedent was, the strength of the urge to perform the compulsion (on a scale from 0-100), and how much time was spent on the compulsion.

In Session 2, monitoring forms were reviewed and a compulsion hierarchy was developed that listed all current compulsions rated on a scale from 0-100 according to how much discomfort it generated if they tried to resist it, or how strong the urge was to do the compulsion (0 = no discomfort/urge, 100 = maximum discomfort/absolute irresistible urge).

From session 3 on, each session started with reviewing the monitoring forms and current ratings of the compulsions on the hierarchy. Next, HRT (awareness training and CR training) was implemented for the first compulsion. Generally, the participant would start with a moderately resistible compulsion that both the therapist and participant felt was most likely to meet with success (rating around 50 on hierarchy).

In sessions 4-8, the implementation of the previous CR was thoroughly reviewed, and adherence was assessed. The participant was asked how they implemented the CR on a day-to-day basis, whether there were any difficulties, and if modification of the CR was needed to maximize ease of administration and compliance. Then the next compulsion was picked to

address with HRT, which depended on how well the implementation of the previous CR went: if implementation was unsuccessful, a compulsion that was lower on the hierarchy was picked next; if implementation of CR was successful, the participant would continue with the next compulsion that was equal or higher on the hierarchy. Therefore, each week a new CR was added on top of the previous one(s), and participants were instructed to continue implementing each CR every time they felt the urge to do the addressed compulsions. Additionally, CRs were generalized to new situations when the participant had mastered the CRs. Furthermore, two relaxation exercises were introduced and practiced: Deep Breathing in Session 5, and Progressive Muscle Relaxation (PMR) in Session 6. Participants were instructed to practice these three times per week, particularly before, during, or after two stressful situations that were identified in session. Relapse prevention was discussed in Session 8 and 9. Finally, in Session 9, the therapist discussed how to develop CRs for the participant's remaining compulsions, and the participant's progress and accomplishments were reviewed.

During the monthly booster sessions, the participant's symptoms and further progress were discussed, the hierarchy was reviewed, and new CRs were developed as needed.