Long-term efficacy of exposure-based intervention compared to stimulus control as a treatment for hair-pulling disorder and skin-picking disorder

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Útdráttur

Markmið: Hárreyti- (Hair-pulling disorder (HPD)) og Húðkroppunarröskun (Skin-picking disorder (SPD)) eru langvinnar og nokkuð algengar geðraskanir. Samsláttur á milli þeirra er meiri en getur átt sér stað af tilviljun og þær hafa áþekka einkennamynd. Svokölluð *habit reversal* þjálfun (HRT), er kjörmeðferð fyrir HPD og SPD, en bakslag er algengt að lokinni meðferð en langtímarannsóknir eru fáar og niðurstöður mótsagnakenndar. Markmið rannsóknarinnar er að bera saman langtímaáhrif af HRT með áherslu á berskjöldun og svarhömlun (exposure and response prevention) og hefðbundna HRT þjálfun þar sem áhersla er á áreitastjórnun, við HPD og SPD.

Aðferð: Þátttakendur voru 15 kvenkyns háskólanemar, fjórir með HPD og 11 með SPD, sem luku annaðhvort fjögra skipta HRT-CERP (*n*=6) eða HRT-SC (*n*=9) meðferð í mars til apríl árið 2017. Þessir 15 þátttakendur mættu til endurmats á einkennum sex og og 12 mánuðum eftir meðferðarlok.

Niðurstöður: Áhrifastærðir höfðu lækkað frá meðferðarlokum í báðum hópum við sex og 12 mánaða eftirfylgd. Lækkunin var umtalsvert meiri í HRT-CERP hópnum en í HRT-SC. Niðurstöður tölfræðiprófa sýndu þó að enginn marktækur munur reyndist vera yfir tíma eða á milli hópa á meginmælitæki rannsóknarinnar fyrir alvarleika einkenna (SPS-R/MGH-HS). Það bendir til að báðar meðferðir haldi árangri sínum einu ári eftir meðferðarlok.

Ályktanir: Langtímaárangur breyttrar útgáfu af HRT, þar sem lögð er áhersla á berskjöldun og svarhömlun (HRT-CERP), er áþekkur því sem næst með kjörmeðferð við HPD og SPD, þar sem áherslu er lögð á áreitastjórnun (HRT-SC). Frekari rannsókna er þörf á langtímaárangri þessara meðferða í stærri og fjölbreyttari úrtökum þátttakenda.

Abstract

Objective: Hair-pulling disorder (HPD) and Skin-picking disorder (SPD) are chronic and common psychiatric disorders. They co-occur more than could be expected by chance and have similar clinical characteristics and symptom presentations. Habit Reversal Training with stimulus control (HRT-SC), is the first-line treatment for HPD and SPD, but relapse rates are high after treatment completion. Information on long-term efficacy of HRT is aslo scarce and research results are conflicting. The purpose of this study was to compare the long-term efficacy of HRT-SC with an adapted version of HRT that included cue-exposure and response prevention (CERP) instead of stimulus control.

Method: Participants were 15 female university students, four with HPD and 11 with SPD, that had completed a four session HRT-CERP (*n*=6) or HRT-SC (*n*=9) in March and April in 2017. Symptom severity was assessed six and 12 months post-treatment in the present study.

Results: Effect sizes decreased in both treatment groups six and 12 months post-treatment, with larger drop being observed in the HRT-CERP group. However, changes over time or differences between groups were not statistically significant, indicating that treatment gains were retained in both groups.

Conclusions: The long-term efficacy of HRT-CERP and HRT-SC is comparable one year post-treatment. The long-term effectiveness of HRT-CERP should be addressed in future studies, using larger and more heterogenous samples.

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Skin picking disorder (SPD; Excoriation disorder) and hair pulling disorder (HPD; Trichotillomania) are characterized by recurrent and excessive picking of skin and pulling of hair, respectively (American Psychiatric Association, 2013). The Diagnostic and statistical manual of mental disorders, fifth edition (DSM-5) and the proposed International classification of diseases, eleventh edition (ICD-11), categorize HPD and SPD as obsessive-compulsive and related disorders (American Psychiatric Association, 2013; Lochner, Roos, & Stein, 2017). Cognitive behavior therapy (CBT) is the first line treatment for HPD and SPD, but relapse rates are high and long-term follow-up research is scarce. The purpose of this study is to compare the long-term effects of habit reversal training with cue-exposure and response prevention (HRT-CERP) to habit reversal training with stimulus control (HRT-SC) for HPD and SPD. This introduction will start with a description of HPD and SPD and their similarities, followed by a description of CBT treatment strategies and their efficacy for HPD and SPD. Last, the mechanisms of change that are at work when using these treatment strategies is discussed along with the purpose of the present study.

Hair pulling disorder (HPD)

HPD is defined by DSM-5 as recurrent pulling out of one´s hair, resulting in hair loss and repeated attempts to decrease or stop hair pulling. The hair pulling causes significant distress or impairment and is not due to another medical condition or mental disorder (American Psychiatric Association, 2013). HPD can involve pulling out one´s hair from many parts of the body. Studies have shown that the most common pulling sites are scalp (72.8%), eyebrows (56.4%), eyelashes (51,6%), pubic (50.7%), legs (21.8%), arms (12.8%), armpits (12,8%), trunk (7.1%) or other body parts (8.1%) (Woods, Flessner, et al., 2006).

Surveys indicate that about 1% of the general adult population meet the criteria for HPD (Duke, Bodzin, Tavares, Geffken, & Storch, 2009). Multiple triggers have been identified, for example affective states like frustration, anxiety, tenseness, boredom, and guilt, positions like lying down resting head on hand and grooming hair and environmental

triggers like a particular room or location and the sight of tweezers or a mirror (G. Diefenbach, Mouton-Odum, & Stanley, 2002; Duke et al., 2009).

Skin picking disorder (SPD)

SPD is defined by DSM-5 as recurrent skin picking resulting in skin lesions and repeated attempts to decrease or stop skin picking. The skin picking causes significant distress or impairment and is not due to physiological effects, another medical condition or mental disorder (American Psychiatric Association, 2013). Any area of the body can be picked, but the head and face are most commonly picked, along with fingers/cuticles, legs, shoulders and back (Lochner et al., 2017; Stein et al., 2010).

The estimated prevalence of SPD in community samples is 1.4%-5.4% (Hayes, Storch, & Berlanga, 2009; Keuthen, Koran, Aboujaoude, Large, & Serpe, 2010). Multiple triggers have been identified, for example skin imperfections, emotions such as stress, anger and anxiety, activities like watching television and reading and being bored or tired (Arnold, Auchenbach, & McElroy, 2001; Neziroglu, Rabinowitz, Breytman, & Jacofsky, 2008; Snorrason, Smári, & Ólafsson, 2010). Repeated efforts to stop picking without success is common which may lead to shame, anxiety and depression (Flessner & Woods, 2006; Lochner et al., 2017).

Comorbidity and similarities between HPD and SPD

HPD and SPD appear to co-occur more than would be expected by chance (Snorrason, Belleau, & Woods, 2012). HPD and SPD have similar clinical characteristics and symptom presentations. For both disorders the main symptom feature is the removal of parts of the body. Both target imperfections and specific areas. Rituals are common in both disorders and most patients pick or pull in episodes every day. Many patients say it worsens at night and some patients have reported occurrences during sleep (Bohne, Keuthen, & Wilhelm, 2005; Christenson, Mackenzie, & Mitchell, 1991; Lochner, Simeon, Niehaus, & Stein, 2002; Murphy, Redenius, O'Neill, & Zallek, 2007; Odlaug & Grant, 2008; Singareddy, Moin,

Spurlock, Merritt-Davis, & Uhde, 2003; Snorrason, Belleau, et al., 2012). SPD and HPD also have similar phenomenology and general demographics (Snorrason, Belleau, et al., 2012). Onset of SPD and HPD can occur at any age but most often in adolescence (Odlaug & Grant, 2011). Majority of individuals in treatment for SPD and HPD are female (Bohne et al., 2005; Snorrason, Belleau, et al., 2012). Behavioral genetics studies have shown that both disorders are heritable and share underlying genetic underpinnings (Monzani, Rijsdijk, Harris, & Mataix-Cols, 2014)

CBT treatments for SPD and HPD

CBT techniques for SPD and HPD can be divided into two categories, traditional behavioral interventions and augmenting strategies. Traditional behavioral interventions directly prevent hair pulling (HP) and skin picking (SD) from occurring or stop the behavior once it's started. Augmenting strategies aim to manage internal states, like urges and anxiety.

Traditional behavioral interventions

Behavioral interventions are the most studied treatment strategies for HPD and SPD and have the most empirical support.

Habit Reversal Training (HRT). HRT consist of awareness training, self-monitoring and the use of competing responses. Awareness training involves a detailed functional assessment where antecedents and consequences of HP/SP are determined. Between sessions patients monitor their HP/SP behavior and record antecedents and consequences. In-session exercises are performed to increase the patients' awareness. When patients' awareness has increased they are taught a competing response (e.g. sitting on one's hands) and encouraged to perform the competing response whenever they detect antecedents (Azrin & Nunn, 1973).

Stimulus Control (SC). SC is sometimes added to HRT. When HP/SP often happens in a certain environment, that environment and certain objects can serve as triggers for HP/SP. HP/SP can therefore be reduced by avoiding these environments and objects. SC only addresses external triggers of picking and pulling, therefore it is important to

differentiate between internal and external triggers when using SC. Examples of SC methods are getting rid of tools, wearing gloves and reducing time spent in triggering environments (Morris, Zickgraf, Dingfelder, & Franklin, 2013).

Augmenting strategies

Augmenting strategies aim to manage internal states, like urges and anxiety.

Cognitive therapy (CT). CT involves identifying problematic thoughts/beliefs, related to HP/SP, and replacing them with more adaptive thoughts/beliefs. Clients will for example record thoughts/beliefs on worksheets and work with the therapist to challenge them and replace with more adaptive alternatives. Cognitive restructuring, Socratic questioning and guided self-dialog is often used in CT (Snorrason, Berlin, & Lee, 2015).

Dialectic behavioral therapy (DBT). DBT involves addressing emotional regulation difficulties that underlie the HP/SP. Mindfulness exercises are used to enhance awareness of HP/SP urges and behavioral antecedents. Clients also train their emotional regulation skills and distress tolerance strategies (Keuthen et al., 2012).

Acceptance commitment therapy (ACT). ACT involves reducing experiential avoidance that underlies SPD and HPD. ACT also involves modifying verbal rules thought to contribute to maladaptive reactions to internal events. ACT uses metaphors and exercises aimed at highlighting how ineffective the struggle with internal experiences is and exercises that encourage acceptance of internal experiences. ACT also uses activities that promote clarification of life goals and values, commitment to let these goals guide behavior and cue-exposure with response prevention (Woods, Wetterneck, & Flessner, 2006).

Cue-exposure and response prevention (CERP). In ERP, patients gradually confront their anxiety provoking stimuli while holding back on performing anxiety reducing compulsions. The main difference between ERP and CERP is that instead of confronting their anxiety provoking stimuli, patients confront their urges to perform appetitive behaviors such as skin picking, hair pulling, overeating or additions. These treatments are based on extinction theory and consider HP/SP a conditioned response that can be eliminated. The

goal of CERP is to decrease the relationship between cues, urges and HP/SP behavior (Boutelle & Bouton, 2015). CERP (and ERP) involves psychoeducation on the disorder the patient suffers from, information on empirical support for CERP, setting up an CERP hierarchy, behavioral exposures and relapse prevention (Sulkowski, Jacob, & Storch, 2013).

Efficacy of treatments for HPD and SPD

Schumer, Bartley, and Bloch (2016) conducted a systematic review and metanalysis of treatments for SPD. Results showed that only behavioral treatments demonstrated significant results compared to inactive control conditions. Evidence from RCT's (randomized controlled trials) did not support the use of pharmacotherapy (SSRI's or lamotrigine) for they were no more effective than placebo. Gelinas and Gagnon (2013)'s meta-analysis and Selles, McGuire, Small, and Storch (2016)'s systematic review and meta-analysis indicated on the other hand that both approaches are comparably effective in reducing SPD severity. Bloch et al. (2007) conducted a systematic review and meta-analysis of treatments for HPD. Results indicated that HRT was superior to pharmacotherapy, both clomipramine and SSRI. Clomipramine was more effective than placebo, but SSRI was not.

Efficacy of Habit Reversal Training (HRT)

HRT is a first line treatment for HPD and has empirical support from at least nine RCT's (see table 1). HRT's empirical support for treating SPD is less than HPD but at least three RCT's have indicated that HRT is an effective treatment for SPD (Moritz, Fricke, Treszl, & Wittekind, 2012; Schuck, Keijsers, & Rinck, 2011; Teng, Woods, & Twohig, 2006). Results from van Minnen, Hoogduin, Keijsers, Hellenbrand, and Hendriks (2003) and Ninan, Rothbaum, Marsteller, Knight, and Eccard (2000) indicate that behavioral treatments (BT), consisting of HRT and SC, are superior to medications (fluoxetine and clomipramine) when treating HPD. On the other hand, results from Dougherty, Loh, Jenike, and Keuthen (2006) indicate that a combination of HRT and sertraline is superior to either treatment alone when treating HPD, but these results are based on only 13 participants. Results from six RCT's indicate that BT's are superior to conditions like minimal attention condition, decoupling,

supportive therapy, negative practice and treatment as usual when treating HPD and SPD (Azrin, Nunn, & Frantz, 1980; Diefenbach, Tolin, Hannan, Maltby, & Crocetto, 2006; Franklin, Edson, Ledley, & Cahill, 2011; Keuthen et al., 2012; Moritz et al., 2012; Rahman, McGuire, Storch, & Lewin, 2017). Results of these studies indicate that HRT is an effective treatment for HPD and SPD.

Efficacy of cue-exposure/response prevention (CERP)

Exposure and response prevention (ERP) has gathered extensive empirical support for treating obsessive compulsive disorder (OCD) (Abramowitz, 1996; Hofmann, Asnaani, Vonk, Sawyer, & Fang, 2012). Empirical support for using CERP when treating HPD and SPD is scarce, with evidence coming from only two case studies (Javidi, Battersby, & Forbes, 2007; Sulkowski et al., 2013). Empirical support for using CERP to treat other impulse control disorders, like over-eating and addictions, has gathered more support (Boutelle & Bouton, 2015). Javidi et al. (2007) conducted a case study where behavioral techniques, including CERP and HRT, was used to treat a woman with HPD. The treatment lasted a year, but improvements were observable after only 4 sessions. At post treatment, the patients hair-pulling and social phobia symptoms had decreased and quality of life increased. The results were maintained at 4-year follow-up (Javidi et al., 2007).

Efficacy of acceptance-enhanced behavior therapy (AEBT)

Woods, Wetterneck, et al. (2006) conducted a RCT using AEBT and found that AEBT was an effective treatment for HPD. AEBT, compared with waitlist, showed significant reduction in HPD symptoms, impairment ratings, hairs pulled, and experimental avoidance, anxiety and depressive symptoms. Symptom reduction was maintained at 3-month follow-up. Capriotti, Ely, Snorrason, and Woods (2015) used AEBT to treat four patients with SPD. Three of four patients showed a clear decrease in SPD symptoms. Twohig and Woods (2004) used AEBT to treat 6 patients with HPD. Results showed that 4 of 6 participants were near full responders and the results were maintained at 3-month follow-up for 3 of 4

participants. Snorrason and Woods (2014) used AEBT to treat a patient with nail picking. Results showed that the patient responded moderately well to treatment.

Efficacy of treatments at follow-up

Results from seven RCTs show that HRT treatment effects are maintained at 2 and 3-month follow-up (Azrin et al., 1980; Franklin et al., 2011; Keuthen et al., 2012; Rahman et al., 2017; Schuck et al., 2011; Teng et al., 2006; Woods, Wetterneck, et al., 2006). Azrin et al. (1980) conducted a 22-month follow-up study of the effects of one HRT session for HPD. Compared to base-line scores, hair pulling had decreased by 99% post-treatment. At 4-month follow-up the reduction was 91% and at 22-month follow-up the reduction was 87%. The negative practice treatment´s (repeated performance of a behavior with the goal of eliminating or reducing the occurrence of the behavior) maximum reduction was 69% at 3-week follow-up and 50% at 3-month. There are some limitations to this study, for example standard measurements of treatment effects were not used, follow-up assessments were conducted by phone and only 12 of 19 participants participated in the follow-up assessments.

Keijsers et al. (2006) conducted a 2-year follow-up study on the effects of six HRT sessions for HPD. Results showed that effect sizes decreased by 49% from post-treatment to 3-month follow-up (from 2.91 to 1.47) and by 70% from 3-month to 2-year follow-up (from 1.47 to 0.87). Results from Diefenbach et al. (2006)'s HRT group therapy did show that treatment effects were not maintained at 3 or 6-month follow-up.

Keuthen et al. (2011) conducted a 3 and 6-month follow-up study of the long-term effects of 11 DBT-enhanced CBT (including HRT) sessions and 4 booster sessions for HPD. Results showed that significant improvement in hair pulling severity and emotion regulation at baseline was maintained three and six months after treatment completion, with all participants being classified as either full or partial responders at these assessment points. Woods, Wetterneck, et al. (2006) conducted a 3-month follow-up study on the effects of 12 AEBT sessions on HPD. Results showed that AEBT is an effective treatment for HPD. AEBT compared with waitlist showed significant reduction in HPD symptoms, impairment ratings,

hairs pulled, and experimental avoidance, anxiety and depressive symptoms. Reductions generally were maintained at 3-month follow-up.

We know of only one case study that reports on the long-term effects of HRT-CERP (Javidi et al., 2007). The results are promising but more research is needed. Results of studies on the long-term effects of HRT-SC for HPD and SPD have been conflicting, with only four RCT's looking at long-term benefits exceeding three months (Azrin et al., 1980; Diefenbach et al., 2006; Keijsers et al., 2006; Keuthen et al., 2012). Therefore, more research is needed.

Table 1

*Results of 12 Randomized Controlled Trials (RCT), and one study without a comparison group, for HPD and SPD.**

Study	N	Female	Age	HPD/ SPD	Primary outcome measure	Follow-up	Duration	Design	Intervention	Comparison	Results and conclusions
Azrin et al. (1980)	34	58%	M=28	HPD	Self-monitoring	1-month 2-month 3-month Treatment group only: 4-month 22-month	1 sess. 2 hours	RCT	HRT	Negative practice program.	Results indicate that HRT is an effective treatment for HPD. HRT compared with Negative practice was twice as effective when comparing average percentage reduction in hairpulling episodes, the number of subjects who stopped hairpulling and those who almost stopped entirely.
Ninan et al. (2000)	16	81%	M=33	HPD	NIMH-TSS[10] NIMH-TIS[11] CGI-I[1]	N/A	9 w	RCT	HRT/CT	Placebo and Clomipramine	Results indicate that CBT is an effective treatment for HPD. CBT compared with Clomipramine and placebo was significantly more effective in reducing symptoms. Clomipramine resulted in symptom reduction, but the difference was not statistically significant compared with placebo.
van Minnen et al. (2003)	40	88%	M=32 SD=11	HPD	MGH-HS[8]	N/A	6 sess. 12 w	RCT	HRT/SC Behavioral Treatment (BT)	C1: Fluoxetine hydrochloride C2: waitlist	Results indicate that BT is an effective treatment when treating HPD and that it is superior to Fluoxetine. BT showed significantly greater reduction in HPD symptoms, higher effect sizes and more clinically significant changes. Effect sizes were 3.8 for BT, 0.42 for fluoxetine and 1,09 for WL. Clinical changes were 64% for BT, 9% for fluoxetine and 20% for WL.
Keijsers et al. (2006) (follow-up from (van Minnen	28	89%	M=29 SD=14	HPD	MGH-HS[8] HPS[23] CGI[1]	3-month 2-year	6 sess. 12 w	Not RCT	HRT/SC Behavioral Treatment	N/A	Results indicate that BT is an effective treatment for HPD. Effect sized post-treatment were 2.91, at

et al., 2003)									(BT)		3 months 1.47 and at 2-year follow-up 0.87. Lower pre-treatment levels of depressive symptoms and complete abstinence from hair-pulling post-treatment predicted better 2-year follow-up results.
Teng et al. (2006)	19	100%	M=24	SPD	Self-monitoring Photos rated TEI-SF[12]	3-month	3 w	RCT	HRT/SC	Waitlist	Results indicate that HRT is an effective treatment for SPD. Skin picking decreased more in the HRT group at post-treatment and follow-up than waitlist. Photo ratings from independent raters confirmed the findings.
Woods, Wetterneck, et al. (2006)	25	92%	M=35	HPD	Self-monitoring MGH-HPS[8] NIMH-TIS[11]	3-month	10 sess. 12 w.	RCT	HRT and ACT[3]	Waitlist	Results indicate that ACT/HRT is an effective treatment for HPD. ACT/HRT compared with waitlist showed significant reduction in HPD symptoms, impairment ratings, hairs pulled, and experimental avoidance, anxiety and depressive symptoms. Reductions generally were maintained at 3-month follow-up.
Diefenbach et al. (2006)	13	92%	M=40 SD=12	HPD	MGH-HS[8] Alopecia rating CGI-S[1] CGI-I[1]	Post waitlist, post treatment, 1-month 3-month 6-month	8 sess.	RCT	HRT/SC Behavioral treatment (BT) group treatment	C1: Supportive therapy (ST) C2: Naturally occurring waiting period (M=38 days)	Results provide partial support for efficacy of BT for HPD. BT showed significantly greater decreases in hair-pulling symptoms and clinically rated hair loss severity than those in ST group. Decreases were also greater after treatment than after waiting period. TTM severity remained problematic post-treatment and only a few participants had clinically significant change post-treatment. At 6-month follow-up a relapse in symptoms occurred.

Dougherty et al. (2006)	13	96%	M=29 SD=8	HPD	HPS[23] CGI-I[1] PITS[19] TTMIS	Assessment every 4-week until 22-week	22 w	RCT	I1: Sertraline I2: Both Sertraline and HRT	HRT	Results indicate that a combination of sertraline and HRT is more effective at treating HPD then either treatment separately. HPD symptoms in all groups improved.
Schuck et al. (2011)	34	88%	M=22	SPD	SPS[5], SPIS[6], SCCQ[7] and photo ratings.	2-month	4 sess.	RCT	HRT/CT	Waitlist	Results indicate that CBT is an effective treatment for SPD. Treatment group showed a significantly larger reduction on all measured variables. The effect sizes were large, ranging from .90 to 1.89 and were maintained at follow-up.
Franklin et al. (2011)	24	67%	7-17 M=12,5	HPD	NIMH-TSS[10] TDI[18] CDI-I[1]	Intervention group only: 2-month	8 w	RCT	HRT/SC Behavior therapy (BT)	Minimal attention condition (MAC)	Results indicate that BT can be an effective treatment for HPD. BT compared with MAC showed a significantly lower NIMH-TSS score post-treatment. BT mean post-score was also significantly lower than pretreatment score. BT groups gains were maintained at 2-month follow-up.
Keuthen et al. (2012)	38	82%	M=31 SD=8,5	HPD	TDI[18] PITS[19] NIMH-TSS[10] ARR[20]	3-month 6-month	11 w + 3-month maintenance	RCT	DBT – enhanced CBT (HRT/SC)	Minimal attention condition (MAC)	Results indicate that DBT is an effective treatment for HPD. DBT compared with MAC was significantly more effective for HPD severity and emotional regulation and was maintained at follow-up. Correlations between HPD severity and emotional regulation were not reported at post-treatment but did occur in maintenance indicating reduced HPD severity with improved emotional regulation.
Moritz et al. (2012)	70	93%	M=29	SPD	Modified SPS[5]	N/A	4 w	RCT	HRT self-help	Decoupling	Results indicate that HRT is a more effective treatment for SPD

									interventions and bibliotherapy		than Decoupling. HRT showed significantly larger reduction in symptoms compared with Decoupling, although HRT only showed 50% symptom reduction. Therefor it promises only modest symptom relief with Self-help.
Rahman et al. (2017)	40	85%	7-17	HPD	ADIS interview TDI[18] MGH-HPS[8] NIMH-TSS[10] CGI-I[1]	1-month 3-month	8 w	RCT	HRT	Treatment as usual (TAU)	Results indicate that HRT can be an effective treatment for HPD in youth. HRT compared to TAU showed significant reduction in HPD symptoms at post and 1- and 3-month follow-up. 76% responded to treatment compared with 21% in TAU group on CGI-I. 12 of 16 treatment responders completed 1-month follow-up and 10 of 16 completed 3-month follow-up.

Note. [1]=Clinical Global Impressions-Improvement/severity. [2]=Treatment responders. [3]=Acceptance and commitment therapy. [4]=If other than typical HRT/cognitive therapy. [5]=Skin Picking Scale. [6]=Skin Picking Impact Scale. [7]=Self-Control Cognition Questionnaire. [8]=Massachusetts General Hospital-Hairpulling Scale. [9]=Massachusetts General Hospital-Skin Picking Scale. [10]=NIMH Trichotillomania Severity Scale. [11]=NIMH Trichotillomania Impairment Scale. [12]=Treatment Evaluation Inventory-Short Form. [13]=Milwaukee Inventory for Subtypes of Trichotillomania–Adult Version. [14]=Milwaukee Inventory for the Dimensions of Adult Skin Picking. [15]=Skin Picking Treatment Scale. [16]=Yale-Brown Obsessive-Compulsive Scale Modified for Neurotic Excoriation. [17]=Psychiatric Institute Trichotillomania Scale. [18]=Trichotillomania Diagnosis Interview. [19]=Psychiatric Institute Trichotillomania Scale. [20]=Affective Regulation Rating. [21]=Minnesota Trichotillomania Assessment Inventory. [22]=Yale-Brown Obsessive-Compulsive Scale Modified for Trichotillomania. [23]=Hair pulling scale.

**Participants were 416 in total, with a medium age of 29,6 years and 84% of them were female.*

Mechanisms of change

HRT and some augmenting strategies (e.g., ACT and CERP) can be construed as exposure-based treatments. It is believed that HRT and augmenting strategies work in part by extinguishing negative reinforcement contingencies between urges to HP/SP, the behavior to HP/SP and reinforcing experiences that follow. The main difference between HRT-SC and HRT-CERP therefore is that while SC decreases opportunities to extinguish negative reinforcement contingencies, CERP encourages patients to experience the urge without engaging in the behavior (Mansueto, Golomb, Thomas, & Stemberger, 1999).

Einarsdóttir (2017) and Lárusson (2017) conducted an RCT to examine the efficacy of HRT-CERP by comparing it to HRT-SC. The purpose of the study was to examine if mechanisms of change would make a difference in the efficacy of treatments for HPD and SPD. The goal of SC is to decrease opportunities to HP/SP by removing external triggers in the environment and thereby also reducing opportunities for extinction trials of the behavior. CERP on the other hand increases opportunities for extinction trials of the behavior by exposing the patient to the urge to HP/SP and encouraging them to hold back on responding with HP/SP. Results of the study indicate that HRT-CERP is an effective treatment strategy for HPD and SPD compared to HRT-SC. There were significant reductions in symptom severity in both treatment groups on all primary outcome measures. There were no significant differences between groups on self-reports, but HRT-CERP was significantly more effective on interview-based measures. Effect sizes were larger for HRT-CERP (2.27-2.96) than HRT-SC (1.28-1.30) on all primary outcome measures (Einarsdóttir, 2017; Lárusson, 2017).

Purpose of the current study

Participants in the current follow-up study were female university students that completed a RCT comparing the efficacy of four sessions of HRT-CERP to four sessions of HRT-SC for HPD and SPD, in March and April 2017 (see Einarsdóttir (2017) and Lárusson (2017). The purpose of the present study was to compare the long-term effects of HRT-CERP and HRT-SC at six and 12-month follow-up. Because stimulus control reduces opportunities for

exposure to triggers of pulling and picking behaviors, it may hamper extinction of the behavior, that could lead to greater relapse following treatment. However, CERP consists of exposure exercises directly targeting triggering stimuli, that should result in greater extinction of pulling and picking behaviors. It was therefore expected that HRT-CERP would be superior to HRT-SC at assessment of symptom severity six and 12 months post-treatment.

Method

Participants

Sixteen, of the 20 participants that completed the treatment in March and April 2017, were interviewed at 6-month follow-up and 18 participants were interviewed at 12-month follow-up (16 face-to-face, 2 via telephone). The final sample consisted of 15 participants that provided data at both assessment points, of which six had received HRT-CERP and nine had received HRT-SC. Demographic information of the sample can be seen in table 2 in the results.

Measures

Psychiatric interviews

Clinical Global Impression (CGI) Scale. CGI assesses overall treatment response, specifically severity and improvement. This semi structured interview has 2 items rated on a 7-point scale assessing severity and improvement of psychopathology. This scale asks that the clinician to rate the patient relative to their past experience with other patients with the same diagnosis, with or without other information. CGIs psychometric properties for HPD and SPD has not been assessed but have proven adequate for other psychiatric disorders (Busner & Targum, 2007; Leon et al., 1993).

Problematic Habit Interview Schedule (PHIS). PHIS is a semi-structured interview that assesses whether DSM-5 criteria are met as well as clinical characteristics of HPD and SPD. The interview specifically assesses whether the hair pulling and skin picking results in skin damage or hair loss, emotional distress, impairment in functioning, desire to reduce skin picking and hair pulling or stop it entirely and previous attempts to stop or reduce the skin picking and hair pulling. Assessment of whether the condition is caused by a medical condition, substances or another psychiatric disorder is also part of the interview. The interview was translated to Icelandic by Ívar Snorrason. Psychometric properties of the

Icelandic version have not been examined but psychometric properties of the English version are acceptable (Snorrason, Belleau, & Lee, 2018).

Skin Picking Scale-Revised Interview Version (SPS-R-IV). SPS-R-IV is an interview version of the SPS-R self-report scale and includes the exact same items. See detailed description below.

MGH Hair Pulling Scale Interview Version (MGH-HPS-IV). MGH-HPS-IV is an interview version of the MGH-HPS self-report scale and includes the exact same items. See detailed description below.

Self-report measures for HPD/SPD

Skin Picking Scale-Revised (SPS-R). SPS-R is an 8-item self-report measure of the severity of SPD in the past week. Items assess the following: 1. frequency of urges to pick, 2. intensity of urges, 3. time spent picking, 4. control over picking
5. distress due to picking, 6. interference due to skin picking, 7. avoidance behavior due to picking and 8. skin damage due to picking. Items are rated on a 5-point scale from 0 (none) to 4 (extreme). The SPS-R was translated to Icelandic by Ívar Snorrason. Psychometric properties of the Icelandic version have not been examined. Psychometric properties of the English version are acceptable (Snorrason, Ólafsson, et al., 2012).

Massachusetts General Hospital Hair pulling Scale (MGH-HS). MGH-HS is a self-report scale, consisting of 7 items. The scale measures the frequency, intensity and controllability of the urge to hair pull and the frequency, intensity and controllability of hair pulling as well as the distress associated with hair pulling the prior week. The items are rated on a 5-point scale from 0-4, with higher scores indicating more severity. The scale was translated to Icelandic by Ívar Snorrason. Psychometric properties of the Icelandic version have not been examined but psychometric properties of the English version are acceptable (Diefenbach, Tolin, Crocetto, Maltby, & Hannan, 2005; Keuthen et al., 2007).

Milwaukee Inventory for Dimensions of Adult Skin Picking (MIDAS). MIDAS is a self-report scale, consisting of 12 items. Six items measure focused skin picking and six

items measure automatic skin picking. Focused skin picking is when there is full awareness of the skin picking taking place, but it is a response to urges or negative affective states. Automatic skin picking on the other hand is when skin picking takes place without awareness. The items are rated on a 5-point scale ranging from 1 (not true for any of my picking) to 5 (true for all my picking). The scale was translated to Icelandic by Ívar Snorrason. Psychometric properties of the Icelandic version have not been examined but psychometric properties of the English version are acceptable (Walther, Flessner, Conelea, & Woods, 2009).

Milwaukee Inventory for Subtypes of Trichotillomania-Adult Version (MIST-A). MIST-A is a self-report scale consisting of 15 items. Ten items measures focused pulling and five items measure automatic pulling. The items are rated from 0-9. The scale was translated to Icelandic by Ívar Snorrason. Psychometric properties of the Icelandic version have not been examined but psychometric properties of the English version are acceptable (Flessner et al., 2008).

Skin Picking Reward Scale (SPRS). SPRS is a self-report scale, consisting of 12 items. The scale was designed to assess how much people with SPD want and like to pick skin. Six items assess wanting (the motivation and drive to engage in picking) and six items assess liking (the experience of pleasure while picking). The items are rated from 1 (almost never) to 4 (almost always). The scale was translated to Icelandic by Ívar Snorrason. Psychometric properties of the Icelandic version have not been examined but psychometric properties of the English version are acceptable (Snorrason, Olafsson, Houghton, Woods, & Lee, 2015).

Hair Pulling Reward Scale (HPRS). HPRS is a self-report scale, consisting of 12 items. The scale was designed to assess how much people with HPD want and like to pull hair. Six items assess wanting (the motivation and drive to engage in pulling) and six items assess liking (the experience of pleasure while pulling). The items are rated from 1 (almost never) to 4 (almost always). The scale was translated to Icelandic by Ívar Snorrason.

Psychometric properties of the hair pulling version have not been examined (Snorrason, Olafsson, et al., 2015).

Other self-report measures

Depression Anxiety Stress Scale (DASS-21). DASS is a 21 item self-report that was designed to assess symptoms of depression, anxiety and stress. DASS consists of 3 scales with 7 items each. Each item is rated from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). Rating applies to last week. Scores on each scale can range from 0-21. The scale was translated to Icelandic by Pétur Tyrfingsson. Psychometric properties of the English version are acceptable. Psychometric properties of the Icelandic version are acceptable for the depression and anxiety scale but unclear for the stress scale (Antony, Bieling, Cox, Enns, & Swinson, 1998; Ingimarsson, 2010; Lovibond & Lovibond, 1995).

Use of treatment strategies questionnaire. This questionnaire is a 2 item self-report to assess how much the participants have used the treatment strategies after treatment. Question 1: how often have you used any of the strategies taught during treatment, when there has been reason to use them? Rated, 1 (Hardly ever/never), 2 (rarely), 3 (sometimes), 4 (often), 5 (very often), and 6 (have not needed to). Question 2: If you have used any of the treatment strategies taught during treatment which ones have you used the most? The questionnaire was designed by the researchers.

Picture ratings. Pictures of the affected areas were taken at 6 and 12-month follow-up. The pictures were evaluated by independent raters who were blind to the purpose of the study. The pictures will not be used to evaluate treatment progress in this essay.

Procedure

The Icelandic data protection authority and the National bioethics committee approved the study. All participants had previously completed a treatment study in Mars and April 2017 and had given permission to be contacted later for a follow-up. Participants were contacted by phone and invited to participate in an in-person study session. At 6- and 12-month follow-

up, the participants completed a psychiatric interview and self-report questionnaires. Questionnaire to measure participant's use of specific treatment methods during the follow-up interval (Use of treatment strategies) was also included. At 12-month follow-up participants who were not available for a face-to-face assessment interview, were invited to complete the PHIS, SPS-R-VI, MGH-HS-VI and CGI interviews via telephone. All interviews, except phone interviews, were audio recorded. At both 6 and 12-month follow-up, pictures were taken of participant's body parts that were the focus of their pulling or picking behaviors. For more information on the procedure in the preceding study see Einarsdóttir (2017); Kristjánsson (2017).

Statistical analysis

IBM SPSS 20 was used to analyze the data. Mixed ANOVAs were used to assess changes in symptom severity from baseline to 6- and 12-month follow-up, depending on type of treatment. Treatment group (HRT-CERP and HRT-SC) was the between-subjects factor and time of assessment (baseline, 6 and 12-month follow-up) was the within-subjects factor. Since Mauchly's test of sphericity was significant for the SPS-R/MGH-HS self-report, and the Greenhouse-Geisser's Epsilon was less than 0.75, the Greenhouse-Geisser correction was used for the self-report. Cohen's d effect sizes were calculated by finding the difference in means between groups and dividing it with the pooled standard deviation of the means. It should be noted that we did not use correction for correlation between the two means when calculating the effect sizes. Cohen (1988) suggested that effect sizes should be considered small when d=0.2, medium when d=0.5 and large when d=0.8.

Since one of the main outcome measures, SPS-R for skin picking and MGH-HS for hair pulling, consists of different number of items (8 in the SPS-R and 7 in the MGH-HS), the total score was divided with the number of items in each questionnaire, that yielded standardized and comparable total scores on a scale from 0-4.

Results

Group comparison

Pre-treatment comparison

Considering that the dropout between groups was unequal, means of the follow up participants are compared with the dropout group. The follow-up group differs from the dropout on the self-report and CGI score (see table 2). There is also considerable difference in HRT-SC's one participant that dropped out and the four participants in HRT-CERP group (see table 2). HRT-SC's one participant that dropped out had hardly any improvement from pre- to post-treatment and was considered amongst the most extremely ill at both pre- and post-treatment on the CGI-severity scale. HRT-CERP group dropouts had a slightly greater decrease in symptom severity from pre- to post treatment than the follow-up participants on the self-report and CGI-severity scale but a slightly smaller decrease in the interview.

Table 2
Means (SD) of pre-treatment and post-treatment by follow-up participation or dropout.

Measurement	Pre-treatm. (*n*=20)	Follow-up pre-treatm. (*n*=15)	Follow-up post-teatm. (*n*=15)	Dropout pre-treatm. (*n*=5)	Dropout post-treatm. (*n*=5)
SPS-R/MGH-HS					
HRT-SC *n*=9/1	2.20 (0.6)	2.16 (0.5)	1.33 (0.6)	2.88[a]	2.5[a]
HRT-CERP *n*=6/4	2.19 (0.5)	2.26 (0.4)	0.94 (0.4)	2.09 (0.6)	0.62 (0.2)
Both groups	2.21 (0.5)	2.20 (0.5)	1.18 (0.5)	2.25 (0.5)	0.99 (0.9)
SPS-R-IV/MGH-HS-IV					
HRT-SC *n*=10 and 9	2.24 (0.4)	2.19 (0.4)	1.34 (0.7)	2.75[a]	2.5[a]
HRT-CERP *n*=10 and 6	2.14 (0.5)	2.22 (0.4)	0.83 (0.3)	2.02 (0.5)	0.80 (0.6)
Both groups	2.19 (0.4)	2.20 (0.4)	1.13 (0.6)	2.17 (0.5)	1.14 (0.9)
CGI-severity					
HRT-SC *n*=10 and 9	4.50 (1.2)	4.56 (0.7)	2.44 (1.0)	6[a]	6[a]
HRT-CERP *n*=10 and 6	4.30 (1.1)	4.33 (1.0)	1.67 (1.0)	4.75 (1.3)	2.0 (1.4)
Both groups	4.40 (1.1)	4.41 (0.8)	2.33 (1.4)	5 (1.2)	2.8 (2.2)

Note. HRT-SC=Habit Reversal Training – Stimulus Control; HRT-CERP=Habit Reversal Training – Cue Exposure with Response Prevention; SPS-R=Skin Picking Scale-Revised; MGH-HS=Massachusetts General Hospital-Hair-pulling Scale; SPS-R-IV=Skin Picking Scale-Revised-Interview Version; MGH-HS-IV=Massachusetts General Hospital-Hair-pulling Scale-Interview Version; CGI= Clinical Global Scale.

[a]=score from one participant

Demographic and clinical characteristics

All participants were female university students and the mean age was similar in the groups (Table 3). There were no significant differences between groups on any of the demographic and clinical characteristics indicators present in table 3.

Table 3

Frequencies of demographic information and mean age by treatment group

Variable	HRT-SC (*n*=9)	HRT-CERP (*n*=6)	Test statistics	*p*
Mean age	25.33	28.17	7.391[a]	0.367
Marital status *n*			0.118[b]	0.932
Single	6	1		
Married or cohabiting	3	5		
Educational level *n*			0.153[b]	0.326
Bachelor's degree student	7	3		
Bachelor's degree finished	2	3		
Primary diagnosis *n*			1.0[b]	0.675
HPD	2	2		
SPD	7	4		
Automatic or focused behavior *n*				0.849
Automatic	4	3	1.0[b]	
Focused	5	3		

Note: HRT-SC=Habit Reversal Training – Stimulus Control; HRT-CERP=Habit Reversal Training – Cue Exposure with Response Prevention; HPD=Hair-Pulling Disorder; SPD=Skin-Picking Disorder.

[a]Independent samples t-test

[b]Fisher's Exact Test - with 2 tailed significance

Treatment efficacy

Table 4 shows scaled mean scores of SPS-R/MGH-HS and SPS-R-IV/MGH-HS-IV and CGI scores at pre-treatment, post-treatment, 6-month and 12-month follow up. Table 4 also shows Cohen's *d* for pre-post treatment, pre-6 month follow up and pre-12 month follow up.

Table 4

Mean scores (and standard deviation) and effect sizes (Cohen's d) for primary measures of symptom severity.

	Pre-treatment *n*=20	Post-treatment *n*=20	Pre-treatment *n*=15	Post-treatm. *n*=15	6-month follow up *n*=15	12-month follow up *n*=15	Cohen´s *d*		
Measurements	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	Pre-post (*n*=20) (*n*=15)	Pre–6m	Pre–12m
HPD/SPD (symptom severity)									
Self-reports (SPS-R/MGH-HS)[1]									
HRT-SC	2.20 (0.6)	1.40 (0.6)	2.16 (0.5)	1.34 (0.7)	1.57 (0.7)	1.46 (0.8)	1.30	1.03	1.13
HRT-CERP	2.19 (0.5)	0.90 (0.5)	2.26 (0.4)	0.94 (0.6)	1.31 (0.8)	1.36 (1.0)	2.50	1.29	1.09
Both groups	2.21 (0.5)	1.19 (0.6)	2.20 (0.5)	1.18 (0.5)	1.46 (0.7)	1.42 (0.8)	1.80	1.20	1.16
Interviews (SPS-R-IV/MGH-HS-IV)[1]									
HRT-SC	2.24 (0.4)	1.45 (0.8)	2.19 (0.4)	1.33 (0.7)	1.46 (0.5)	1.37 (0.7)	1.29	1.71	1.51
HRT-CERP	2.14 (0.4)	0.81 (0.5)	2.22 (0.4)	0.83 (0.4)	1.28 (0.8)	1.29 (0.9)	2.96	1.34	1.19
Both groups	2.19 (0.4)	1.13 (0.7)	2.20 (0.4)	1.13 (0.6)	1.39 (0.6)	1.34 (0.8)	1.72	1.52	1.36
CGI-Severity									
HRT-SC	4.50 (1.2)	2.80 (1.5)	4.56 (0.7)	2.22 (1.1)	3.33 (1.2)	3.11 (1.9)	1.28	0.79	0.89
HRT-CERP	4.30 (1.1)	1.80 (1.1)	4.33 (1.0)	2.50 (2.0)	3.00 (2.0)	2.67 (1.0)	2.27	0.81	1.56
Both groups	4.40 (1.1)	2.30 (1.4)	4.41 (0.8)	2.33 (1.4)	3.20 (1.5)	2.93 (1.6)	1.68	0.91	1.07
DASS-21									
Anxiety									
HRT-SC	7.60 (8.5)	4.60 (4.1)		4.9 (4.3)	5.56 (7.0)	4.44 (4.8)	0.45	0.26	0.46
HRT-CERP	6.40 (6.5)	4.20 (5.2)		2.33 (3.9)	1.00 (1.7)	3.00 (2.8)	0.38	1.15	0.69
Both groups	7.00 (7.4)	4.40 (4.6)		3.87 (4.2)	4.13 (5.9)	4.0 (3.9)	0.42	0.43	0.51
Depression									
HRT-SC	16.40 (13.6)	10.6 (11.5)		7.56 (6.8)	8.67 (7.0)	6.00 (4.6)	0.46	0.71	1.02
HRT-CERP	12.20 (9.9)	5.80 (6.5)		5.33 (6.8)	7.33 (6.0)	5.00 (1.1)	0.76	0.59	1.02
Both groups	14.30 (11.7)	8.20 (9.5)		6.67 (6.4)	10.3 (10.5)	7.6 (8.8)	0.57	0.36	0.65
Stress									
HRT-SC	14.00 (8.7)	9.20 (4.0)		8.67 (3.9)	11.78 (9.9)	11.3 (10.1)	0.71	0.24	0.29
HRT-CERP	17.00 (9.1)	12.00 (9.9)		8.67 (10.0)	10.00 (8.0)	11.33 (6.0)	0.52	0.82	0.73
Both groups	15.50 (9.1)	10.60 (7.5)		8.67 (6.6)	11.13 (8.7)	12.6 (9.7)	0.59	0.49	0.31
Total score									
HRT-SC	38.0 (26.0)	24.4 (16.1)		21.1 (13.0)	26.0 (21.1)	21.8 (17.0)	0.63	0.51	0.74
HRT-CERP	35.6 (22.5)	22.0 (20.9)		16.3 (19.7)	18.3 (14.6)	19.3 (7.8)	0.63	1.07	1.14
Both groups	36.8 (23.7)	23.2 (18.2)		19.2 (15.5)	25.5 (20.7)	24.3 (19.2)	0.64	0.51	0.58

Note: M=mean; SD=standard deviation; SPS-R=Skin Picking Scale-Revised; MGH-HS=Massachusetts General Hospital-Hair-pulling Scale; SPS-R-IV=Skin Picking Scale-Revised-Interview Version; MGH-HS- IV=Massachusetts General Hospital-Hair-pulling Scale-Interview Version; CGI= Clinical Global Scale; DASS-21=Depression Anxiety Stress Scale-21item; HRT-SC=Habit Reversal Training – Stimulus Control; HRT-CERP=Habit Reversal Training – Cue Exposure with Response Prevention. *Post treatment mean scores are displayed as both full baseline data (n=20) and reduced data (n=15).*

[1]Scaled mean score because of different item count on each list. In appendix I is a table that displays total scores from self-report and interview version for each participant.

Primary outcome measures

SPS-R/MGH-HS self-report scales. A 3(time: post-treatment vs. 6-month vs. 12-month assessment) x 2(treatment group; HRT-SC vs. HRT-CERP) mixed design ANOVA was conducted. There was no significant main effect for time, $F(1.420,18.460)=2.092$, $p=0.161$, or for group $F(1,13)=0.598$, $p=0.453$. The time by group interaction was also not significant, $F(1.420, 18.460)=0.404$, $p=0.604$. This indicates that there are no significant

changes in treatment efficacy during the follow-up interval and that this is the case in both treatment groups.

Cohen's *d* effect sizes were also calculated (see table 4). In general, effect sizes from pre- to post-treatment were larger in the HRT-CERP group. However, pre-treatment to 6- and 12-month follow up effect sizes almost dropped by half in HRT-CERP group while the drop was 13% and 20% in the HRT-SC group. Changes in symptoms severity 12 months post treatment can still be considered large in both treatment groups (Cohens d' > 0.80).

SPS-R-IV/MGH-HS-IV interview. A 3(time: post- vs. 6-month vs. 12-month assessment) x 2(treatment group; HRT-SC vs. HRT-CERP) mixed design ANOVA was conducted. There was no significant main effect for time, $F(2,26)=1.215$, $p=0.313$, or for group $F(1,13)=0.874$, $p=0.367$ and the time by group interaction was also not significant, $F(2,26)=0.643$, $p=0.534$. This also indicates that there is no significant difference in treatment effect maintenance between groups and that there is not a significant difference in post treatment scores and follow up scores for either group. Therefor both treatment groups maintain their treatment effects.

Cohen's *d* effect sizes were also calculated (see table 4). In general, effect sizes from pre- to post-treatment were larger in the HRT-CERP group. However, pre-treatment to 6- and 12-month follow up effect sizes dropped by more than half in HRT-CERP group while it increased by 32% and 17% in the HRT-SC group. Changes in symptoms severity 12 months post treatment can still be considered large in both treatment groups (Cohens d' > 0.80).

CGI scores. A 3(time: post-treatment vs. 6-month vs. 12-month assessment) x 2(treatment group; HRT-SC vs. HRT-CERP) mixed design ANOVA was conducted. There was no significant main effect for time, $F(2,26)=2.59$, $p=0.09$, or for group $F(1,13)=1.20$, $p=0.29$ and the time by group interaction was also not significant, $F(2,26)=0.10$, $p=0.90$. This also indicates that treatment effects were retained according to CGI scores and to a comparable degree in both groups. Table 5 shows percentage of participants by CGI-severity score, group and time of measurement. The rating is relative to the clinicians past

experience with other patients with the same diagnosis, with or without other information. The change in severity scores from post treatment to follow up is similar in both groups. Cohen's *d* effect sizes are presented in table 4 and show that effect sizes from pre- to post-treatment were larger in the HRT-CERP group but dropped considerably at six and 12-month follow up.

Table 5

Percentage (and number) of participants by CGI-severity score, treatment group and time of assessment

Group and time	Normal, shows no signs of illness	Borderline ill	Slightly ill	Moderately ill	Markedly ill	Among the most extremely ill
HRT-SC Post	33.3 (3)	22.2 (2)	44.4 (4)	0	0	0
HRT-SC 6m	0	33.3 (3)	22.2 (2)	22.2 (2)	22.2 (2)	0
HRT-SC 12m	22.2 (2)	33.3 (3)	0	11.1 (1)	22.2 (2)	11.1 (1)
HRT-CERP post	50.0 (3)	0	33.3 (2)	0	0	16.7 (1)
HRT-CERP 6m	16.7 (1)	50.0 (3)	0	0	16.7(1)	16.7(1)
HRT-CERP 12m	16.7 (1)	16.7 (1)	50.0 (3)	16.7 (1)	0	0

Note. HRT-SC=Habit Reversal Training – Stimulus Control; HRT-CERP=Habit Reversal Training – Cue Exposure with Response Prevention; 6m=6-month follow up; 12m=12-month follow up.

Correlations between primary outcome measures

Table 6 shows correlations between SPS-R/MGH-HS, SPS-R-IV/MGH-HS-IV and CGI-severity scale at 6- and 12-month follow up. The correlations ranged from 0.42-0.97. The correlation between self-report and the interview version of SPS-R/MGH-HS at 6-month follow-up was 0.79 and at 12-month it was 0.70. The strong correlation between different forms of the same measure at 6-month and 12-month follow up, indicates that there was a good convergence in the assessment of severity between the therapist and participants.

Table 6

Correlations between primary outcome measures at 6-month and 12-month follow up

	1	2	3	4	5	6
1. SPS-R/MGH-HS 6. Month follow up (6m)	-					
2. SPS-R-IV/MGH-HS-IV 6m	0.79*	-				
3. CGI-severity scale 6m	0.58*	0.70**	-			
4. SPS-R/MGH-HS 12. Month follow up (12m)	0.89**	0.64*	0.45	-		
5. SPS-R-IV/MGH-HS-IV 12m	0.70**	0.46	0.36	0.97**	-	
6. CGI-severity scale 12m	0.63**	0.55*	0.42	0.76**	0.84**	-

Notes: SPS-R=Skin Picking Scale-Revised; MGH-HS=Massachusetts General Hospital-Hair-pulling Scale; SPS-R-IV=Skin Picking Scale-Revised-Interview Version; MGH-HS-IV=Massachusetts General Hospital-Hair-pulling Scale-Interview Version; CGI= Clinical Global Scale

*p<0.05, **p<0.01

Use of treatment strategies during follow up

Participants were asked to rate the amount of usage of specific treatment strategies during the follow-up period on a scale, 1 (Hardly ever/never), 2 (rarely), 3 (sometimes), 4 (often), 5 (very often), and 6 (have not needed to). At 6-month follow up the HRT-CERP groups mean was 3.67 (SD=1.37) and at 12-month follow up the mean was 3 (SD=1.41). At 6-month follow up the HRT-SC groups mean was 2.78 (SD=1.36) and at 12-month follow up the mean was 3 (SD=1.31). HRT-CERP group reported more use of the strategies at 6-month but at 12-month follow-up the reported use was equal between groups.

A 2(time: 6-month vs. 12-month assessment) x 2(treatment group; HRT-SC vs. HRT-CERP) mixed design ANOVA was conducted. There was no significant main effect for time, $F(1,12)=0.659$, $p=0.433$, or for group $F(1,12)=0.517$, $p=0.486$ and the time by group interaction was also not significant, $F(1,12)=3.191$, $p=0.099$. This indicates that there is no significant difference in treatment usage between groups and that there is not a significant difference in usage at 6-month follow-up scores and 12-month follow-up for either group.

Discussion

The purpose of this study was to compare the long-term effects of HRT-CERP and HRT-SC for HPD and SPD. Result showed that there were no significant differences at six and 12-month follow up between the treatments on any of the primary outcome measures. This indicates that symptom improvement is retained over a one-year follow-up period, and to a comparable degree, in both forms of treatment.

Results of previous studies on long-term effects of HRT-SC have been conflicting. Only four RCT's have studied long-term treatment efficacy beyond three months in HPD and SPD (Azrin et al., 1980; Diefenbach et al., 2006; Keijsers et al., 2006; Keuthen et al., 2012). Like Keuthen et al. (2012) our results show that the significant improvement in HPD and SPD symptoms after treatment was maintained at 6- and 12-month follow up. Keijsers et al. (2006) results show that effect sizes decreased by 49% from post treatment to 3-month follow up (from 2.91 to 1.47) and decreased by 70% from 3-month to 2-year follow up (from 1.47 to 0.87). Our results showed less decrease in effect sizes for the HRT-SC group on self-reports (SPS-R/MGH-HS): at 6-month follow up the effect size only decreased by 21% and at 12-month it had decreased only by 13% from post treatment. It should be mentioned that effect sizes, based on CGI-scores, in this group decrease more or 38% at six month follow up and 30% at 12-month follow up. Keijsers et al. (2006)'s pre-post treatment effect sizes were larger than ours and therefor they had a greater decrease but similar effect sizes at follow up. Azrin et al. (1980) results are difficult to compare to ours because of differences in methods used to assess symptom severity.

It was hypothesized that HRT-CERP would show greater long-term effects than HRT-SC, because CERP consists of exposure exercises that should reduce avoidance of symptom triggers and result in greater extinction of picking and pulling behaviors. This hypothesis was not supported. The reason could be that the group comparison reveals that there are differences in the HRT-SC and HRT-CERP dropouts. The only participant that dropped out of HRT-SC had only very small decreases in symptom severity on primary

measures and was considered amongst the most extremely ill at both pre- and post-treatment on the CGI-severity scale. The four participants that dropped out of the HRT-CERP group had a slightly greater decrease in symptom severity from pre- to post-treatment than the follow-up participants on the self-report and CGI scale but a slightly smaller decrease on the interview. Another possible reason for the decrease in effect sizes for the HRT-CERP group and therefore our hypothesis not being supported is that three of six participants in HRT-CERP follow-up group were not abstinent from picking or pulling post treatment and therefore extinction had not occurred for them jet. This can be resolved by more treatment sessions in general or flexible number of treatment sessions, that is until extinction has occurred. The reason for the hypothesis not being supported should not be how much the participants used the treatment strategies since HRT-CERP reported more usage of treatment strategies at 6-month follow-up.

Only one case study that we know of has been conducted on the long-term effects of HRT-CERP. Javidi et al. (2007) found that at post treatment the patients HPD and social phobia symptoms had decreased and quality of life increased. The results were maintained at 4-year follow up. The main difference between these studies is that this study only had four sessions over four weeks while Javidi et al. (2007) had 23 sessions over one year. It is likely that additional sessions and/or booster sessions could have reduced avoidance of symptom triggers more and resulted in greater extinction of picking and pulling behaviors.

Limitations

The sample size in the study was small, only 15 participants were assessed during 6- and 12-month follow up, therefore the power to find significant differences is limited. Secondly the dropout was different between groups. There were small differences between the mean scores of the follow up participants or the drop-out group on the primary measures at pre- and post-treatment, but greater differences between the dropout participant of HRT-SC and the four dropout participants of HRT-CERP. There was no significant difference between treatment groups on any of the demographic and clinical characteristics. Thirdly, the sample

was quite homogeneous. Participants were females and mean age was 26.5 (SD=5.7). Studies on HPD and SPD are generally conducted in young groups of female participants. The 12 RCT's and one study without a comparison group listed in table 1, includes 416 participants in total, with a medium age of 29,6 years and 84% are female. This could mean that studies on HPD and SPD in general are not adequately reflecting the SPD/HPD clinical population. The forth limitation is that even though the interviewer was blind to treatment condition, he was not blind to the purpose of the study. The fifth limitation is that there was no waitlist control group that would control for changes in symptoms over time that are irrelevant of treatment.

Strengths

This is the first study to our knowledge that compares the long-term efficacy of HRT-CERP and HRT-SC for HPD and SPD. To assess symptom improvement, we used multiple outcome measures, including self-report scales and clinical interviews.

Conclusions

HRT-SC is a first line treatment for HPD and SPD. Therefore, the finding that there is no significant difference in the long-term effectiveness of HRT-SC and HRT-CERP is promising and the effect sizes do show that the two treatments have similar results 12-months after treatment. None the less, the power to find significant differences is limited and therefore this should be interpreted with caution. This is the first controlled study to compare the long-term effects of HRT-CERP and HRT-SC on HPD and SPD and one of very few controlled studies on the long-term effects of the first line treatment of HPD and SPD.

These results encourage further research on long-term effects of these treatment protocols. These results also encourage the application of HRT-CERP as treatment for HPD and SPD. The limitations of this study need to be kept in mind, especially the small sample size and the differences in dropouts between groups. Future research should include larger samples that are representative of the general population and additional treatment sessions.

HRT-CERP should also be compared to other types of interventions like pharmacotherapy and a combination of both treatments, as well as a waitlist.

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