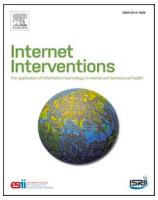
Internet Interventions 30 (2022) 100573

Contents lists available at ScienceDirect

Internet Interventions

journal homepage: www.elsevier.com/locate/invent



Internet-delivered acceptance-based behavior therapy for trichotillomania and skin-picking disorder in a psychiatric setting: A feasibility trial

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ARTICLE INFO

Keywords:
Hair-pulling disorder
Trichotillomania
Skin-picking disorder
Behavior therapy
Acceptance-based strategies
Internet-delivered therapy

ABSTRACT

Trichotillomania (TTM) and skin-picking disorder (SPD) are two clinically related conditions that can be successfully treated with behavior therapy (BT). There is some research indicating that BT for TTM and SPD can be efficacious also when delivered online instead of face-to-face, however, previous studies have mainly used self-recruited samples in a university context and it is unclear if the effects of online BT also extend to regular psychiatric patients. The current study set out to investigate if internet-delivered BT (I-BT) is a feasible, acceptable and preliminarily efficacious treatment for patients in a routine psychiatric setting. Twenty-five adult clinician-referred patients with TTM ($n = 7$) and/or SPD ($n = 18$) received 10 weeks of therapist-guided I-BT. The I-BT program incorporated both traditional interventions (e.g. habit reversal) as well as more recent acceptance-based techniques (e.g. embracing the urges and mindfulness). Clinician- and self-rated outcomes were assessed at pretreatment, posttreatment and at the delivery of 4 additional booster modules. Results showed that the majority of the participants were satisfied with the treatment and found it credible. The average number of completed internet modules was 7.2/10; five participants ended treatment prematurely. Significant decreases in hair pulling and skin picking severity were demonstrated from pretreatment to posttreatment with within-group effect sizes ranging from $d = 0.89$ to 1.75. The results remained significant up to the 12-month follow-up on most outcome measures. Altogether, the results provide initial evidence suggesting that I-BT could be a feasible, acceptable and potentially effective treatment for TTM and SPD for patients in a regular psychiatric setting.

1. Introduction

Trichotillomania (TTM) and skin-picking disorder (SPD) are two very similar psychiatric disorders (Snorrason et al., 2012a) characterized by recurrent and excessive hair pulling and skin picking, leading to hair loss and skin lesions. Both TTM and SPD have a point prevalence of approximately 2 % (Grant and Chamberlain, 2021).The pulling or picking can be highly time consuming and together with the time spent on hiding the consequences of the behaviors, it can occupy several hours a day (Tucker et al., 2011; Woods et al., 2006a). Not surprisingly, for many sufferers this interferes with their everyday life, such as social and occupational activities. Findings from earlier studies show that social interference was experienced by all TTM participants and nearly half of the participants with SPD. In addition, occupational interference was experienced by almost 80 % of the participants with TTM and 35 % of individuals with SPD (Diefenbach et al., 2005; Flessner and Woods, 2006).

Behavior therapy (BT) has been shown to be an effective treatment for TTM and SPD with moderate to large effect sizes compared to both passive and active control groups (Farhat et al., 2020; Selles et al., 2016). Unfortunately, many sufferers (74–85 %) of TTM and SPD do not receive this treatment (Tucker et al., 2011; Woods et al., 2006a) and one research study has indicated that there is a knowledge gap among clinicians of how to treat these disorders (Marcks et al., 2006). In addition, shame and stigma, lack of knowledge about TTM and SPD, as well as geographic and economic factors, may pose additional barriers to treatment (Marcks et al., 2006; Flessner et al., 2007).

One way to increase the availability of BT for patients who struggle with TTM/SPD could be to deliver the treatment digitally instead of face-to-face. Such treatments could possibly increase accessibility to evidence-based care for people living in geographically remote areas as well as to reach people who refrain from seeking treatment due to shame and stigma. The need for more flexible, remotely delivered health care interventions has become even more important during the Covid-19

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https://doi.org/10.1016/j.invent.2022.100573
Received 1 June 2022; Received in revised form 6 September 2022; Accepted 9 September 2022
Available online 13 September 2022

pandemic (Holmes et al., 2020). In one study by Moritz et al. (Moritz et al., 2012), 70 online recruited individuals who reported excessive skin-picking behaviors were randomly allocated to either a web-based self-guided BT ("habit reversal therapy" provided as bibliotherapy) or to a control intervention ("decoupling techniques"). Results showed that the BT group had a greater reduction of skin-picking symptoms than the control group. A subsequent trial by Gallinat (Gallinat et al., 2019) randomized 133 online-recruited individuals to either an online intervention consisting of BT-related techniques (SaveMySkin) or to a waiting-list. Results indicated larger reductions in the intervention group ($d = 0.67$) but this study also acknowledged a high attrition rate (35 %). There is to our knowledge only one controlled trial that has tested online BT for TTM. In this trial, 60 participants with TTM were randomly allocated to receive a self-guided online BT program (stoppulling.com) or to a waiting-list. Results showed a significant, but small, symptom reduction favoring the intervention ($d = 0.21$); however, effects did not extend to self-rated symptoms. Non-responders were subsequently switched to in-person BT who achieved a further decline in symptoms after this second wave of treatment (Rogers et al., 2014). Altogether, there is some support suggesting that BT is effective when provided in an online format for individuals who struggle with TTM and SPD. However, previous research has mainly been focused on self-recruited individuals within a university setting (Moritz et al., 2012; Gallinat et al., 2019; Rogers et al., 2014) and it is unclear if the results can be extended to a regular psychiatric context. This is an important issue as patients in regular health care are often presented with a rather complex symptom presentation e.g. comorbid ADHD, obsessive-compulsive disorder (OCD) etc. The current study set out to address this knowledge gap.

Furthermore, in-person treatment protocols for other psychiatric disorders have previously been translated to therapist-guided digital formats and successfully been evaluated in several trials (Carlbring et al., 2005; Andersson et al., 2012). Delivering BT digitally could hopefully also provide opportunities to reach populations of TTM and SPD, that would not otherwise seek or receive treatment. The aim of the current study was therefore to translate a BT program for TTM/SPD previously shown effective when delivered in a group format at our clinic (Asplund et al., 2021) to a digital format and investigate if this novel intervention is feasible, acceptable and possibly efficacious also when delivered via the internet. The program includes both elements of traditional BT as well as more recent acceptance-based strategies (see "Treatment" below for a more detailed explanation). In the aim of improving treatment adherence and to prevent relapse, which might be of particular importance for TTM/SPD-patients with more complex symptom presentations, the I-BT used in this study was therapist-guided and also included booster modules.

Our hypotheses were the following:

1) Patients will rate I-BT as an acceptable and feasible treatment format.
2) Patients who receive Internet-based Behavior Therapy (I-BT) will have reductions in TTM or SPD symptoms as well as associated impairments.

2. Methods

This study was an open pilot feasibility study with repeated measurements; pretreatment, posttreatment (primary endpoint), and long-term follow-ups at 1-, 3-, 6-, and 12 months.

2.1. Participants

Twenty-five ($N = 25$) clinician-referred participants with a primary diagnosis of TTM ($n = 7$) or SPD ($n = 18$) were included in the study. The study was open for Swedish adults with a principal diagnosis of TTM or SPD, with sufficient verbal fluency to work with the treatment program and with access to internet at home. Exclusion criteria were the following; a) lifetime diagnosis of bipolar disorder or psychosis, b) current substance dependence, c) acute suicidal ideation (scoring 5 or above on item 9 on the Montgomery-Åsberg Depression Rating Scale - Self Report (MADRS-S) (Svanborg and Asberg, 1994), d) other serious comorbidity that could jeopardize treatment participation, e) changes in psychotropic medication within 10 weeks prior to the start of treatment, f) other concurrent psychological intervention that could have an effect on symptoms of TTM or SPD, or g) completed BT for TTM or SPD in the last 24 months. Participants who were on stable medication were requested to keep their dose stable during the study period, but we did not specifically monitor medication adherence. The study was approved by the Swedish Ethical Review Authority (2019–06325). The trial was registered at Clinicaltrials.gov, registration ID: NCT04559750.

As shown in Table 1, most of the participants were female (96 %) and ranged in age from 20 to 49 years (mean = 30.4, SD = 7.1). A majority of the participants started pulling/picking in their early teens (mean = 11.9, SD = 4.2). All participants had their problems for many years (mean duration = 19.2, SD = 8.1). More than half of the participants (56 %) suffered from at least one additional psychiatric disorder. ADHD (28 %) was the most common comorbid disorder, followed by OCD (12 %) and generalized anxiety disorder (GAD; 12 %). Some of the participants met the diagnostic criteria for both TTM and SPD (16 %). Their primary diagnosis, the one deemed as most impairing for the individual, determined if they were treated as a TTM- or SPD-participant. A majority of the referrals came from general practitioners (68 %) and about one third were from other psychiatric clinics (32 %).

2.2. Recruitment and assessment procedures

All participants were recruited through clinician referrals to Ångestenheten, a clinic specialized in OCD and related disorders operated by the Stockholm City Council. Participant recruitment was carried out between August 2019 and September 2020 (due to regional regulations related to the Covid-19 pandemic, the recruitment was paused from

Table 1
Clinical characteristics and socio-demographics of the sample ($N = 25$).

Variable	Mean/n	SD/%
Age in years (mean, SD)	30.4	(7.8)
Age at onset (mean, SD)	12.2	(4.0)
Duration (years) of primary diagnosis (mean, SD)	18.2	(8.1)
Female (n, %)	24	(96 %)
Previous psychological intervention for TTM/SPD (n, %)	2	(8 %)
Occupational status (n, %)		
Employed	14	(56 %)
On sick leave	1	(4 %)
Student	9	(36 %)
Unemployed	1	(4 %)
Education (n, %)		
High school	12	(48 %)
College/university	13	(52 %)
Referral (n, %)		
From general practitioners	17	(68 %)
From psychiatric outpatient care	8	(32 %)
Current comorbidity, (n, %)	14	(56 %)
Attention deficit disorder, with/without hyperactivity	7	(28 %)
Both trichotillomania and skin picking disorder	4	(16 %)
Obsessive compulsive disorder	3	(12 %)
Generalized Anxiety Disorder	3	(12 %)
Body dysmorphic disorder	2	(8 %)
Panic disorder	2	(8 %)
Social anxiety disorder	2	(8 %)
Health anxiety	1	(4 %)
Autism spectrum disorder	1	(4 %)
Current stabilized drug treatment (n, %)	15	(60 %)
Selective serotonin reuptake inhibitor	12	(48 %
Other antidepressants	2	(8 %)
Centrally acting sympathomimetics	5	(20 %)
Melatonin	2	(8 %)

March 2020 to August 2020). Potentially eligible participants underwent a structured diagnostic interview with a psychiatrist using the Mini-International Neuropsychiatric Interview (M.I.N·I) (Sheehan et al., 1998) and the DSM-5 criteria for TTM and SPD (American Psychiatric Association, 2013). The MADRS-S (Svanborg and Asberg, 1994) was used to measure the magnitude of eventual depressive symptoms. The Alcohol Use Disorders Identification Test (AUDIT) (Saunders et al., 1993) and the Drug User Disorders Identification Test (DUDIT) (Berman et al., 2005) were used to assess substance abuse. Individuals who were preliminarily assessed to fulfill the inclusion criteria were contacted by a clinical psychologist and subsequently provided written informed consent for study participation. Fig. 1 shows the flow of participants through the trial.

2.3. Treatment

The treatment consisted of a 10-week program delivered in an encrypted online platform with two-factor authentication. The treatment was divided into 10 modules (chapters) and the participants were encouraged to spend one week on each module. For each module, all participants had to monitor the pulling/picking during the week and complete the homework assignments in order to get access to the next module the following week by their therapist. Participants interacted with the same therapist throughout the whole treatment. The main role of the therapists was to guide and support the participants through the treatment exercises and to provide feedback on homework assignments as well as answer questions. The participants had unlimited access to their therapist and were encouraged to contact the therapist if they needed clarification or support. Messages between participants and therapists were sent via a built-in email system on the encrypted internet platform. All homework assignments and questions from the participants were reviewed and replied to within 48 h on weekdays. The therapists had no face-to-face contact with the participants during the treatment. If the participant had not logged on to the internet platform for 7 days, a text message was sent to encourage the participant to do so. The internet therapists were all psychologists, except for one who was a clinical psychology student in her final year of the 5-year psychology program. All therapists had extensive training in the treatment components and had access to on-demand supervision during the treatment period from a senior clinician (first author). To ensure treatment integrity and adherence to protocol, the senior clinician continuously monitored the messages sent by the therapists during the entire treatment period.

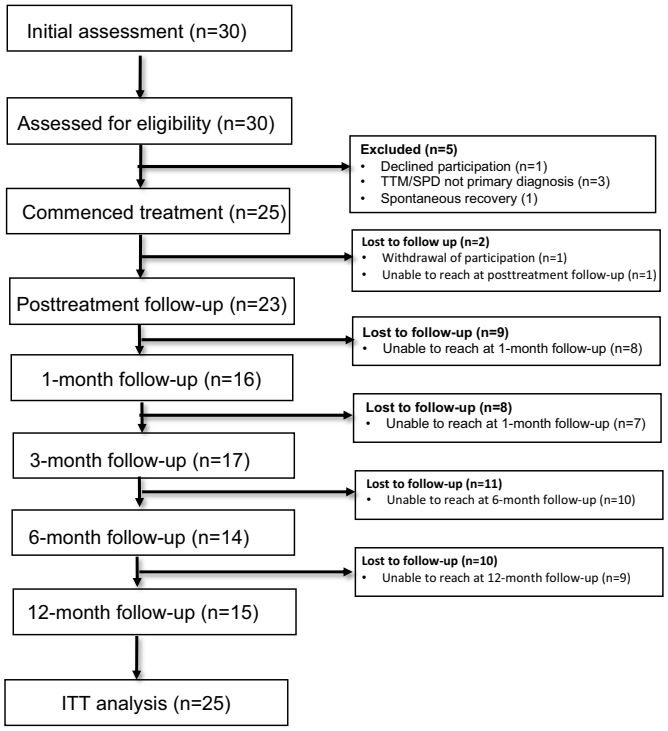

Fig. 1. Participant flow through the trial.

The I-BT program broadly follows the same treatment outline as the therapist manual "ACT-enhanced Behavior Therapy for Trichotillomania" by Woods and Twohig (Woods and Twohig, 2008). This treatment manual incorporates both traditional habit reversal therapy techniques (e.g. self-monitoring, stimulus control, incompatible behavior) as well as more recent innovations based on acceptance and commitment therapy (e.g. teaching the patients the concept of control as the problem and not the solution, embracing the urges, mindfulness). The self-help text is about 252 pages long and contains descriptions of the treatment components and how to implement these in everyday life through detailed explanations, case examples, metaphors and practical exercises. One main focus in the I-BT program in this study was the technique of "embracing the urge" i.e. the participants were instructed to proactively trigger the urge of pulling/picking and when the urge showed up, act mindfully and willingly towards the urge and not try to get rid of it as long as it was present. By proactively practicing embracing the urge, the individuals are hypothesized to be better prepared to refrain from skin-picking or hair-pulling when the urge appears unexpectedly in everyday life. Finally, as previous research has shown high relapse rates in patients with TTM/SPM, we also offered 4 booster modules at 1, 3, 6 and 12 months after post-treatment. eTable 1 in the online supplement shows a summary of the content of the treatment modules.

3. Outcomes

Detailed information about the questionnaires and assessment points are shown in eMethod 1 and eTable 2 in the online supplement. Participants got access to booster modules directly after completing he corresponding assessment. All self-rated measures were completed online.

3.1. Feasibility outcomes

Based on our prior experience of feasibility trials (Andersson et al., 2012; Enander et al., 2016; Bragesjö et al., 2021) we chose an explorative approach focusing on four factors of feasibility described below.

3.1.1. Participant engagement

Participant engagement was analyzed based on adherence, treatment activity and level of treatment dropout. Adherence to I-BT was defined as the average number of modules completed during the treatment. A module was regarded as completed when the participant had answered a short quiz about the content of the self-help text, had completed the homework assignments of the current module and finally, had registered the time spent pulling/picking for each day of the week in the weekly online registration tool. In addition to adherence, we also measured the treatment activity of each participant as the number of sent messages during the 10-week program. Treatment dropout was defined as coming to a mutual agreement with the online therapist to terminate the treatment.

3.1.2. Treatment satisfaction and credibility

Treatment satisfaction and credibility were assessed with Client Satisfaction Questionnaire (CSQ) (Nguyen et al., 1983) and the Treatment Credibility Scale (TCS) respectively (Borkovec and Nau, 1972).

3.1.3. Therapeutic alliance

Therapeutic alliance was assessed using the self-reported Working Alliance Inventory – Short Form (WAI—S) (Busseri and Tyler, 2003).

3.1.4. Negative events

Negative events perceived by the participants were assessed at post-treatment with the Negative Effects Questionnaire (Rozental et al., 2016).

3.2. Primary outcome measures

The self-reported Massachusetts General Hospital Hairpulling Scale (MGH-HS) (Keuthen et al., 1995), measuring hair-pulling severity was the primary outcome measure for the participants with TTM. This scale comprises 7 items regarding pulling behavior and the consequences of pulling as well as the urges to pull hair. The scale has a total score of 0–28, with a higher score indicating greater symptoms of hair pulling. The scale has shown good test-retest reliability ($r = 0.97$), internal consistency ($\alpha = 0.89$) and convergent and divergent validity (O'Sullivan et al., 1995). The internal consistency in this sample ($\alpha = 0.87$; baseline data), was considered good. Clinically significant change on the MGH-HS was defined as at least 35 % or a 7-point reduction as proposed by Farhat et al. (2019). As a supplement, we also report the frequency of participants with complete abstinence from hair pulling based on the guidelines by Nelson et al. (2014).

The self-rated Skin Picking Scale - Revised (SPS-R) (Snorrason et al., 2012b), measuring skin-picking severity and impairment, was the primary outcome measure for the SPD participants. The scale comprises 8 items regarding skin lesions, subjective distress, and functional impairment of picking. The scale has a total score of 0–32, where a higher score indicates a more severe disorder. The scale has shown acceptable psychometric properties; high internal consistency ($\alpha = 0.83$) and preliminary convergent and discriminant validity for the two subscales. In this sample the internal consistency was good ($\alpha = 0.82$; baseline data). No validated cut-off score is established for clinically significant change on the SPS-R but Keuthen et al. have found that a cut-off score of 7 or higher on the self-reported Skin Picking Impact Scale (SPIS) (Keuthen et al., 2001a) can discriminate normal skin picking behavior from compulsive skin picking (Keuthen et al., 2001a).

3.3. Secondary outcome measures

3.3.1. Clinician-rated outcome measures

All participants were assessed by a clinician with the Clinical Global Impression - Severity and Improvement scale (CGI-S/CGI-I) (Guy, 1976) and the Global Assessment of Functioning scale (GAF) (Jones et al., 1995). Participants with TTM were additionally assessed with the National Institute of Mental Health Trichotillomania Severity Scale and Trichotillomania Impairment Scale (NIMH-TSS/TIS) (Swedo et al., 1989). Remission was defined as no longer meeting the diagnostic criteria for TTM or SPD according to the DSM-5.

3.3.2. Self-rated outcome measures

Secondary self-rated outcome measures were the MADRS-S (Svanborg and Asberg, 1994), the Patient Health Questionnaire 9 (PHQ-9) (Kroenke et al., 2001), the Sheehan Disability Scale (SDS) (Leon et al., 1997) and the EuroQol (EQ5D) (EuroQolGroup, 1990), the self-reported Skin Picking Inventory Scale (SPIS) (Keuthen et al., 2001a) (only for participants with SPD). In order to facilitate comparisons with other SPD trials, we also included scores of the unrevised version of the Skin Picking Scale (SPS) (Keuthen et al., 2001b), retained from the SPS-R total score.

3.3.3. Self-rated process measures

As the I-BT program in this study used acceptance-based techniques, we wanted to investigate if psychological inflexibility and experiential avoidance changed during the treatment period. This was done using the Acceptance and Action Questionnaire - II (AAQ-II; (Bond et al., 2011)) and Acceptance and Action Questionnaire for Trichotillomania (AAQ-4-TTM; (Houghton et al., 2014)).

3.4. Safety procedures

To monitor major changes in depression as well as suicidality during treatment, MADRS-S was administered bi-weekly. Participants who scored ≥5 on item 9, which measures suicidal ideation, were immediately contacted by their therapist for a psychiatric assessment.

3.5. Statistical analyses

The analyses were carried out as per the intention-to-treat (ITT) principle. In order to investigate if I-BT was associated with reductions in TTM- or SPD symptoms as well as associated impairments, we used linear mixed effects models with time as an independent variable and primary and secondary outcome measures as dependent variables. The models comprised fixed effects for time and a random intercept for individuals. As previous research has shown a positive relationship between pulling/picking and experiential avoidance (Flessner and Woods, 2006; Woods et al., 2006b), we also did a post hoc correlation between the delta value on the AAQ-2 and the AAQ4TTM and the delta value on the MGH-HS and the SPS-R. Missing data of the primary outcome measures at posttreatment and follow-up were deemed to be missing at random by using analyses with logistic regression models ($p = .072–0.667$). The statistical analyses were calculated using the Stata statistical software, 13.1.

4. Results

4.1. Feasibility outcomes

4.1.1. Participant engagement

The mean number of completed modules was 7.2 (SD = 3.5, range 1–10). On average, the participants sent 13.8 messages to their therapist during the course of the 10-week treatment (SD = 10.0, range 1–42). Sixty-four percent ($n = 16$) of the participants completed at least 6 of the 10 modules which comprised the core components of the treatment (habit reversal training and acceptance and commitment therapy techniques). About half (56 %; $n = 14$) of the sample completed all 10 modules. The completion rate of the 4 booster modules was lower, with a mean of 1.7 modules (SD = 1.8). Half of the sample completed at least one booster module, whereas all of the booster modules were completed by 40 % of the sample. Five (20 %) participants ended treatment beforehand (two at module 1, one at module 3, one at module 4 and one at module 5). The participant's reason for terminating treatment prematurely were an extensive work load and not related to the treatment itself. The termination of the fifth participant was due to a worsening of depressive symptoms and suicidal ideation caused by problems at work, which led to non-compliance with the treatment.

4.1.2. Treatment satisfaction and credibility

The mean score on the CSQ-8 was 26.6 (SD = 4.7) which indicated a generally high level of satisfaction with the I-BT treatment ($n = 18$). Nine (50 %) participants reported that they were very satisfied with the treatment provided. Another 8 participants (44 %) were mostly satisfied and 1 participant (6 %) was indifferent or mildly dissatisfied with the treatment. The mean credibility ratings were in the high range (M = 40.1, SD = 8.9). The mean score on the WAI-S was 66.8 (SD = 15.5) indicating a high degree of working alliance.

4.1.3. Negative events

The most common negative events, rated by the participants as probably caused by the treatment, were experiences of more unpleasant feelings (44 %) and increased stress (38 %). For a more detailed presentation of the reported negative events, see eTable 4 in the online supplement.

4.2. Primary outcome

4.2.1. Effects on hair-pulling and skin-picking

The mixed effects model showed a significant effect from pre- to posttreatment with large within-group reductions on the primary outcome, MGH-HPS, z(7) = 8.49, $p < .001$, $d = 0.9$; SPS-R, z(18) = 12.75, p < .001, $d = 1.7$. For participants with SPD, the positive change in symptom reduction remained significant until the one-year follow up (SPS-R, z(14) = 13.18, p < .001, $d = 1.2$). For the participants with TTM, the positive change remained significant until the 6-month follow up (MGH-HPS, z(5) = 8.37, $p < .044$, $d = 1.3$). See Table 2 for more detailed information.

4.2.2. Clinically significant change

Based on the definition of clinically significant change proposed by Farhat et al., where the optimal definition of treatment response was 35 % or a 7-point reduction on the MGH-HS (Farhat et al., 2019), 43 % ($n = 3$) of the TTM-participants achieved clinically significant change at posttreatment. At the 12-month follow-up, none of the TTM-participants remained clinically significantly changed. In addition, based on the guidelines by Nelson et al. (2014) none of the TTM-participants demonstrated complete abstinence from hair pulling at posttreatment or at the 12-month follow-up. According to the cut-off scores from analyses on the SPIS proposed by Keuthen et al. (2001a), at posttreatment, 11 % ($n = 2$) of the SPD-participants achieved clinically significant change. At the 12-month follow-up, the proportion of SPD-participants achieving clinically significant change decreased to 5 %.

4.3. Secondary outcomes

4.3.1. Clinician-administered outcomes

Forty-eight percent ($n = 12$) of the complete sample were rated as responders based on the CGI—I, at posttreatment which decreased to only 20 % ($n = 5$) at the 12-month follow-up. According to CGI—S, one TTM participant was considered to be in remission at posttreatment and at the 12-month follow-up. The corresponding figure for SPD was 22 % ($n = 4$) at posttreatment and at the 12-month follow-up. The CGI-S and CGI-I results are presented in eTable3 in the online supplement. Both the severity- as well as the impairment subscales on the NIMH-TSS/TIS had significant improvements from pre- to posttreatment NIMH-TSS, z(7) = 4.99, $p < .001$, $d = 1.7$ and NIMH-TIS, z(7) = 4.03, $p < .021$, $d = 1.4$.

4.3.2. Self-rated outcome measures

Significant improvements were seen on skin picking severity (SPS), (z(18) = 11.28, p < .001, $d = 1.6$) as well as on behavioral and emotional consequences of skin picking (SPIS, z(18) = 6.09, p < .001, $d = 0.7$). Regarding the non-disorder-specific outcome measures, we found significant decreases in functional impairment and general symptoms from pretreatment to posttreatment, according to SDS (z(25) = 3.73, p < .001, $d = 0.72$) and GAF-S (z(25) = 37.40, $p = .004$, $d = 0.89$) with moderate to large effect sizes, while no significant improvements were demonstrated on MADRS-S (z(25) = 8.40, $p = .908$, $d = 0.46$), PHQ-9 (z(25) = 6.97, $p = .304$, $d = 0.33$), EQ5D VAS (z(25) = 11.96, $p = .241$, $d = 0.34$), EQ5D Status (z(25) = 25.87, $p = .214$, $d = 0.40$) and the GAF function scale (z(25) = 46.20, $p = .230$, $d = 0.37$). Detailed information on secondary measures is shown in Table 3.

4.3.3. Process measures

Experiential avoidance, measured with the AAQ4TTM, was significantly reduced from pre- to posttreatment (z(25) = 21.96, $p = .001$, $d = 1.4$) and from pretreatment to the 12-month follow-up (z(25) = 20.63, p = .001, $d = 1.2$). The AAQ-2 reductions from pre- to posttreatment did not reach significance (z(25) = 12.09, $p = .105$, $d = 0.5$). The reduction in experiential avoidance according to AAQ4TTM was moderately correlated with reductions in skin-picking severity (SPS-R (rs = 0.64, $p < .05$). However, reductions in symptoms of hair-pulling severity according to the MGH-HS were only very weakly and non-significantly correlated with a reduction in experiential avoidance (AAQ4TTM (rs = 0.05, $p > .05$).

5. Discussion

The aim of this study was to explore the feasibility, acceptability and preliminary efficacy of I-BT for TTM and SPD in a routine psychiatric setting. Overall, a majority of the participants were engaged in and highly satisfied with the treatment and rated the treatment as credible. The participants' average rating of the working alliance with their therapist was high, which suggests that the internet format was not obstructive, but rather, enabled a strong and positive therapeutic relationship. Together with the high engagement in treatment, based on the average number of completed modules as well as the number of sent messages and the relatively low drop-out rates, we conclude that the treatment was feasible and acceptable to participants in this regular clinical context. Nevertheless, increased stress was experienced as a negative event by a significant proportion of the participants during the treatment and this calls for modifications of the treatment as described further below. In addition, increased unpleasant feelings were experienced by many of the participants during the treatment. This negative event was anticipated as this is part of the ACT-rationale of acting mindfully and willingly towards urges and other unpleasant feelings and not trying to get rid of them. There were significant improvements on the main outcome measures on both TTM and SPD from pretreatment to posttreatment with large effect sizes comparable to previous meta-analyses (Farhat et al., 2020; Selles et al., 2016) of mostly in-person behavior therapy. Effects were also extended to the clinician rated NIHM-TSS/TIS of the TTM-participants as well as for the disorder specific secondary outcome measures for SPD. With that being said, only a small proportion of participants abstained completely from pulling or picking and only a few were considered to be in remission. These findings are in line with most previous research (Woods et al., 2006b; Ninan et al., 2000; van Minnen et al., 2003; Schuck et al., 2011) and call for further development and improvement of TTM- and SPD-treatments.

Table 2
Primary outcome measures at all assessment points.

								Within-group effect size d					
	PRE	MID	POST	1-Month FU	3-Month FU	6-Month FU	12-Month FU	PRE to POST		PRE to 6-month FU		PRE to 12-month FU	
Measure	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	*d*	CI- CI+	*d*	CI- CI+	*d*	CI- CI+
MGH-HS	20.43 (4.43)	13.71 (3.99)	15.57 (6.21)	13.8 (6.30)	17.33 (6.78)	15.2 (3.49)	16.25 (3.77)	0.89	−0.22 1.98	1.28	−0.02 2.53	0.99	−0.35 2.27
SPS-R	17.22 (3.37)	13.88 (3.44)	11.00 (3.65)	9.73 (4.41)	12.55 (3.30)	11.67 (2.88)	13.09 (3.73)	1.75	0.94 2.54	1.69	0.75 2.61	1.17	0.35 1.97

Note. PRE (pre-treatment), MID (mid-treatment), POST (post-treatment), FU (follow-up), M (means), SD (standard deviations), MGH-HS (Massachusetts General Hospital Hairpulling scale), SPS-R (Skin Picking Scale – Revised).
Effect sizes, Cohen's d, are reported with 95 % CIs.

Table 3
Secondary outcome measures at all assessment points.

							Within-group effect size d					
	PRE	POST	1-Month FU	3-Month FU	6-Month FU	12-Month FU	PRE to POST		PRE to 6-month FU		PRE to 12-month FU	
Measure	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	d	CI- CI+	d	CI- CI+	d	CI- CI+
NIHM-TSS	19.14 (2.27)	10.33 (7.12)				14.67 (6.53)	1.73	0.40 3.01			0.94	−0.24 2.07
NIHM-TIS	6.14 (0.90)	3.5 (2.51)				4.83 (3.19)	1.44	0.16 2.65			0.58	−0.55 1.68
SPIS	30.61 (10.91)	15.38 (8.77)	14.8 (9.32)	21.25 (9.78)	19.71 (6.80)	17.6 (9.18)	1.51	0.69 2.31	1.09	0.15 2.01	1.26	0.40 2.09
SPS	12.44 (2.85)	7.93 (2.93)	7.0 (3.0)	8.82 (2.64)	8.0 (2.29)	9.09 (3.11)	1.55	0.77 2.32	1.62	0.68 2.52	1.11	0.29 1.91
AAQ-II	26.6 (8.66)	22.83 (7.13)	22.31 (6.97)	25.13 (11.92)	22.55 (6.83)	20.43 (7.55)	0.47	−0.15 1.08	0.50	−0.22 1.22	0.74	0.06 1.42
AAQ4TTM	46.76 (6.58)	36.61 (7.72)	35.94 (9.64)	38.87 (6.98)	38.18 (7.53)	36.07 (8.95)	1.44	0.75 2.12	1.25	0.47 2.01	1.43	0.69 2.15
MADRS-S	16.2 (7.75)	12.33 (9.55)	9.31 (8.96)	11.93 (11.45)	8.45 (9.90)	9.36 (7.17)	0.46	−0.15 1.07	0.92	0.17 1.66	0.91	0.22 1.59
SDS	10.84 (7.59)	5.72 (6.17)	5.38 (6.90)	8.4 (8.81)	5.73 (5.31)	5.43 (5.72)	0.72	0.09 1.34	0.73	−0.01 1.45	0.77	0.09 1.44
EQ-5D-VAS[a]	55.31 (20.33)	60.46 (22.96)				63.70 (24.08)	0.34	−0.28 0.94	.		0.48	−0.19 1.14
EQ-5D STATUS[a]	0.77 (0.15)	0.82 (0.13)				0.82 (0.12)	0.40	−0.21 1.01			0.38	−0.29 1.03
PHQ-9	10.48 (5.87)	8.6 (5.66)				7.14 (6.51)	0.33	−0.29 0.93			0.56	−0.11 1.22
GAF-F[a]	73.4 (7.63)	76.05 (7.06)				79.5 (7.45)	0.37	−0.24 0.96			0.81	0.19 1.42
GAF-S[a]	60.64 (7.03)	67.32 (8.08)				65.0 (9.12)	0.89	0.26 1.52			0.55	−0.05 1.15

Note. PRE (pre-treatment), POST (post-treatment), FU (follow-up), M (means), SD (standard deviations), SPIS (Skin Picking Impact Scale), AAQ-II (Acceptance and Action Questionnaire-2), AAQ4TTM (Acceptance and Action Questionnaire for Trichotillomania), MADRS-S (Montgomery Åsberg Depression Rating Scale Self-report), SDS (Sheehan Disability Scale), EQ-5D (EuroQol), PHQ-9 (Patient Health Questionnaire 9), GAF-F (Global Assessment of Functioning, Symptom Scale, Function Scale), GAF-S (Global Assessment of Functioning, Symptom Scale).
Effect sizes, Cohen's d, are reported with 95 % CIs.
[a] Higher scores indicate better health. Sign of effect sizes changed for clarity.

One possible treatment innovation of the I-BT could be to condense the material even more, to streamline the homework exercises and add the possibility to listen to the material as audio presentations. This might lead the patients to better focus on the core components of the treatment. Another possible way to increase patient engagement could be to provide "modular treatments" where the patients work exclusively with the modules that are specifically relevant to their own situation. Modular treatments have previously been demonstrated to have some advantages over fixed module sequencing (Chorpita et al., 2017) for other psychiatric disorders. For instance, in the context of TTM/SPD-treatment this would make it possible for patients to skip the treatment component of stimulus control, which by some is considered a short term and ineffective technique which they have already tried by themselves. A modular approach might function to boost motivation and help these patients work more effectively with other parts of the treatment, which they find more helpful. Patient engagement could possibly also be increased by individualizing the program by offering optional modules for specific problems some of the patients may suffer from, as has been tried in previous internet interventions (Persson Asplund et al., 2018; Holländare et al., 2011). For example, those patients whose pulling/picking is triggered mostly by emotional instability, can be offered an optional module where they are taught emotion regulation techniques. All the suggestions above might also be viable ways of enhancing treatment adherence to purely self-guided interventions. However, the effects of such strategies remain speculative and should be evaluated empirically in both guided and unguided treatments.

One of the strengths with the current study was the routine psychiatric setting with clinically referred participants. Previous online TTM- and SPD-studies have used self-referrals (Flessner et al., 2007; Moritz et al., 2012; Gallinat et al., 2019; Rogers et al., 2014; Mouton-Odum et al., 2006) and most of them have relied on self-reported data with no verified diagnosis of TTM or SPD (Flessner et al., 2007; Moritz et al., 2012; Gallinat et al., 2019; Mouton-Odum et al., 2006). As shown in the participant flow chart, only a few of the referred patients were excluded from the study, when assessed for eligibility. This resulted in a heterogenic sample of participants with a broad spectrum of comorbidities, including neuropsychiatric conditions, with ADHD being the most common comorbidity (28 %). Thus, our results may be more generalizable to patients with TTM and SPD encountered in psychiatric care than those in previous research on online interventions for these disorders.

The non-significant 12-month follow-up effects of the TTM-participants could possibly be a result of lack of power given the small sample size. Another explanation could also be that participants with TTM had higher relapse rates. There are a number of previous studies that have reported elevated relapse rates for patients with TTM (Woods et al., 2006b; Diefenbach et al., 2006; Keijsers et al., 2006) and one theory is that – as hair loss recovers more slowly than the skin damage – individuals with TTM do not experience the same degree of improvements as in SPD. This could in turn have negative effects for the long-term motivation to continue working with the treatment (Asplund et al., 2021). One way to overcome potential motivational obstacles and achieve sustained long-term effects for this patient group could possibly be to design more tailored boosters, and also upscale the degree of therapist dosage (e.g. face-to-face or video sessions). Additionally, patients might appreciate visual guidance that provides more high-resolution feedback of the treatment gains (e.g. highlight even less visible regrowth of hair). Also, therapists might work particularly on providing the patient with information about the long-term effects and highlight the need for continuing the exercises also after the acute treatment has ended. Future studies should look into more closely the long-term effects of these patients and how to optimize booster sessions

adherence.

The findings regarding experiential avoidance were somewhat ambiguous since significant decreases from pretreatment to posttreatment were observed in only 1 of the 2 outcome measures. It is possible that the increase of acceptance of urges to pull or pick as demonstrated in AAQ4TTM was not detected by the more general measure of experiential avoidance in AAQ-2. The decrease in experiential avoidance in AAQ4TTM was moderately correlated to decreases in SPD-symptoms, but not to decreases in TTM-symptoms. Once again, the non-significant results for TTM-participants could possibly be due to a lack of power, but also potentially due to a more negligible role of experiential avoidance in this disorder. According to our clinical experience, it is not unusual that patients have difficulties understanding the questions posed in these measures of experiential avoidance, possibly leading to inaccuracies in the results. Based on these difficulties, future studies could consider developing more specific process measures relevant specifically for this patient group.

As the main aim of this pilot study was to explore the feasibility and acceptability of a novel treatment format and not the efficacy of the treatment, the sample size was set to a small number and we did not include a control group. The absence of a control group limits the possibilities to draw conclusions about the efficacy of I-BT. The improvements observed may have been due to other factors such as the mere passing of time or unspecific factors such as caregiver attention, expectancy or social desirability. However, given that both TTM and SPD are considered chronic disorders when not given adequate treatment (Wilhelm et al., 1999; Christenson et al., 1991) and that the mean duration of TTM- and SPD symptoms in our sample was >18 years, we consider it improbable that the effects of treatment in this study could be wholly explained by spontaneous remission or unspecific factors. The lack of a priori standards for evaluating feasibility is also to be considered a limitation, since it may lead to arbitrary conclusions. Therefore, our trial should be considered explorative in that regard. Another limitation with this study is that changes in medication during the treatment were not controlled for. The collaborating psychiatrists at our clinic asked the participants to refrain from medication changes, but we did not explicitly collect information about this. Hence, we cannot rule out that the treatment effects were affected by medication. The extent of missing data at follow-up is another limitation which might affect the certainty of the long-term effects of I-BT. Finally, the lack of interrater reliability data on the diagnoses is also to be considered as a limitation.

6. Conclusions

The findings from this study suggest that I-BT is a feasible, acceptable and preliminary efficacious treatment for patients with TTM and SPD in a psychiatric setting. Controlled trials of I-BT for TTM and SPD are warranted.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Acknowledgements

We would like to thank Philip Brenner, Sasa Markovic and Lovisa Dagerskog for diagnostic assessment. Many thanks also to internet therapists Anna Holmberg, Ulrika Kolmodin, Max Sannemalm, Lovisa Algovik and Lina Forsberg. The current study used the BASS platform from the eHealth Core Facility at Karolinska Institutet. We would like to thank Erik Sjöstrand and Brjánn Ljótsson for valuable technical support with the BASS platform. This study was supported by grants from Psykiatri Nordväst, Stockholm County Council, and Fredrik and Ingrid Thuring foundation. All researchers were independent of the funders. The funders had no part 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.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.invent.2022.100573.

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