



## The effects of brief cognitive-behaviour therapy for pathological skin picking: A randomized comparison to wait-list control

Kathrin Schuck\*, Ger P.J. Keijsers, Mike Rinck

Behavioural Science Institute, Radboud University Nijmegen, Montessorilaan 3, P.O. Box 9104, 6500 HE Nijmegen, The Netherlands

### ARTICLE INFO

#### Article history:

Received 6 April 2010

Received in revised form

2 September 2010

Accepted 13 September 2010

#### Keywords:

Pathological skin picking

Dermatillomania

Skin excoriation

Dermatological condition

Impulse-control disorder

Brief cognitive-behaviour therapy

### ABSTRACT

Thirty-four college students suffering from pathological skin picking were randomly assigned to a four-session cognitive-behavioural treatment ( $n = 17$ ) or a waiting-list condition ( $n = 17$ ). Severity of skin picking, psycho-social impact of skin picking, strength of skin-picking-related dysfunctional cognitions, and severity of skin injury were measured at pre-, post-, and two-months follow-up assessment. Participants in the treatment condition showed a significantly larger reduction on all measured variables in comparison to the waiting-list condition. The obtained effect sizes for the outcome measures were large, ranging from .90 to 1.89. Treatment effects were maintained at follow-up. In conclusion, cognitive-behavioural therapy, even in brief form, constitutes an adequate treatment option for pathological skin-picking behaviour.

© 2010 Elsevier Ltd. All rights reserved.

A growing body of research is devoted to dysfunctional, repetitive body-focused behaviours. Pathological skin picking (PSP), also called neurotic skin excoriation or dermatillomania, is characterized by recurrent and excessive picking or scratching of skin, skin lesions, and minor surface irregularities up to the point of causing severe tissue damage (Odlaug & Grant, 2008). Grave manipulation and deep penetration of skin occur frequently and, habitually, tools as needles, cannulae, or pincers are employed. Negative consequences can be profound and include lesions, infections, pigmentations, and scarring, as well as substantial emotional distress and functional impairment.

Up to this point, there is no clear uniformity in defining PSP. Criteria are manifold and their employment in previous research has been diverse (Grant & Odlaug, 2007; Keuthen et al., 2007; Snorrason, Smari, & Olafsson, 2010). Current research suggests that skin picking is a common behaviour which can range widely in frequency and severity (Bohne, Wilhelm, Keuthen, Baer, & Jenike, 2002; Hayes, Storch, & Berlanga, 2009). According to Hayes et al. (2009), a total of 62.7% of an American community sample engaged in some form of skin picking, defined as any picking, rubbing, or scratching of skin. Of their sample, 11.2% reported to engage in severe self-injurious skin picking, defined as a total score of seven or above on the Skin Picking Scale (SPS; Keuthen, Wilhelm,

et al., 2001). Comparable results were obtained by Bohne et al. (2002) in a sample of German college students. In their study, 77.6% of the sample engaged in one or more daily skin-picking episodes. Of the sample, 4.6% reported to feel significantly distressed or functionally impaired as a consequence of skin-picking behaviour. Using the conservative criterion of substantial emotional or functional disturbance, as required by the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1994), Keuthen et al. (2007) reported point prevalence rates of 2–4% of the general population for psychopathological skin picking.

Despite the common prevalence of skin picking in the general population, research on PSP is scarce. Particularly surprising is the small number of treatment studies that have addressed PSP in terms of psychotherapeutic treatments, as opposed to pharmacological treatments, which have been applied rather frequently. Indeed, only one study has utilized an experimental, waiting-list controlled design to assess the behavioural treatment of PSP (Teng, Woods, & Twohig, 2006). In this study, a total of 19 female college students completed assessments after random assignment to either a waiting-list or a treatment condition. In the treatment condition, participants received a 1-h treatment session, which included enhancement of awareness of skin picking, application of an incompatible response, and encouragement to find a social support person. The treatment session was followed by two 30-min booster sessions within two weeks after the treatment session. The treatment condition was superior to the waiting-list condition in reducing self-reported daily occurrences of skin-picking behaviour

\* Corresponding author. Tel.: +31 24 3612705; fax: +31 24 12776.

E-mail address: [k.schuck@bsi.ru.nl](mailto:k.schuck@bsi.ru.nl) (K. Schuck).

at post- and 3-months follow-up measurement, with a 77% decrease from pre-treatment to post-treatment for the treatment condition compared to a 16% decrease for the waiting-list condition. There were no significant differences in self-reported skin picking between the post-measurement and the follow-up measurement, indicating that treatment results were maintained. Additionally, these results were confirmed by severity ratings of photographs of skin injuries, as rated by independent assessors.

The results of Teng et al. (2006) provide preliminary evidence for the effectiveness of behavioural treatments in PSP. These findings are bolstered by earlier, uncontrolled studies (Rosenbaum & Ayllon, 1981; Twohig & Woods, 2001). However, clear conclusions are still compromised by the relatively small number of treatment studies and the small number of participants in these studies. Furthermore, all studies conducted so far have solitarily put emphasize on a behavioural standpoint in the treatment of skin-picking behaviour. However, PSP is likely to encompass dysfunctional and irrational cognitions, which are observed in many forms of psychopathology and impulse-control disorders such as trichotillomania (pathological hair pulling). These cognitions may be insufficiently addressed by behavioural interventions alone. Indeed, in the treatment of trichotillomania, cognitive interventions have been found effective in reducing hair pulling severity, providing preliminary support for the role of cognitions in the maintenance of hair pulling pathology (Keijsers, Maas, van Opdorp, & van Minnen, submitted for publication). The adjunct of cognitive interventions to traditionally administered behavioural interventions may offer an incremental value to treatment effects in PSP. Finally, the promising findings of Teng et al. (2006) ask for additional exploration. For example, up to this point, treatment effects, as reported by the participants, are limited to the frequency of skin-picking occurrences. A broader elaboration of treatment effects on symptoms associated with PSP, for example psycho-social impact of skin picking or dysfunctional skin-picking-related cognitions, is still waiting to be addressed.

Therefore, the present study investigated the effectiveness of a brief cognitive-behavioural intervention in PSP in comparison to a waiting-list condition. Assessments were conducted immediately before treatment, directly after treatment termination, and at two-months follow-up. Treatment effects were evaluated on several levels of measurement: skin-picking severity, psycho-social impact of skin picking, dysfunctional skin-picking-related cognitions, and severity of skin injury as rated by independent assessors. We expected the cognitive-behavioural intervention to be superior to the waiting-list condition for all outcome variables immediately after treatment as well as at follow-up.

## Method

### Participants

The sample consisted of 34 participants, 30 of them female. Participants satisfied the following inclusion criteria: Repetitive skin picking resulting in visible tissue damage and motivation to undergo a short cognitive-behavioural treatment aimed at reducing skin-picking behaviour. No exclusion criteria were employed. All participants were students or employees of the Radboud University Nijmegen or the HAN University of Applied Science, aged between 18 and 28 years (mean = 21.8,  $SD = 2.5$ ). Participants were recruited during lectures using a screening questionnaire and by advertisements using the university study participation system. Participants were randomly assigned to either a treatment condition ( $n = 17$ ) or a waiting-list condition ( $n = 17$ ). After study completion, participants in the waiting-list condition were also offered treatment.

### Procedure

Participants, who met inclusion criteria, were sent a comprehensive information brochure, which included information on the aim, procedure, and timetable of the study. All assessments took place in the university research laboratory. Each participant was tested individually. After giving informed consent, participants completed three questionnaires, namely the Skin Picking Scale, the Skin Picking Impact Scale, and the Self-Control Cognition Questionnaire (see Measures section for further information). Thereupon, participants were asked to indicate the most severely manipulated skin area. A photograph of this area was taken. Finally, participants were informed in which condition they were placed, were paid, and thanked.

Within a week, participants in the treatment condition were called by their assigned therapist for the first treatment session. The assignment of participants to therapists depended on the schedules of participants and therapists. Treatment consisted of four sessions of cognitive-behaviour therapy, administered according to the treatment manual described below. Participants in the waiting-list condition received no attendance. After five weeks, the second assessment took place. The third assessment followed eight weeks after the second assessment. Procedures and place were identical across conditions and across assessments.

For randomisation, a computer program was used which allowed for equal chance on a dichotomous event. The present data is part of a larger study in which implicit measures have also been assessed among participants. The results on implicit measures will be reported elsewhere.

### Measures

#### Severity of skin picking

A measure of severity of skin picking was obtained using a Dutch adaptation of the Skin Picking Scale (SPS; Keuthen, Wilhelm, et al., 2001). The SPS is a self-report instrument consisting of six items which measure the frequency of urges to pick the skin, the intensity of urges, the time spent skin picking, interference due to skin picking, distress associated with skin picking, and avoidance behaviour due to skin picking over the last week. Each item is rated on a 5-point severity scale ranging from 0 (none) to 4 (extreme), resulting in a total score between 0 and 24. The SPS correlated moderately ( $r = .49$ ) with self-reported duration of daily skin picking (Keuthen, Wilhelm, et al., 2001). Sensitivity and specificity analyses yielded a total score of seven or above to differentiate self-injurious skin picking from non-self-injurious forms of skin picking (Keuthen, Wilhelm, et al., 2001). Internal consistency of the SPS (Cronbach's  $\alpha = .85$ ) was good.

#### Psycho-social impact of skin picking

A measure of psycho-social impact of skin picking was obtained using a Dutch adaptation of the Skin Picking Impact Scale (SPIS; Keuthen, Deckersbach, et al., 2001). The SPIS is a self-report instrument consisting of ten items which measure the social, behavioural, and emotional consequences of skin picking over the last week. Each item is rated on a 6-point severity scale ranging from none (0) to severe (5), resulting in a total score between 0 and 50. Moderate correlations ( $r = .42$ ) with self-reported duration of daily skin-picking episodes have been reported (Keuthen, Deckersbach, et al., 2001). Sensitivity and specificity analyses yielded, again, a total score of seven or above to differentiate self-injurious skin picking from non-self-injurious forms of skin picking (Keuthen, Deckersbach, et al., 2001). Internal consistency of the SPIS (Cronbach's  $\alpha = .91$ ) was excellent.

### Skin-picking-related cognitions

A measure of dysfunctional, skin-picking-related cognitions was obtained using the Self-Control Cognition Questionnaire (SCCQ; Keijsers et al., submitted for publication), which was developed to assess cognitions in people who suffer from unwanted habits. The SCCQ is a self-report instrument consisting of 11 items which measure beliefs about rewarding aspects of the habit (e.g., 'When I am sad, I expect ... will comfort me') and beliefs about one's inability to resist the urge to give into the habit (e.g., 'I don't think I will be able to resist the urge to ...'). Each item is rated on a 5-point Likert scale ranging from 1 (not at all applicable) to 5 (very applicable), resulting in a total score between 11 and 55. In the present study, all items of the SCCQ were adapted to skin picking. Higher scores indicate stronger beliefs in the rewarding aspects of skin picking and stronger belief associated with giving into the habit. Internal consistency of the SCCQ (Cronbach's  $\alpha = .75$ ) was satisfactory. Concurrent validity correlations between the SPS, SPIS, and SCCQ are given in Table 1.

### Photograph severity rating

After the first assessment, participants were asked to identify a recently picked area which they judged most severely injured. A photograph of this area was taken with a Canon Power Shot G9 camera from a distance of approximately 5–8 inches using the macro modus. At the subsequent assessments, photographs of the same areas were taken again. Additionally, participants were asked whether a more severe skin injury had occurred at a different skin area. While skin picking frequently shifted within one skin area, for example from the forehead to the chin, it barely shifted across skin areas, for example from the face to the chest. Even though a large part of participants reported skin picking at two different areas (e.g., face and back), one area was usually experienced as more severely injured. A measure of severity of skin injury was obtained using severity ratings of these photographs, rated by twelve psychology graduate students. Photographs were displayed to the raters on a computer screen using a Power Point presentation. Each slide contained three photographs of the same participant at pre-, post- and follow-up assessment. The order in which the photographs of the three assessments were displayed on the slide was quasi-random, and the order in which the slides were presented to the raters was counterbalanced. Raters were blind to treatment condition. For each photograph on the slide, raters were asked to judge how severely they thought the skin was injured on a rating scale from 1 to 4 (not or barely injured, mildly injured, moderately injured, severely injured). Higher scores indicate more severe injury. Raters recorded their ratings by entering their score on a paper-and-pencil rating scale.

### Frequency and severity

Supplementary measures of frequency and severity of skin picking were obtained using two author-constructed items. Both items referred to the previous seven days. The frequency-measure consisted of one questions asking for the daily average of skin-picking frequency. For item rating, five response options were

offered (less than once a day, once a day, twice a day, between three and five times a day, more than five times a day). The severity-measure consisted of one questions asking for the severity of tissue damage. Again, five response options were offered (not visible, red marks/rash, visible tissue damage, severe wound, possibly permanent tissue damage).

### Urge and resistance

Measures of urge to pick skin and resistance to urge to pick skin were obtained using two visual analogue scales. Both items referred to the previous seven days. The urge-measure consisted of one question asking for the experienced urge to pick skin (from no urge to intense urge). The resistance-measure consisted of one question asking for the ability to resist the urge to pick skin (from unable to able). For scoring, a percentile-score was calculated, ranging between 0 and 100. Higher scores indicate more intense urge and higher ability to resist the urge.

### Treatment

The treatment took place in and under responsibility of the 'Ambulatorium, Academic Centre Social Sciences' (ACSW) of the Radboud University Nijmegen, the Netherlands. The ACSW is a psychotherapy outpatient care facility with particular expertise in research and treatment of impulse-control disorders.

Six therapists participated in the present study. All therapists were master-level students who completed a clinical internship at the ACSW. All therapists were experienced in the delivery of the treatment, carefully trained in the implementation of the treatment manual, and weekly supervised by a licensed clinical psychologist/psychotherapist.

The treatment consisted of four 45-min sessions of cognitive-behaviour therapy, administered across a period of five weeks. Treatment sessions were conducted according to a treatment manual. The treatment manual was specifically designed for this study. It was partly based on a six-session treatment manual for behaviour therapy, for which excellent results have previously been reported in the treatment of trichotillomania (van Minnen, Hoogduin, Keijsers, Hellenbrand, & Hendriks, 2003), and partly based on interventions from cognitive therapy, also previously used successfully in the treatment of trichotillomania (Keijsers et al., submitted for publication).

The treatment consisted of an intake session which covered the development, course, circumstances, and impact of skin picking. Additionally, medical causes for skin picking, current and former treatment for skin picking or other medical or psychiatric conditions, and common comorbid disorders (depressive symptoms, obsessive-compulsive disorder, trichotillomania, pathological nail biting) were assessed. During the first session, participants received psycho-education concerning the development and maintenance of unwanted habits and an additional information brochure with more detailed treatment information. In the second session, cognitive interventions were introduced. Dysfunctional, automatic cognitions with regard to skin picking were identified, critically questioned on believability, objectivity and functionality, and eventually replaced by more functional and rational cognitions. Examples of frequently encountered dysfunctional cognitions are 'I will not be able to relax until I have removed this irregularity', 'It has been a stressful day – I have earned to pick my skin', 'I cannot resist the urge'. Particular emphasis was put on the identification of cognitions that frequently lead to the initiation or deterioration of a skin-picking episode, for example 'I am just going to have a short look at this', 'I really have to do this now', or 'I have to squeeze tighter to remove this'. Examples of how patients replaced these cognitions are 'Looking and touching

**Table 1**  
Concurrent validity correlations between primary outcome measures.

Scale	SPS	SPIS
SPS		
SPIS	.78**	
SCCQ	.56*	.57**

Note. SPS = Skin Picking Scale, SPIS = Skin Picking Impact Scale, SCCQ = Self-Control Cognition Questionnaire. \* $p < .01$ ; \*\* $p < .001$ .

**Table 2**  
Means, standard deviations, and effect sizes for outcome measures for the treatment condition (CBT) and waiting-list condition (WL).

Measure	Group	Assessment 1	Assessment 2	Assessment 3	Cohen's <i>d</i> (2nd – 1st)	Cohen's <i>d</i> (3rd – 1st)
SPS	CBT	10.07 (2.67)	5.43 (3.41)	4.93 (2.76)	1.52	1.89
	WL	9.44 (4.47)	8.31 (4.18)	7.81 (4.92)	0.26	0.35
SPIS	CBT	26.57 (10.17)	17.14 (10.81)	13.57 (10.95)	0.90	1.23
	WL	20.94 (12.05)	18.00 (11.51)	17.06 (12.06)	0.25	0.32
SCCQ	CBT	33.71 (7.18)	22.07 (8.63)	21.36 (6.18)	1.47	1.84
	WL	31.19 (5.43)	29.81 (7.80)	29.50 (8.88)	0.21	0.23
Photograph rating	CBT	2.67 (0.65)	1.90 (0.50)	1.83 (0.66)	1.31	1.27
	WL	2.60 (0.65)	2.47 (0.71)	2.36 (0.71)	0.19	0.35
Urge	CBT	76.33 (16.55)	36.00 (23.40)	35.65 (24.71)	1.99	1.93
	WL	69.82 (23.28)	53.91 (24.63)	51.16 (27.06)	0.66	0.74
Resistance	CBT	35.55 (20.42)	73.81 (14.75)	62.19 (26.12)	2.15	1.14
	WL	27.20 (19.37)	42.71 (25.25)	39.52 (31.33)	0.69	0.47

Note. SPS = Skin Picking Scale, SPIS = Skin Picking Impact Scale, SCCQ = Self-Control Cognition Questionnaire.

increases the likelihood that I will end up picking my skin', 'The urge is going to ease off', or 'Squeezing tighter is likely to render a scar or wound'. In the third session, cognitive interventions were followed by behavioural interventions aimed at enhancing self-control. Emphasis was put on the collaborative search for adequate interventions to enhance awareness of skin picking (e.g., registration of skin-picking episodes, use of gloves or bandages around the fingers during critical situations), interventions to restrict skin picking (e.g., adhering to particular conditions, for example, not picking with fingernails or picking solely with dimmed lights), and interventions to prevent (or delay) skin picking (e.g., calling a friend, going for a walk, cleaning the room). The fourth session focused mainly on relapse prevention (i.e., enhancement of self-efficacy, differentiation between lapse and relapse, agreement on clearly defined measures to be applied by the patient in case of a lapse). After each session, homework assignments were given. Assignments included registration of the time spent skin picking, completion of registration forms from cognitive therapy, and adherence to previously made regulations concerning the restriction and delay of skin picking.

#### Attrition

During the course of the study, a total of four participants were lost to attrition. In the treatment condition, three participants withdrew before the start of the treatment. Reasons were lack of time and a preference for dermatological treatment. In the waiting-list condition, one participant was inaccessible after the pre-measurement. Furthermore, in the waiting-list condition, one participant was unavailable for the post-measurement, and one participant was unavailable for the follow-up measurement. The final sample included 28 participants who completed all assessments and 30 participants who completed at least two assessments. Participants with missing assessments were compared to the remaining participants on skin-picking severity and psycho-social impact of skin picking using a multivariate analysis of variance (MANOVA). Overall, missing values were not significantly

associated with skin-picking severity,  $F(1, 32) = 1.04$ ,  $p = .32$ , but related significantly to lower psycho-social impact of skin picking,  $F(1, 32) = 5.86$ ,  $p = .02$ .

## Results<sup>1</sup>

### Pre-treatment group differences

To assess possible differences between the treatment condition and the waiting-list condition on demographic characteristics, chi-square analyses and an analysis of variance (ANOVA) were conducted. No significant differences between the treatment and the waiting-list group were observed in age,  $F(1, 28) = .03$ ,  $p = .86$ ,  $\eta_p^2 < .01$ , gender,  $\chi^2(1, N = 30) = .24$ ,  $p = .63$ , or nationality,  $\chi^2(1, N = 30) = .07$ ,  $p = .79$ . To assess possible pre-treatment differences between the treatment condition and the waiting-list condition on outcome variables, a multivariate analysis of variance (MANOVA) was conducted. As expected, the multivariate group effect for the three primary outcome questionnaires SPS, SPIS, and SCCQ was not significant,  $F(3, 26) = 1.11$ ,  $p = .36$ ,  $\eta_p^2 = .11$ . Table 2 displays means and standard deviations for both groups.

### Descriptive statistics

According to the classification by Keuthen, Wilhelm, et al. (2001) and Keuthen, Deckersbach, et al. (2001), a total of 25 participants (73.5%) were identified to engage in self-injurious skin picking using the SPS, and 32 participants (94.1%) were identified to engage in self-injurious skin picking using the SPIS. Furthermore, a total of 33 participants (97.1%) reported to have picked their skin at least once a day within the last week, and 28 participants (84.8%) reported to have visibly damaged their skin, induced a severe wound, or possibly even caused themselves permanent tissue damage within the last week. The average urge to pick skin, as assessed by the urge-scale, was 71.53,  $SD = 19.89$ , and the average ability to resist the urge to pick skin, as assessed by the resistance-scale, was 32.04,  $SD = 19.67$ .

Additional demographic data were collected during the intake interview. As these data were clinician-assessed during the first treatment session, this information is reported solely for the treatment condition ( $n = 14$ ). Seven participants reported no dermatological cause for skin picking, no past or current psychiatric disorder, and did not meet criteria for current obsessive-compulsive disorder (OCD), depressive disorder, trichotillomania, or onychophagia (pathological nail biting). Four participants reported skin picking due to a dermatological condition (i.e., eczema, acne), no past or current psychiatric disorder, and did not meet criteria for

<sup>1</sup> Results pertain to an intent-to-treat analysis with last observation carried forward for participants who provided data at least once after baseline ( $N = 30$ ). Additionally, a complete-case analysis ( $N = 28$ ) was conducted. Across both analyses, there were no differences in statistical significances of findings except for two instances: In the complete-case analysis, (1) the group by time interaction effect on the photograph severity rating changed from significant,  $F(2, 27) = 3.91$ ,  $p < .05$ ,  $\eta_p^2 = .22$ , to marginally significant,  $F(2, 25) = 2.76$ ,  $p = .08$ ,  $\eta_p^2 = .18$ , and (2) the univariate group by time interaction effect for resistance changed from marginally significant,  $F(2, 25) = 3.32$ ,  $p = .06$ ,  $\eta_p^2 = .11$ , to significant,  $F(2, 23) = 4.16$ ,  $p < .05$ ,  $\eta_p^2 = .14$ .

**Table 3**  
Data used to determine cut-off points and Reliable Change Index (RC) for the SPS, SPIS, and SCCQ.

Symbol	Definition	SPS	SPIS	SCCQ
$M_1$	Mean for clinical sample at pre-measurement	12.78	27.54	32.37
$S_1$	Standard deviation for clinical sample at pre-measurement	3.83	16.57	6.33
$M_0$	Mean for non-clinical sample	2.83	1.23	–
$S_0$	Standard deviation for non-clinical sample	2.56	3.53	–
$X_1$	Pre-treatment score of an individual			
$X_2$	Post-treatment score of an individual/follow-up score of an individual			
$S_{diff}$	Standard error of difference (pre-to post-treatment score)	3.16	1.49	6.33
	Standard error of difference (pre-to follow-up score)	3.25	2.02	6.27
$S_E$	Standard error of measurement of scale (pre-to post-treatment score)	2.23	1.06	4.48
	Standard error of measurement of scale (pre-to follow-up score)	2.30	1.43	4.43
$r_{xx}$	Test–retest reliability of scale (pre-to post-treatment score)	.66	.83	.50
	Test–retest reliability of scale (pre-to follow-up score)	.64	.69	.51

Note. SPS = Skin Picking Scale, SPIS = Skin Picking Impact Scale, SCCQ = Self-Control Cognition Questionnaire.

any of the assessed comorbid disorders. Three participants met criteria for a comorbid disorder or reported a current comorbid disorder. Of these participants, one participant reported current admission to psychotherapeutic treatment for hypochondria. One participant met criteria for current depressive disorder, reported current use of SSRIs and current participation in a group therapy for depression, and reported to suffer from eczema. One participant reported past psychotherapeutic treatment for OCD, continued use of SSRIs, and skin picking due to psoriasis. None of the participants reported former psychotherapeutic or psycho-pharmacological treatment for skin picking.

#### Primary outcome variables

Table 2 displays means and standard deviations of the primary outcome measures (i.e., SPS, SPIS, and SCCQ) at pre-, post- and follow-up measurement for the treatment group and the waiting-list group. To evaluate the effect of cognitive-behaviour therapy on these primary outcome measures, a 2 (condition)  $\times$  3 (pre, post, FU) repeated measures MANOVA was conducted for scores on the SPS, SPIS, and SCCQ simultaneously.

As hypothesized, the analysis showed a significant multivariate group by time interaction effect,  $F(6, 23) = 5.12, p < .01, \eta_p^2 = .57$ , indicating that skin-picking symptom severity differed across time as a function of group. Follow-up univariate ANOVAs revealed that this interaction effect was significant for all three outcome measures, namely the SPS,  $F(2, 23) = 8.68, p < .01, \eta_p^2 = .24$ , the SPIS,  $F(2, 23) = 7.80, p < .01, \eta_p^2 = .22$ , and the SCCQ,  $F(2, 23) = 17.89, p < .001, \eta_p^2 = .39$ . As hypothesized, comparisons revealed a superiority of the treatment group over the waiting-list group in pathology reduction.

A separate analysis for the treatment condition showed a significant main effect of time,  $F(6, 8) = 8.22, p < .01, \eta_p^2 = .86$ . Pair-wise comparisons using the Sidak correction for the SPS, the SPIS, and the SCCQ indicated a significant symptom reduction from pre-measurement to post-measurement (all  $ps < .01$ ) and from pre-measurement to follow-up measurement (all  $ps < .01$ ). There were no significant differences between the post-measurement and the follow-up measurement (SPS:  $p = .89$ ; SPIS:  $p = .28$ ; SCCQ:  $p = .96$ ) for any outcome variable. For the waiting-list group, the multivariate effect of time was not significant,  $F(6, 10) = 2.57, p = .09, \eta_p^2 = .61$ .

In addition, effect sizes for the primary outcome measures SPS, SPIS, and SCCQ were calculated using Cohen's  $d$  for repeated measures<sup>2</sup> (Cohen, 1988). Results are displayed in Table 2. Effect sizes were found to be high in the treatment condition, ranging

from .90 to 1.89, and low in the waiting-list condition, ranging from .12 to .35.

#### Clinically significant change

Clinically significant change on the SPS, the SPIS, and the SCCQ was evaluated using the methodology by Jacobson and Truax (1991). Following their recommendation, cut-off score  $c^3$  should be used to define recovery when normative data for a representative clinical and non-clinical sample are available. For the SPS and the SPIS, these data were derived from the validation studies of Keuthen, Wilhelm, et al. (2001) and Keuthen, Deckersbach, et al. (2001). For the SCCQ, no appropriate normative data for a representative clinical or a non-clinical sample are available. Therefore, only cut-off score  $a^4$  can be used to define recovery. Additionally, we used the Reliable Change Index (RC)<sup>5</sup> to define improvement. The data used to calculate cut-off point  $c$ , cut-off point  $a$ , and RC are summarized in Table 3. The cut-off point for the SPS was 6.82, the cut-off point for the SPIS was 5.85, and the cut-off point for the SCCQ was 19.71. Therefore, scores of 6 or below on the SPS, scores of 5 or below on the SPIS, and scores of 19 or below on the SCCQ were considered to lie within the functional range. Percentages of improved and recovered participants in the treatment and the waiting-list condition are presented in Table 4.

#### Photograph severity rating

To evaluate the photograph severity rating, a 2 (group) by 3 (time) repeated measures ANOVA was conducted. Results showed a significant group by time interaction effect,  $F(2, 27) = 3.91, p < .05, \eta_p^2 = .22$ , indicating that the photograph severity ratings of skin injuries over time differed across both groups. Separate analyses were conducted for both groups to evaluate photograph severity ratings of skin injury across time. For the treatment condition, a significant main effect of time,  $F(2, 12) = 12.71, p < .01, \eta_p^2 = .68$ , was found. Pair-wise comparisons using the Sidak correction indicated a significant reduction in severity from pre-measurement to post-measurement ( $p < .01$ ) and from pre-measurement to follow-up measurement ( $p < .01$ ). No significant difference in severity between the post-measurement and the follow-up measurement ( $p = .99$ ) was observed. For the waiting-list condition, the main effect of time was not significant,  $F(2, 14) = .75, p = .49, \eta_p^2 = .10$ .

<sup>3</sup>  $c = S_0M_1 + S_1M_0/S_0 + S_1$ .

<sup>4</sup>  $a = M_1 - 2S_1$ .

<sup>5</sup>  $RC = X_2 - X_1/S_{diff}$ ,  $S_{diff} = \sqrt{(S_E)^2}$ ,  $S_E = S_1\sqrt{1-r_{xx}}$ .

<sup>2</sup>  $d = M_1 - M_2/\sqrt{(SD_1^2 + SD_2^2)/2}$ .

**Table 4**  
Percentages of improved and recovered participants in the treatment condition (CBT) and the waiting-list condition (WL) on the SPS, SPIS, and SCCQ.

Scale	Group	N	Assessment 1 to Assessment 2			Assessment 1 to Assessment 3		
			% Improved, but not recovered	% Recovered	% Unimproved or deteriorated	% Improved, but not recovered	% Recovered	% Unimproved or deteriorated
SPS	CBT	14	0.0	57.1	42.9	0.0	64.3	35.7
	WL	15	0.0	6.7	93.3	0.0	13.3	86.7
SPIS	CBT	14	71.4	21.4	7.1	50.0	42.9	7.1
	WL	15	53.3	13.3	33.3	46.7	13.3	40.0
SCCQ	CBT	14	21.4	50.0	28.6	50.0	42.9	7.1
	WL	15	0.0	13.3	86.7	0.0	13.3	86.7

Note. SPS = Skin Picking Scale, SPIS = Skin Picking Impact Scale, SCCQ = Self-Control Cognition Questionnaire.

In addition, effect sizes for the photograph severity rating were calculated using Cohen's *d* for repeated measures (Cohen, 1988). Results are displayed in Table 2. Effect sizes from pre- to post-measurement and from post- to follow-up measurement were found to be high in the treatment condition and moderate in the waiting-list condition.

#### Frequency and severity

Measures of skin-picking frequency and severity were included as a qualitative adjunct to the validated primary outcome measures. Report of these variables was expected to enable a better and more intuitive understanding of actual treatment outcomes. No statistical analysis was performed on these variables, and results are reported solely for the treatment condition. At pre-measurement, 71% of the sample reported to pick their skin at least twice day while the same applied to only 36% of the sample at follow-up measurement. Similarly, 93% of the sample reported to have caused themselves visible tissue damage, severe wounds, or permanent skin damage at pre-measurement whereas the same applied to only 36% of the sample at follow-up measurement. Additionally, at follow-up, 29% of the sample reported to refrain from skin picking on a daily basis whereas this did not apply to any of the participants at pre-measurement.

#### Urge and resistance

To evaluate the effect of cognitive-behaviour therapy on the measures urge and resistance, a 2 (condition) × 3 (time) repeated measures MANOVA was conducted. As hypothesized, the analysis revealed a significant multivariate group by time interaction effect,  $F(4, 25) = 3.51, p < .05, \eta_p^2 = .36$ , indicating that symptoms associated with PSP across time differed as a function of group. Follow-up univariate ANOVAs revealed that these group differences in symptoms across time were significant for urge,  $F(2, 25) = 3.87, p < .05, \eta_p^2 = .12$ , and marginally significant for resistance,  $F(2, 25) = 3.32, p = .06, \eta_p^2 = .11$ . As hypothesized, comparisons revealed a superiority of the treatment group over the waiting-list group in reduction of urge and increase in resistance. Results are displayed in Table 2.

For the treatment group, pair-wise comparisons using the Sidak correction indicated a significant symptom reduction for urge and resistance from pre-measurement to post-measurement (both  $ps < .001$ ) and from pre-measurement to follow-up (both  $ps < .05$ ) measurement. No significant differences between the post-measurement and the follow-up measurement were observed for urge ( $p = 1.00$ ) or resistance ( $p = .09$ ).

#### Discussion

In line with previous research, symptoms associated with PSP were reduced considerably following a brief, standardized

cognitive-behavioural treatment. Analyses revealed significant differences between the treatment condition and the waiting-list condition in skin-picking severity, psycho-social impact of skin picking, and dysfunctional cognitions related to skin picking. While significant improvements were observed for the treatment condition on all measured variables, no significant differences were found for the waiting-list condition. In addition, photograph severity ratings by independent assessors indicate a substantial improvement in severity of skin injury for the treatment condition over the waiting-list condition. The obtained effect sizes for all outcome measures, including the photograph severity rating, suggest large improvements. The adjunct of cognitive interventions to traditionally administered behavioural interventions may have contributed to the substantial size of treatment effects.

Importantly, treatment effects were maintained at two-month follow-up measurement. The results confirm the pilot findings of Teng et al. (2006). In addition, the present study is the first to employ a broad range of outcome measures in the assessment of treatment effects in PSP. Notably, substantial and consistent effects were achieved within relatively few treatment sessions, suggesting that extensive treatment may not be required to achieve improvement in skin-picking pathology.

It is interesting to note that in the present study participants with a dermatological condition were accepted. Our results indicate that cognitive-behaviour therapy, not usually considered as a treatment option for patients suffering from dermatological conditions such as eczema or neurodermatitis, may be of help for PSP patients suffering from these dermatological conditions. Indeed, preliminary findings by Rosenbaum and Ayllon (1981) support this assertion. In four case studies, they found an effect of habit reversal training on skin-picking severity in patients suffering from neurodermatitis. In the present study, 43% of the participants in the treatment condition reported to suffer from a dermatological condition and, compared to the other participants, no significantly different treatment effects were found for this subsample. However, given the rather small sample size, any effect would have to be very marked to show up. In addition, dermatological conditions were not reliably diagnosed, but self-reported by the participants. Therefore, more research is needed to clarify whether cognitive-behavioural therapy may indeed constitute a treatment option for patients suffering from dermatological conditions.

As opposed to the previous pilot study of Teng et al. (2006), the present study provides additional insight into processes of change emerging with treatment. As expected, participants reported an increased ability to resist the urge to pick skin following treatment. In addition, and possibly somewhat surprisingly, urge scores decreased as readily as resistance scores increased. This finding has been formerly reported by Keijsers, van Minnen, and Hoogduin (2006) and Keijsers, van Minnen, Hoogduin, Klaassen, et al. (2006). Indeed, as urge is reported to be one of the main trigger variables in the elicitation of various dysfunctional behaviours, its apparent susceptibility to treatment is very encouraging. However,

it should be noted that the resistance and urge scores used in our study were not established by properly validated instruments. Nevertheless, the face value of these items is intuitive.

A further possible limitation of the present study applies to the Self-Control Cognition Questionnaire (SCCQ), which was used to assess dysfunctional skin-picking-related cognitions. Intuitively, cognitive processes appear to play an important part in the maintenance of skin-picking pathology, and information regarding treatment effects on these processes is valuable. However, validation research on this instrument is still ongoing and psychometric properties have not been conclusively established as yet. More importantly, our findings are based on a relatively small number of participants, and the fact that participants were predominantly students may additionally restrict generalizability of findings. Finally, the follow-up measurement may still be considered rather short-term, and more information on the maintenance of treatment effects is needed.

In conclusion, brief cognitive-behaviour therapy is shown to be highly effective in reducing symptoms associated with PSP at post-measurement and follow-up measurement. Future research should attend to more heterogeneous samples, preferably within different settings, and stability of treatment effects across longer spans of time.

### Acknowledgements

We like to thank Claudia Cangialosi, Lisette Tannhauser, Linh Cao, Rianne van Niekerk, and Marietje de Bijl for their help in conducting the treatments. Also, we are grateful to the students and employees who took part in this study.

This work was supported by the Behavioural Science Institute, Radboud University Nijmegen.

### References

- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- Bohne, A., Wilhelm, S., Keuthen, N. J., Baer, L., & Jenike, M. A. (2002). Skin picking in German students: prevalence, phenomenology, and associated characteristics. *Behavior Modification, 26*, 320–339.
- Cohen, J. (1988). *Statistical power analysis for the behavioural sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Grant, J. E., & Odlaug, B. L. (2007). Lamotrigine treatment of pathologic skin picking: an open-label study. *Journal of Clinical Psychiatry, 68*, 1384–1391.
- Hayes, S. L., Storch, E. A., & Berlanga, L. (2009). Skin picking behaviors: an examination of the prevalence and severity in a community sample. *Journal of Anxiety Disorders, 23*, 314–319.
- Jacobson, N. S., & Truax, P. (1991). Clinical significance: a statistical approach to defining meaningful change in psychotherapy research. *Journal of Consulting and Clinical Psychology, 59*, 12–19.
- Keijsers, G. P. J., Maas J., van Opdorp, A., & van Minnen, A. Behaviour therapy versus cognitive therapy for trichotillomania: a randomized controlled trial, submitted for publication.
- Keijsers, G. P. J., van Minnen, A., & Hoogduin, C. A. L. (2006). Kunnen ongewenste gewoonten blijvend veranderd worden? Zelfcontrole in de klinische psychologie. [Consolidating changes in unwanted habits? Self-control in clinical psychology]. *De Psycholoog, 41*, 594–600.
- Keijsers, G. P. J., van Minnen, A., Hoogduin, C. A. L., Klaassen, B. N. W., Hendriks, M. J., & Tanis-Jacobs, J. (2006). Two-year follow-up results: predictors of treatment outcome. *Behaviour Research and Therapy, 44*, 359–370.
- Keuthen, N. J., Deckersbach, T., Wilhelm, S., Engelhard, I., Forker, A., O'Sullivan, R. L., et al. (2001). The skin picking impact scale: scale development and psychometric analyses. *Psychosomatics, 42*, 397–403.
- Keuthen, N. J., Jameson, M., Loh, R., Deckersbach, T., Wilhelm, S., & Dougherty, D. D. (2007). Open-label escitalopram treatment for pathological skin picking. *International Clinical Psychopharmacology, 22*, 268–274.
- Keuthen, N. J., Wilhelm, S., Deckersbach, T., Engelhard, I. M., Forker, A. E., Baer, L., et al. (2001). The skin picking scale: scale construction and psychometric analyses. *Journal of Psychosomatic Research, 50*, 337–341.
- Odlaug, B. L., & Grant, J. E. (2008). Clinical characteristics and medical complications of pathologic skin picking. *General Hospital Psychiatry, 30*, 61–66.
- Rosenbaum, M. S., & Ayllon, T. (1981). The behavioral treatment of neurodermatitis through habit reversal. *Behavior Research and Therapy, 19*, 313–318.
- Snorrason, I., Smari, J., & Olafsson, R. P. (2010). Emotion regulation in pathological skin picking: findings from a non-treatment seeking sample. *Journal of Behavior Therapy and Experimental Psychiatry, 41*, 238–245.
- Teng, E. J., Woods, D. W., & Twohig, M. P. (2006). Habit reversal as a treatment for chronic skin picking: a pilot investigation. *Behavior Modification, 30*, 411–422.
- Twohig, M. P., & Woods, D. W. (2001). Habit reversal as a treatment for chronic skin picking in typically developing adult male siblings. *Journal of Applied Behavior Analysis, 34*, 217–220.
- van Minnen, A., Hoogduin, C. A. L., Keijsers, G. J. P., Hellenbrand, I. C. J., & Hendriks, G. J. (2003). Treatment of trichotillomania by behavior therapy or fluoxetine: a randomized, waiting-list controlled study. *Archives of General Psychiatry, 60*, 517–523.