Patterns of Skin Picking in Skin Picking Disorder: An Ecological Momentary Assessment Study

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Abstract

Background: Skin picking disorder (SPD) is an understudied mental illness that is classified in the category of body-focused repetitive behavior disorders (BFRBDs). Literature suggests that pathological skin picking is strongly integrated into the daily lives of affected individuals and may involve a high degree of variability in terms of episode characteristics, frequency, and intensity. However, existing data on the phenomenology of SPD are limited and typically involve retrospective assessments which may fail to accurately capture the variability of behavior.

Objective: The objective of the present study was to investigate skin picking in the daily lives of individuals suffering from SPD by using ecological momentary assessment (EMA). The first aim focused on the description of skin picking patterns (e.g., characteristics, intensity, and distribution of episodes and urges) and the second aim was to explore differences in characteristics and patterns between automatic and focused skin picking.

Methods: Participants were recruited online and underwent an online screening, a diagnostic telephone interview, and a comprehensive online self-report questionnaire before participating in an EMA protocol. The latter included ten consecutive days with 7 pseudo-random time contingent assessments per day between 8am and 10pm. The EMA questionnaire assessed the current skin picking urge, occurrence of the behavior, and a detailed assessment of the episodes' characteristics (e.g., length, intensity, consciousness) if applicable.

Results: The final sample consisted of 57 participants, who completed at least 70 % of the scheduled assessments (94.7 % female, mean age: M = 29.3; SD = 6.77). In total, participants completed 3,758 EMAs and reported 1,467 skin picking episodes. The results showed that skin picking occurred frequently (M = 2.57; SD = 1.12 episodes per day and person) in relatively short episodes (1-30 min) and it was distributed quite evenly throughout the day and across different days of the week. Focused and automatic episodes were relatively balanced across all reported episodes (focused episodes: 54.9 %) and over the course of the day. The analyses showed statistically significant differences between self-reported triggers for the two styles. Visual and tactile cues, and the desire to pick the skin were more important for the focused style, while boredom and concentration problems were more prominent in automatic skin picking (SMD = 0.31-0.82).

Conclusions: The current results contribute to an enhanced understanding of the phenomenology of SPD using a more rigorous assessment methodology. Our findings underscore that picking can impact affected persons multiple times throughout their daily life. Clinical Trial: German Clinical Trials Register: DRKS00025168

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Original paper

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Abstract

Background

Skin picking disorder (SPD) is an understudied mental illness that is classified in the category of body-focused repetitive behavior disorders (BFRBDs). Literature suggests that pathological skin picking is strongly integrated into the daily lives of affected individuals and may involve a high degree of variability in terms of episode characteristics, frequency, and intensity. However, existing data on the phenomenology of SPD are limited and typically involve retrospective assessments which may fail to accurately capture the variability of behavior.

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The objective of the present study was to investigate skin picking in the daily lives of individuals suffering from SPD by using ecological momentary assessment (EMA). The first aim focused on the description of skin picking patterns (e.g., characteristics, intensity, and distribution of episodes and urges) and the second aim was to explore differences in characteristics and patterns between automatic and focused skin picking.

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Participants were recruited online and underwent an online screening, a diagnostic telephone interview, and a comprehensive online self-report questionnaire before participating in an EMA protocol. The latter included ten consecutive days with 7 pseudo-random time contingent assessments per day between 8am and 10pm. The EMA questionnaire assessed the current skin picking urge, occurrence of the behavior, and a detailed assessment of the episodes' characteristics (e.g., length, intensity, consciousness) if applicable.

Results

The final sample consisted of 57 participants, who completed at least 70 % of the scheduled assessments (94.7 % female, mean age: M = 29.3; SD = 6.77). In total, participants completed 3,758 EMAs and reported 1,467 skin picking episodes. The results showed that skin picking occurred frequently (M = 2.57; SD = 1.12 episodes per day and person) in relatively short episodes (1-30 min) and it was distributed quite evenly throughout the day and across different days of the week. Focused and automatic episodes were relatively balanced across all reported episodes (focused episodes: 54.9 %) and over the course of the day. The analyses showed statistically significant differences between self-reported triggers for the two styles. Visual and tactile cues, and the desire to pick the skin were more important for the focused style, while boredom and concentration problems were more prominent in automatic skin picking (SMD = 0.31-0.82).

Conclusions

The current results contribute to an enhanced understanding of the phenomenology of SPD using a more rigorous assessment methodology. Our findings underscore that picking can impact affected persons multiple times throughout their daily life.

Keywords: Skin picking disorder; Ecological momentary assessment; EMA; Body focused repetitive behavior; Obsessive-compulsive spectrum

1. Introduction

Skin picking disorder (SPD) is a mental disorder, which is characterized by the body-focused repetitive behavior (BFRB) of manipulating one`s own skin including e.g., squeezing, scratching or rubbing – summarized as 'skin picking' [1]. SPD is not a rare, even though it received comparatively little attention in research and clinical practice so far. A recent meta-analysis reported a pooled point prevalence of 3.45 % for SPD [2]. A large representative study in the US found a lifetime prevalence rate of 3.1 % [3]. The *Diagnostic and Statistical Manual of Mental Disorders, 5th Edition* (DSM-5) states that more than 75 % of SPD sufferers are female, but gender ratios differ substantially across studies (odds ratio (OR): 0.57-8.47) with a pooled OR of 1.45 (95% CI: [1.15-1.81]) [1,2]. Literature suggests high comorbidities for individuals with SPD, especially with trichotillomania and other body-focused repetitive behavior disorders, as well as with depression, substance addiction, obsessive-compulsive disorder, and trauma [4-8].

Pathological skin picking is accompanied by skin damage including wounds, scarring and the risk of infections [9]. On the psychological side, affected individuals experience emotional distress resulting from the behavior itself and its consequences. Most important aspects are feelings of guilt and shame, impaired self-esteem and the experienced loss of control over the behavior most often resulting in self-blaming [10]. Social impairment due to skin picking often includes social withdrawal, interference in occupational contexts and avoidance [11, 12].

So far, there has been little research on the phenomenology of SPD and the existing research is of questionable validity as it often entails retrospective reporting, so that the clinical picture has not been described in sufficient detail to date. This hinders a well-grounded understanding of the disorder as well as the development of specific treatment options.

Few previous studies have described skin picking in terms of the frequency and episode length, e.g., one study reported a median of 38 minutes for skin picking per day (range: 1 - 360 min), while another found a mean of eight episodes per day (*SD* = 22) with an average length of 21 minutes (*SD* = 42) [11, 12]. In more recent study, 78 % of participants reported that they typically have one to five episodes per day and that most episodes are shorter than 30 minutes. Moreover, the majority reported that they picked their skin almost every day [10]. Meanwhile, data on high-risk times throughout the day are very scarce with only one small study reporting such data [13]. However, the small number of studies and the large variability among the results, suggest a need for additional, and more rigorous investigations.

In addition to episode characteristics, different styles of skin picking characterized by the extent of awareness during behavior were examined. "Focused skin picking" is supposed to occur more intentionally and in response to urges or difficult emotions, whereas "automatic skin picking" takes place without awareness and is supposed to be associated with certain (routine) situations and passive activities [14]. So far, little is known about the distribution of automatic and focused skin picking within and between individuals, other than that that there seems to be high variability. However, a recent study reported a shift from focused towards more automatic skin picking with increasing age [15].

In terms of episode triggers, previous studies identified certain internal and external states commonly precipitating skin picking behavior. Commonly reported triggers are affective states (e.g., tension, boredom), visual and tactile perceptions of skin irregularities, passive activities and certain situations or places (e.g., waiting, reading, bathroom) [5, 9, 16, 17]. Unfortunately, there is currently almost no data available on the distribution of skin picking and skin picking urges over the course of a day and of a week.

Moreover, the existing studies on skin picking phenomenology include crucial shortcomings due to their cross-sectional and retrospective designs. It is well known that retrospective assessments imply a high risk of systematic biases caused by the way memories are stored and retrieved [18]. Moreover, these designs are not able to capture dynamic processes and to identify specific variations, e.g., in behavioral patterns throughout the day or week. Both of these issues are relevant to studies on SPD

phenomenology. For example, the large range in the number and length of skin picking episodes in former studies indicates that it is critical to examine the distribution and characteristics of the behavior and to explore the role of intra- and interindividual variability in the behavior. In the clinical setting, affected individuals often report that the behavior can strongly vary from day to day - depending on a multitude of factors, e.g., like being in company versus alone or at work versus at home. These differences are masked in retrospective studies when the average time spent on SP in the last two weeks is assessed.

In addition, retrospective studies usually do not allow a reliable assessment and differentiation of characteristics of different styles of skin picking, which are characterized by the extent of awareness during skin picking. Moreover, the link between specific triggers and different skin picking styles, as well as the distribution of focused versus automatic skin picking have not been investigated in detail. Of note, as most individuals with skin picking show a mixture of both styles, the retrospective assessment of separate triggers for automatic versus focused episodes would be very likely biased.

A promising method to comprehensively investigate processes of skin picking behavior is ecological momentary assessment (EMA) [19]. Momentary assessments within the daily life of individuals provide the opportunity to study dynamic processes in real-time, while minimizing retrospective biases. Since EMA allows a more detailed assessment of behavioral processes and implies a high ecological validity, the method received much attention in psychological research in the last two decades and was successfully applied by numerous studies in the investigation of different psychopathologies [e.g., anxiety, substance use, eating disorders; 20, 21, 22].

For skin picking research, EMA is a promising tool for reliably investigating the distribution as well as characteristics skin picking episodes. The analysis of these data then affords an understanding of the course of skin picking behavior throughout the day and week in detail, and to identify high risk times and related circumstances. To the best of our knowledge, EMA has not yet been applied to investigate these research questions in skin picking disorder. Therefore, the main objective of the present study is to investigate skin picking in the natural environment of individuals suffering from skin picking disorder using EMA. Such data are urgently needed for a more comprehensive description and understanding of the phenomenology and mechanisms of this comparatively new disorder.

The study followed two aims: The first aim was to describe skin picking patterns in daily life of the participants (e.g., number, length, intensity, distribution of skin picking episodes, distribution of skin picking urges, self-reported triggers).

The second aim of the study was to explore differences between automatic and focused skin picking with respect to distributions (e.g., daytimes), characteristics of the episodes (e.g., length, intensity), and self-reported triggers.

2. Materials and methods

2.1 Procedures

Participants were recruited between November 2021 and May 2022 through support groups and online via mailing lists, specific forums, and social media. Inclusion required a minimum age of 18 years, satisfaction of the DSM-5 criteria for SPD and providing informed consent for study participation. The inclusion of participants involved three stages of assessment: a) an initial online screening, which assessed sociodemographic information and skin picking symptoms, b) a diagnostic interview via telephone in which the DSM-5 criteria for SPD were assessed, and c) an online self-report questionnaire (baseline) for those assessed to be eligible in the interview.

EMA sampling started at the day after completion of the baseline questionnaire. The assessment period comprised ten consecutive days with seven pseudo-random time contingent assessments per day between 8am and 10pm. In addition, participants were asked to record additional skin picking episodes (event contingent recording). The prompts were sent to the participants' smartphone via text message, which contained a link to the EMA questionnaire. Additional records could be made via the

online study platform. The time and event contingent EMA records took at most 5 minutes. All assessment procedures were conducted with the software ASMO [23].

2.2 Measures

2.2.1 Online screening

The screening questionnaire included sociodemographic variables and the German version of the Skin Picking Scale-Revised [SPS-R; 24, 25]. The scale assesses skin picking severity over the past week and consists of eight items that can be split in two subscales: symptom severity and impairment. A global score can also be calculated. All items are rated on a 5-point Likert Scale from 0 (e.g., “none”) to 4 (e.g., “extreme”). The internal consistency of the total scale was high in the present study (α = .84; subscales: symptom severity: α = .77; impairment: α = .85).

2.2.2 Diagnostic interview

To assess the DSM-5 criteria for SPD, semi-structured interviews based on a BFRB module (personal communication with L. Mehrmann, 02/2021) for the DIPS Open Access Diagnostic Interview for Mental Disorders were conducted via telephone [26]. The interviews were carried out by the first author (CG) and a student worker, who was trained and continuously supervised.

2.2.3 Baseline measures

The baseline questionnaire contained the following assessment instruments:

Skin Picking Severity

The current skin picking severity was assessed in the baseline questionnaire with the SPS-R described above [24, 25].

Impairment due to skin picking

Skin picking-related impairment was assessed with the German translation of the Skin Picking Impact Scale (SPIS) [27, 28], which refers to the last week and contains ten items capturing potential impairments due to skin picking (e.g., feeling unattractive, shamed or being not able to do certain things due to skin picking) rated on a 5-point Likert scale (0: “not at all”; 4: “severe”). The internal consistency of the SPIS was excellent in this study (α = .90).

Modes of skin picking

Different styles of skin picking (focused vs. automatic) were assessed with the German version Milwaukee Inventory for the Dimensions of Adult Skin Picking [MIDAS; 14]. We translated the scale in a former study following generally accepted recommendations including backtranslation and approval by one of the authors of the original scale (D. W. Woods) [29]. The scale consists of 12 items, which are rated from 1 “not true for any of my skin picking” to 5 “true for all of my skin picking”. Both subscales (focused, automatic) contain six items and showed an acceptable internal consistency of α = 62.

Depressive Symptoms

Depressive symptoms were captured by means of the Patient Health Questionnaire-9 (PHQ-9) [30]. The scale contains nine items, which are rated on a Likert scale from 0 (“not at all”) to 3 (“almost every day”) in reference to the last two weeks. The scale showed a good internal consistency in our study (α = .84).

Anxiety

Symptoms of generalized anxiety disorders (GAD) were assessed with the GAD-7 [31]. Cronbach’s α was .84.

2.2.4 Ecological Momentary Assessment (EMA)

The EMA assessments included urge intensity (1: “no urge” to 5: “very strong”) and skin picking occurrence since the last assessment (yes/no). If skin picking occurred, additional questions assessed

the following: intensity of skin picking (1: “very weak” to 5: “very strong”), length of the episode (12 options: about 10, 20, 30 … 120 min.), awareness at episode onset (“Did you notice when you started picking your skin?”; yes/no), and 6) perceived triggers (“What contributed to your skin picking?”). For the last question, seven items had to be rated on a 5-point Likert scale: a) visual or tactile cues, b) itching, c) tension, d) boredom, e) difficulties concentrating on a task, f) desire for skin picking, g) certain routine (e.g., evening routine), h) other (text field).

2.3. Statistical analyses

Patterns of skin picking were analyzed using descriptive statistics, including frequencies and aggregated means within persons. The distribution of skin picking urges as well as the distribution and characteristics of automatic and focused skin picking were also analyzed descriptively. T-tests for paired samples were calculated to test differences between focused and automatic episodes. Focused and automatic episodes were classified based on the yes-/no-question “Did you notice when you started picking your skin?”. Differences were quantified using standardized mean differences (SMD). Analyses were performed in R (Version 4.1.2; R Development Core Team, 2021) and with SPSS Statistics version 29.0. (IBM).

2.4. Ethics Approval

All study procedures were approved by the ethics committee of the Medical Faculty of Heidelberg University and the trial was registered at the German Clinical Trials Register before recruitment started [DRKS00025168].

3. Results

3.1 Sample description

Overall, 113 individuals completed the screening questionnaire. Of these, 79 participants started the EMA assessments. One person dropped out during the EMA period and one person was excluded from the final analysis due to wearing an awareness bracelet, which vibrates when touching certain body areas for prevention of skin picking. Overall, 57 out of 77 (74.0 %) answered at least 70 % of all scheduled EMA questionnaires (i.e., at least 49 assessments). The participant flow is shown in figure 1.

Participants of the final sample (N = 57) completed 65.93 (SD = 7.24) EMAs on average with a range of 51 to 99 per person. Frequencies above the number of scheduled time-contingent assessments (N = 70) result from additional entries made by participants on their own initiative (event-contingent records).

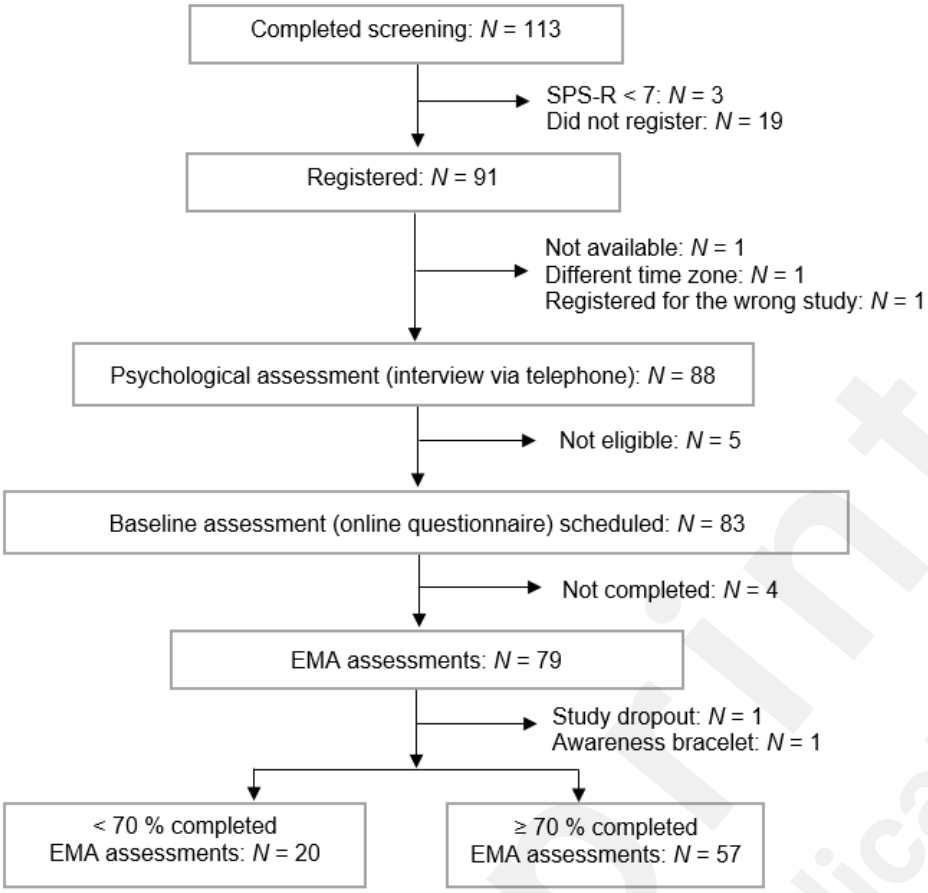

Figure 1. Participant flow

3.2 Participants

The majority of participants was female (94.7 %) with a mean age of 29 years (*SD* = 6.77). About half of the participants were employed and one third university students. The sample showed a PHQ-9 mean score of 11.63 (*SD* = 5.41) indicating moderate depressive symptoms, a GAD-7 mean score of 9.63 (*SD* = 4.85) indicating mild to moderate anxiety, and a mean SPS-R score of 18.00 (*SD* = 4.00) which indicates a substantial SPD severity. The participants in the analyzed sample do not appear to differ from the participants who were excluded from the analyses due to the low EMA completion rate (<70 %).

A detailed overview of sociodemographic and clinical characteristics is given in Table 1.

Table 1. *Sample characteristics.*

	Total EMA sample (*N*=77)	EMA ≥ 70 % (*N*=57)	EMA < 70 % (*N*=20)
Female	96.1% (*N*=74)	94.7% (*N*=54)	100% (*N*=20)
Mean Age (SD)	28.84 (6.51)	29.3 (6.77)	
Education			
Still in school	1.3% (*N*=1)	/	5.0% (*N*=1)
Middle secondary	10.4% (*N*=8)	10.5 % (*N*=6)	10.0% (*N*=2)
Highest secondary	35.1% (*N*=27)	33.3 % (*N*=19)	40.0% (*N*=8)
University	53.2% (*N*=41)	56.1 % (*N*=32)	45.0% (*N*=9)
Occupational status			
Employed	51.9% (*N*=40)	49.1% (*N*=28)	60.0% (*N*=12)

Trainee	1.3% (*N*=1)	1.8 % (*N*=1)	/
School student	1.3% (*N*=1)	/	5.0% (*N*=1)
University student	29.9% (*N*=23)	31.6 % (*N*=18)	25.0% (*N*=5)
Housewife/ househusband	3.9% (*N*=3)	5.3 % (*N*=3)	/
Retired	2.6% (*N*=2)	1.8 % (*N*=1)	5.0% (*N*=1)
Unemployed	2.6% (*N*=2)	1.8 % (*N*=1)	5.0% (*N*=1)
Other	6.5% (*N*=5)	8.8 % (*N*=5)	/
Family status			
Single	44.2% (*N*=34)	38.6 % (*N*=22)	60.0 % (*N*=12)
In a relationship	32.5% (*N*=25)	35.1 % (*N*=20)	25.0 % (*N*=5)
Married	19.5% (*N*=15)	21.1 % (*N*=12)	15.0 % (*N*=3)
Separated/divorced	2.6% (*N*=2)	3.5 % (*N*=2)	/
Other	1.3% (*N*=1)	1.8 % (*N*=1)	/
PHQ-9	11.95 (5.60)	11.63 (5.41)	12.15 (5.86)
GAD-7	10.04 (4.64)	9.63 (4.85)	10.50 (4.01)
SPS-R	17.69 (3.98)	18.0 (4.00)	16.70 (3.87)
SPIS	23.45 (8.57)	23.33 (8.94)	23.80 (7.61)
MIDAS focused	19.90 (3.92)	19.70 (3.90)	20.45 (4.05)
MIDAS automatic	18.18 (3.63)	18.49 (3.58)	17.30 (3.74)

Note. PHQ-9: depressive symptoms; GAD-7: anxiety; SPS-R: skin picking severity; SPIS: skin picking related impairment; MIDAS focused: conscious skin picking; MIDAS automatic: automatic/unconscious skin picking.

3.3 Number and distribution of episodes

In total, 57 participants completed 3,758 EMAs and reported 1,467 skin picking episodes during the study period of ten days. Altogether, 1.351 episodes (92.1 %) were reported in time-based assessments and only 116 (7.9 %) in event-based assessments. On average, participants reported a mean number of 2.57 episodes per day (*SD* = 1.12; range: 0.8 – 5.4).

Slightly more than half of the sample (56.1 %; *N* = 32) reported episodes on each day of the 10-day EMA phase, while 28.1 % (*N* = 16) reported one day without skin picking and 15.8 % (*N* = 9) had two, three or four days without skin picking.

SP episodes were relatively evenly distributed throughout the day. Small peaks in the number of episodes emerged in the first (8-10am; 17.3 % of all episodes) and the last (8-10pm; 14.4 % of all episodes) regular assessment period of each day. The number of episodes over the course of a day is shown in detail in Figure 2 and in Table 3. It should be noted that to avoid a biased comparison between time-based and event-based surveys, only the periods covered by the time-based assessment are presented.

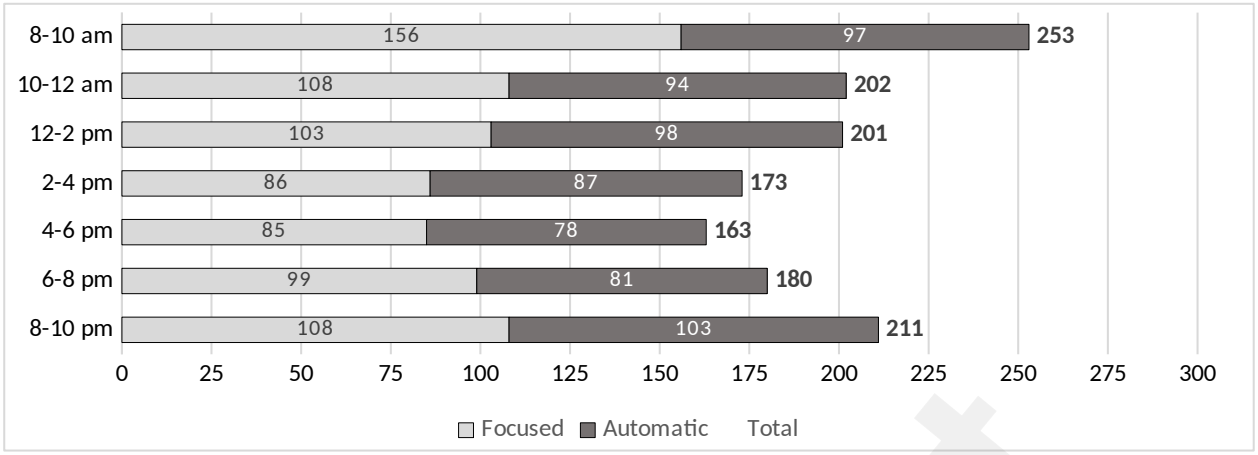

Figure 2. Episode distribution throughout the day.

Weekdays

The episodes were quite evenly distributed over the days of the week. Across all participants, the average number of episodes per day ranged between 2.20 for Saturdays and 2.77 for Mondays and Tuesdays (Mo: *M* = 2.77, SD = 1.78; Tue: *M* = 2.77, SD = 1.65; Wed: *M* = 2.66, SD = 1.50; Thu: *M* = 2.54, SD = 1.50; Fr: *M* = 2.53, SD = 1.59; Sa: *M* = 2.20, SD = 1.50; Su: *M* = 2.57, SD = 1.66).

Length and intensity

In 43.8 % (*N* = 642) of all episodes, participants indicated the shortest selectable length (approx. 10 minutes), 20 minutes were reported in 21.3% (*N* = 312) and 30 minutes in 14.8 % (*N* = 217) of all episodes (Table 2). Only 9 participants (15.8 %) reported any episode of 60 minutes or longer and only 6 (10.5 %) reported episodes of at least 90 minutes.

Table 2. *Length of episodes.*

Approx. length	Episodes % (n)
10 min	43.8 (642)
20 min	21.3 (312)
30 min	14.8 (217)
40 min	6.6 (97)
50 min	2.7 (39)
60 min	4.4 (64)
70 min	0.9 (14)
80 min	1.8 (26)
90 min	1.4 (22)
100 min	0.4 (6)
110 min	0.1 (2)
120 min	1.8 (26)

Note.

Table 3 displays the distribution of focused and automatic episodes as well as episode intensity and urge intensity over the course of the day.

Table 3. *Urge and episode parameters over the day.*

Time	All Episodes (*N* = 1,467) % (*N*)	Focused episodes (*N* = 806) % (*N*)	Automatic episodes (*N* = 661) % (*N*)	Intensity of episodes (*N* = 1,467) *M*(*SD*)	Urge intensity EMA with episodes (*N* = 1,467) *M*(*SD*)	Urge intensity EMA without episodes (*N* = 2,291) *M*(*SD*)
8-10am	17.2 (253)	19.35 (156)	14.67 (97)	2.61 (0.87)	2.53 (0.98)	1.78 (0.79)
10-12am	13.8 (202)	13.40 (108)	14.22 (94)	2.38 (0.72)	2.54 (0.92)	1.92 (0.73)
12am-2pm	13.7 (201)	12.78 (103)	14.83 (98)	2.19 (0.78)	2.75 (0.86)	1.87 (0.68)
2-4pm	11.8 (173)	10.67 (86)	13.16 (87)	2.43 (0.86)	2.89 (0.84)	1.83 (0.71)
4-6pm	11.1 (163)	10.55 (85)	11.80 (78)	2.43 (0.88)	2.90 (0.95)	1.92 (0.76)
6-8pm	12.3 (180)	12.28 (99)	12.25 (81)	2.43 (0.78)	3.00 (0.85)	1.92 (0.71)
8-10pm	14.4 (211)	13.40 (108)	15.58 (103)	2.77 (0.74)	3.02 (0.88)	1.94 (0.76)

Note. Intensity scores are aggregated means within each person. Only periods of time-based assessments are listed. The total *N* refers to all registered episodes.

The reported intensity of the episodes across all subjects was on average 2.55 (*SD* = 1.11; 2: “mild”, 3: “medium”). Throughout the day, the intensity of the episodes was quite stable. The average person means in the regular EMA phase (8am-10pm) varied between 2.19 (SD = 0.78; 12am-2pm) and 2.77 (SD = 0.74; 8pm – 10pm). Slightly higher average intensities were reported in the evening and in the morning (see Table 3).
Overall, in terms of intensity, most episodes were rated as very mild (19.6 %, *N* = 288), mild (30.5

%, *N* = 448) or medium (29.0 %, *N* = 426). Participants rated 16.4% (*N* = 240) of the episodes as severe and 4.4% (*N* = 65) as very severe. Ten participants (17.5 %) did neither report severe nor very severe episodes.

Urge intensity

The mean urge intensity (aggregated within persons) varied between 2.53 (SD = 0.98) in the morning (8-10am) and increased in small increments throughout the day with the highest mean being 3.02 (SD = 0.88) in the evening (8-10pm). So the average urge intensity varied between mild ("2") and medium ("3"), and was significantly higher in assessments with reported episodes (*M* = 2.84, *SD* = 0.71) compared to those without episodes (*M* = 1.89, *SD* = 0.65; *t*(56) = 12.31, *P*<.001, SMD = 1.63). The average scores for the urge intensity per period are shown in Table 3.

3.4 Episode characteristics

3.4.1 Consciousness

Participants reported a conscious onset of the behavior in 54.9 % (*N* = 806; "focused episodes") and an unconscious onset in 45.1 % (*N* = 661; "automatic episodes") of all episodes. Most participants reported both types of episodes (86.0 %, *N* = 49). One third of participants (*N* = 19) reported 75 % or more focused episodes and eight patients of these reported exclusively focused episodes (14.04 %). A proportion of 75 % or more automatic episodes was indicated by eight participants (14.04 %) and it overall ranged between 0 and 98.2 % (*Md* = 39.3, IQR: 14.2-63.3).

Across all subjects, the ratio between these two modes was relatively balanced throughout the day, with focused episodes occurring slightly more often. However, comparatively more focused episodes occurred in the morning (8am-10am). Details are shown in Table 3.

Focused and automatic episodes did not differ significantly in terms of the intensity of the behavior or urge intensity (intensity: M_f = 2.56, *SD* = 0.62; M_a = 2.45, *SD* = 0.78; *t*(48) = 1.52, *P* = .14; urge intensity: M_f = 2.86, SD = 0.77); M_a = 2.90, *SD* = 0.86; *t*(48) = -0.19, *P* = .85).

3.4.2 Self-reported triggers

Across all participants the highest average values resulted for visual and tactile cues (e.g., felt or seen something on the skin; *M* = 3.62, *SD* = 1.26), tension (*M* = 2.63, *SD*= 1.29) and habit (*M* = 2.71, *SD* = 1.45).

Comparisons between focused and automatic episodes showed higher scores in focused episodes for visual and tactile cues as well as for the item „wanted to pick the skin" (SMD = 0.64/0.82). In contrast, boredom and problems with concentration achieved higher scores in automatic episodes (SMD = -0.31/ -0.41).

In the "other" category additional conditions were mentioned in *N* = 97 episodes: Working/being at the PC, talking on the phone, smartphone time, reading, watching TV, driving, showering, encountering a mirror, physical fatigue or tiredness, hunger, emotional discomfort and social situations or conflicts. Scores are displayed in Table 4.

Table 4. *Self-reported triggers.*

	Total	Focused (*N* = 57) *M* (*SD*)	Automatic (*N* = 49) *M* (*SD*)M	*t*(48)	*p*	SMD
Visual or tactile cues	3.64 (1.26)	3.93 (0.75)	3.47 (0.99)	4.482	<.001	0.64
Tension	2.63 (1.29)	2.58 (0.88)	2.84 (0.97)	-1.532	.13	-0.22
Boredom	1.69 (1.03)	1.62 (0.85)	1.84 (0.89)	-2.187	.03	-0.31
Problems with concentration	2.17 (1.31)	2.02 (0.85)	2.31(1.06)	-2.847	.006	-0.41

Wanted to pick the skin	2.14 (1.27)	2.55 (1.05)	1.94 (1.03)	5.753	<.001	0.82
Habit/routine	2.71 (1.45)	2.89 (1.02)	2.56 (1.10)	1.818	.08	0.26
Itch (*df* = 39)	1.67 (1.09)	1.68 (0.91)	1.81 (1.00)	1.157	.25	0.18

Note. Answers rated on a 5-point Likert scale (1: not at all; 5: extremely). T-test results refer to the comparisons of focused and automatic episodes. "Habit" relates to the item „I picked my skin out of a routine (e.g., after arriving home/during the evening bath routine)".

4. Discussion

SPD has now been officially recognized as a separate disorder for ten years. However, despite increased research efforts, there is still a lack of studies on the phenomenology of the disorder. To our knowledge, this is the first study to investigate skin picking behavior by using EMA in the daily life of sufferers.

The results document in several ways how strongly the behavior is interwoven with the everyday life of affected individuals. For example, 56.1 % reported that they experienced one day without SP within the 10-day study phase, but only 14.0 % reported 2 to 4 days without SP. In other words, skin picking occurred almost every day. In addition, participants reported an average of 2.6 episodes per day (range: 0.8 - 5.4), suggesting that the behavior is not limited to one daily episode, but occurs several times a day and continuously influences daily life. These results are consistent with results of two retrospective studies reporting also several episodes per day [10, 12]. The continuity of the behavior is also reflected by the results on the course of the day and the week. Throughout the day, episodes were more or less evenly distributed, with only small peaks in the morning and evening. Similarly, the average urge intensity varied only slightly over the monitored periods and ranged constantly between weak and medium, with values in the evening being somewhat higher. However, as expected, the urge intensity was considerably higher in assessments with reported episodes compared to those without. Regarding the frequency of the episodes, there were also only a few small differences between the different weekdays. The lowest average number of episodes was reported for Saturdays and the highest for Mondays and Tuesdays, but the differences between other weekdays were quite small. Overall, data regarding the skin picking urges and behavior indicate that both are experienced frequently by affected individuals.

In terms of the episode characteristics, it is important to note that 43.8 % were no more than 10 minutes long and 80 % of the episodes were no longer than 30 minutes, so that the results suggest rather short, but frequent episodes. This is also in line with previous studies reporting that the majority of episodes are under 30 minutes [10, 12]. However, short episodes are not necessarily mild since the skin can be severely damaged in just a few minutes.

Regarding consciousness of the episodes, the results show groups of individuals with a quite high preponderance (e.g., ≥ 75% of episodes) of a focused (33 %) or automatic (14 %) style. A unilateral style of automatic skin picking (e.g., > 95 % automatic episodes) was quite rare (4 % versus 14% for the focused style).

However, the ratio between focused and automatic episodes was relatively balanced, although there were clear differences between individuals. Overall, more participants showed a tendency towards a focused style. The minor predominance of focused skin picking is also consistent with the results of a recent study that similarly found a slight dominance of focused skin picking for middle adulthood [15].

In recent years, different studies tried to identify different skin picking subtypes between individuals regarding various characteristics (e.g., symptom presentation and styles of skin picking, neurobiology), but nevertheless this research is still in its beginning [14, 32-35]. However, as research shows that most sufferers show both styles of skin picking, there is an obvious necessity to understand the different types of skin picking PSP to develop prevention and intervention strategies

specifically for automatic and focused skin picking. This is especially the case, because the onset and course of an automatic episode can strongly differ from focused episodes necessitating different coping strategies matched to the specific picking style.

Along these lines, self-reported triggers differed statistically significant between focused and automatic episodes. Visual or tactile cues and the desire to pick the skin (item “wanted to pick”) played a more important role in focused episodes, while boredom and problems with concentration were more related to automatic episodes. Other triggers (e.g., tension, itch) did not differ between the two modes of skin picking. The largest difference was found for the trigger desire (“wanted to pick”, SMD = 0.82). Of note, the results do not provide any evidence that one of the two styles is associated stronger with tension than the other.

Overall, the results offer useful insights into the nature, frequency, distribution, and intensity as well as specific triggers of skin picking. They also provide important starting points for future studies that should investigate these aspects in more detail. However, our results should be interpreted in the light of the specific strengths and limitations of this study. The latter may include a bias due to self-selection of the participants. It is likely that it is a rather specific sample of individuals, who are willing to track their skin picking for a period of ten days several times a day. However, our data suggest a substantial impairment in terms of skin picking severity, depression, anxiety, and skin picking related impairment.

Another limitation results from the assessment method since self-observation and tracking skin picking can also increase the awareness and therefore the controllability of the behavior. Moreover, is it also discussed that the registration of an episode may serve a punishing function due to the extra effort to record it so that the likelihood of the behavior is reduced. These mechanisms could have produced two biases in the present study: First, the number of automatic episodes could be underestimated due to the increased awareness during the study. Second, the frequency and intensity of the behavior may have been reduced by the continuous monitoring within the study period.

Also, the assessment started regularly with the question “Have you picked your skin since the last assessment?”. This could have caused a bias towards more reported episodes in the first period of the day as individuals might also report skin picking, which occurred in the night before. Consequently, the total number of the period between 8 and 10am should be interpreted cautiously.

Another limitation refers to the assessment of the episode length, which was assessed by multiple choice with options in steps of ten minutes. The shortest selectable option was “about 10 minutes”, but during the study we received feedback from participants that their episodes were much shorter. However, this also leads us to the open question of what constitutes a skin picking episode and if micro episodes might play an important role. In addition, we know from clinical work that some people report that the behavior occurs almost constantly throughout the day. In this context, the question arises, whether and for whom it makes sense to divide the behavior into episodes. In this study, participants were forced to report behavioral episodes, but it remains unclear what participants have defined as an episode for themselves and if they tracked micro episodes. Future research needs to address these issues by applying an even tighter, more precise measurement of behavior, but this will also need to take the above-mentioned difficulty of measurement reactivity in account.

Despite these limitations and the need for further research, this study also has some important strengths. To the best of our knowledge, this is the first study using EMA to assess skin picking and it is also the first EMA study in the field of pathological body-focused repetitive behaviors in general. It provides new insights into the phenomenology of the SPD allowing a more reliable and accurate description of skin picking in everyday life of affected individuals, which is essential for a comprehensive understanding of SPD of this relatively newly defined disorder. The study clearly demonstrates the advantages of measurement via EMA, since behavioral parameters could be assessed that cannot be measured at all – or only with considerable distortions – in retrospective assessments. Furthermore, the study was conducted with a sufficiently large sample of individuals fulfilling the diagnostic criteria for SPD, who showed overall a good adherence, so that the study

provides high-quality data.
Our experience with the assessment of skin picking using EMA and the resulting data serve as a firm basis for further EMA studies on SPD and other disorders in the field of body-focused repetitive behaviors and contribute to an enhanced understanding of an understudied but highly impairing mental disorder.

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Conflicts of Interest
The authors declare no conflict of interest.

Abbreviations
BFRB: body-focused repetitive behavior
EMA: ecological momentary assessment
GAD-7: Generalized anxiety disorders-7
MIDAS: Milwaukee Inventory for the Dimensions of Adult Skin Picking
PHQ-9: Patient Health Questionnaire-9
SMD: standardized mean differences
SPD: skin picking disorder
SPS-R: Skin Picking Scale-Revised
SPIS: Skin Picking Impact Scale

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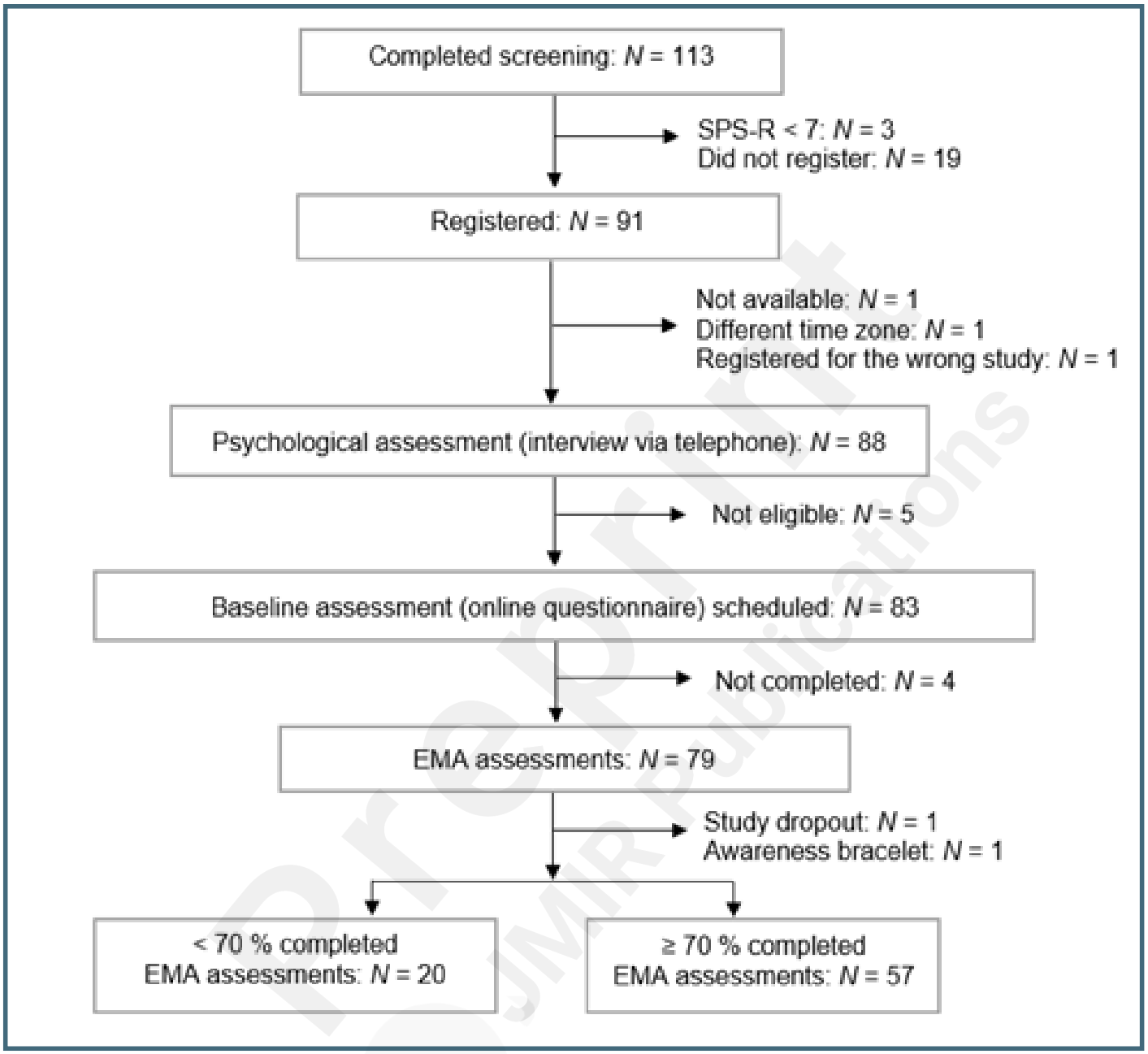
Supplementary Files

Figures

Participant flow.



Episode distribution throughout the day.