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Abstract

Background

Pathological Skin Picking (PSP) may begin at any age, but the most common age of onset is during adolescence. Age of onset is a potentially useful clinical marker to delineate subtypes of psychiatric disorders. The present study sought to examine empirically defined age of onset groups in adults with PSP and assess whether groups differed on clinical characteristics.

Method

Participants were 701 adult respondents to an internet survey, who endorsed recurrent skin picking with tissue damage and impairment. Latent profile analysis (LPA) was conducted to identify subtypes of PSP based on age of onset. Then subgroups were compared on demographic and clinical characteristics.

Results

The best fitting LPA model was a two-class solution comprised of a large group with average age of onset in adolescence (*n* = 650; 92.9% of the sample; Mean age of onset = 13.6 years) and a small group with average onset in middle adulthood (*n* = 50; 7.1% of the sample; Mean age of onset = 42.8 years). Relative to the early onset group, the late onset group reported significantly less focused picking, less skin picking-related impairment, lower rates of co-occurring body-focused repetitive behaviors, and trends towards reduced family history of PSP. Individuals in the late onset group also reported increased rates of comorbid depression, anxiety and posttraumatic stress disorder, and were more likely to report that initial picking onset seemed related to or followed depression/anxiety and physical illness.

Conclusion

Findings suggest the presence of two distinct PSP age of onset groups: (1) an early onset group with average onset in adolescence, clinical characteristics suggestive of greater picking-related burden and familiality, and a profile more representative of the general PSP population; and (2) a late onset group with average onset in middle adulthood, increased co-occurring affective and trauma conditions, and initial onset associated with or following other mental health and physical problems. Future replication is needed to assess the validity and clinical utility of these subgroups.

Keywords

Pathological skin picking, Excoriation, Onset, 1. Introduction

Increasing empirical attention has been given to pathological skin picking (PSP) – now classified as excoriation (skin-picking) disorder – a psychiatric problem characterized by recurrent picking, scratching and/or squeezing of the skin that is not solely accounted for by a dermatological condition [1]. PSP can be associated with impairment across several domains, including physical (e.g., scars, sores, infections) [2], social (e.g., avoidance of social situations, interference with intimate relationships), psychological (e.g., anxiety, depression, shame), and financial (e.g., monetary loss due to efforts to conceal skin damage or therapeutic services) [3]. Further, affected

persons frequently report picking-related interference with academic (e.g., completing homework, studying) and occupational (e.g., job resignation, avoidance of career advancement, productivity loss) functioning [3,4].

Most individuals with PSP report picking in the context of an urge or aversive emotional state (i.e. focused picking style). In other instances, the behavior is performed automatically, without reflective awareness (i.e., automatic picking style) [5]. PSP frequently co-occurs with trichotillomania (hair-pulling disorder) and other body-focused repetitive behaviors (e.g., nail biting, etc.) [6]. PSP is also commonly comorbid with depression, anxiety disorders, obsessive-compulsive disorder, body dysmorphic disorder, and substance use disorders [[6], [7], [8]]. Individuals with PSP commonly report a family history of skin picking [9].

PSP historically has received limited research attention, and little is understood about the heterogeneity of the PSP population. Prior research has suggested that clinically meaningful distinctions might be made among those with PSP based on automatic versus focused picking [5] and impulsive versus compulsive picking [10]. Age of onset has also proven to be a useful clinical marker to distinguish between subtypes of various psychiatric disorders, including obsessive-compulsive disorder [11], generalized anxiety disorder [12], panic disorder [13], agoraphobia [14], schizophrenia [15], bipolar disorder [16], and Alzheimer's disease [17]. Studies have revealed differences between early and late symptom onset groups in sex ratio [[11], [12], [13]]; socioeconomic variables [12]; symptom presentation [11,13,16]; co-occurring psychiatric, physical, behavioral and environmental variables [[11], [12], [13],16]; family history [11,14,16]; treatment response [11]; cognitive functioning [15]; symptom course [16]; and neural structure [17]. Findings support clinical and etiological differences suggestive of a more severe illness presentation in those with early onset disorders [11,13,[15], [16], [17]], which has implications for understanding differences in treatment response and symptom trajectory. Thus, identification of PSP subtypes using age of onset may inform our understanding of individual differences in PSP phenomenology, etiology and treatment outcome.

PSP may begin at any age; however, average onset during adolescence is most commonly reported – particularly in samples drawn from psychiatric clinics, the community and university settings [18]. However, a limited number of studies report a later onset in middle adulthood (i.e., 30 to 39 years) in dermatology clinic samples [[18], [19], [20], [21], [22]]. Odlaug and Grant [23] reasoned that PSP onset prior to versus following puberty might represent a clinically useful means of distinguishing between groups of individuals with PSP. The authors compared individuals with onset before and after the age of 10 years and found similar clinical characteristics between the groups overall, although individuals with earlier onset had a greater treatment seeking delay and were more likely to report automatic picking. A separate study also did not find substantial differences between clinical characteristics of early (prior to the age of 11 years) and late (after the age of 11 years) onset PSP, but showed that only individuals with later onset deviated from normal controls on a cognitive set-shifting task [24]. Although these preliminary studies are informative, in both, the age demarcating early from late onset was not selected empirically.

The present study sought to use latent profile analysis (LPA) to identify age of onset subgroups in a large sample of adults with PSP. A secondary aim was to explore demographic and clinical differences in those empirically defined groups. Based on prior research largely revealing pubertal skin picking onset [18], with a few studies reporting middle adult symptom onset [[19], [20], [21], [22]], we hypothesized that LPA will yield two age of onset groups, including adolescent and adult, and group comparisons will suggest greater severity in the early onset group.

2. Material and methods

2.1. Participants

Participants were drawn from a sample of adult respondents to an internet survey on PSP (i.e., Skin Picking Impact Survey) who met specified criteria for PSP [4]. The survey was posted on advocacy and support websites for individuals with skin picking and related conditions. Interested individuals accessed the survey via a SurveyMonkey (https://www.surveymonkey.com) web link. Initially, a total of 1663 individuals indicated study agreement after reading a university Institutional Review Board-approved informed consent form. See the original publication [4] for details regarding the sample and methodology. Study inclusion was based on report of an age of 18 years or older and endorsement of the following criteria for PSP established through dichotomous (i.e., yes/no) and Likert scale items developed for the original study: (1) current repeated skin picking resulting in tissue damage that would be visible if the skin is not covered (i.e., response of yes to the following questions: *"Do you currently pick/scratch at your skin (picking/scratching includes any behavior that you do to the surface of your skin that has the potential to cause damage. Could include, but not limited to picking, scratching, digging, squeezing, and picking.)?"* and *"Does your picking/scratching result in tissue damage that you could see if it isn't covered or hidden?"*); (2) significant skin picking-related impairment in one of five life domains (i.e., rating of 3 or higher on a 1-to-9 Likert scale assessing skin picking-related impairment in home management, social life, close relationships, work, or academic life); and (3) presence of picking behavior not due to delusions (i.e., endorsement of 'Never/Almost Never (0-10%)' for the following question: *"How often do you pick/scratch your skin because you believe small bugs/insects are crawling on/in your skin or in response to voices others may not be able to hear (e.g., deceased relatives, beings from another planet, etc.)?"*). Participants who were younger than age 18 (n = 9) or who failed to complete any of the eligibility items (n = 575) were excluded. This included failure to report age (n = 237), engagement in current skin picking (n = 245), whether skin picking resulted in damage (n = 49), whether picking was due to bugs/insects or voices (n = 382), or a rating on at least one of the Likert scale interference items (n = 554). A sizeable number of participants (n = 732) completed informed consent but closed the survey prior to finishing, which contributed largely to the missing data. This yielded an original sample of 760 participants. The present study includes the 701 of these respondents who met criteria for PSP and completed a question regarding age of initial skin picking onset (i.e., *"About how old were you when you first began to pick/scratch your skin on most days for at least 2 weeks or longer?"*). This subsample had an average chronological age of 28.2 years (SD = 6.7) and was predominantly female (n = 665; 94.9%) and Caucasian (n = 610; 87.4%), with just over half endorsing single/never married status (n = 375; 53.8%).

2.2. Measures

2.2.1. Skin picking impact survey [4]

This is a comprehensive internet survey assessing a range of skin picking-related issues, including (a) phenomenology; (b) clinical characteristics; (c) treatment seeking, utilization and outcome; and (d) impact. Participants were queried regarding treatment seeking status (i.e., *"Have you ever received treatment or sought professional help for your skin picking/scratching?"*) and age at first treatment seeking (i.e., *"About how old were you when you first sought or received treatment for picking/scratching?"*). Treatment seeking delay in years was assessed by subtracting age of onset from age at which treatment was first sought. Participants were also asked to rate their perceived benefit from treatment (i.e., "*Compared with how your skin picking/scratching was before you started treatment, your skin picking/scratching is now:"*), using the following anchors adapted from the Clinical Global Impressions – Improvement Scale [25]: "Very Much Improved," "Much Improved," Minimally Improved," "Unchanged," "Minimally Worse," "Much Worse," and "Very Much Worse". Finally, participants were asked *"What type of professional did you first tell about your skin picking/scratching?"* and *"Please check any of the following interventions that you have had for your skin picking/scratching."*

Psychiatric comorbidity was assessed via a checklist of mental illnesses other than picking/scratching (i.e., *"Have you ever been diagnosed with a mental illness other than skin picking/scratching?*"). Participants were also asked if they had ever engaged in body-focused repetitive behaviors besides skin picking, including: "Recurrent picking/scratching at your nose resulting in damage (e.g., frequent *nosebleeds*, painful scabbing, a hole in the nasal passageway)?", *"Recurrent biting of nails resulting in damage (e.g., infection of the nailbeds, or tissue around nails)?"*, *"Recurrent biting of lips or cheeks resulting in damage (e.g., scarring, oral bleeding)?"*, and *"Have you ever pulled out your hair resulting in noticeable hair loss, such as bare patches, or thinning of hair?"* Family history of PSP was derived from the following item: *"Please indicate any biological relatives that you believe have (or have had) a problem with skin picking/scratching."*

Picking sites were assessed via a checklist with the following prompt: *"In the past 2 weeks, have you repeatedly picked/scratched from your (check all that apply)?"* Psychosocial and physical impact of skin picking was also assessed via a checklist (i.e., *"As a result of your picking/scratching, have you ever experienced…"*). Similarly, events associated with initial onset were assessed via a checklist with the following prompt: *"Did the initial onset of the skin picking/scratching seem related to or follow any of the following events? Please check all that apply."* Finally, participants rated skin picking-related psychosocial (i.e., social embarrassment, anxiety, sadness, frustration, anger, and social avoidance) and physical (i.e., bleeding, minor sores, deep craters, scars, infections, and general disfigurement) impairment using a checklist item (i.e., *"As a result of your picking/scratching, have you experienced…? (check all that apply)."*

2.2.2. Skin picking scale-revised (SPS-R)

The SPS-R [18] is an 8-item self-report scale assessing severity (4 items) and impairment related to skin picking symptoms (4 items). Items refer to the past week and are rated on a 5-point scale ranging from 0 (*"none"*) to 4 (*"extreme"*). Previous research suggests that the SPS-R has a robust factor structure, high internal consistency and good convergent and discriminant validity in skin picking samples [18].

2.2.3. Milwaukee inventory of adult skin picking (MIDAS)

The MIDAS [5] is a 12-item measure that assesses the degree to which respondents' picking is (a) automatic (6 items), characterized by picking without reflective awareness, and (b) focused (6 items), characterized by picking with reflective awareness in response to urges or negative affect. Items are rated on a 5-point scale ranging from 1 (*"not true for any of my picking"*) to 5 (*"true for all of my picking"*). Preliminary analyses showed the two-factor structure of the scale demonstrates good to very good internal consistency and good convergent and discriminant validity [5].

2.2.4. Depression anxiety and stress scale-21 item version (DASS-21)

The DASS-21 [26] is a self-report scale assessing symptoms of depression, anxiety, and stress over the past month (7 items on each subscale). Items are rated on a 4-point Likert scale, ranging from 0 (*"did not apply to me at all"*) to 3 (*"applied to me very much, or most of the time"*), with higher scores indicative of greater symptom severity. Previous studies suggest that the DASS-21 demonstrates good internal consistency and convergent validity in both clinical and nonclinical samples [27,28].

2.3. Analytic plan

To establish the optimal number of PSP age of onset classes, LPA was conducted on the self-reported age of onset variable using Mplus (Version 7.4) [29]. A two-class solution was fit first, followed by iterative solutions with additional numbers of classes. The best-fit solution was evaluated using the Akaike Information Criterion (AIC) [30], Bayesian Information Criteria (BIC) [31], sample-size adjusted BIC (ABIC) [32], entropy, and bootstrapped parametric likelihood ratio test (BLRT) [33]. Consistent with previous studies [34,35], model selection also was based on the size of the smallest class, such that the smallest class should not be less than or

equal to 5% of the total sample size due to concerns of over-fitting the data. SPSS 24 was used to perform independent samples *t*-tests to compare the emergent age of onset groups on demographic characteristics and chi-squared tests of independence to compare groups on demographic and clinical variables. A test of normality (i.e., Shapiro-Wilk test) revealed a non-normal distribution for continuous variables. Therefore, the Mann-Whitney *U* Test was performed to compare groups on continuous clinical variables.

3. Results

3.1. LPA of skin picking age of onset

Results from LPA are presented in Table 1. In the two-class model, the first class (*n* = 650, 92.9% of the sample) had a mean age of onset of 13.6 years, and the second class (*n* = 50, 7.1% of the sample) had a mean age of onset of 42.8 years. In the three-class model, the first class (*n* = 637, 90.9%) had a mean age of onset of 13.3 years, the second class (*n* = 40, 5.7%) had a mean age of onset of 33.9 years, and the third class (*n* = 24, 3.4%) had a mean age of onset of 49.8 years. The three-class model had a lower AIC, BIC, and ABIC, as well as a significant BLRT, compared to the two-class model. However, entropy was slightly lower in the three-class model than in the two-class model, and the smallest class proportion was below 5% in the three-class model. Therefore, the two-class model was selected as the optimal model for forming PSP age of onset subgroups. The four-, five-, and six-class models exhibited successively higher BIC, lower entropy, and/or lower smallest class proportions relative to the models with one less class. For all models, age of onset exhibited a very large degree of separation between classes (Cohen's *d*s > 1.5). A power analysis simulation study found that given such separation, multiple model selection criteria were strong in detecting the correct number of classes [36].

Table 1. Summary of findings from latent profile analyses of age of pathological skin picking onset (*N* = 701).

Number of classes	Bayesian information criterion (BIC)	BIC (sample size adjusted)	AIC	Entropy	Smallest class proportion	Bootstrap likelihood ratio test		Mean age of onset (years)
						χ^2 (df = 3)	***p***	
1	–	–	–	–	–	–	–	–
2	**4785.061**	**4772.36**	**4766.851**	**0.977**	**0.071**	**−2379.425**	**<0.001**	**13.6; 42.8**
3	4745.474	4726.423	4718.159	0.958	0.034	−2353.079	<0.001	13.3; 33.9; 49.8
4	4749.741	4724.339	4713.321	0.904	0.029	−2348.66	0.04	13.0; 26.0; 37.3; 51.0
5	4754.37	4722.618	4708.845	0.830	0.031	−2344.422	<0.001	5.0; 13.6; 24.4; 36.8; 50.5
6	4747.67	4709.568	4693.04	0.867	0.003	−2334.52	<0.001	5.0; 13.2; 22.5; 35.1; 49.0; 62.5

Note. Best fitting models are bolded.

3.2. Demographics

Table 2 shows demographic variables in the early and late onset groups. The groups did not differ on sex ratio or ethnic minority status. Participants in the early onset group were more likely to be single/never married, and participants in the late onset group were more likely to be currently married, divorced or widowed.

Table 2. Demographic characteristics associated with early and late onset pathological skin picking.

	Age of Onset 30 ≤ *n* = 651	**Age of Onset 30> *n* = 50**	**Statistic**	***df***	***p*-value**

Age of PSP onset *M (SD)*	**13.6 (5.4)**	**42.8 (8.0)**	**−25.43[1]**	**52.5**	**<0.001**
Chronological age *M (SD)*	**32.4 (11.0)**	**49.7 (9.2)**	**−10.81[1]**	**699**	**<0.001**
Gender *n* (%)					
Female	616 (94.6)	48 (98.0)	NA[3]	NA	0.504
Male	35 (5.4)	1 (2.0)	–	–	–
Ethnicity *n* (%)					
Caucasian	567 (87.5)	43 (86.0)	.008[2]	1	0.931
Ethnic minority	81 (12.5)	7 (14.0)	–	–	–
Marital status *n* (%)					
Single/never married	**367 (56.7)**	**8 (16.0)**	**29.35[2]**	**1**	**<0.001**
Currently married	**217 (33.5)**	**29 (58.0)**	**11.11[2]**	**1**	**0.001**
Separated	14 (2.2)	0 (0.0)	NA[3]	NA	0.615
Divorced	**48 (7.4)**	**11 (22.0)**	**NA[3]**	**NA**	**0.001**
Widowed	**1 (0.2)**	**2 (4.0)**	**NA[3]**	**NA**	**0.014**

Note. M = mean; SD = standard deviation; [1] Student *t*-test (2-sided); [2]Chi square test (2-sided); [3]Fisher's Exact Test (2-sided). Significant findings are bolded.

3.3. Clinical characteristics

As shown in Table 3, the two groups did not differ on dimensional ratings of skin picking severity or impairment (SPS-R); depression, anxiety or stress severity (DASS-21); medication use; skin picking-related treatment seeking; or perceived benefit from treatment. However, the early onset group obtained higher scores on the focused picking scale relative to the late onset group. The early onset group also reported greater illness duration and greater total number of picking sites. Among those who sought treatment for skin picking (early onset: *n* = 314; late onset: *n* = 22), the late onset group reported a higher chronological age at initial treatment seeking, whereas the early onset group reported greater years of treatment seeking delay. Among participants who had sought treatment for skin picking, there were no significant differences in the type of health professional participants first told of skin picking between age of onset groups (see Table 3). With respect to type of skin picking intervention received, beyond higher rates of behavioral treatment (56.4%) endorsed in the early onset group relative to the late onset group (31.8%; $\chi^2 = 4.06$; $p = .044$), no significant differences in treatment type were found.

Table 3. Clinical characteristics associated with adolescent and adult onset pathological skin picking.

	Age of onset 30 ≤ *n* = 651	**Age of onset 30> *n* = 50**	**Statistic**	***df***	**p-Value**
SPS-severity median	9.0	10.0	−1.73[1]		0.084
SPS-impairment median	7.0	6.0	−1.03[1]		.0.305
DASS-D median	12.0	18.0	−0.84[1]		0.403
DASS-A median	6.0	5.0	−0.62[1]		0.539
DASS-S median	18.0	18.0	−0.58[1]		0.562
MIDAS-automatic median	16.0	16.0	−.91[1]		0.329
MIDAS-focused median	**18.0**	**15.0**	**−2.09[1]**		**0.037**
Duration of illness median	**16.0**	**5.0**	**−7.62[1]**		**<0.001**
Number of picking sites median	**4.0**	**2.0**	**−5.41[1]**		**<0.001**
Treatment seeking %	49.1%	45.8%	0.08[2]	1	0.778
Age at initial treatment seeking* median	**21.0**	**46.0**	**−6.53[1]**		**<0.001**
Treatment seeking delay*	**7.0**	**2.0**	**−3.02[1]**		**0.003**
Professional first told of skin picking					
Psychiatrist* %	22.5%	31.8%	.55[2]	1	0.460
Psychologist* %	21.5%	18.2%	.01[2]	1	0.918
Primary care physician/family doctor* %	19.0%	22.7%	NA[3]	NA	0.587

Dermatologist* %	19.6%	9.1%	NA[3]	NA	0.394
Other non-psychiatric physician* %	0.0%%	0.0%	NA	NA	___
Social worker* %	1.3%	9.1%	NA[3]	NA	0.053
Therapist/counselor* %	16.1%	9.1%	NA[3]		0.548
Perceived benefit from treatment CGI* M (SD)	4.0	4.0	−0.70[1]		0.484

Note. [1] Mann-Whitney U test (*Z*-score; 2-sided); [2]Chi square test (2-sided); [3]Fisher's Exact Test (2-sided). Significant findings are bolded. * = Only among those who sought treatment (Adolescent onset, *n* = 314, adult onset, *n* = 22).

3.4. Psychiatric comorbidity and family history

Compared to the late onset group, the early onset group reported a greater number of comorbid body-focused repetitive behaviors (see Table 4). In contrast, the late onset group was more likely to endorse co-occurring major depressive disorder, generalized anxiety disorder, panic disorder, and posttraumatic stress disorder (see Table 4). In addition, the late onset group was more likely to endorse depression/anxiety (66.0% versus 49.8%; $\chi^2 = 4.27$; $p = .039$) and physical illness (10.0% versus 2.9%; Fisher's exact test = 0.023) as events related to or following initial onset of PSP. Finally, rates of family history of PSP were higher in the early onset group, although the difference did not reach statistical significance (see Table 4).

Table 4. Comparison of lifetime psychiatric conditions, lifetime body-focused repetitive behaviors, and family history in early and late onset pathological skin picking.

	Age of onset 30 ≤ *n* = 651	**Age of onset 30> *n* = 50**	**Statistic**	***df***	**p-Value**
Psychiatric comorbidity					
Depressive disorder	**51.1%**	**78.7%**	**12.31[2]**	**1**	**<0.001**
Bipolar disorder	7.1%	6.4%	NA[3]	NA	>0.999
Generalized anxiety disorder	**30.0%**	**51.1%**	**8.03[2]**	**1**	**0.005**
Panic disorder	**8.4%**	**19.1%**	**NA[3]**	**NA**	**0.030**
Specific phobia	3.6%	6.4%	NA[3]	NA	0.414
Social phobia	11.9%	21.3%	2.72[2]	1	0.099
Posttraumatic stress disorder	**10.5%**	**23.4%**	**5.90[2]**	**1**	**0.015**
Obsessive-compulsive disorder	24.5%	19.1%	0.43[2]	1	0.512
Tourette's/tic disorder	1.0%	0.0%	NA[3]	NA	>0.999
Anorexia nervosa	4.0%	4.3%	NA[3]	NA	0.710
Bulimia nervosa	5.3%	2.1%	NA[3]	NA	0.502
Alcohol abuse/dependence	2.6%	4.3%	NA[3]	NA	0.376
Drug abuse/dependence	3.1%	2.1%	NA[3]	NA	1.000
ADHD	13.0%	10.6%	0.06[2]	1	0.808
BDD	5.6%	8.5%	NA[3]	NA	0.342
Trichotillomania	24.5%	23.4%	0.00[2]	1	>0.999
At least 1 diagnosis	**58.8%**	**78.0%**	**6.34[2]**	**1**	**0.012**
BFRB comorbidity					
Nose picking	**38.2%**	**22.9%**	**3.85[2]**	**1**	**0.050**
Nail biting	51.9%	41.7%	1.47[2]	1	0.226
Cheek/lip biting	47.4%	36.2%	1.80[2]	1	0.180
Hair pulling	47.7%	41.3%	0.47[2]	1	0.495
Total number of BFRBs	**1.71 (1.30)**	**1.2 (1.04)**	**3.13[1]**	**54.61**	**0.003**
At least 1 BFRB	84.0%	79.2%	0.45[2]	1	0.503
Family history					
Family history of ExD	46.9%	32.0%	3.55[2]	1	0.060

Note. [1]Student *t*-test (2-sided); [2]Chi square test (2-sided); [3]Fisher's Exact Test (2-sided). Significant findings are bolded. BFRB = Body-focused repetitive behavior.

3.5. Psychosocial and physical impact

With respect to skin picking-related psychosocial and physical impairment, all significant findings revealed greater endorsement of social and physical impairment and emotional distress in the early onset group (see Table 5).

Table 5. Comparison of impairment and emotional distress in early and late onset pathological skin picking.

	Age of Onset 30 ≤ n = 651	**Age of Onset 30> n = 50**	**Statistic**	***df***	**p-Value**
Social embarrassment	**92.2%**	**80.0%**	**NA[3]**	**NA**	**0.008**
Anxiety	**80.6%**	**62.0%**	**8.70[2]**	**1**	**0.003**
Sadness	68.5%	62.0%	0.62[2]	1	0.432
Frustration	85.1%	74.0%	3.51[2]	1	0.061
Anger	**56.6%**	**32.0%**	**10.39[2]**	**1**	**0.001**
Social avoidance	**70.5%**	**56.0%**	**3.92[2]**	**1**	**0.048**
Minor sores	84.6%	94.0%	2.57[2]	1	0.109
Deep craters	42.8%	42.4%	0.26[2]	1	0.611
Bleeding	94.6%	92.0%	NA[3]	NA	0.515
Scars	**83.7%**	**64.0%**	**11.04[2]**	**1**	**0.001**
Infections	**45.5%**	**30.0%**	**3.93[2]**	**1**	**0.047**
General disfigurement	33.2%	30.0%	0.10[2]	1	0.755

Note. [1] Student t-test (2-sided); [2]Chi square test (2-sided); [3] Fisher's Exact Test (2-sided). Significant findings are bolded.

4. Discussion

The present study is the first to examine empirically derived age of onset subgroups in PSP. A LPA yielded two distinct age of onset subgroups: a large group (92.9% of the sample) with average skin picking onset during adolescence (mean of 13.6 years) and a small group (7.1% of the sample) with average onset in adulthood (mean of 42.8 years).

Relative to the early onset group, the late onset group reported engaging in less focused picking and endorsed less skin picking-related impairment, but not skin picking severity. Additionally, the late onset group endorsed reduced comorbidity with other body-focused repetitive behaviors but higher rates of lifetime co-occurring affective and trauma conditions (i.e., depressive disorder, generalized anxiety disorder, panic disorder, and posttraumatic stress disorder). The late onset group was also more likely to report that initial picking onset was related to or followed depression/anxiety and physical illness. Further, the late onset group exhibited a trend towards significantly lower rates of family history of PSP. Together, these findings suggest that early onset PSP may carry greater burden (i.e., more focused and impairing picking) and increased familiality and may be more associated with clinical characteristics typical of PSP [5,9,24]. Despite finding higher relative endorsement of comorbid anxiety and depression in the late onset PSP group, there were no significant differences between groups on dimensional ratings of anxiety and depression (i.e., DASS-21). However, this may be due to differences in timeframes for the items, with the DASS-21 assessing symptoms over the past week, and the Skin Picking Impact Survey item assessing recall of diagnosed mental illnesses over one's lifetime.

Other differences between the early and late onset groups were noted but may reflect group differences in mean chronological age (i.e., 32.4 and 49.7 years, respectively). For example, relative to the early onset group,

the late onset group reported a shorter delay from onset to treatment, shorter duration of illness, and older chronological age when initially seeking services. Additionally, the late onset group reported a lower number of picking sites, which may reflect decreased duration of illness given research in trichotillomania showing that target sites tend to increase with duration of illness [37,38]. Rates of marital status also differed between groups, with the early onset group endorsing 'single/never married' at higher rates than the late onset group. This too may reflect between-group differences in average chronological age. Alternatively, as the early onset group also displayed longer duration of illness relative to the late onset group, this finding may reflect poorer social functioning in the early onset group. With respect to type of services utilized to treat PSP, the late onset group was less likely to have received behavioral treatment for skin picking relative to the early onset group. The reason for this is unclear. However, those with late onset symptoms may have less knowledge of available treatment options due to shorter illness duration.

The present investigation should be considered in the context of several limitations. First, the Skin Picking Impact Survey required retrospective recall of health information. Recall of PSP age of onset may be especially challenging for those with a longer duration of illness. Relatedly, our sample included only adults, which may have hindered recall of any early childhood symptom onset and, hence, our detection of childhood PSP onset subgroups. It has been suggested that very early onset trichotillomania (i.e., younger than 5 years old) represents a distinct subtype characterized by an episodic and self-limiting course [38]. At present, it is unclear whether early onset PSP follows a similar remitting course. In order to better understand potential age of onset subtypes in PSP, data from a broader range of samples are needed, including participants from a variety of settings (i.e., psychiatric and dermatological) and age groups (e.g., children and adolescents).

Additionally, report of psychiatric disorders diagnosed by a health professional may lack reliability as participant recall may be hindered by the time that has passed since the participant's last diagnostic evaluation. Therefore, participants in the late onset group may have better recall of diagnostic information presented by health professionals. A further limitation is the use of self-report measures. However, research on age of onset in other disorders, such as obsessive-compulsive disorder [11], has indicated that methods of inquiring about age of onset (e.g., self-report versus interview, age of onset of problem versus age of onset of diagnosis) have generally produced similar age of onset subgroups. Studies increasingly show that self-report internet surveys produce consistent findings with interview [39] and paper-and-pencil self-report [40]. Nevertheless, replication of the current findings with interview measures is warranted.

In addition, the recruitment method may limit the generalizability of the findings. Individuals responding to an internet survey posted on PSP websites may differ from the general PSP population. Moreover, individual items assessing criteria for PSP and other clinical characteristics were developed for the Skin Picking Impact Survey and were not psychometrically tested, which may also limit the generalizability of the present findings. Similarly, as the sample was largely Caucasian, findings may not be representative of the broader population of adults with PSP. Further, consistent with prior PSP research [6], the sample was predominantly female (94.9%), which may reflect a sex difference in prevalence of PSP, or alternatively, a sex difference in support seeking behavior or research participation. It is also important to note that because non-adolescent age of onset subgroups in PSP showed relatively low frequencies, sample size may be a limitation in this study and should be considered in future work. All models in this study exhibited very large separation in age of onset between classes, which generally increases statistical power [36]. Nevertheless, small class sizes tend to reduce statistical power. For this reason, future studies in PSP should continue to recruit large samples. Finally, as data are cross-sectional, directionality of reported events (e.g., PSP onset and lifetime events) cannot be established.

5. Conclusions

Overall, the findings provide preliminary support for the existence of at least two distinct age of onset subgroups in PSP: early onset (i.e., adolescence on average) and late onset (i.e., middle adulthood on average), which may represent clinically meaningful delineations. Findings may have implications for understanding trajectories of PSP over time. Future studies should explore whether early onset PSP has a more chronic and burdensome course over time. Additionally, findings have implications for the application of tailored treatments. For example, as early onset PSP was associated with greater focused picking, this suggests treatments geared towards management of aversive emotions (e.g., Acceptance and Commitment Therapy, Dialectical Behavior Therapy) may be especially therapeutic [41,42]. Further, as trends in findings suggest early onset PSP may be more familial, use of age of onset cutoffs may inform exploration of genetic factors associated with PSP. Future research is needed to better understand the validity and utility of these subgroups.

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