Psychiatry Research 249 (2017) 35–38

Contents lists available at ScienceDirect

Psychiatry Research

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

Cold pressor pain in skin picking disorder

Jon E. Grant[a,*], Sarah A. Redden[a], Samuel R. Chamberlain[b]

[a] Department of Psychiatry & Behavioral Neuroscience, University of Chicago, Chicago, IL, USA
[b] Department of Psychiatry, University of Cambridge; & Cambridge and Peterborough NHS Foundation Trust (CPFT), UK

ARTICLE INFO

Keywords:
Skin Picking Disorder
Cold pressor test
Pain
Autonomic

ABSTRACT

Excoriation (skin-picking) disorder (SPD) is a disabling, under-recognized condition in which individuals repeatedly pick at their skin, leading to noticeable tissue damage. There has been no examination as to whether individuals with SPD have different pain thresholds or pain tolerances compared to healthy counterparts. Adults with SPD were examined on a variety of clinical measures including symptom severity and functioning. All participants underwent the cold pressor test. Heart rate, blood pressure, and self-reported pain were compared between SPD participants (n=14) and healthy controls (n=14). Adults with SPD demonstrated significantly dampened autonomic response to cold pressor pain as exhibited by reduced heart rate compared to controls (group x time interaction using repeated ANOVA $F=3.258$, $p < 0.001$). There were no significant differences between the groups in terms of overall pain tolerance (measured in seconds), recovery time, or blood pressure. SPD symptom severity was not significantly associated with autonomic response in the patients. In this study, adults with SPD exhibited a dampened autonomic response to pain while reporting pain intensity similar to that reported by the controls. The lack of an autonomic response may explain why the SPD participants continue a behavior that they cognitively find painful and may offer options for future interventions.

1. Introduction

Excoriation (skin-picking) disorder (SPD) is a disabling, under-recognized condition in which individuals repeatedly pick at their skin, leading to noticeable tissue damage (APA, 2013). Psychosocial impairment, reduced quality of life, and medical problems such as infections are common among individuals with SPD (Flessner and Woods, 2006; Tucker et al., 2011). Despite its relatively high prevalence (with an estimated lifetime prevalence rate of 1.4–5.4% for clinically meaningful picking that results in distress or functional impairment) (Hayes et al., 2009; Keuthen et al., 2010), SPD remains poorly understood with limited data regarding underlying pathophysiology and optimal treatments (Grant et al., 2012).

While skin picking would likely be painful for healthy individuals, those with SPD report picking episodes lasting several hours, resulting in significant skin damage (Odlaug and Grant, 2008; Tucker et al., 2011), which may suggest changes in pain perception – such as loss of pain sensitivity. To date, no research has examined whether individuals with SPD experience pain differently from healthy controls. In related research, Christenson et al. (1994) found that adults with trichotillomania (a related body focused repetitive behavior disorder) (Grant and Stein, 2014) exposed to a steadily increasing pressure stimulus to the fingertip failed to show hypoalgesia. Similarly, trichotillomania volunteers in an experimental hair-pulling task reported levels of physical pain comparable to healthy controls (Diefenbach et al., 2008). The previous research in trichotillomania is valuable, but skin picking and hair pulling may differ in terms of pain. While plucking a hair may be momentarily discomforting, picking into the skin would seem to produce greater pain and the pain would likely endure even after the picking ends and the skin is healing. Therefore, the question remains as to whether adults with SPD have different pain thresholds, pain tolerances, or autonomic responses to painful stimuli, as contrasted to people without this disorder.

One means of understanding pain perception is via the cold pressor test. The cold pressor test requires participants to immerse their hands in ice-cooled water until the task becomes too uncomfortable. Although the pain circuitry of SPD has not been previously examined, a general understanding of pain suggests that noxious cold cutaneous sensations are recognized primarily by the cold-sensitive ion channel TRPM8 before sensory signal transduction (Winchester et al., 2014). Functional neuroimaging data reveals that noxious cold stimulation applied to the upper limbs of healthy subjects was associated with activation of the amygdala and anterior cingulate cortex, regions classically implicated in aversive emotional processing (Duerden and Albanese, 2013). Intriguingly, limited imaging and cognitive data implicate the anterior cingulate cortex in the pathophysiology of SPD

* Corresponding author.
E-mail address: jongrant@uchicago.edu (J.E. Grant).

http://dx.doi.org/10.1016/j.psychres.2016.12.050
Received 30 August 2016; Received in revised form 30 November 2016; Accepted 30 December 2016
Available online 31 December 2016
0165-1781/

(Odlaug et al., 2016).

Using the cold pressor test, and based on the clinical data regarding SPD, we hypothesized that adults with SPD would exhibit a dampened autonomic response to pain compared to healthy controls. In addition, we hypothesized that adults with SPD would subjectively report less discomfort when undergoing the cold pressor task and that pain sensitivity significantly and negatively correlated with worse skin picking symptom severity.

2. Materials and methods

2.1. Participants

Men and women aged 18–65 with a current primary diagnosis of SPD, based on DSM-5 criteria, were recruited by media advertisements, referrals, and in person at the Trichotillomania Learning Center (TLC) Foundation for Body Focused Repetitive Behaviors annual conference.

Age and gender-matched healthy controls were recruited by word of mouth and through poster and newspaper advertisements. All control group participants were free of any current psychiatric disorder, as measured using the Mini International Neuropsychiatric Inventory (MINI) (Sheehan, et al., 1998), and Minnesota Impulse Disorder Inventory (MIDI) (Grant, 2008).

Exclusion criteria across all participants included: 1) history of Raynaud's phenomenon; 2) history of cardiovascular disorder; 3) open cuts or sores on the hands; 4) history of fainting or seizures; 5) fracture of the limb to be submersed; 6) history of frostbite; and (7) an inability to understand or undertake the procedures or an inability to provide written informed consent.

The Institutional Review Board (IRB) of the University of Chicago approved the study and consent procedures, which followed the Declaration of Helsinki's ethical principles for medical research involving human participants. After a complete description of study procedures, participants were given the opportunity to ask questions and provided voluntary informed consent using the IRB-approved consent form. Subjects were compensated with $10 cash at the end of the visit.

2.2. Procedures

Demographics and clinical features of SPD were assessed with an unpublished semi-structured interview. The semi-structured interview included DSM-5 diagnostic criteria for SPD as well as questions regarding SPD's phenomenology. Psychiatric comorbidity was assessed using the *Structured Clinical Interview for DSM-IV* (SCID) (First, et al., 1997).

Skin picking severity measures were: (i) The *Yale Brown Obsessive Compulsive Scale modified for Neurotic Excoriation (NE-YBOCS)* (Arnold et al., 1999); and (ii) the *Skin Picking Symptom Assessment Scale (SP-SAS)*. The NE-YBOCS is a 10-item scale that assesses picking symptoms during the last seven days. The SP-SAS is a self-report scale of skin picking symptoms over the past seven days (Grant et al., 2007). Both scales have demonstrated good preliminary reliability and validity (Grant et al., 2007).

We examined pain perception using the *Cold Pressor Test (CPT)*. The CPT is a reliable and valid pain induction method (Edens and Gil, 1995) that requires participants to submerge their hand in a 85-fluid ounce container filled with ice water at a temperature between 0–4 °C. Participants immersed the non-dominant hand in the water bath to just above the wrist and were instructed to keep their hand open (rather than in a closed fist position) while it was in the water. Before immersion, participants were told to keep the hand in the water until the pain became intolerable or until the cutoff time of 3 min was reached. During the task, subjects rated their pain at 15-second intervals using an adapted version of the valid and reliable self-report Wong-Baker Faces Pain Rating Scale (Al' Absi et al., 2004; Aziato et al., 2015; Wong and Baker, 1988). Pain was rated on a scale from 0 (not painful at all) to 100 (extremely painful). Intermediate ratings marked on the Likert scale include 25 (somewhat painful), 50 (moderately painful), and 75 (very painful). Pain ratings were displayed on a large poster in a line from 0 to 100. Each intermediate rating included a visual representation of pain associated with that rating. Latency to pain tolerance (when the hand was voluntarily withdrawn) was measured with a stopwatch in seconds. Heart rate and blood pressure were recorded serially using an automated digital device: heart rate every 15 s, and blood pressure at baseline and at point of hand withdrawal. Because the CPT may cause physical discomfort or psychological stress, volunteers were free to discontinue the task at any point.

2.3. Data analysis

Demographic and unitary CPT measures were compared between the SPD and the control groups using one way analysis of variance or equivalent non-parametric tests where appropriate. For serial CPT measures, data were entered into repeated measures analyses of variance; effects of disease severity were evaluated by entering these parameters as potential covariates. Where CPT data were not available for a subject at a given time point due to attrition, the appropriate group mean was entered into the model. Results were reported with significance defined as $p < 0.05$ two-tailed, uncorrected. Data were analyzed using SPSS (version 22; IBM, Armonk, NY).

3. Results

There were no significant demographic differences between participants with SPD (N =14, M_{age} =32.0 years, SD =11.0, 64.3% women) and healthy controls (N =14, M_{age} =31.0 years, SD =7.8, 78.6% women). The mean NE-YBOCS and SP-SAS scores for the SPD participants were 19.7 and 27.5, respectively, which correlates to moderate severity of symptoms. The mean age of picking onset for those with SPD was 14.1 years. 71.4% (N=10) picked from more than one part of their body (e.g. face (50%, N=7), fingers (28.6%, N=4), arms (35.7%, N=5), legs (28.6%, N=4)). Because the cold pressor task could induce pain in the hand area, SPD individuals in this study who picked at their hands or fingers also picked from other body areas and did not have open excoriations on their hands at the time of testing. All 14 of the SPD group picked daily for at least one hour each day and all had noticeable excoriations. The most commonly cited triggers for picking included: boredom, stress, and sedentary activities.

3.1. Cold pressor test

The mean time that the cold water was tolerated (i.e. time spent before removing hand from the water) was 120.14 s in the SPD group compared to 145.71 s in the control group (t=−1.175, p=0.250). In addition the percentage of individuals with SPD who left their hands in the water for the entire 3 min period was 50.0% compared to 57.1% of the control group (Fisher's Exact Test, p=1.000).

The mean heart rate at each time point for each group is shown in Fig. 1. There was a main effect of time (F=8.494, $p < 0.001$), a main effect of group (F=7.565, p=0.011), and a significant group x time interaction (F=3.258, $p < 0.001$).

The SPD group showed significantly dampened autonomic response versus the controls. Time 1 represents baseline, and Time 13 represents +180 s.

Mean pain ratings for the SPD and control groups at each time point are shown in Fig. 2. There was a main effect of time (F=40.723, $p < 0.001$), but no main effect of group ($p > 0.10$), nor was there a significant group by time interaction ($p > 0.20$).

Adults with SPD did not differ from controls in their subjective pain