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Is ACT-Informed Exposure a Viable Treatment for Excoriation Disorder?

A Multiple Baseline Study

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Abstract

This study piloted the use of ACT-informed exposure as an adjunct to habit reversal training (HRT) for excoriation disorder (ExD). Using a nonconcurrent multiple baseline single case design, 4 participants completed sessions of exposure and HRT. Repeated measures and self-report data were collected on skin picking and psychological flexibility. 2 participants completed HRT followed by exposure, and 2 participants completed exposure followed by HRT. Results support the effectiveness of HRT in reducing picking. Results suggest exposure may have some impact in reducing picking, but effects were weaker compared to HRT. Contrary to predictions, repeated measures and self-report data did not indicate consistent improvement in psychological flexibility during exposure phases. As any reduction in picking may be clinically meaningful and all participants maintained gains at follow-up, there is some indication that exposure may be a second-line treatment worth further study. Limitations and future areas of research are discussed.

Keywords: acceptance and commitment therapy; exposure; excoriation disorder; single case design; habit reversal training

Is ACT-Informed Exposure a Viable Treatment for Excoriation Disorder?

A Single Case Design Study

Excoriation disorder (ExD) involves repetitive skin picking at one or more areas of the body. It is part of what are called body-focused repetitive behaviors (BFRBs) that include trichotillomania (hair pulling), nailing biting, and cheek biting. In a large sample of college students, 5.7% reported clinical levels of skin picking with 23.9% reporting subclinical picking within the past month (Houghton, Alexander, Bauer, & Woods, 2018).

Research on pharmaceutical treatments for ExD has been mixed, with reviews suggesting that placebo-controlled trials indicate no clear benefit to pharmaceutical interventions (Schumer, Bartley, & Bloch, 2016; Selles, McGuire, Small, & Storch, 2016). Instead, behavioral interventions appear most effective in reducing picking behavior (Schumer et al., 2016; Selles et al., 2016). The best supported behavioral treatment for ExD is habit reversal training (HRT). Originally developed to treat tic disorders and nervous habits, Twohig and Woods (2001) adapted HRT to treat skin picking. HRT involves: (a) awareness training of antecedents to picking; (b) and practicing a competing response that is incompatible with picking (e.g., clasping fingers together).

Early studies focused on HRT alone (Teng, Woods, & Twohig, 2006; Twohig & Woods, 2001), while subsequent studies included stimulus control interventions aimed at reducing exposure to triggers (e.g., covering mirrors) and creating barriers to picking (e.g., wearing gloves) as part of an HRT package (Capriotti, Ely, Snorrason, & Woods, 2015; Flessner, Busch, Heideman, & Woods, 2008). For the purposes of this study, HRT will refer to a package of: (a) awareness training; (b) competing response; (c) and stimulus control interventions. HRT appears successful as a standalone treatment and has been combined with cognitive therapy interventions

(Schuck, Keijers, & Rinck, 2011) and acceptance and commitment therapy (ACT; Capriotti et al., 2015; Flessner et al., 2008). There is evidence that ACT without HRT may be an effective but not optimal treatment for ExD (Twohig, Hayes, & Masuda, 2006).

ExD is categorized in the 5th Edition of the *Diagnostic and Statistical Manual of Mental Disorders* among the obsessive-compulsive and related disorders (OCRD; American Psychiatric Association, 2013). For many OCRDs such as obsessive-compulsive disorder, body dysmorphic disorder, and hoarding, exposure therapy is considered one of the most effective interventions (e.g., Abramowitz & Jacoby, 2015). To date there is little published on the use of exposure therapy with BFRBs such as trichotillomania and ExD. Although an ACT-based treatment manual for trichotillomania by Woods & Twohig (2008) includes a brief section on using cue exposure in treating hair pulling, a recent review by Murphy, Flessner, and Smith (2016) found no empirical research studies on the use of exposure therapy in treating BFRBs.

Abramowitz and Jacoby (2014) argue that exposure is not an appropriate intervention for BFRBs. However, this criticism is based on a fear/anxiety model of exposure. Recent research has expanded the use of exposure in treating conditions that are not necessarily fear-based such as misophonia (Frank & McKay, 2018) and Tourette's syndrome (van de Griendt, van Dijk, Verdellen, & Verbraak, 2018; Verdellen et al., 2008).

The focus of exposure in ACT is not fear reduction so much strengthening psychological flexibility (Hayes, Strosahl, & Wilson, 2012; Thompson, Luoma, & LeJeune, 2013). Psychological flexibility refers to the ability to respond adaptively to aversive stimuli while taking action towards meaningful life directions. It has been conceptualized as consisting of 6 non-orthogonal core processes: *acceptance*, *cognitive defusion*, *present moment awareness*, *self-as-context, values*, and *committed action*. Recent studies have found that both non-ACT

exposure (e.g., focused on fear reduction) and exposure delivered in an ACT context strengthen psychological flexibility in OCRDs (Thompson, Twohig, & Luoma, 2021; Twohig et al., 2018). As exposure is already an accepted intervention in the treatment of several anxiety and OCRDs (e.g., Bluett, Homan, Morrison, Levin, & Twohig, 2014), expanding its use in treating BFRBs may help further a larger goal of disseminating transdiagnostic interventions (Murphy et al., 2016). Additionally, as ACT interventions without exposure have been found to be effective in the treatment of ExD (Capriotti et al., 2015; Flessner et al., 2008; Twohig et al., 2006), the addition of exposure within an ACT context is a logical extension of this prior acceptance-based research for BFRBs.

Many people with ExD learn through HRT to resist the urge to pick in the moment. However, the researcher observed in his clinical experiences that some clients report that resisting urges to pick requires great effort and concentration. When these clients become tired, distracted, and less able to inhibit behavior, they sometimes return to pick at targets they sighted earlier in the day. One aim of implementing exposure in an ACT context is to teach people with ExD to practice emotional acceptance of their urges to pick with less struggle, allowing these urges to eventually reside and reducing the likelihood they will pick later when they become distracted or tired.

The purpose of this pilot study was to examine the use of exposure as an adjunct to HRT for ExD. It was predicted that the addition of exposure would result in: (a) decreases in skin picking above and beyond HRT alone; (b) and increases in psychological flexibility in responding to picking urges (i.e., able to observe urges to pick without engaging in picking behavior). To our knowledge, this is the first research study on the use of exposure in treating BFRBs.

**Method**

**Design**

This study used an intensive single-case design methodology (e.g., Barlow, Nock, & Hersen, 2009) and was conducted in a private behavioral health clinic in a northwestern state in the United States. Single-case designs are particularly conducive to practice settings, as they require fewer resources and less infrastructure to implement than group designs while maintaining high internal control (Codd, 2018). This manuscript was prepared according to SCRIBE guidelines for reporting single case design studies (Tate et al., 2016). Prior to data collection, this study was approved by the Behavioral Health Research Collective Institutional Review Board (IRB). Participants ($N = 4$) were recruited through websites associated with the researcher's clinic, professional listservs, word-of-mouth referrals, and through an approved posting on The TLC Foundation for Body-Focused Repetitive Behaviors "Volunteer for Research" webpage.

This study used a nonconcurrent multiple baseline design across participants. This within-participants design compares participants across baseline and interventions phases and allows participants to be incorporated into the study as they become available (e.g., Barlow et al., 2009). Baselines were staggered, and participants did not begin the intervention phase until a stable baseline of daily skin picking was established. There were 2 conditions. In condition 1, following the baseline phase, two participants began with HRT followed by exposure. In condition 2, following the baseline phase, two participants began with exposure followed by HRT. Participants were randomly assigned to each condition. The first participant was assigned to condition 1, the second to condition 2, the third to condition 1, and the fourth to condition 2. If

a participant discontinued before completing the study, the next participant accepted into the

study would fill the vacant condition.

After a stable baseline was established following a minimum of 3 weeks, participants

began the intervention phase. For participants who began HRT prior to exposure, HRT

interventions were not withdrawn during the exposure phase; however, no new HRT

interventions were added (e.g., stimulus control). For participants who began with exposure prior

to HRT, exposure exercises were suspended during the HRT phase.

**Measures**

Consistent with single-case design methodology (Barlow et al., 2009; Codd, 2018), the

primary outcomes of picking and psychological flexibility were assessed through repeated

measures. Participants submitted daily scores of one-item measures of picking and psychological

flexibility. Participants could choose the method for submitting scores: a.) leave voice mail on

researcher's private extension; b.) submit through secure online form; c.) email researcher. All

participants chose to email ratings in a de-identified form (i.e., if someone were to read the

email, it would not be clear what the numbers reflected). Established self-report measures of

picking and psychological flexibility were administered at each session, and measures of

psychological functioning and picking style were administered at the beginning of each phase.

**Repeated measurement.** Our primary hypotheses were tested using 2 one-item measures

administered daily to assess changes in behavior across phases.

*Self-monitoring.* After consenting to the study, participants were asked to provide daily

scores of the "**number** of *skin picked* and/or *hairs pulled*." Skin picking was defined as "removal

of one's skin via the use of finger(s) or device (e.g., tweezers)," and hair pulling was defined as

"pulling out of one's hair via the use of finger(s) or device." The wording of these items was

adapted from published single-case design studies of picking (e.g., Flessner et al., 2008; Twohig et al., 2006). The hair pulling item was included for any participants with co-morbid trichotillomania, as skin picking and hair pulling may co-occur at rates higher than expected by chance (Snorrason, Belleau, & Woods, 2012). However, none of the participants in this sample reported hair pulling.

*Before Session Questionnaire (BSQ; Forman et al., 2012)*. The full BSQ consists of a bank of items intended to assess outcomes and processes related to ACT and cognitive therapy (CT). Two BSQ items intended to assess theorized mediators of change between ACT and CT reflect the use of *change* strategies (e.g., challenging thoughts or feelings) versus *acceptance* strategies (e.g., accepting thoughts and feelings without trying to change them). The first item reflects *cognitive acceptance*. The second item reflects *affective acceptance*. As Thompson et al. (2021), which used these items for repeated measurement of psychological flexibility in a sample of participants with OCD, found that the *cognitive* and *affective* items covaried, these 2 items were combined into a single item for this study. The daily psychological flexibility item was worded as "Whenever I had **bothersome thoughts** or **feelings** over the past day, I tended to...." and was rated on a Likert-type scale from 1 ("Just notice them without trying to change them") to 7 ("Try to change them or get rid of them"). Lower scores reflect greater psychological flexibility.

**Self-report measures.** In addition to repeated measurement, the study included standardized self-report measures of behavior relevant to the study hypotheses.

*Skin-Picking Scale-Revised (SPS-R; Snorrason, Olafsson, et al., 2012).* The SPS-R is an 8-item self-report measure of skin picking. Items are rated on a scale of 0 to 4, with higher scores reflecting greater picking severity. A total score or 2 subscales (symptom severity; impairment)

may be calculated. For this study, only the total score is presented as the subscales did not yield any additional findings above and beyond the total score alone. According to Snorrason, Olafsson et al., internal consistency for the total score is .83 and the subscales have high correlations with the total score (.86-.89).

*Acceptance and Action Questionnaire-II (AAQ; Bond et al., 2011).* The AAQ is a 7-item self-report measure of psychological flexibility on a scale of 1 ("never true") to 7 ("always true") with lower scores reflecting greater psychological flexibility. Internal consistency ranges from .78-.88, and it has acceptable test-retest reliability (3 months = .81; 12 months = .79; Bond et al., 2011). Ong et al. (2019) found that context-specific variants of the AAQ (e.g., diagnosis) exhibited greater treatment sensitivity than the version of the AAQ used in this study. Although there is a published version of the AAQ for trichotillomania (i.e., AAQ-TTM; Houghton et al., 2014), there were no known versions of the AAQ for ExD at the time this study was conducted, and the general measure was used.

*Milwaukee Inventory for the Dimensions of Adult Skin Picking (MIDAS; Walther, Flessner, Conelea, & Woods, 2009).* The MIDAS is a 12-item self-report measures that assess 2 styles of skin picking: (a) focused; and (b) automatic. Each subscale consists of 6 items rated on a Likert-scale from 1 ("Not true for any of my picking") to 5 ("True for all of my picking"). The MIDAS subscales have demonstrated adequate internal consistency (.77-.81) and are orthogonal (Walther et al., 2009)

*Outcome Questionnaire-45.2 (OQ45; Lambert et al., 1996).* The OQ45 was designed to assess client outcome of overall life functioning in treatment settings. Items are rated on a 5-point Likert scale of 0 ("never") to 4 ("always") with a possible total score between 0 – 180. The recommended cut-off score is $\geq$63 for clinical significance, and differences in scores of 14 points

or more between two or more administrations are considered clinically significant. Although there are three subscales, only the total score was used. Lambert et al. (1996) found the total score has high internal consistency (.92) and high test-retest reliability (.84).

**Procedure**

Participants completed a phone screening prior to scheduling an in-person assessment. Phone screening eligibility included: (a) 18 years or older; (b) can read and speak in English; (c) no disabilities that would preclude ability to participate in the study (e.g., autism spectrum) or thought disorders; (d) no previous treatment experience with cognitive behavior therapy for BFRBs. If a potential participant passed the phone screen and remained interested in the study, a 45-minute assessment was scheduled with the researcher who was also the therapist for all participants.

At the in-person assessment, participants were provided a description of the study and completed a study-specific consent form. ExD diagnosis was confirmed using *DSM-5* criteria. The participant completed all self-report measures (i.e., SPS-R, AAQ, MIDAS, OQ45). At completion of the assessment, participants were asked to begin daily self-monitoring (e.g., number of picks per day; BSQ item). At each session, participants completed the SPS-R and AAQ. At each change in phase, participants also completed the MIDAS and OQ45.

At completion of treatment, a 3-month follow-up was scheduled. Participants suspended daily assessments until the follow-up, when the experimenter contacted them and asked them to provide 2 weeks of daily assessments. They attended one in-person session where they completed self-report measures and provided feedback about the study. Participants were given a $50 gift certificate for completing the 3-month follow-up.

Consistent with the recommendation in Barlow et al. (2009) that baseline be plotted with a minimum of 3 data points, all participants completed the AAQ and SPS-R across at least 3 baseline sessions before beginning the intervention phase. During the baseline phase, the therapist also gathered information about picking behavior, psychosocial history, and provided an informational handout on BFRBs.

The HRT phase had 3 components: (a) awareness training through completing a daily self-monitoring form; (b) identifying and practicing a competing response with one's hands (e.g., lacing fingers together) when participants noticed an urge to pick; (c) identifying and implementing stimulus control interventions (e.g., removing light bulbs in bathroom or replacing with lower wattage to reduce ability to see imperfections on skin).

The exposure phase was designed by the researcher. In the first session of the exposure phase, participants were oriented to the ACT psychological flexibility model. Creative Hopelessness—the idea that struggling with or trying to avoid urges to pick increases their intensity—was introduced through an experiential exercise, Finger Traps. A guided mindfulness exercise created by the researcher, called "Willingness with Urges" was introduced in session, and participants were provided with a recording for home practice. A third experiential exercise, the Willingness Switch, oriented participants to the ACT process of acceptance or willingness defined as "being fully present and allowing yourself to feel the urge." In the second session, the therapist provided the rationale for ACT-informed exposure:

> We're going to be focusing on deliberately evoking the urge to pick your skin, and then practicing being present with these urges without picking. You'll learn ways to respond more flexibly to whatever shows up for you when you experience urges.

The therapist and participant identified procedures to deliberately trigger urges to pick. These procedures included some combination of: (a) tactile or visual scanning of picking sites; (b) common picking contexts (e.g., bathroom); (c) site or part of the body (e.g., face, arms, shoulders). For example, participants might practice exposure to tactile scanning of their shoulders or visual scanning of their face in a mirror. Participants assigned ratings of difficulty to each procedure on a 0-10 scale (0 = no urge; 10 = overwhelming urge).

During exposure, participants practiced evoking urges to pick while rating their experience of the urge on two scales: (a) Urges (0-10: 0 = no urge; 10 = overwhelming urge); (b) and Willingness (0-10: 0 = not willing; 10 = fully open). The therapist guided participants to practice observing and developing awareness of internal events such as thoughts (e.g., "I need to pick this"), breathing (e.g., deep or shallow), interoceptive sensations (e.g., tightness in chest), and sense perceptions (i.e., touch, taste, smell, sight, sound). After evoking urges to pick, participants were instructed to practice willingness and expand their awareness of other sense perceptions (e.g., breathing; interoceptive sensations). Every 30 seconds to 1-2 minutes, participants rated Urges and Willingness scores. Exposure was repeated in-session until participants developed a consistent procedure they could practice at home. As homework, participants were instructed to practice exposure at home for 5-10 minutes per day. Each trigger was practiced for 1-2 weeks.

## Results

### Participant Background and Summary of Treatment

Participant 1 (P1) was White, cis-gender, queer, female in her mid-20's who had been picking since age 11 with worsening picking in the past 3-4 years. She was referred to the study by her Employee Assistance Program therapist whom she had started seeing for work-related

stress, and she agreed to discontinue treatment with this therapist after beginning the study. P1

stated she typically picked when she was anxious, stressed, or bored. Thoughts related to picking

included, "get that out of my skin" (e.g., ingrown hair). P1 stated that picking usually began as

automatic and became more focused when she became aware she was picking. P1 reported

history of depressive episodes, multiple traumas, and disordered eating when younger. P1

reported she had keratosis pilaris. She was prescribed psychiatric medication. P1 found that, after

triggering urges to pick, expanding her attention to ambient sounds augmented her ability to

remain present and practice willingness with urges. When asked for feedback at study

completion, P1 stated she "really liked" exposure practice and found it "more helpful overall."

She described HRT strategies as "good starters."

Participant 2 (P2) was a White, cis-gender, heterosexual female in her early 30s. She was

referred by her primary therapist, whom P2 had been seeing for anxiety and depression. As P2

had been working with her therapist for 6 months prior to beginning the study, and they had not

focused on skin picking, the researcher allowed her to continue working with her primary

therapist on the condition they did not address picking. She was not prescribed psychiatric

medication. P2 reported co-morbid OCD, generalized anxiety disorder, and dysthymic disorder.

P2 reported she primarily picked at blemishes on her body with picking episodes lasting no

longer than 15-20 minutes. During the exposure phase, P2 found that expanding awareness of her

breathing and sense perceptions helped her remain present and practice willingness with urges to

pick. At treatment completion, P2 stated she found exposure "helpful but hard." When asked

about treatment order (exposure, then HRT), P2 stated she thought treatment order was

reasonable, as she "learned to sit with urges" during the exposure phase before taking action to

disrupt them using HRT.

Participant 3 (P3) was a White, cis-gender, queer female in her late 60s. She learned about the study through The TLC Foundation for Body-Focused Repetitive Behaviors "Volunteer for Research" webpage. P3 reported history of treatment for OCD, and she had been diagnosed with bipolar II disorder within the past 10 years. She stated she had not received treatment for skin picking and had not realized ExD was a diagnosis until recently. She was prescribed psychiatric medication. P3 reported history of picking since age 7 when she began picking at her knuckles. In order of severity, P3 reported she: (a) tears/chews at skin on fingers; (b) tears skin on the underside of her toes and feet; (c) pops pimples on her face, neck, and back; (d) scratches at her scalp; (e) scratches the inside of her ear canal with paper clip (new). P3 indicated she had tried stimulus control interventions in the past on her own. During the exposure phase, P3 found that expanding awareness of her breathing, interoceptive sensations, and sense perceptions (esp. taste), and by naming internal experiences ("belly breathing") allowed her to remain present and practice willingness with urges to pick. At study completion, P3 stated she found "exposure has been what really accelerated" progress with picking, noting practice increased awareness of picking behavior. P3 recommended exposure be practiced in 15+ minutes increments, as she felt she required more time to "get to the friendly place" and did not believe exposure would have been as effective if she had limited practice to 5-10 minutes, the minimum required by the study protocol.

Participant 4 (P4) was a White transgender, non-binary, bisexual individual in their late 20's. They learned of the study while researching therapists. They were not in therapy and not prescribed psychiatric medication. P4 reported picking began as a small child. When they were 5 or 6, they realized they could pull skin under their fingernail and experienced this as extremely reinforcing. P4 stated that, "anytime I look at my hand, I have an urge to pick" (e.g., cuticles). P4

reported picking at their face, shoulder, and neck. Stated they use their fingers primarily to pick but had started to pick with tweezers more recently. During the exposure phase, P4 found that expanding awareness of visual stimuli (e.g., movement of trees) and tactile sensations (e.g., sensation of jeans) helped them remain present and practice willingness with urges to pick. At study completion, P4 stated they found exposure "challenging" but felt exposure practice increased awareness of picking behavior and facilitated engagement in HRT. P4 stated they felt exposure work "clicked" when they began HRT.

Two participants dropped out during the study. They were each replaced by the next volunteer who completed the screening. One, a cis-gendered female, withdrew due to childcare issues during the baseline phase after two meetings. P1 replaced her in condition 1. The other participant, a cis-gendered female, who was in the exposure then HRT condition, completed six meetings and withdrew as she was struggling to complete out of session work (e.g., exposure practice; daily assessments) and had upcoming travel plans. P2 replaced her in condition 2. No adverse events were reported by participants in this study.

## Primary Outcomes – Daily Assessment

The standard method for evaluating single case design data is visual inspection (e.g., Barlow et al., 2009). Repeated measurement data was graphed and carefully inspected for shifts between phases.

**Number of skin picks per day.** Graphs of daily ratings for these items are provided in Figure 1. Baseline number of skin picks per day is higher for participants in condition 1 than for participants in condition 2. In condition 1, baseline mean picks per day for P1 and P3 are 55.85 and 69.56, respectively. In condition 2, baseline mean picks per day for P2 and P4 are 27.71 and 25.00, respectively.

Baselines appear stable. The first week of data for P1 was not included on the graph because of a misunderstanding about what was being tracked. Instead of number of skin picks per day, P1 initially reported picking "episodes" per day, which included multiple pickings. After reexplaining the metric at the second session, P1 began tracking number of picks per day. There is a sudden decrease in picking 3 days before beginning the intervention phase. This may reflect normal day-to-day fluctuations for P1, as these scores remain within the range of ratings that preceded them and mainly stand out because they are consecutive.

Graphs for P1 and P3, who engaged in the HRT phase before the exposure phase, indicate marked decreases in picking during the HRT phase. There are additional decreases in picking during the exposure phase; however, it is not possible from the study design to gauge whether P1 and P3 would have continued to report reductions in picking with HRT alone.

Graphs for P2 and P4, who engaged in the exposure phase before the HRT phase, indicate minimal decreases in picking during the exposure phase compared to HRT phase. In the graphs for both P2 and P4, there are greater reductions in picking between the exposure and HRT phases, than between the baseline and exposure phases.

Taken together, graphs for all participants support the robustness of HRT in reducing in picking. Reductions in picking during exposure phases were much smaller compared to the HRT phases. Graphs in Figure 1 indicate all four participants maintained reductions in picking at the 3-month follow-up.

**Daily psychological flexibility ratings.** Graphs of daily ratings of the BSQ one-item psychological flexibility measure are provided in Figure 2. Lower scores reflect strong psychological flexibility whereas higher scores reflect low psychological flexibility.

P1 and P3, following baseline, engaged in HRT followed by exposure. The graph for P1 indicates improvement in psychological flexibility between baseline and HRT phases, contrary to predictions, and little change in psychological flexibility between HRT and exposure phases. The graph for P3 indicates improvement in psychological flexibility between baseline and HRT phases, and additional improvements in psychological flexibility between HRT and exposure phases. Interestingly, although P3 maintained reductions in daily picking at 3-month follow-up, there appeared to be worsening psychological flexibility at 3-month follow-up.

P2 and P4, following baseline, engaged in exposure followed by HRT. The graph for P2 indicates minimal changes in psychological flexibility between baseline, HRT, exposure phases, and an improvement in psychological flexibility between end of treatment and 3-month follow-up. The graph for P4 indicates minimal changes in psychological flexibility between baseline and exposure phases, and, contrary to prediction, improvements in psychological flexibility during the HRT phases. In summary, the hypothesis that the exposure phase would result in increase in psychological flexibility was not supported across participants.

**Primary Outcomes – Self-Report Measures**

In addition to the repeated measurement items presented above, self-report measures of skin picking (SPS-R) and psychological flexibility (AAQ) were administered at each session. Scores are graphed in Figure 3. Graphs of these self-report measures are consistent with the one-item repeated measures of daily picking (Figure 1) and psychological flexibility (Figure 2).

Graphs in Figure 3 indicate stable baselines for P2, P3, and P4 for the SPS-R and AAQ, and a stable baseline for P1 on the AAQ. P1's SPS-R scores indicate decrease in picking during the baseline phase in Figure 3, consistent with the repeated measures of daily skin picks per day in Figure 1.

Graphs for self-report measures of skin picking and psychological flexibility were consistent with the repeated measurement of the same constructs. Graphs for P1 and P3 indicate clear improvements in picking during the HRT phase, with smaller improvements in picking during the exposure phase. Graphs for P2 and P4 indicated small improvements in picking during the exposure phase following baseline, with greater improvements in picking during the HRT phase. None of the graphs indicate consistent improvements in psychological flexibility across treatment phases.

**Secondary Outcomes**

Changes in scores on the MIDAS and OQ45 are presented in Table 1. These measures were administered at pre-treatment, and at the end of each phase (baseline; HRT; exposure). There were baselines differences on OQ45 scores between conditions. Baseline OQ45 scores were not clinically significant ($\geq$63) for P1 and P3 in condition 1, indicating these participants were not experiencing clinically significant distress in life functioning. Baseline OQ45 scores were clinically significant for P2 and P4 in condition 2, indicating these participants were experiencing clinically significant distress in life functioning.

Across phases, scores on the OQ45 for P1 and P3 remained below the cut-off ($\geq$63) for clinical significance, and scores on the OQ45 for P2 and P4 remained above the cut-off ($\geq$63) for clinical significance. A change in 14 points between administrations of the OQ45 is considered clinically significant (Lambert et al., 1996). P2 exhibited no clinically significant change in scores (14+) during treatment but exhibited a clinically significant improvement between the end of treatment and 3-month follow-up. P4 exhibited clinically significant worsening in life functioning between baseline and exposure phase with a return to baseline levels during the HRT

phase. P4 exhibited a clinically significant improvement in functioning between the end of treatment and 3-month follow-up.

**Discussion**

To our knowledge, this study is the first to examine the use of exposure therapy in the treatment of BFRBs. In a controlled single case design study, daily skin picking and psychological flexibility were assessed across a combined HRT and ACT-informed exposure treatment for ExD. Results support the effectiveness of HRT for reducing skin picking and is consistent with prior research (Capriotti et al., 2015; Flessner et al., 2008; Schuck et al., 2011; Teng et al., 2006; Twohig & Woods, 2001). Although there was no comparison group in this study, the rapid and substantial improvements in picking that occurred during the HRT phases that followed exposure phases suggest the effects of HRT are not the result of placebo, as improvements occurred following a credible treatment. Participants that began with exposure exhibited greater improvements in picking during HRT phases compared to exposure phases where improvements were minimal.

Although participants who engaged in HRT before exposure exhibited additional improvements in picking during the exposure phase, it cannot be ruled out that these improvements may be due to additional practice with HRT. Interestingly, in both graphs, reductions in picking during exposure following HRT appear after several days into the exposure phases, which could suggest participants may require time to practice exposure. This practice effect is also indicated in the graph for P2, where there are additional reductions in picking during the last week of the exposure phrase, just prior to the introduction of HRT.

Potential confounding variables for these results are the differences in baseline picking between the two conditions. P1 and P3, who began treatment with HRT, reported greater skin

picks per day during baseline than P2 and P4, who began treatment with exposure. The greater

reductions in picking for P1 and P3 during their HRT phases compared to the initial exposure

phases for P2 and P4 may reflect a regression to the mean for P1 and P3 or a floor effect for P2

and P4. As graphs for P2 and P4 indicate additional and larger reductions in daily picking during

the HRT following exposure, a floor effect appears less of a concern. Of note, baseline SPS-R

scores were similar for P1, P3, and P4, suggesting skin picking severity for P4 may have been

comparable with P1 and P3, even if P4 engaged in fewer picks per day.

Baseline differences between conditions were a result of the randomization process.

Given that participants were randomized to each condition as they were accepted into the study,

it would have been difficult to match picking severity between the 2 conditions. Additionally,

matching picking severity between conditions would have involved greater experimenter

manipulation of the randomization process, which could have risked introducing additional

experimenter bias into the study (e.g., assigning participants who appeared to be strong

candidates for exposure to the exposure first condition). Given that HRT resulted in more robust

reductions in picking across participants in both conditions compared to exposure regardless of

treatment order, it does not appear that baseline differences would have significantly altered the

overall results. Another difference between the conditions is that baseline OQ45 scores indicate

that P2 and P4 were experiencing clinically significant distress in life functioning whereas P1

and P3 were not. This latter finding is not unusual as, although it is common for people with

clinical BFBRs to reported distress about symptoms and physical damage, actual functional

impairment from symptoms is rarer (Houghton et al., 2018).

Based on the results, HRT is a clear first-line treatment which offers rapid (3 sessions)

and robust improvements. Results were less supportive of exposure as an effective treatment for

ExD. One reason Murphy et al. (2016) could not find any published studies on the use of exposure therapy for BFRBs may reflect the *file drawer problem* (i.e., results with null findings are less likely to be published).

However, there is some evidence exposure is worth further study as a second-line treatment for ExD. All participants reported experiencing exposure as a credible and tolerable treatment. Participants who began with exposure stated they believed exposure helped prepare them for HRT, and participants who began with HRT attributed additional improvements in picking to the subsequent exposure practice. For example, P1 described exposure as "more helpful overall" and P3 stated "exposure has been what really accelerated" treatment progress. One interpretation of the data and participant feedback is that exposure is too difficult as a first-line treatment and may facilitate additional treatment gains with practice after HRT interventions have been implemented.

It is noteworthy that all four participants maintained improvements in picking during at 3-month follow-up (Figures 1 and 3). Although controlled trials of HRT for skin picking that aggregate participant data indicate gains are maintained at follow-up (Schuck et al., 2011; Teng et al., 2006), smaller trials suggest maintenance of treatment gains vary by individual. One single case design study of HRT for picking found that only 1 of 2 participants had maintained gains at a 4-month follow-up (Twohig & Woods, 2001), and a single case design study of an ACT intervention for picking found that only 1 of 4 treatment responders maintained gains at a 3-month follow-up (Twohig et al., 2006). It is possible that exposure, in helping participants learn to accept urges to pick while not engaging in picking behavior, reduced relapse.

Results did not support the hypothesis that exposure strengthens psychological flexibility in people with ExD. In a prior single case design study of exposure for OCD using the same one-

item psychological flexibility repeated measure, results indicated exposure for OCD resulted in

improvements in psychological flexibility (Thompson et al., 2021). It is possible that

psychological flexibility may be less relevant for ExD populations, or that the measure was too

broad for a behavior as specific as skin picking. Given that recent studies have found that

context-specific psychological flexibility measures are more sensitive to change (e.g., Ong et al.,

2019), it is possible that adapting the item to psychological flexibility in the context of picking

would have been more clinically relevant for participants. Future research may focus on creating

a psychological flexibility measure for individuals with ExD.

One reason exposure appeared less effective in the treatment of ExD compared to other

OCRDs such as OCD may be that exposure is more effective in targeting distress, whereas

Tucker, Woods, Flessner, Franklin, & Franklin (2011) found the majority of people with ExD

experience pleasure, gratification, or relief immediately after picking. Some researchers have

proposed an addiction model to account for the pleasurable emotional response that people with

BFRBs report when engaging in pulling or picking behavior (see Conelea, Frank, & Walter,

2017). Oliveirra et al. (2019) found that, although ExD exhibits greater diagnostic overlap with

OCD compared to behavioral addictions, there was enough of an overlap with gambling

addiction to suggest impulsive/addictive features of picking consistent with addiction. From an

addictions perspective, exposure for picking may be an intervention through which to practice

acceptance of urges in the presence of cues that trigger the problem behavior (e.g., Otto, Powers,

& Fischmann, 2005). As people with ExD often report the experience of picking as pleasurable,

the impact of exposure may be smaller in ExD than for other OCRDs.

There are several limitations of this study. As a small N study, it is not clear the degree to

which the results of the four participants in this study generalize to ExD at the population level.

Additionally, the study relied on self-report measures. The researcher considered taking photographs of picking sites to augment data collection but decided against it because many people pick at sites that may be embarrassing for the participants (e.g., chest, pubic region). There were also no formal measures of therapist treatment adherence or treatment compliance. The researcher was the therapist for all participants.

Given the more robust impact of HRT compared to exposure, a study with a larger sample might compare a combined protocol of HRT followed by exposure against HRT alone to assess if the addition of exposure therapy confers advantages above and beyond HRT alone. It may also be useful to compare relapse rates in a follow-up with HRT alone against HRT + exposure. Given that one participant recommended spending more time engaged in daily exposure practice than required by the treatment protocol, increasing the time engaged in daily exposure practice may improve outcomes.

In summary, this study supported to effectiveness of HRT for ExD. As a pilot study of exposure for ExD, results indicated that exposure is less effective for ExD than HRT—if it is effective at all. Given that any additional reductions in picking may be meaningful for clients with ExD, results suggest it may be worth comparing HRT alone against HRT + exposure to assess if adding exposure offers any improvements to HRT alone, and if exposure reduces relapse.

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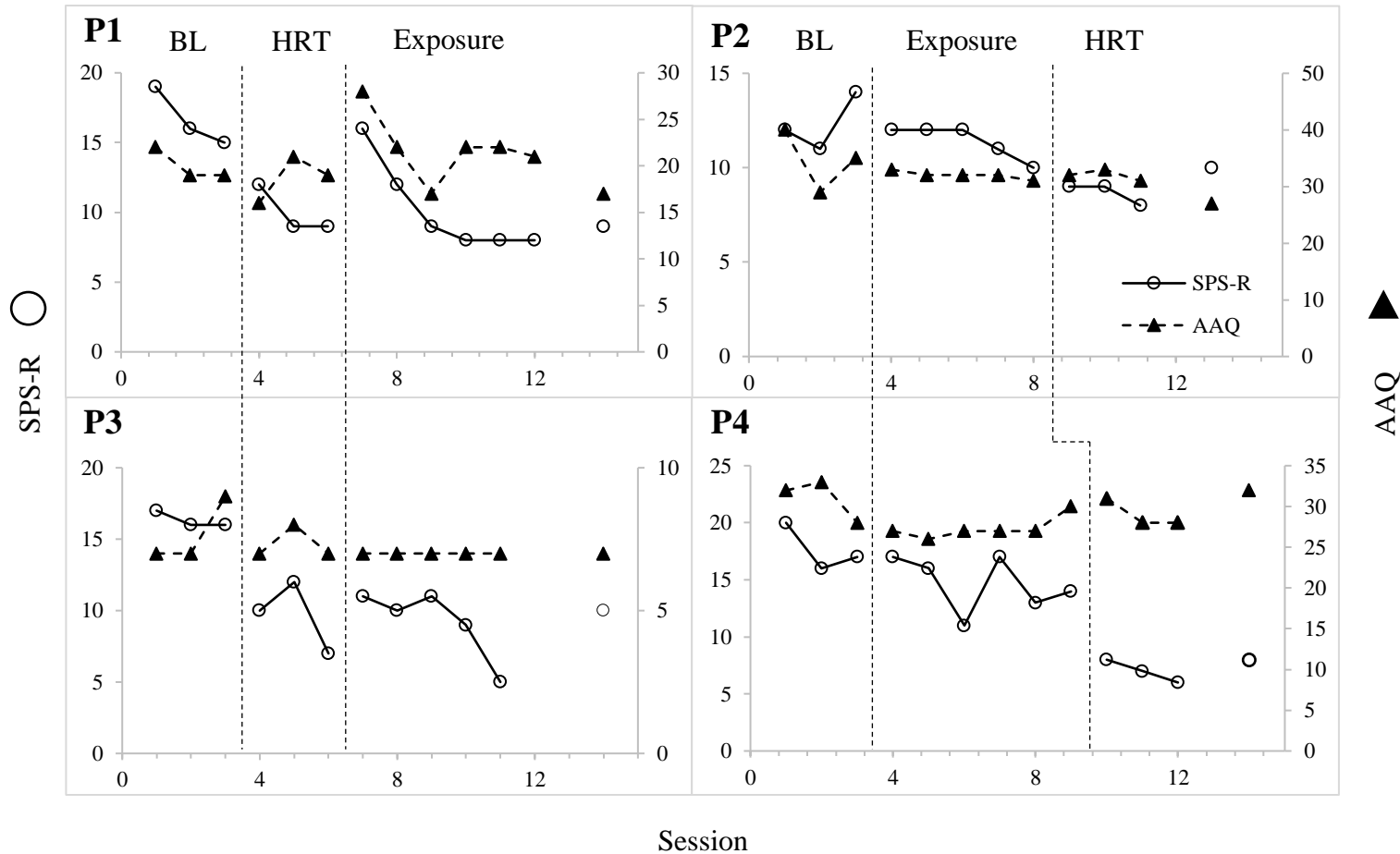
Figure 1
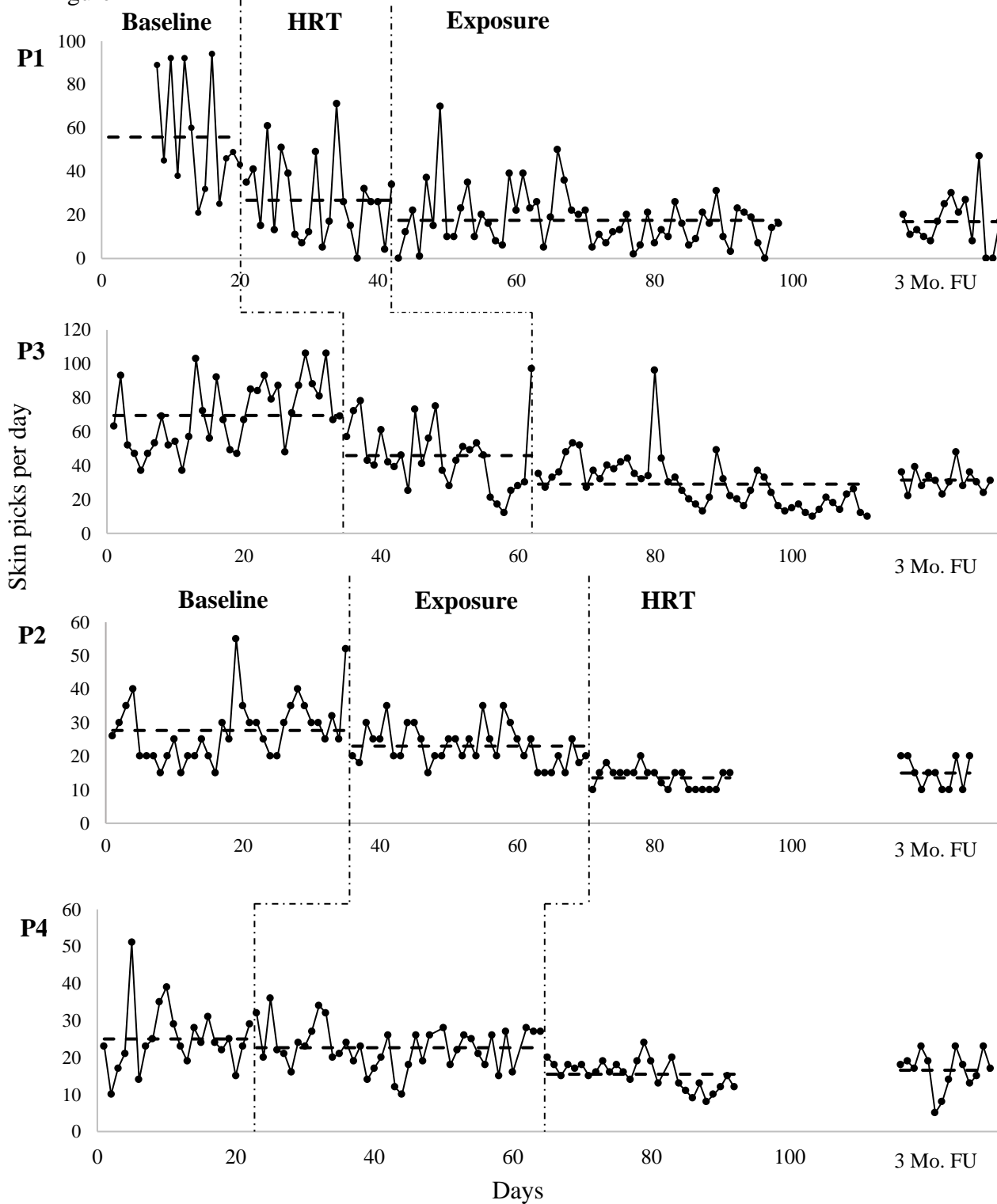


Daily ratings of skin picks per day

Figure 2
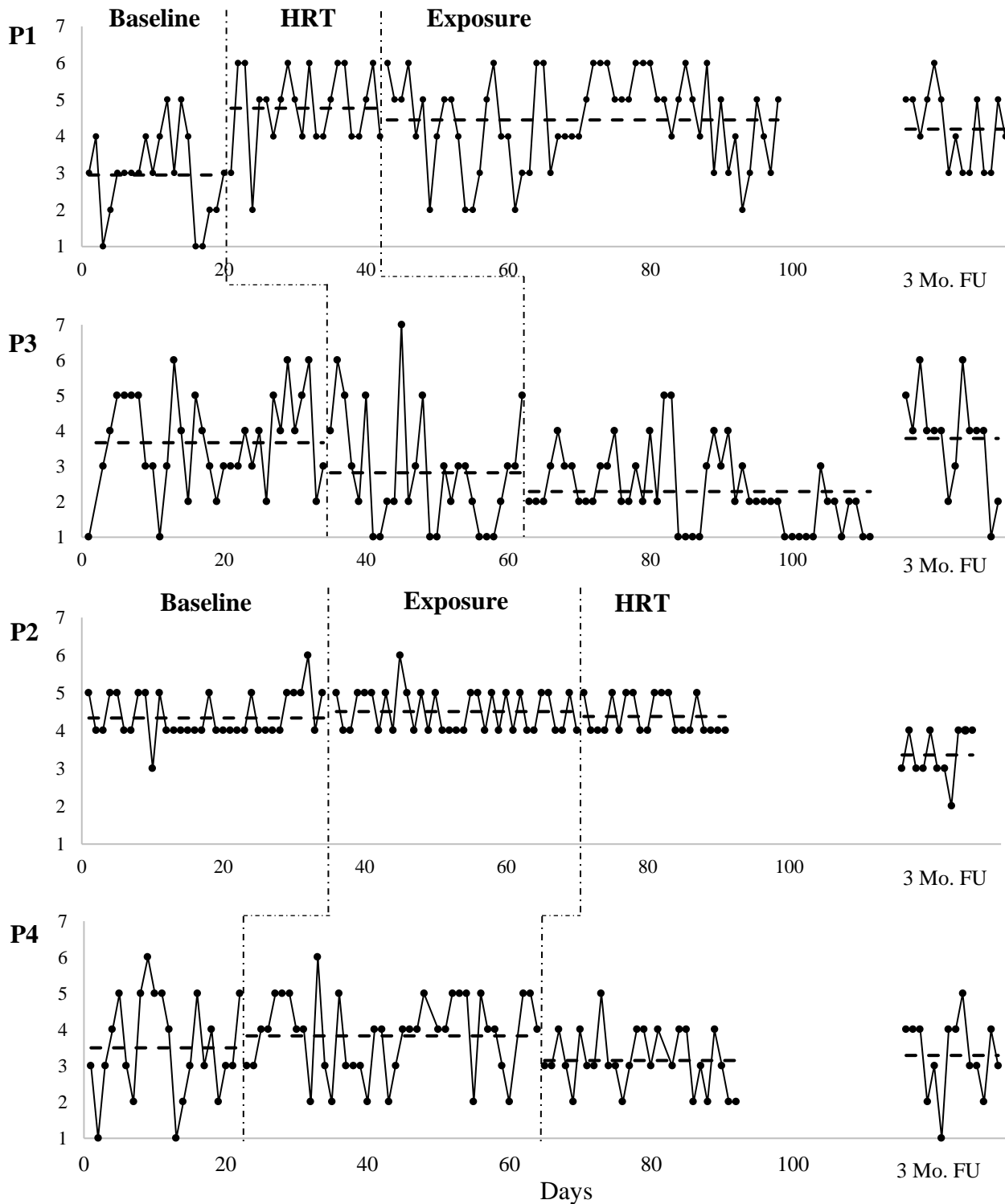


Daily ratings of BSQ psychological flexibility processes scores. Decreasing scores (e.g., 1) reflects shift towards increase in psychological flexibility. Means are represented by dashed lines for each phase.

Figure 3



Self-report measures of skin picking and psychological flexibility across treatment sessions and 3-month follow-up. Note that y-axes are scored differently across participants.
SPS-R = Skin Picking Scale-Revised; AAQ = Acceptance and Action Questionnaire-II; BL = baseline; HRT = habit reversal training; exposure = ACT-informed exposure

Table 1

*Self-report measure scores for pre-treatment, end of treatment phases, post-treatment, and 3-month follow-up*

| | P1 | | | | | P2 | | | | | P3 | | | | | P4 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pre | HRT | EXP | Post | FU | Pre | EXP | HRT | Post | FU | Pre | HRT | EXP | Post | FU | Pre | EXP | HRT | Post | FU |
| OQ45 | 53 | 54 | 51 | 51 | 49 | 93 | 92 | 93 | 98 | 72 | 40 | 38 | 37 | 29 | 39 | 80 | 94 | 84 | 82 | 97 |
| MIDAS | | | | | | | | | | | | | | | | | | | | |
| focused | 17 | 19 | 22 | 25 | 18 | 12 | 16 | 16 | 14 | 12 | 14 | 11 | 16 | 13 | 14 | 19 | 21 | 22 | 17 | 16 |
| automatic | 17 | 19 | 16 | 16 | 17 | 11 | 12 | 14 | 13 | 13 | 15 | 17 | 13 | 14 | 16 | 18 | 16 | 17 | 16 | 20 |

Phases: Pre = intake; HRT = habit reversal training; EXP = ACT-informed exposure; Post = final session; FU = 3-month follow-up
MIDAS = Milwaukee Inventory for the Dimensions of Adult Skin Picking; OQ45 = Outcome Questionnaire-45.2.