Recall of Expressed Affect During Naturalistically Observed Interpersonal Events in Those With Borderline Personality Disorder or Depressive Disorder

Whitney C. Brown1, Sarah L. Tragesser2, Rachel L. Tomko1, Matthias R. Mehl3, and Timothy J. Trull1

Abstract
We used the Electronically Activated Recorder to observe 31 individuals with either borderline personality disorder (BPD; n = 20) or a history of a depressive disorder (n = 11). The Electronically Activated Recorder yielded approximately forty-seven 50-second sound clips per day for 3 consecutive days. Recordings were coded for expressed positive affect (PA) and negative affect (NA), and coder ratings were compared to participants’ reports about their PA and NA during interpersonal events. BPD participants did not differ from participants with depressive disorder in terms of their recalled levels of NA or PA across different types of interpersonal events. However, significant discrepancies between recalled and observed levels of NA and PA were found for BPD participants for all types of interpersonal events. These findings may reflect limitations in the ability of those with BPD to recall their emotional intensity during interpersonal events and may also provide some evidence for emotional invalidation experienced by those with BPD.

Keywords
Electronically Activated Recorder, borderline personality disorder, naturalistic observation

Human memory does not produce perfect records of stored information akin to a computer’s hard drive; rather, our memory of both emotions and events are biased in several ways (e.g., see Holland & Kensinger, 2010, for a review). For example, peak-end effects (e.g., Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993) and telescoping effects, (e.g., Janssen, Chessa, & Murre, 2006) alter our recall of life events and experiences. Many experiences and behaviors of interest to psychologists are subject to these recall biases, including coping (Stone et al., 1998), substance use and abuse (Pickett, Kasza, Biesecker, Wright, & Wakschlag, 2009), and affective instability (AI; e.g., Solhan, Trull, Jahng, & Wood, 2009), for example. Likewise, limitations in memory for emotional states and interpersonal experiences are also subject to reconstruction at the time of retrieval, making these vulnerable to a range of memory biases.

The present study focuses on the recall of affective experience and, in particular, affect during interpersonal encounters. Several previous studies have found that the recall of affect may not always be accurate and that recall accuracy may depend on the valence of affect or on participant characteristics. For example, Thomas and Diener (1990) used experience sampling methodologies to assess the recall of both positive and negative affective experience in a sample of undergraduate students, assessed daily over the course of 3 weeks. The authors found that individuals were relatively accurate in their recollection of the frequency of positive affect (PA) experiences, but the intensity of both PA and negative affect (NA) was overestimated. Other investigators have found a negative recall bias (Banich et al., 2009), such that individuals tend to recall events more negatively than the event was experienced in real time. In addition to this negative recall bias, the reconstruction of emotional memories is also biased by prior expectations of the event, gender differences, cultural beliefs about emotionality, personality traits, and knowledge, or experience, acquired after an event (Denkova, Dolcos, & Dolcos, 2012; Holland & Kensinger, 2010).

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Although no one is likely to have perfect recollection of events or emotional experiences, the extent to which there are more recall discrepancies and these discrepancies are greater in degree is likely to be associated with psychological consequences. For example, conflicting feedback on one’s emotional state, behaviors, or actions has been theorized to constitute an invalidating environment and is believed to be a major contributing factor for the development and maintenance of emotional dysregulation problems in individuals with borderline personality disorder (BPD; Linehan, 1993).

Consistent with this possibility, those with psychological conditions characterized by emotional dysregulation may be more likely to show such biases in their mood recall. Discrepancies between recall and real-time self-reports of affect have been reported in clinical samples with mood dysregulation. For example, Ben-Zeev, Young, and Madsen (2009) found that although recalled levels of PA and NA were associated with real-time reports of affect using PDAs (personal digital assistants), both healthy controls and individuals with depressive disorders (DDs) recalled their PA and NA as being more intense than their ratings in real time. Furthermore, healthy control participants retrospectively exaggerated their weekly level of PA to a greater extent than their weekly level of NA, whereas those in the depressed group did not exhibit this bias. In another study, outpatients with a diagnosis of BPD were found to have an overall negative recall bias compared to healthy controls, such that those with BPD retrospectively underestimated positive emotions and overestimated negative emotions (Ebner-Priemer et al., 2006).

In studying the recollection of affective experiences, researchers rarely have an objective, non–self-report measure of the participant’s real-time emotion experiences (Thomas & Diener, 1990). Although it is believed that momentary ratings of affective experience are more valid and reliable than retrospective reports, even momentary ratings are produced through the lens and filter of the individual and thus may be subject to some degree of bias. This bias may be especially prevalent among those with emotion dysregulation problems like BPD because frequent experiences of high-intensity emotional states and the tendency to think in all-or-none terms may make it difficult to label and identify the specific emotions that are experienced (Suvak et al., 2011).

Interestingly, coder-rated observations of affect and behavior have shown validity above and beyond self-reports of emotions. For example, Mason, Sbarra, and Mehl (2010) investigated predictors of psychological adjustment following marital separation. In this “thin-slice” approach (Ambady & Rosenthal, 1992), “reading judges” rated written narratives, whereas “listening judges” rated 30-second audio recordings of participants’ stream-of-consciousness descriptions of their separation from their spouse. Although ratings of psychological adjustment from both reading and listening judges were positively associated with participant reported distress, only the listening judges’ ratings were associated with prospective increases in distress 3 months later after statistically accounting for relationship length, separation initiator status, and time since separation. This finding suggests that it is not the content of the description but the affect with which the individuals described their separation that is associated with later adjustment. Furthermore, this demonstrates that social and emotional information obtained solely from the auditory channel of communication may illuminate important psychosocial sequelae of negative interpersonal events.

Difficulties in emotional regulation and expression may manifest themselves during interpersonal encounters, and emotionally dysregulated individuals may be particularly unreliable reporters of affective reactions to these events. As mentioned previously, individuals with BPD may have low emotional clarity and difficulty labeling their emotional experiences (Suvak et al., 2011). Results from an emotional labeling task in which participants rated their emotional response to International Affective Picture System (Lang, Bradley, & Cuthbert, 2008) stimuli suggested that individuals with BPD were more likely to use valence and not arousal to describe emotional experience. Suvak et al. (2011) suggest that this tendency to experience emotions in gross versus specific terms as well as an “all-or-nothing” pattern of thinking about experiences may contribute to BPD individuals’ reported difficulty with labeling emotions. Furthermore, BPD and DDs diagnoses are also associated with the use of experiential avoidance and emotional suppression, which are forms of emotion regulation, albeit maladaptive (Cribb, Moulds, & Carter, 2006; Gratz, Tull, & Gunderson, 2008; Linehan, Cheavens, Lejuez, & Lynch, 2005). These coping strategies may also result in a biased recall of emotion during negative interpersonal events.

Fortunately, technological advances allow for naturalistic assessment of emotional experience in daily life, independent of self-report (Mehl, Pennebaker, Crow, Dabbs, & Price, 2001). In the present study, clinical participants with BPD or with a history of DD wore the Electronically Activated Recorder (EAR; Mehl et al., 2001) for 3 days. The EAR device unobtrusively records ambient sounds in the participants’ immediate environment. In past EAR studies, the sampled ambient sounds have been coded for affect, behavior, and characteristics of the environment (e.g., Hasler, Mehl, Bootzin, & Vazire, 2008; Mehl, Gosling, & Pennebaker, 2006; Tomko et al., 2012). In the present study, we focused on participants’ emotional experiences in interpersonal encounters as they occurred in daily life.

There were two main goals of the current research. The first goal was to determine the extent to which salient interpersonal events occurring over the study period were captured by the EAR. Second, we wanted to determine the
degree to which participants’ recalled affective experience during interpersonal events corresponded to coders’ ratings of that affect as recorded by the EAR. We enlisted two groups of participants to address these issues, including those with BPD and those with a recent history of DD (but no BPD diagnosis or AI). Both groups of disorders are characterized by emotion dysregulation, although individuals with BPD are considered to show higher levels of AI (i.e., high variability and intensity), primarily in NA (American Psychiatric Association, 2000). Both groups are also characterized by interpersonal problems, but it is believed that those with BPD may show heightened NA triggered by relationship conflicts (American Psychiatric Association, 2000).

Real-time self-report assessments are not typically highly correlated with retrospective self-report in clinical outpatients (e.g., Solhan et al., 2009). Therefore, we hypothesized that the discrepancy between observational ratings and retrospective recall of affect would be significant. Furthermore, we hypothesized that all our participants would recall their affective experiences during these interpersonal events more negatively than they were observed and rated by our coders (i.e., a negative affective bias). Last, we predicted that the BPD group would express and recall higher levels of NA overall during these interpersonal events as compared to the DD group, given the core BPD feature of AI and previous findings for a strong negative recall bias in those with BPD.

Method

Participants

All participants were recruited following their completion of a previous study of AI (see Trull et al., 2008, for more details regarding the previous study) and were paid $40 for their participation. In the present study, 51 total participants wore the EAR device and were interviewed at the end of the study period. Thirty-one of these participants are included in the following analyses; we limited our analyses to those participants to address these issues, including those with BPD and those with a recent history of DD (but no BPD diagnosis or AI). Both groups of disorders are characterized by emotion dysregulation, although individuals with BPD are considered to show higher levels of AI (i.e., high variability and intensity), primarily in NA (American Psychiatric Association, 2000). Both groups are also characterized by interpersonal problems, but it is believed that those with BPD may show heightened NA triggered by relationship conflicts (American Psychiatric Association, 2000).

Electronically Activated Recorder

The EAR is a digital voice recorder that captures brief intervals of sound in participants’ environments. Participants received a Dell Axim 50 PDA loaded with EAR software and an attached microphone (OPTIMUS Tie-Clip Microphone) that clipped onto their clothing. In the present study, the EAR recorded approximately 47 times a day between the hours of 9 a.m. and 11 p.m., recording every 18 minutes for 50 seconds in duration. The 31 participants had a mean of 102 valid/audible waking sound-files ($SD = 32.1$) out of 168 possible sound-files per participant (an average of 61% per participant).

Measures

Observed Affect. Six research assistants were trained to code the audio files for expressed affect, and they were unaware of the current research hypotheses. One rater coded each participant’s set of audio files, and each sound file was reviewed as many times as necessary before assigning codes. Affect was coded using descriptors from the Positive and Negative Affect Schedule—Expanded. PA items (happy, proud) and NA items (afraid, sad, guilty, angry) were rated on a scale ranging from 1 (not at all) to 5 (extremely). Raters were instructed to use this scale to indicate how the participants appeared to feel in any given sound file. Any audible information from the participant (e.g., voice tone, nonverbal utterances, crying) was used to inform coders’ ratings. Interrater reliabilities, reported as intraclass correlations (ICCs) using absolute agreement (Shrout & Fleiss, 1979) were conducted on a subsample of the original 51 participants ($n = 19$) by having a second rater listen to the audio files and provide independent ratings. Observer PA and NA scores were calculated by taking the mean score for the items on each respective scale (range = 1.0-5.0). ICCs for affect ratings across the study period were good for both observer PA (ICC = .78) and NA (ICC = .91).

Recalled Affect. At the end of the study period, the participants returned the EAR device and were interviewed by research staff about their most positive and most negative interpersonal interaction for each day of the study period (Thursday to Saturday), resulting in a maximum of six interpersonal events per participant. The participants were asked to provide a brief description of the event and describe those who were part of the interaction, the time of day, duration of the interaction, and the nature of the interaction (e.g., leisure activity). The participants also rated their own level of PA and NA during these events, using terms consistent with the mood items described above. Recalled affect was rated on a 1 (not at all) to 5 (very much) scale. Positive recalled affect included the items happy/excited and confident/determined, whereas negative recalled affect...
Table 1. Correlations Among Observed and Recalled Positive and Negative Affects.

<table>
<thead>
<tr>
<th>Affect</th>
<th>Recalled negative affect</th>
<th>Observed negative affect</th>
<th>Recalled positive affect</th>
<th>Observed positive affect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recalled negative affect</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Observed negative affect</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Recalled positive affect</td>
<td>−.373**</td>
<td>−.069</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Observed positive affect</td>
<td>−.231</td>
<td>−.393**</td>
<td>1.13</td>
<td>—</td>
</tr>
</tbody>
</table>

*p < .01.

included the items ashamed/guilty, nervous/ill at ease/tense, 
hostile/irritated, and sad/upset. Recalled PA and NA scores 
calculated were by taking the mean score for the items on 
each respective scale (range = 1.0-5.0).

Locating and Coding Interpersonal Events. Three research 
staff listened to EAR sound files to locate the interpersonal 
events recalled by participants in the interview described 
above. First, staff listened to the EAR files based on the 
participant’s report of the date and duration of the event 
(e.g., Friday, between 3 p.m. and 4:30 p.m.). If the event 
not found in the recalled time interval, the search range 
was extended by 1 hour in each direction (e.g., 2 p.m. to 
5:30 p.m.). One final search was done if the event could 
not be located, by extending the search range by 1 additional 
hour in each direction (e.g., 1 p.m. to 6:30 p.m.).

An interpersonal event was considered to be located if 
content of the audio files was consistent with the partici-
pant’s description. Final confirmation of the interpersonal 
event record on the EAR files was made by the first author 
(WCB). Of 51 individuals who had completed the interper-
sonal interview at the end of the study (described above), 20 
had no interpersonal events that could be located on the 
EAR files; these participants were excluded from further 
analyses. Among the original 51 participants that wore the 
EAR, there were no between–diagnostic group differences 
in the number of events located: t(49) = 0.276, p = .784; 
SE = 0.53. Participants included in the following analyses 
height one interpersonal event located, as judged by a 
consensus of the research staff.

Results

In the final sample of 31 participants, a total of 57% of 
recalled interpersonal events (N = 106 events) out of 186 pos-
sible interpersonal events were captured by the EAR. To 
address the possibility that events of relatively longer dura-
tion were more easily located on the EAR device than shorter 
events, we conducted a test of self-reported event length on 
whether the events were detected on the EAR. We found a 
statistically significant difference between the self-reported 
length of detected (M = 2:06:15 hours; SD = 2:00:05 hours) 
and undetected events: M = 1:14:40 hours; SD = 1:24:35 
hours; t(175.8) = 3.348, p = .001; SE = 0:15:24 hours. 

Because participants varied as to how many interpersonal 
events were captured in EAR recordings, one positive or one 
negative event per participant was randomly chosen using a 
random number generator for those participants with multi-
ple positive and negative events for the present analyses 
(total n = 58 events). Four participants provided only one 
detectable event (n = 1 positive event, n = 3 negative events). 
Observer-rated and participant-recalled affect were corre-
lated by interpersonal event type (positive vs. negative) in 
order to determine the agreement between participants’ recol-
lection and observer-coded sound clips yielded from the 
EAR. As indicated in Table 1, across all 31 participants, 
recalled and observed affect ratings were not significantly 
correlated with each other, regardless of valence. However, 
within rating source (recalled vs. observed), NA and PA rat-
ings were significantly negatively correlated.

To determine whether the BPD and DD participants ret-
rospectively recalled significantly different mean levels of 
affect during interpersonal events, we conducted a series of 
t tests. The mean affect ratings by group and interpersonal 
event type can be found in Table 2. As shown in Table 2, 
there were no significant mean differences between the 
groups for the recollection of either affect during negative 
events: NA, t(28) = .765, p = .451; PA, t(28) = −1.032, p = 
.311, or positive events: NA, t(26) = 0.252, p = .803; PA, 
t(26) = −0.887, p = .383. Also shown in Table 2, our coders’ 
ratings of affect (observed affect) did not differ by group for 
either negative interpersonal events: NA, t(26) = 0.378, p = 
.708; PA, t(28) = 1.198, p = .241, or positive interpersonal 
events: NA, t(26) = 1.321, p = .198; PA, t(26) = −0.219, p = 
.828.

Next, to determine whether the level of NA and PA dur-
ning interpersonal events recalled by participants was similar 
to observers’ ratings of affect as recorded by the EAR, we 
conducted a series of paired t tests to compare the difference 
between the means of recalled and observed NA and PA. As 
indicated in Tables 3 and 4, paired t tests indicated statisti-
cally significant paired differences between recalled and 
observed NA for both negative: DD, paired t(10) = 2.468, 
p = .033; BPD, paired t(18) = 3.437, p = .003, and positive 
interpersonal events: DD, paired t(9) = 4.248, p = .002; 
BPD, paired t(17) = 2.897, p = .010, such that NA was 
recalled to be higher than was observed by our coders for 
both diagnostic groups.
There was also a statistically significant difference between recalled and observed PA for negative: paired t(18) = −3.744, p = .001, and positive events: paired t(17) = 3.286, p = .004, in the BPD group. There was also a trend for a significant paired difference between recalled and observed PA for positive events: DD paired t(9) = 2.220, p = .054, but not for negative events: DD paired t(10) = −.730, p = .482, in the DD group. PA associated with positive events was recalled more intensely by both the DD and BPD groups than it was observed by our coders.

To address the possibility that our participants’ current depression symptoms influenced their own retrospective ratings of affect during interpersonal events, we sought to statistically control the correlation between observed and recalled affect using self-reported depression scores as measured by the Inventory to Diagnose Depression (IDD; Zimmerman, 1994; Zimmerman, Coryell, Corenthal, & Wilson, 1986). Overall, our participants scored in the mild-moderate range of current depression; there was no significant difference between groups in depressive symptoms: DD, M = 29.4, SD = 20.4; BPD, M = 23.6, SD = 9.2, t(12.4) = 0.889, p = .391. IDD scores were not significantly correlated with recalled NA or PA for positive interpersonal events: NA, r = .171, p = .385; PA, r = −.083 p = .676, or for recalled PA during negative interpersonal events (r = .206, p = .274). IDD scores, however, were significantly related to recalled NA during negative interpersonal events (r = .405, p = .026). However, residual scores obtained by regressing IDD scores onto recalled affect scores were not significantly associated with observers’ ratings of affect (Negative Event NA: r = −.139, p = .464; Negative Event PA: r = .026, p = .892; Positive Event NA: r = .282, p = .146; Positive Event PA: r = .034, p = .863. Therefore, it appears that current depressive symptomatology did not significantly account for the lack of significant relations between recalled and observed affect.

### Discussion

This investigation is the first using the EAR to compare observer-rated affect to retrospectively recalled affect during naturalistically observed interpersonal experiences of outpatients with emotional dysregulation. The EAR recorded a majority of salient interpersonal events recalled by participants with BPD and DDs. We found a significant difference between recalled and observed PA for both positive and negative interpersonal events in the BPD group. In the BPD group, PA was recalled more intensely than it was observed by our coders during positive interpersonal events but was recalled less intensely during negative interpersonal events. For DD participants, PA during positive interpersonal events was recalled more intensely than it was observed by our coders. For both groups, NA was recalled as more intense than it was observed by our coders, regardless of the type of interpersonal event.

One interpretation of the obtained results is that emotionally dysregulated individuals, especially those with BPD, retrospectively recall emotions during interpersonal events more intensely than they were experienced in real time. The results are somewhat consistent with this view.
BPD and DD participants rated their NA during both positive and negative events higher than the observers rated the participants’ level of NA. Both BPD and DD participants also recalled their PA to be more intense during positive events than the observers coded their affect. One possible explanation of these results is that all-or-none thinking tends to occur particularly during and after negative events for individuals with disorders of emotion dysregulation (Suvak et al., 2011), leading to peaks of NA, which then influence recollections of emotional state (i.e., a peak-end bias). Similarly, it may be the case that individuals with BPD possess an overall negativity bias. Among those with BPD, the recalled level of PA was significantly lower than that rated by coders during negative events. Although this differs from our hypothesis that any affect (negative or positive) would be recalled more intensely, it does suggest that BPD individuals are recalling negative events to be more unpleasant than they are observed by others.

There are other findings that are inconsistent with the interpretation of a tendency to recall all affects as more intense regardless of the interpersonal event. For example, the levels of PA recalled and observed for DD participants did not differ for negative interpersonal events. So the generalization that those with emotion dysregulation problems consistently rate their recalled level of affect as more intense than what is observed was not supported.

Another possible explanation of the above finding is that current depressive symptoms among participants might account for the discrepancy between recalled and observed affect. Depression has been shown to contribute to biases in emotional recall and expression (Gotlib & Joorman, 2010; Matthews & MacCleod, 2005). When we explored whether the discrepancy between coders’ observation and participants’ recall of NA could be accounted for by current depressive symptoms, we did not find evidence supporting this alternative explanation. NA recalled during the DD group’s negative interpersonal events was associated with current depressive symptoms. However, the residuals obtained from this relationship were not associated with observed NA. It is possible that our sample was not “depressed enough” to show this effect since we did not require participants to be currently experiencing a major depressive episode (although the average participant endorsed mild-moderate levels of depression). Cognitive biases in depression, which could affect recall of emotion, have not been shown to persist beyond or between episodes, with the exception of overgeneral memories (Gotlib & Joorman, 2010; Mackinger, Pachinger, Leibetseder, & Fartacek, 2000). A similar study using a more depressed sample might uncover such an effect.

A third interpretation of the discrepancy between recalled and observed affect is that observers have fewer emotion cues available to them and thus perceive overall lower levels of emotion than the individual experiences or recalls from his or her own perspective. On one hand, previous research using thin-slice methodologies has demonstrated that strangers can accurately identify personality traits and emotional states with minimal information (e.g., Ambady & Rosenthal, 1992; Mason et al., 2010; Oltmanns, Friedman, Turkmheimer, & Fiedler, 2004). On the other hand, the retrospective interview might be more sensitive to the level of recalled NA during interpersonal events than our observational measure. As noted earlier, however, discrepancies were not found across the board for both groups of participants, and in one case the discrepancy indicated that BPD participants rated their PA significantly lower during negative events than did observers.

So, what are the implications of a mismatch between observed and recalled emotional experience? In particular, this discrepancy was found for all affects within both types of interpersonal events for our BPD participants. Individuals with emotion dysregulation problems may feel misunderstood by others in their daily lives if they have difficulty expressing the intensity of the emotions or feelings as they occur or if they do not appear to react emotionally to negative interpersonal events (Butler et al., 2003; Rottenberg, Gross, & Gotlib, 2005). In particular, individuals with BPD have reported lack of clarity regarding emotional experiences as well as emotional suppression (Lynch, Robins, Morse, & Krause, 2001; Suvak et al., 2011). This pattern of expressed emotion may be experienced as confusing or erratic to an observer, given that the display of emotion may not always match the internal intensity that a person reports feeling.

On the other hand, this may be some evidence for an “invalidating environment,” one that is crucial to Linehan’s (1993) theory of BPD. In particular, emotional invalidation occurs when one’s emotional states or feelings are ignored.

Table 4. Paired $t$ Tests for Affect Ratings in Borderline Personality Disorder Group by Interpersonal Event.

<table>
<thead>
<tr>
<th></th>
<th>Mean difference (SD)</th>
<th>$t$</th>
<th>df</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive event recalled—observed PA</td>
<td>0.728 (0.940)</td>
<td>3.286</td>
<td>17</td>
<td>.004</td>
</tr>
<tr>
<td>Positive event recalled—observed NA</td>
<td>0.377 (0.552)</td>
<td>2.897</td>
<td>17</td>
<td>.010</td>
</tr>
<tr>
<td>Negative event recalled—observed PA</td>
<td>−0.839 (0.976)</td>
<td>−3.744</td>
<td>18</td>
<td>.001</td>
</tr>
<tr>
<td>Negative event recalled—observed NA</td>
<td>0.832 (1.06)</td>
<td>3.437</td>
<td>18</td>
<td>.003</td>
</tr>
</tbody>
</table>

Note. df = degrees of freedom; NA = negative affect; PA = positive affect.
discounted, minimized, or punished. Results from the present study suggest that observers rate the intensity of affect differently than do those with BPD who experienced it. Although speculative, this mismatch could potentially be the basis for experience of emotional invalidation to the extent that observers (e.g., the partner in the interpersonal interaction) have difficulty judging the intensity of the BPD person's feelings and then engage in interpersonal behaviors that are experienced as minimizing or punishing (e.g., ignoring, belittling, minimizing). To date, there have been few studies on emotional invalidation, and almost all have involved retrospective reports of childhood experiences with caregivers (Krause, Mendelson, & Lynch, 2003; Rosenthal, Polusny, & Follette, 2006; Selby, Braithwaite, Joiner, & Fincham, 2008). The EAR methodology used here may be a fruitful way to characterize and explore emotional invalidation as it occurs in daily life.

Although our study presents some intriguing, preliminary findings using an innovative methodology, there are several limitations of this investigation that should be considered in the interpretation of our results. One limitation is that a 50-second audio clip may not be sufficient to capture the overall emotional intensity of an entire interpersonal encounter. Thus, it is possible that a recording of a complete interpersonal encounter may have been rated differently from the random sample recording of the encounter. Second, although a strength of our design was the comparison of interpersonal encounters of two near-neighbor diagnostic groups (i.e., BPD and DD), it would also be of interest to collect similar data for interpersonal encounters of healthy control dyads (i.e., those without clinically significant emotional dysregulation). Third, a psychometric interpretation of the discrepancy between recalled and observed affect is that the scales used in this study were not psychometrically equivalent, such that our coders and our participants were using the affect scales differently. Because our coders and our participants did not rate affect items the same way (i.e., using an observational coding scheme vs. responding to questions as posed by an interviewer), we cannot address this alternative hypothesis.

Although the EAR device allows for researchers to quantify aspects of the environment, expressed affect, and behavior, the EAR provides auditory information only. Most studies using thin-slice paradigms or other social judgment tasks involve participants viewing video clips or engaging in live interactions in the laboratory. These tasks and interactions allow individuals to use both visual and auditory information to make social judgments. It is possible that our coders missed important social and emotional (nonverbal) cues from the interpersonal events because they were not detected by the EAR device. Although thin-slice research demonstrates that affective information and personality traits can be observed accurately through the acoustic channel (Borkenau & Liebler, 1992; Mason et al., 2010), future research using other ambulatory assessment methods that also capture visual information is warranted.

Another limitation of this investigation is our small sample size. Approximately 60% of all interpersonal events nominated by this sample were captured by the EAR's sampling rate, and there were, on average, approximately 100 sound files per participant. However, we were unable to locate at least one positive and negative event for several participants, because they were unable to nominate an interpersonal event at the interview, the interpersonal event occurred outside of the sampling period and was not detected by the EAR, the interpersonal event could not be found on the sound files, or the corresponding sound file could not be coded for affect (i.e., did not contain any utterances). These circumstances left us with a smaller sample size, particularly for the depressed group. Therefore, some of the nonsignificant findings for the depressed group may warrant further investigation.

A final limitation of this study is that we did not simultaneously obtain momentary self-report data, such as mood ratings using an electronic diary. The EAR allows for momentary behavioral observation, a segment of traditional psychological assessment previously missing from ambulatory assessment methodologies. Currently, technology is available allowing researchers to combine momentary self-report and behavioral observation methodologies using a single device (Mehl, Robbins, & Deters, 2012). A major advantage of the EAR is it allows for momentary sampling of interpersonal environments (e.g., a dyadic interaction) and emotional expression (e.g., anger), resulting in rich observational data. Future studies should use a multimethod design in which affect is momentarily observed and self-reported in real-world contexts. A multitrait–multimethod investigation into the discrepancy of observed and recalled affect will allow for tests of measurement invariance, which will further our knowledge of emotional expression in interpersonal interactions. Last, these kinds of designs should be utilized within the dyadic perspective, allowing psychologists to explore differences between how emotional processes are observed by others versus how they are subjectively experienced, especially within clinical populations.

**Conclusions**

In this investigation using the EAR, we found significant discrepancies between recalled affect (both NA and PA) and observed levels of affect for BPD participants across both positive and negative interpersonal events. There are two major clinical implications for these findings. First, in an assessment context, it is important to note that the recall of emotional states in past interpersonal encounters by BPD patients may be discrepant from those either observing the encounter or participating in the encounter. Therefore, it may be helpful to supplement retrospective self-reports of
emotions with those from peers or family members in order to get a broader picture of the emotional sequelae of interpersonal events. Second, in a treatment context, these findings suggest that those treating individuals with BPD should be aware of possible discrepancies between how therapeutic interactions are experienced by the BPD patient and how the therapist observes the patient’s experience. As a clinician, it may be wise to share one’s observations of the BPD patient’s emotional experience (and perhaps be corrected) instead of assuming that one’s interpretation of the observed emotional experience is correct.

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