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BRIEF REPORT

Concurrent and Prospective Relations Between Attention to Emotion and Affect Intensity: An Experience Sampling Study

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Theorists contend that emotional awareness is vital to being able to use emotional information adaptively. The extent to which individuals attend to and value their feelings, or attention to emotion, is a facet of emotional awareness. Little research, however, has examined whether attention to emotion affects the magnitude or intensity of emotional experiences. In the present study we examined the relations between attention to emotion and levels of affect in 53 healthy adults. Participants carried hand-held electronic devices for approximately 7 days and were randomly prompted eight times per day to answer a series of questions. At each prompt, participants reported attention to emotion, current negative affect (NA), and positive affect (PA). All findings presented were computed using multilevel modeling. Replicating findings obtained using trait-level measures, we found that attention to emotion was associated concurrently with higher levels of both NA and PA. We also found prospectively that attention to emotion at one prompt predicted a decrease in levels of NA, but no change in levels of PA, at the subsequent prompt. These findings suggest that emotional processes serve different functions over time and highlight the role of attention to emotion in affect regulation.

Keywords: affect intensity, attention to emotion, emotional awareness, emotion regulation, experience sampling

Several theorists have postulated that being aware of one's feelings is vital to being able to use emotional information adaptively (Bagby, Taylor, & Parker, 1994; Clore et al., 2001; Palmieri, Boden, & Berenbaum, 2009). Attention to emotion, a facet of emotional awareness, is defined as the extent to which people attend to and value their feelings (Salovey, Mayer, Goldman, Turvey, & Palfai, 1995). Higher levels of attention to emotion have been associated with various forms of coping and emotion regulation (Gohm & Clore, 2002).

Another important aspect of emotion regulation is altering the magnitude or intensity of affective reactions (Gross & Thompson, 2007; Thompson, 1994). Affect intensity is a unique facet of emotional experience that has been differentiated from both the frequency and duration of affect (Schimmack, Oishi, Diener, & Suh, 2000). Affect intensity has been related to a wide range of social, cognitive, behavioral, and health outcomes (see Larsen, 2009, for a review).

Although some investigators have conceptualized as traits or dispositions the extent to which individuals attend to their emotions and the intensity with which they experience affect, it is likely that these characteristics vary over time and across situations. For example, individuals might attend more to their emotions when discussing their relationship with a romantic partner than when discussing a memo with coworkers. Certainly, attending to one's emotions at all times would be cognitively taxing and maladaptive. Moreover, emotion regulation is a dynamic process (Gross & Thompson, 2007), of which attention to emotion is only one facet. No research has yet examined how levels of attention to emotion are related to the levels of affect on a moment-to-moment basis in a naturalistic setting.

Using an experience sampling methodology, we examined the association between state levels of attention to emotion and both negative affect (NA) and positive affect (PA). Investigators using questionnaires to examine the relations among trait levels of these

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constructs have found that higher levels of attention to emotion are associated concurrently with the tendency to experience affect intensely (Gohm & Clore, 2002; R. J. Thompson, Dizen, & Berenbaum, 2009). It may be, therefore, that stronger emotional reactions are more likely than are weaker emotional reactions to elicit individuals' attention, and/or that the process of attending to, if not perseverating about, one's emotions might exacerbate those feelings. Based on these findings, we predicted that higher levels of attention to emotion "moment-to-moment" (that is, at each prompt) would be associated with higher intensity of both NA and PA.

Unlike most studies of affect intensity and attention to emotion, which have typically been cross-sectional, we used an experience sampling methodology that allowed us to examine the temporal relations between attention to emotion and levels of affect. In contrast to the "concurrent" predictions described above, we hypothesized that, prospectively, higher levels of attention to emotion would predict subsequent decreases in NA and increases in PA. This hypothesis is rooted in the formulation that one function served by emotions is to provide individuals with information (Clore et al., 2001). Essentially, we posit that when individuals report higher levels of attention to emotion, they are more engaged in processing, or even regulating, their emotions. Although there is some evidence for the adaptability of up-regulating or increasing negative emotions (Tamir & Ford, 2009; Tamir, Mitchell, & Gross, 2008), we expect that in their everyday life, individuals who are attending to their emotions will be generally trying to down-regulate or decrease their level of NA. Indeed, Vassilopoulos (2008) found in an experimental study with high socially anxious individuals that increasing self-focused attention led to a decrease in self-reported anxiety 7 min later. Consistent with this position, individuals who are less aware of their emotions (e.g., who pay less attention to their emotions or have less clarity of their emotions) have been found to benefit more from interventions that focus on expressive writing and emotional approach coping than have individuals who are more aware of, or better able to describe, their emotions (Baker & Berenbaum, 2007, 2008). Similarly, we expect that when people are attending to their emotions they will try to up-regulate or increase their levels of PA.

In this study we assessed the relation between attention to emotion and levels of NA and PA in a group of psychologically healthy individuals (i.e., individuals who did not meet criteria for any current or past psychopathology). Understanding emotion regulation processes in a group of healthy individuals is important in providing a normative reference while excluding individuals with known difficulties in emotion regulation (e.g., individuals with Major Depressive Disorder; Ehring, Tuschen-Caffier, Schnulle, Fischer, & Gross, 2010). As we noted above, we predicted that higher levels of attention to emotion would be associated concurrently with higher intensity of NA and PA, and prospectively, with subsequent reductions in levels of NA and increases in levels of PA.

Method

Participants

A total of 53 participants between the ages of 18 and 39 (M = 25.4 years; SD = 6.4 years) were recruited for this study.[1] All participants were native English speakers. The majority of participants were women (67.9%). Ethnic/racial make-up of the sample was primarily Caucasian (62.3%), with 17.0% Asian American, 9.4% multiracial, 9.4% African American, and 1.9% Latino/a. With respect to educational attainment, 47.2% indicated completing "some" college; 43.4% had a bachelor's degree, and 9.4% had an advanced degree. Individuals were eligible to participate if they experienced no current/past history of any mental health disorders as assessed by the Structured Clinical Interview for *DSM–IV* Axis I Disorders (SCID-I; First, Spitzer, Gibbon, & Williams, 2001). Additional eligibility requirements included a Beck Depression Inventory-II (Beck, Steer, & Brown, 1996) score of 9 or less.

Procedure

Individuals were recruited from the surrounding communities of the University of Michigan in Ann Arbor, Michigan, and Stanford University in Stanford, California. Advertisements were posted online (e.g., Craigslist) and at local agencies and businesses (e.g., bulletin boards). Each site recruited approximately 50% of the sample. Participants recruited by the two sites varied in their distribution of gender, $\chi^2(1) = 8.75$, $p < .01$, with the Michigan sample being composed of a greater proportion of men than was the California sample. Participant recruitment by site also differed significantly by age, $t(51) = 3.89$, $p < .01$, with the Michigan sample being younger than the California sample, Michigan sample: $M = 22.5$ years, $SD = 4.8$ years; California sample: $M = 28.6$ years, $SD = 6.6$ years. This age difference was also reflected in significant educational differences, $\chi^2(2) = 10.55$, $p < .01$: the Michigan sample mostly (67.9%) reported "some college," whereas the California sample mostly (60%) reported bachelor's degrees. Because the samples did not differ on the central variables of interest (i.e., mean levels of NA, PA, and attention to emotion over the week), ts(51) < 1.66, ns, we combined the two samples for the remaining analyses.

Participants completed the SCID-I and, if eligible, returned to the laboratory to complete a series of self-report questionnaires and computer tasks.[2] Participants were then individually instructed on the experience sampling protocol and completed a full practice trial (see below). Participants carried a hand-held electronic device (Palm Pilot Z22) programmed using the Experience Sampling Program 4.0 (Barrett & Feldman Barrett, 2000). Participants were prompted (via a tone signal) eight times per day between 10:00 a.m. and 10:00 p.m. The majority of participants carried the device for 7 to 8 days to be prompted 56 times. Prompts occurred at random times within eight 90-min windows per day; thus, prompts could occur between a few minutes and almost 3 hr apart (M = 93 min). If participants did not respond to a prompt within 3 min, data for that trial were recorded as missing. Up to 56 trials of data were recorded for each participant. Participants completed on average 42.4 trials (SD = 7.8). Participants provided informed consent and were compensated for their participation in the study, receiving an extra incentive for responding to more than 90% of the prompts. The protocol was approved by both universities' Institutional Review Boards.

[1] Ten additional participants were excluded due to their Beck Depression Inventory-II scores being outside the range of eligibility (n = 3) or equipment failure (n = 7).

[2] These data are not presented in this report.

Experience Sampling Items

Affect. At each trial, participants reported their current intensity of NA and PA. Using a 4-point scale (*not at all = 1, little = 2, much = 3, a great deal = 4*), participants indicated the intensity with which they were currently feeling each of 11 emotions. For each prompt, NA was computed as the mean of seven negative emotions (sad, anxious, angry, frustrated, ashamed, disgusted, and guilty; Cronbach's alpha across experience sampling period = .81), and PA was computed as the mean of four positive emotions (happy, excited, alert, and active; Cronbach's alpha across experience sampling period = .82). The affect words were drawn from various sources, including the Positive Affect Negative Affect Scale (Watson, Clark, & Tellegen, 1988) and Ekman's basic emotions (Ekman, Friesen, & Ellsworth, 1972).

Attention to emotion. At each trial, participants reported the extent to which they were attending to their emotions at the time of the prompt by responding to the item, "I am paying a lot of attention to how I feel right now." This item was always presented before any affect items and was adapted from the Attention to Feelings subscale of the Trait Meta-Mood Scale (TMMS; Salovey et al., 1995). The item was selected because it had the highest factor loading on this subscale (Salovey et al., 1995). Using a 4-point scale (*not at all = 1, little = 2, much = 3, a great deal = 4*), participants indicated at each trial the extent to which they were attending to their emotions. As part of the questionnaire/computer task session, participants completed the Attention to Feelings subscale of the TMMS, Cronbach's alpha = .87, which provides a trait measure of attention to emotion. The correlation between participants' averaged scores on the attention to emotion item across the entire sampling protocol (i.e., up to 56 trials) and their scores on the TMMS attention to emotion subscale were $r = .32$, $p < .05$.

Results

Statistical Overview

First, we examined mean levels of NA and PA over the week. Second, we tested our "concurrent" hypotheses that, within prompts, attention to emotion would be positively associated with NA and PA. Finally, we tested our "prospective" hypotheses that, within days, attention to emotion at one prompt would predict decreases in NA and increases in PA at the subsequent prompt. Because of the nested data structure, we conducted multilevel modeling procedures. We included prompt (within-person) and between-person levels in our analyses. We used Hierarchical Linear Modeling (HLM 6.06; Raudenbush, Bryk, & Congdon, 2008), which simultaneously estimates within- and between-person effects (Krull & MacKinnon, 2001) while handling missing data inherent to multilevel data (Snijders & Bosker, 1999).[3] NA, PA, and attention to emotion served as the within-participant or Level 1 variables. Predictors were centered for each individual.

Descriptive Analyses

To examine mean of NA and PA, we conducted two hierarchical linear models, one predicting NA and one predicting PA. The models we tested are below:

Level 1 Model:

$$\text{affect}_{ij} = \beta_{0j} + r_{ij}$$

Level 2 Model:

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

At Level 1 affect_{ij} represents NA or PA for participant j at prompt i; β_{0j} represents each participant's mean affect (i.e., NA or PA) across the sampling period, and r_{ij} represents the error term or the within-person variance. At Level 2 the γ_{00} represents the grand mean of affect (i.e., NA or PA) over the experience sampling week. The u_{0j} represents the error term or the between-person variance. The mean level of NA over the experience sampling week was 1.138 (*SE* = .023), and the mean level of PA was 2.151 (*SE* = .064). To examine attention to emotion, we conducted a third model with attention to emotion as the outcome variable. The mean attention to emotion score was 1.913 (*SE* = .069).

Concurrent Analyses

Next, we tested our hypothesis that attention to emotion would be positively associated concurrently with levels of NA and PA. To examine relations between attention to emotion and NA and PA, we conducted two hierarchical linear models, one with NA as an outcome variable and one with PA as an outcome variable. We computed within-participant associations between attention to emotion and NA, and attention to emotion and PA. Predictors were centered for each individual. The models we tested are below:

Level 1 Model:

$$\text{affect}_{ij} = \beta_{0j} + \beta_{1j}(\text{attention to emotion}) + r_{ij}$$

Level 2 Model:

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

At Level 1 affect_{ij} represents NA or PA for participant j at prompt i; β_{0j} represents each participant's mean affect (i.e., NA or PA) across the sampling period; β_{1j} represents the linear slope between attention to emotion and affect for each participant, and r_{ij} represents the within-person variance. At Level 2, the γ_{00} coefficient values represent the grand mean of affect and γ_{10} represents the slope between attention to emotion and affect for the entire sample. The u_{0j} and u_{1j} are error terms, representing between-person variance unaccounted for by the included predictor variables. The coefficients from both models are presented in Table 1. Attention to emotion was significantly associated with NA, with higher levels of attention to emotion associated with higher levels of NA. Attention to emotion was also significantly and positively associated with PA. These results support our "concurrent" hypotheses that higher levels of attention to emotion would be associated with higher levels of both NA and PA "in the moment." Finally, we tested both

[3] We report parameter estimates with robust standard errors.

Table 1
Concurrent Findings: Relations between Attention to Emotion and Negative and Positive Affect

Fixed effect		Unstandardized coefficient	*SE*	*t*(52)	*p*
		Outcome variable: Negative affect			
Mean level, intercept, β_0	γ_{00}	1.138	.023	49.494	<.001
Attention to emotion slope, β_1	γ_{10}	.069	.014	4.875	<.001
		Outcome variable: Positive affect			
Mean level, intercept, β_0	γ_{00}	2.151	.064	33.368	<.001
Attention to emotion slope, β_1	γ_{10}	.148	.027	5.385	<.001

Note. SE = standard error.

models again including linear and quadratic time-of-day effects (i.e., time in minutes since first prompt of that day) as additional predictors at Level 1 to control for potential time-of-day fluctuations in affect that are independent of attention to emotion. As expected, after controlling for potential time-of-day effects, all γ_{00} and γ_{10} coefficients remained statistically significant and comparable in magnitude (NA: $\gamma_{00} = 1.14; \gamma_{10} = .07$; PA: $\gamma_{00} = 2.19; \gamma_{10} = .15$, *p*s $< .001$).[4]

Prospective Analyses

Finally, we tested our hypothesis that, prospectively, attention to emotion would predict decreases in NA and increases in PA. We examined whether, after controlling for initial levels of NA (PA), attention to emotion at the same prompt, *t*, would predict NA (PA) at the subsequent prompt, *t + 1*, within days. We conducted two hierarchical linear models: (1) attention to emotion$_t$ and NA$_t$ were simultaneously regressed onto NA$_{t+1}$; and (2) attention to emotion$_t$ and PA$_t$ were simultaneously regressed onto PA$_{t+1}$. Predictors were centered for each individual. The models we tested are below:

Level 1 Model:

$$affect_{(t+1)ij} = \beta_{0j} + \beta_{1j}(\text{attention to emotion}_t) + \beta_{2j}(\text{affect}_t) + r_{ij}$$

Level 2 Model:

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + u_{2j}$$

The coefficients from both models are presented in Table 2. First, we conducted the hierarchical model predicting NA$_{t+1}$ scores. Both attention to emotion$_t$ and NA$_t$ were significantly associated with NA$_{t+1}$, with attention to emotion$_t$ showing an inverse relation with NA$_{t+1}$, and NA$_t$ showing a positive relation with NA$_{t+1}$. These results indicate that, consistent with our hypothesis, higher levels of attention to emotion predicted lower levels of NA over time, even after controlling for initial levels of NA.[5] We conducted the prospective NA model again including linear and quadratic time-of-day effects as predictors. All γ_{00}, γ_{10}, and γ_{20} coefficients remained statistically significant and comparable in magnitude ($\gamma_{00} = 1.14$, $\gamma_{10} = -.02$, $\gamma_{20} = .19$, *p*s $< .05$). Linear and quadratic time-of-day effects were not significant. Next, we conducted the hierarchical model predicting PA$_{t+1}$. PA$_t$ was positively and significantly associated with PA$_{t+1}$. Contrary to our hypotheses, attention to emotion$_t$ was not significantly associated with PA$_{t+1}$ after controlling for PA$_t$. Instead, attention to emotion showed weak prospective relations with PA. Again, linear and quadratic time-of-day effects were not significant.

The results of our analyses indicate that attention to emotion predicts decreases in NA over time. To examine whether the reverse direction of effect is also significant, we conducted two additional hierarchical linear models examining whether NA (PA) at prompt *t* is associated with changes in attention to emotion at prompt *t + 1*, controlling for attention to emotion at prompt *t*. Again, predictors were centered for each individual. The models we tested are below:

Level 1 Model:

$$attention\ to\ emotion_{(t+1)ij} = \beta_{0j} + \beta_{1j}(\text{affect}_t) + \beta_{1j}(\text{attention to emotion}_t) + r_{ij}$$

Level 2 Model:

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + u_{2j}$$

In both models, attention to emotion$_t$ was positively and significantly associated with attention to emotion$_{t+1}$ (NA model: $\gamma_{10} = .127$, $p = .001$; PA model: $\gamma_{10} = .138$, $p < .001$), indicating that reports of attention to emotion at one point in time are positively associated with reports of attention to emotion up to 3 hr later. In neither model was affect significantly associated with attention to emotion$_{t+1}$ over time, after controlling for attention to emotion$_t$

[4] Neither the linear nor the quadratic time-of-day effects was significant for the NA model; both of these effects were significant for the PA model, indicating lower levels of PA in the evening and higher levels of PA in the middle of the day than in the morning or evening.

[5] We also conducted a hierarchical linear model in which attention to emotion$_t$, NA$_t$, and attention to emotion$_{t+1}$ were simultaneously regressed onto NA$_{t+1}$. All coefficient values were significant, γs: −.031 to .217, *p*s < .004, with NA$_t$ and attention to emotion$_{t+1}$ positively associated with NA$_{t+1}$, and attention to emotion$_t$ inversely associated with NA$_{t+1}$. These findings clearly indicate that greater attention to emotion at time *t* predicts lower NA over time above and beyond the significant relation between attention to emotion and NA at time *t+1*.

Table 2
Prospective Findings: Attention to Emotion Predicting Changes in Negative and Positive Affect

Fixed effects		Unstandardized coefficient	*SE*	*t*(52)	*p*
		Outcome variable: negative affect$_{t+1}$			
Mean level, intercept, β_0	γ_{00}	1.137	.023	48.800	<.001
Attention to emotion$_t$ slope, β_1	γ_{10}	−.022	.010	−2.199	.032
Negative affect$_t$ slope, β_2	γ_{20}	.193	.046	4.205	<.001
		Outcome variable: positive affect$_{t+1}$			
Mean level, intercept, β_0	γ_{00}	2.156	.066	32.720	<.001
Attention to emotion$_t$ slope, β_1	γ_{10}	.003	.022	.135	.893
Positive affect$_t$ slope, β_2	γ_{20}	.285	.036	7.864	<.001

Note. SE = standard error; t = is any given experience sampling prompt; $t + 1$ = the experience sampling prompt directly following the t prompt within day.

(NA model: $\gamma_{20} = .083$, $p = .319$; PA model: $\gamma_{20} = -.014$, $p = .657$).

Discussion

Previous research has found that the disposition to experience intense emotions is positively associated with the disposition to pay attention to one's emotions (Gohm & Clore, 2002; R. J. Thompson et al., 2009). The present study is the first to examine these constructs in a naturalistic setting using experience sampling. Replicating patterns found in studies examining relations among trait versions of these constructs, the present results suggest that paying attention to one's emotions is associated concurrently with the experience of stronger magnitude of affect. In fact, higher levels of attention to emotion co-occurred with reports of experiencing more intense NA and PA. Importantly, our concurrent findings remained significant when controlling for linear and quadratic time-of-day effects of PA.

By using an experience sampling method, we were also able to examine the relation between attention to emotion and NA and PA prospectively. As we hypothesized, attention to emotion prospectively predicted a *decrease* in levels of NA, even after controlling for previous levels of NA. The results of our prospective analyses suggest that the association between attention to emotion and levels of NA over a period of a few minutes to a few hours is unidirectional. That is, we found that higher levels of attention to emotion were associated with decreases in NA over time, but did not find a significant relation between these two constructs in the opposite direction: higher levels of NA were not associated with changes in attention to emotion.

Importantly, our prospective findings cannot be explained by a "regression to the mean" interpretation because regression to the mean operates both to increase and to decrease extreme scores over time. For example, according to regression to the mean, individuals who have unusually high values at prompt t would have lower values at prompt $t + 1$, and that individuals with unusually low values at prompt t would have higher values at prompt $t + 1$. These two cases, however, would yield comparable grand means of all prompts; the only values that would differ are the individual data points. Thus, regression to the mean would actually yield data supporting a null hypothesis in this study.

Attention to emotion was not related prospectively to PA. This finding stands in contrast to our hypothesis that attention to emotion would predict increases in PA. One interpretation of this null finding is that attention to emotion plays a more central role in the regulation of NA than of PA. Individuals may have differential emotion regulatory goals with PA than they do with NA; for example, although they may try to maintain (rather than increase or decrease) their levels of PA in everyday life, they may attempt to reduce their levels of NA. Future research is needed to replicate these findings and test these explanations.

We should note three limitations of the present study. First, we assessed the extent to which participants were thinking about their emotions. Attention to emotion, however, is generally defined as both attending to and valuing one's emotional states (Salovey et al., 1995). Future research could profitably use a more nuanced approach to measuring attention to emotion by assessing whether individuals report being guided by or placing importance on their emotions. Second, the measures of NA and PA used in this study did not fully represent the affective circumplex assessed in other experience sampling research (Pietromonaco & Barrett, 2009). Consequently, it remains for future research to examine more explicitly whether the relation between attention to emotion and NA and PA varies as a function of arousal. Finally, despite the positive concurrent relation between attention to emotion and affect intensity, we cannot determine whether, as we proposed earlier, the association between these two constructs *in-the-moment* (i.e., within a timeframe of seconds) is bidirectional.

Despite these limitations, our findings represent an important contribution to the emotion regulation literature by examining emotional processes as they occur relatively naturally over time. The results of this study provide support for the formulation that attention to emotion is an important component of emotion regulation. Further, the different pattern of findings we obtained depending on whether the relation between attention to emotion and NA was assessed concurrently or prospectively highlights the importance of examining individuals' emotional experiences over time. Indeed, our results suggest that emotional processes serve different purposes as a function of the temporal nature of the relation between attention to emotion and levels of NA and PA.

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