

Self-distancing promotes positive emotional change after adversity: Evidence from a micro-longitudinal field experiment

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Abstract

Objective: This research examines changes in emotionality following adverse experiences in daily life. We tested whether daily self-distancing (vs. self-immersing) in reflections on adversity results in positive change in emotionality. Additionally, we probed the “dosage” effect of repeated self-distancing.

Method: A micro-longitudinal field experiment combined 4-week daily diary and experimental manipulation of perspective during diary-based reflections on adverse experiences to explore the trajectory of change in emotionality. Each day, participants ($N = 149$) described and reflected on one significant event from that day and rated emotionality. We randomly assigned participants to reflect from a self-immersed or self-distanced perspective.

Results: Self-distanced participants showed change toward positive emotionality while maintaining the same level of negative emotionality, whereas self-immersed participants did not show changes in positive or negative emotionality. We also observed that self-distancing reached its maximum effect (“dosage”) for positive emotionality in the third week of the diary.

Conclusions: Repeated self-distanced reflections can promote positive change in emotionality in the face of everyday adversity. Notably, repeated self-distancing effectiveness has a saturation point. In contrast, self-immersed reflections on adversity do not promote positive emotional change. Together, these observations raise the question how the default self-immersed reflection on traumatic experiences impacts personal growth.

Keywords: Post-traumatic growth, emotion, adversity, self-distancing, emotional change.

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Does facing difficult life experiences foster personal growth? Some psychological theorists and clinicians have suggested that adverse experiences can be a source of positive change in people's behavior, cognition, and emotionality (e.g., Tedeschi & Calhoun, 2004; Yalom & Lieberman, 1991). This idea is closely linked to the concept of post-traumatic growth (PTG), broadly defined as self-reported positive outcomes following traumatic events (Tedeschi & Calhoun, 2004). Such outcomes include perceived positive changes in the self, in relationships, and in one's perspective on life (Affleck, Tennen, & Gershman, 1985). Scholars have identified PTG as important for relationship quality, open-mindedness, perception of personal strength, spirituality, and appreciation of life (Jayawickreme & Blackie, 2014; also see Tedeschi & Calhoun, 2004). Theoretical accounts of PTG suggest that growth should be particularly salient when examining changes in aspects of people's emotionality (e.g., Aldwin, Levenson, Spiro, & Bosse, 1989; Aron & Aron, 1997), including trauma-related emotional reactivity and the valence of post-traumatic cognitions (Aldwin & Levenson, 2004; Calhoun & Tedeschi, 2006). Empirical evidence corroborates the importance of emotionality for PTG, indicating that people's ability to experience positive emotions following a traumatic experience predicts subsequent PTG (Linley & Joseph, 2004).

Despite the theoretical and clinical interest in PTG, a broader consideration of the emotional consequences of adversity suggests a paradox. On the one hand, adverse experiences can be a source of strength and *positive* emotional and personal development (Tedeschi & Calhoun, 2004). On the other hand, adverse experiences are associated with maladaptive avoidance, depressive rumination, and increased *negative* emotional reactions such as high levels

of anxiety and distress (e.g., Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). This contradiction highlights the need for a systematic exploration of mechanisms underlying different trajectories (i.e., changes) in emotionality following adversity. To address this paradox, we propose that self-reflection perspective (self-immersed vs. self-distanced) people adopt when working through adverse experiences is a mechanism that influences emotional trajectories. To test how self-reflection perspective affects emotional change following adversity, we uniquely combined features of a randomized-control trial with a prospective longitudinal design. Specifically, in a month-long micro-longitudinal field experiment we tested how different self-reflection perspectives on daily adversity influence emotional trajectories.

Self-Distanced vs. Self-Immersed Reflection: A Key Mechanism for Emotional Growth?

We suggest that one way to address the paradox of positive emotional change versus negative emotional consequences after adversity is by considering how reflecting on adverse events from different vantage points—namely self-immersed versus self-distanced perspectives— impact emotional reactions to adverse events. On the one hand, when reflecting on past experiences people often adopt a self-immersed perspective, visualizing the event through their own eyes and immersing in the specific details and emotions they experienced (e.g., Nigro & Neisser, 1983). Self-immersed reflection—the North American default perspective when reflecting on adverse experiences (Grossmann & Kross, 2010; McIsaac & Eich, 2004; Wu & Keysar, 2007)—is associated with narrower thinking (e.g., Grossmann & Jowhari, 2018), negative emotionality, distress, and depressive symptomatology (Tackman et al., 2019).

On the other hand, accumulating evidence suggests that reflecting on adversity from a self-distanced perspective can facilitate constructive reasoning and effective regulation of negative emotions. Self-distancing often entails visualizing the event from a “fly on the wall” observer

perspective and taking psychological distance from the experience, for example by reflecting on the experience using third-person language (Grossmann & Kross, 2014; Kross et al., 2014; Nook et al., 2017). Adopting a self-distanced perspective promotes a “big picture” view, recognizing that life events are in flux and may not fit one’s expectations (Grossmann & Kross, 2010; Kross & Grossmann, 2012; see Grossmann, 2017, for a review).

Evidence from experimental and observational research suggests that recalling negative events from a self-distanced (vs. default self-immersed) perspective reduces the recounting of negative emotions (e.g., Ayduk & Kross, 2008; Mischkowski, Kross, & Bushman, 2012) and attenuates momentary emotional distress (Grossmann & Kross, 2010; Kross & Ayduk, 2011). Experimental evidence also suggests long-term benefits of self-distancing for emotion regulation, reducing people’s negative emotionality and distress not only immediately after adopting a self-distanced (vs. self-immersed) perspective, but also when recalling the same event again a week or even a month after the self-reflection manipulation (Kross & Ayduk, 2008; Penner et al., 2016).

Research on expressive writing further corroborates the long-term benefits of self-distancing. Participants who recalled a single distressing event on the first day of the study and engaged in expressive writing exercises about this event (vs. a neutral topic) for the next three days showed more spontaneous self-distancing in their writing and simultaneously reported less negative emotionality, both immediately after the study and during a follow-up one month later (Park, Ayduk, & Kross, 2016). However, whether self-distancing influences emotionality following *daily* adversity and the *trajectory* of emotional change over time remains unknown. Moreover, no research has yet explored a possible saturation point or “dosage” of repeated self-distancing effects. In other words, it is unclear how many repeated self-distancing experiences lead to

positive emotional change and at what point do they become ineffective in promoting additional change in emotionality.

Post-Traumatic Growth: Possible Solutions to Past Limitations

To resolve the paradox concerning the consequences of adversity, it is also important to address two major limitations of prior research on post-traumatic growth. First, most empirical studies exploring the role of adverse experiences for resilience and growth in positive personal characteristics (e.g., spirituality, meaning of life, optimism; Park, 2010; Roepke, Jayawickreme, & Riffle, 2013; Scheier & Carver, 1985) have employed underpowered cross-sectional samples. To address this limitation, we conducted a prospective micro-longitudinal field experiment with a well-powered sample and multiple repeated measures. Such study design has been largely missing from the extant literature on PTG (see Blackie, Jayawickreme, Tsukayama, Forgeard, Roepke, & Fleeson, 2017).

Second, much of the evidence for PTG relies on people's retrospective assessments of how much they have changed after experiencing adversity. This method has two severe limitations. It can be extremely effortful as people have to recall a personal characteristic (e.g., emotionality) before the traumatic experience and compare it to their current characteristic (e.g., Bostock, Sheikh, & Barton, 2009). Additionally, this self-assessment is often unreliable due to memory biases, social desirability concerns and self-enhancing positive illusions (Tennen & Affleck, 2009). Reliance on retrospective self-reported evidence of change has led some researchers to suggest that PTG may be no more than a positive illusion (Coyne & Tennen, 2010). We addressed this limitation by collecting *daily* data of participants' emotional reactions to an adverse experience that occurred on the *same* day. Additionally, we utilized the Event-Reconstruction Method, which guides participants to recall the context and details of an

experience—minimizing the biases that result from retrospective recall and global assessments (Brienza, Kung, Santos, Bobocel, & Grossmann, 2018).

Additionally, existing PTG research has focused mostly on major traumatic life events, such as life-threatening health conditions (e.g., Shand, Cowlshaw, Brooker, Burney, & Ricciardelli, 2015), immigration (e.g., Hussain & Bhushan, 2011), and genocide (Blackie, Jayawickreme, Forgeard, & Jayawickreme, 2015). Undoubtedly, such traumatic events play fundamental roles in people's lives but can be quite rare across a person's lifespan (Frans, Rimmö, Åberg, & Fredrikson). The relatively low frequency of such traumatic events over a lifespan limits the study of growth using prospective longitudinal methods.

To circumvent this limitation, we followed recommendations to explore the more common daily adversities in people's lives (Aldwin & Levenson, 2004). Adversity in this form consists of smaller-scale negative events such as social conflicts (e.g., disagreements at home or work), unpleasant social interactions, economic setbacks, and health problems. Though minor in comparison to major traumas, daily adverse events accumulate over time and can have a substantial impact on people's well-being (Grzywacz, Almeida, Neupert, & Ettner, 2004; McEwen 1998). Further, the relatively higher frequency of these events makes them more amenable to testing different prospective emotional trajectories, because participants are more likely to experience these kinds of adverse events multiple times across the course of a study. Notably, despite the prevalence of daily adversity in the lives of many people, it remains unclear to what extent encountering everyday adversity can facilitate positive emotional change. In the current research, we focused on adverse social situations people encounter in daily life.

Research Overview

To investigate incremental changes in emotionality following daily adversity, we conducted a prospective micro-longitudinal field experiment. In a daily diary, participants described and provided ratings of positive and negative emotionality for a key adverse experience of each day. We randomly assigned participants to reflect on daily events from either a self-distanced or a self-immersed perspective. We predicted that over time, self-distanced reflections on adverse events would promote adaptive changes in emotions, from an unbalanced, uniformly negative emotionality to a more balanced emotionality involving an appreciation of both positive and negative emotional experiences. In other words, balanced emotionality in reflections on an adverse event could entail an increase in positive emotionality, a decrease in negative emotionality, or both.

We did not have directional predictions for self-immersed condition, because of the nuances in past research. On the one hand, self-immersed reflections could heighten ruminative thought patterns and negative emotionality (Lyubomirsky & Nolen-Hoeksema, 1995). On the other hand, past evidence indicates that repeated daily writing exercises, which typically starts with self-immersed vantage point (McIsaac & Eich, 2004) can on its own foster shifts toward self-distancing (Grossmann, Gerlach & Denissen, 2016; Park et al., 2016) and promote decrease in negative affect (e.g., Gortner, Rude, & Pennebaker, 2006).

Additionally, the micro-longitudinal field experiment design allowed us to estimate for the first time the saturation point, or an efficient “dosage,” of repeated self-distanced reflections for positive emotional change. Specifically, utilizing a novel two-line method (Simonsohn, 2018) we explored whether the effect self-distanced reflection on emotionality shows a continuously positive trajectory or whether the trajectory changes during the 4-weeks diary, such that

additional instances of self-distanced reflection no longer lead to relatively more positive emotional changes.

Method

The present data come from a large-scale research project carried out in a community in southwestern Ontario, Canada. In this study, we investigated participants' goals, emotions, and reasoning about daily adverse events in their lives (see full project documentation, including a structural and timeline summary on Open Science Framework; osf.io/6p2us). For the present research question, we analyzed the data from the four-week daily diary field experiment. On Days 1-6 of each week of the diary, participants received identical surveys asking them about events experienced that day. On Day 7 of each week, participants received a different survey in which we instructed them to freely reflect on one adverse event from the previous week, without an explicit instruction to adopt a particular perspective in their reflections¹.

Participants

We recruited 290 participants from the local community and public universities in the Kitchener-Waterloo area in Southern Ontario to take part “in research on social experiences and personal goals in daily life” for the opportunity to earn up to \$110. Of these, 164 participants took part in the four-week daily diary field experiment. The diary sample consisted of 78% women; $M_{\text{age}} = 22.38$; $SD_{\text{age}} = 7.41$; 37% white, 31% Asian, 10% East Indian, 6% Black, 6% Middle Eastern, 10% mixed race or other; 59% had high-school education, 17% had completed some college; 20% had a Bachelors degree, and 4% had a Masters degree.

Following pre-registered protocol (<https://osf.io/gbf6y>), we excluded 15 participants (self-distanced condition: $n = 8$; self-immersed condition: $n = 7$) who reported less than two

¹ Initially we planned to analyze Day 7 data. Due to a technical error, the majority of participants could not see an adverse event they reported experiencing on Day 7, resulting in an insufficient number of observations for statistical analyses.

social (adverse or non-adverse) events across the four weeks of the diary. Participants completed an average of 15.23 ($SD = 6.28$, Range: 1-24) diary entries and reported 1,302 (adverse and non-adverse) events during the four weeks of the diary experiment (self-distanced condition: $n = 581$, $M = 9.36$ /participant, $SD = 4.35$; self-immersed condition: $n = 721$, $M = 8.07$ /participant, $SD = 4.82$). We analyzed responses from 130 participants (70 in the self-distanced condition) who reported between one and ten *adverse* events across the four weeks (see supplementary Figure S1 for frequencies of reported adverse events). Participants reflected on 358 adverse events overall (self-distanced condition: $n = 211$, $M = 3.03$ per participant, $SD = 2.11$; self-immersed condition: $n = 147$, $M = 2.47$ per participant, $SD = 2.36$).

Procedure and Measures

Self-reflection manipulation. Before beginning the four-week diary, we randomly assigned participants to the self-immersed or the self-distanced reflection conditions. During the diary study participants recalled a daily event and described their stream of thoughts from the assigned self-reflection perspective. We used an established perspective manipulation to induce self-immersed and self-distanced perspectives during reflections (e.g., Grossmann & Kross, 2014; Kross et al., 2014).

Participants in the self-immersed condition read that “To facilitate your recall, please try to visualize this social event from a first-person perspective. Picture yourself in the event and ask yourself, “Why *am I* feeling or behaving this way?”

Participants in the self-distanced condition read that “To facilitate your recall, please try to visualize this social event from a third-person perspective. Picture yourself in the event and ask yourself, “Why is he/she [referring to yourself] feeling or behaving this way?”

Following the recall, participants reconstructed the event. Next, participants reflected and describe their stream of thoughts about the event from their assigned perspective (see Appendix for additional instructions).

Daily reflections. To investigate reactions to daily adversity, we sent participants daily surveys, instructing them to respond to the survey at the end of each day. Each daily survey began with a ‘daily event screener,’ asking participants to report which of the social events types — conflict/argument with another person; annoying/irritating social situation; sad/bad news in a social setting; celebration with others; enjoyable social event— occurred that day. Participants could also report experiencing a self-control conflict or indicate that none of the listed types of events happened that day. In both cases, they were not subject to the self-reflection manipulation on that day and proceeded to answer other questions. Participants could indicate multiple types of events. The labels “adverse events” and “non-adverse events” were not presented to participants.

The next part of the survey involved in-depth responses about a single event. This event was selected by an algorithm based on participants’ reported events according to the following rules: (a) if participants reported experiencing a single event, the algorithm presented a corresponding prompt; (b) if participants reported experiencing both adverse and non-adverse events, the algorithm presented a prompt instructing participants to recall and reflect on the adverse event (i.e., we prioritized concrete adverse events—conflict/argument with another person; annoying/irritating social situation— over other events); (c) if participants reported multiple events of the same type (e.g., two adverse events), the algorithm randomly presented one corresponding prompt for the in-depth reflection.

Event reconstruction and reflection. Following the event selection, participants recalled and visualized the event from their randomly assigned perspective. To facilitate recall and minimize biases, participants reconstructed the social event using the Event Reconstruction Method. They indicated the first name of the other person(s) involved in the event, the time of day and location of the event, how long it went on for, and whether it was an isolated episode or an ongoing issue. Additionally, participants rated the intensity of the event on a 7-point scale (0 = *Not at all intense*; 6 = *Extremely intense*). After recalling the event, participants described their stream of thoughts about the event from their randomly assigned perspective. We included short writing prompts to ensure participants understood how to reflect from a self-immersed perspective (i.e., using first-person pronouns) or self-distanced perspective (i.e., using their name and third-person pronouns).

Emotionality. We operationalized positive and negative emotionality as the importance of specific positive and negative emotions in participants' emotional experience. After reflecting on the adverse social event from their randomly assigned perspective, we presented participants with sixteen emotions (8 positive: happy, competent, calm, friendly, proud, joyful, inspired, relaxed; $\alpha = .87$; 8 negative: annoyed, blue, angry, worried, anxious, guilty, afraid, criticized; $\alpha = .82$) and asked them to rate on a 7-point scale (0 = *Not at all*; 6 = *Very much*) the extent to which each emotion was an important part of how they feel about the event (based on the Modified Differential Emotion scale, Fredrickson, Tugade, Waugh, & Larkin, 2003). Of these sixteen emotions, twelve were taken from the PANAS (Watson & Clark, 1994) and four (competent, friendly, annoyed, criticized) were added to further address social aspects of emotional experiences. For positive emotions, we included non-hedonic emotions (proud, competent, inspired, friendly) and low arousal emotions (calm, relaxed).

Covariates. We collected *demographic characteristics* (age, sex, education, and household income) as part of an online survey participants completed before beginning the diary study. We collected *baseline positive and negative emotionality* ratings during a pre-diary laboratory session in which participants reflected on a recent adverse social event without self-reflection manipulation. Participants rated the extent to which they experienced each of twenty emotions (10 positive: happy, proud, joyful, strong, delighted, confident, cheerful, calm, relaxed, at ease; $\alpha = .88$; and 10 negative: afraid, angry, guilty, sad, nervous, annoyed, ashamed, alone, irritable, blue; $\alpha = .78$) during the adverse event on a 7-point scale (0 = *Not at all*; 6 = *Very much*). We used participants' mean positive and negative emotion scores as separate covariates.

We measured *context of the events* (time of day, length of event, whether the event was an isolated or recurring issue) and *engagement in the reflection task* (number of words in the reflection narrative and time spent on the reflection page) during the event reconstruction and reflection, respectively. Table 1 presents the means and standard deviations of covariates.

Table 1
Descriptive statistics of covariates

	Self- distanced	Self-immersed
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Covariates	<i>M (SD)</i>	<i>Range</i>	<i>M (SD)</i>	<i>Range</i>
Event intensity	4.21 (1.22)	1 – 7	4.25 (1.29)	1 – 7
Event duration*	15 – 60 minutes	15 minutes – several days	15 – 60 minutes	15 minutes – several days
Baseline positive emotionality	0.86 (0.94)	0 – 5	1.02 (0.89)	0 – 3.6
Baseline negative emotionality	2.82 (1.07)	0.6 – 5.5	2.81 (1.07)	0.8 – 6
Number of words in narrative	80.44 (67.02)	12.4 – 353	88.37 (58.75)	11.66 – 301
Time spent reflecting (seconds)	232.54 (310.65)	24.01 – 2140.65	268.92 (320.88)	38.05 – 1708.12
Age	22.29 (3.72)	17 – 62	22.81 (7.66)	.242
Annual household income*	50,001-75,000	Under 15,000 – over 150,000	50,001-75,000	Under 15,000 – over 150,000
Education*	High school degree	High school degree – Doctoral degree	Highschool degree	Less than high school – Doctoral degree

.Median category is presented for categorical predictors*

Results

Likelihood of Reporting Adversity

First, we ran a generalized linear mixed model with a binominal distribution using the *lme4* package in *R* statistical software (Bates, Maechler, Bolker, & Walker, 2015) to examine possible effects of self-reflection condition on participants' likelihood of reporting an adverse negative (vs. non-adverse) event during the diary. For this analysis, we treated all negative events reported during the diary study (i.e., conflict/argument with another person; annoying/irritating social situation; sad/bad news in a social setting) as adverse events. This model included the diary day of the event as a Level 1 predictor, condition (self-immersed vs. self-distanced perspective) as a Level 2 predictor, and event type as a binominal dependent variable, with responses nested

within participants and a random slope of day. We controlled for the total number of reported events (grand-mean centered).

Participants were similarly likely to report adverse and non-adverse events, $B = -0.132$, $SE = 0.189$, $z = .69$, $p = .484$. Adverse events were significantly less likely to be reported later in the diary, $B = -0.023$, $SE = 0.012$, $z = 2.43$, $p = .015$. Moreover, participants in the self-distanced condition showed a higher likelihood of reporting adverse events than participants in the self-immersed condition, $B = 0.414$, $SE = 0.207$, $z = 2.00$, $p = .045$. The Condition X Day interaction was not significant, $B = -0.029$, $SE = 0.022$, $z = 1.29$, $p = .197$, suggesting similar likelihood of reporting adverse events in both conditions over time.

Changes in Emotionality Over Time

Our main hypothesis stated that participants in the self-distanced (vs. self-immersed) condition would express a more balanced emotional reaction to adverse events over time (via increasing/decreasing importance of positive/negative emotions, respectively). To test this hypothesis, we examined differences in participants' post-reflection ratings of how important positive and negative emotions were in their reaction to adverse experiences as a function of condition (self-immersed vs. self-distanced) and the diary day.

The distribution of emotion importance ratings was positively skewed (see supplementary Figure S2). To account for the skew, we fitted a generalized linear mixed model with an inverse gamma distribution. In the inversed gamma model, higher estimates of the reported coefficients reflect lower emotion-importance. Our model included emotion valence (positive vs. negative) and diary day as Level 1 predictors, condition (self-immersed vs. self-distanced) as a Level 2 predictor. Emotion-importance ratings comprised our dependent measure, with diary day crossed within participants.

We observed significant main effects of condition and emotion valence (see Table 2). As predicted, these effects were in turn qualified by a significant three-way Day X Valence X Condition interaction, $B = -0.003$, $SE = 0.002$, $t = 2.07$, $p = .039$. As Figure 1 and Table 2 indicate, the overall importance of negative emotions was significantly higher than the overall importance of positive emotions. Additionally, the overall emotion-importance at the beginning of the diary experiment was significantly lower after participants engaged in self-distanced (vs. self-immersed) reflection (see Supplemental Analysis 2.a for differences between self-distanced and self-immersed conditions on an “average day”). Most importantly, visual inspection of Figure 1 indicates that only participants in the self-distanced condition showed change in the importance of positive emotions over time. Results including the number of reported adverse events as a covariate yield identical results (see robustness checks section below).



Figure 1. Estimated marginal means and 95% confidence bands from the generalized mixed effects model with condition, diary day, and valence as predictors of emotion importance.

Table 2
Results from a generalized mixed effects model

	Emotion Importance
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Predictors	Estimate	95% CI	<i>t</i>	<i>p</i>
(Intercept)	0.361	0.347 – 0.372	50.98	< .001
Condition	0.039	0.010 – 0.061	2.73	.006
Day	-0.002	-0.003 – -0.001	4.18	< .001
Valence	0.182	0.164 – 0.199	20.73	< .001
Day x Valence	-0.003	-0.005 – -0.001	3.66	< .001
Day x Condition	-0.002	-0.004 – 0.0003	1.93	.053
Valence x Condition	0.021	-0.014 – 0.057	1.15	.251
Day x Condition x Valence	-0.004	-0.0071 – -0.0002	2.07	.039
Random Effects				
σ^2		0.35		
τ_{00} Participant		0.001		
τ_{00} Day		0.001		
ICC		0.01		
Observations		5676		
Marginal R^2 / Conditional R^2		.019 / .025		
Deviance		21668.57		
AIC		21692.57		

Note. We used a generalized linear mixed model with an inverse gamma distribution. Higher estimated coefficients reflect lower emotionality.

We formally tested the nature of the Condition X Day X Valence interaction, exploring the change in the trajectory of positive and negative emotions separately in the self-immersed and self-distanced conditions. In the self-immersed condition, participants rated the importance of negative compared to positive emotions significantly higher, $B = 0.173$, $SE = 0.013$, $t = 13.02$, $p < .001$. There was no change in overall (positive and negative) emotion-importance over time, $B = 0.0004$, $SE = 0.001$, $t = .35$, $p = .729$. The Day X Valence interaction in the self-immersed condition was not significant, $B = -0.001$, $SE = 0.001$, $t = 1.07$, $p = .285$, suggesting there was no difference in the trajectory of positive versus negative emotionality.

By comparison, participants in the self-distanced condition demonstrated both significant increase over time in emotion-importance, $B = -0.002$, $SE = 0.001$, $t = 2.23$, $p = .026$, and significantly higher importance of negative compared to positive emotions, $B = 0.150$, $SE = 0.007$, $t = 20.87$, $p < .001$. In line with our prediction, we found a significant Day X Valence interaction, $B = -0.005$, $SE = 0.001$, $t = 4.57$, $p < .001$. Simple slopes analysis indicated growth in the importance of positive emotions, $B = -0.006$, $SE = 0.001$, $t = 4.65$, $p < .001$, but no significant change in negative emotions importance, $B = -0.001$, $SE = 0.001$, $t < 1$, $p > .40$.

Robustness checks. We tested the robustness of the Condition X Day X Valence interaction by fitting five separate models with different control variables. The interaction remained significant when controlling for the number of adverse events experienced during the diary, $t = 2.12$, $p = .034$, baseline ratings of positive and negative emotionality following recall of an adverse event (reported during the pre-diary session), $t = 2.22$, $p = .027$, demographic characteristics (age, sex, education, and household income), $t = 2.29$, $p = .022$, event intensity, $t = 2.07$, $p = .039$, participants' engagement in the reflection task (the number of words in the reflection narrative and time spent reflecting on the adverse event, both grand-mean centered), $t = 2.10$, $p = .035$, and contextual differences between the adverse events (i.e., time of day, length of conflict, whether the event was an isolated or recurring issue), $t = 2.13$, $p = .033$. We run an additional exploratory analysis testing the potential moderating role of event classification as recurring versus isolated. This event characteristic did not interact with the model, $t = .84$, $p = .400$.

What “Dosage” of Self-Distancing Is Effective?

At what point does the repeated exercise of writing a diary-based reflection from a self-distanced perspective lose its effectiveness in promoting positive emotions' importance? We

examined whether the trajectory of change in the self-distanced condition continued throughout the entire diary period, leveled off, or decreased after a certain time point. To probe the “shape” of self-distanced reflection effects on change in positive emotionality, we utilized the recently developed “two-lines” analysis (Simonsohn, 2018) to assess whether the change in positive emotions’ importance shows a linear positive or curvilinear trajectory. The “two-lines” analysis is based on estimating two regression lines of a predictor: one for low values and one for high values. The analysis uses these two estimations to identify a data-driven “tipping point” from which the trajectory of the predictor changes. Simulations and example-based analyses suggest this technique is superior to fitting a quadratic trend of temporal variability (Simonsohn, 2018).

We first run a generalized mixed effects model to test the quadratic effect of day (grand-mean centered) on positive emotions’ importance in the self-distanced condition. The model yielded a significant effect of day, $B = -0.002$, $SE = .001$, $t = 2.69$, $p = .007$, and a quadratic effect of day, $B = 0.0005$, $SE = 0.0002$, $t = 2.37$, $p = .018$. Given the presence of a curvilinear relationship, the two-lines analysis uniquely allows us to estimate the exact tipping point.

Using the two-line approach, we identified Day 16 of the diary as the tipping point from which self-distanced reflection did not show an additional increase in positive emotions (see Figure 2).² Next, upon recommendation of the developer of the two-line method (U. Simonsohn, personal communication, June 3, 2019), we ran an interrupted generalized mixed effects model (as in our previous analyses, we used the inversed gamma distribution) to predict importance of positive emotions in the self-distanced condition. Specifically, we included the diary day since the beginning of the diary and the day count variable starting on Day 16 as predictors (see also Lopez Bernal, Cummins, & Gasparrini, 2017). Positive emotions’ importance increased before

² The results were robust when controlling for the number of adverse events participants reported during the diary, days 1-16: $B = .03$, $Z = 3.91$, $p < .001$; days 17+: $B = -.03$, $Z = -.76$, $p = .444$.

the tipping point, $B = -0.006$, $SE = 0.001$, $t = 4.01$, $p < .001$. After the tipping point, there was a marginal decrease in positive emotion importance, $B = 0.002$, $SE = 0.001$, $t = 1.88$, $p = .059$. This suggests the effect of self-distanced reflection for positive emotionality has a saturation point, reaching its maximum effect toward the end of the third week of the daily exercises (accounting for instruction-free Sundays).

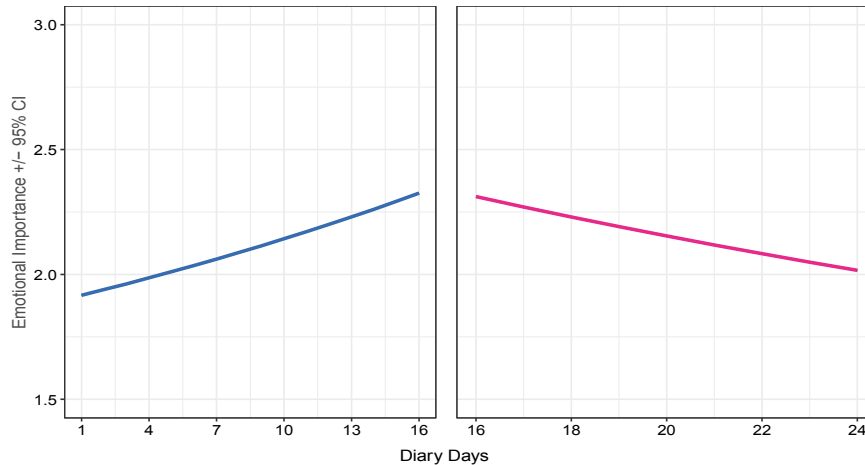


Figure 2. Estimated marginal means and 95% confidence bands from the interrupted generalized mixed effects model for the self-distanced condition with diary day before and after the tipping point as predictors of positive emotions' importance.

Discussion

We started this paper by proposing that the trajectory of personal change in emotionality after facing adversity depends on the perspective people adopt when reflecting on their experiences. We hypothesized that self-distanced reflections promote positive emotional change in views of adverse experiences, fostering a representation of adverse experiences through a balanced lens of both positive and negative emotions rather than solely focusing on negative emotions. Conversely, a self-immersed reflection would not lead to such positive change in emotionality concerning the views of adverse experiences over time.

To test this hypothesis, we conducted a four-week micro-longitudinal field experiment in which participants engaged in daily diary reflections on the most significant events of the day

from a (randomly assigned) self-immersed or self-distanced perspective. Assessments of participants' emotionality after adverse experiences partially supported our proposition: Whereas self-immersed participants showed a trend toward greater overall (i.e., not valence-specific) emotionality, participants in the self-distanced condition showed significant growth in positive emotionality while sustaining no increase in negative emotionality, thereby enabling a more emotionally balanced (i.e., positive and negative, as compared to predominantly negative) appraisal of adverse events. These results held when controlling for a range of covariates, including the demographic characteristics of the sample, baseline levels of positive and negative emotionality, the number of reported adverse events, and contextual characteristics (e.g., time of day and novelty) of the events.

Our findings provide initial evidence of the role of self-reflection type in emotional trajectories following adversity. Rather than assuming a uniformly adaptive or maladaptive role of adverse experiences for subsequent shifts in emotionality (Taylor, Way, & Seeman, 2011; Tedeschi & Calhoun, 2004), we have identified two distinct trajectories as a function of self-immersed and self-distanced reflections on adverse events. In notable contrast to prior research, we demonstrated *prospective* changes in emotional trajectories across time as a function of experimental manipulation. Building on this initial evidence, future longitudinal work may explore the roles of individual and cultural differences in self-reflection types for emotionality (e.g., Grossmann & Kross, 2010; Park et al., 2016) and other aspects of personality and character (Jayawickreme & Blackie, 2014).

The present results dovetail with emerging research on the effects of self-distancing. Prior research focused on laboratory studies of the short-term effects of a single self-distanced recall of a major negative experience or involved cross-sectional observations of self-distancing effects

(Kross & Ayduk, 2017, for review), some of which were observed repeatedly over time (Park et al., 2016; Ranney, Bruehlman-Senecal, & Ayduk, 2016). The present research expands this body of research, combining for the first time both experimental and micro-longitudinal approaches to explore the causal role of self-distanced and self-immersed reflections for *change* in emotionality over time. Thereby, the current work provides a new perspective on the effects of self-distancing, pointing out the longitudinal consequences of this practice over time.

Additionally, our results provide an initial experimental test of the “dosage” effect for self-distancing. Specifically, by examining the effects of repeated self-distanced reflection, we were able to estimate the tipping point at which the self-distancing exercise stops incrementally increasing positive emotionality. To do this, we utilized state-of-the-art analytical tools that facilitate probing a range of curvilinear patterns with a lower chance of detecting false-positives (Simonsohn, 2018). In our data, the additive effect of self-distancing for positive emotionality reached a plateau toward the end of the third week. This saturation point of repeated self-distancing is in line with the principle of habituation to a repeated stimulus (i.e., response to a repeated stimulus will decrease/cease over time), and with the general notion that it is likely that repeated effects to decrease, or even reverse over time (Funder & Ozer, 2019). Although this insight about the “dosage” of repeated self-distancing exercises may have implications for therapeutic approaches that incorporate self-distancing, we caution that this effect requires further replications across longer timespans and other types of adversity (e.g., major traumas) before suggesting clinical and therapeutic recommendations.

Implications for research on post-traumatic growth

This work extends existing PTG research. First, it examines *prospective* changes in emotionality rather than the retrospective assessment of past emotional reactions to adversity; the

latter cannot be distinguished from people's beliefs about emotional change and are likely to be biased due to cognitive distortions (Frazier & Kaler, 2006). In other words, the present work documents prospective changes in positive emotions following self-distancing when appraising adverse events, rather than retrospective beliefs that one had experienced positive emotions following the negative event. Second, the micro-longitudinal experimental design allowed a direct test of self-distanced reflections' influence on growth-related processes (i.e., increasing positive emotionality over time). Such evidence contributes to the understanding of psychological processes underlying post-adversity growth, which cannot be examined using traditional cross-sectional designs.

It is noteworthy that past PTG research has suggested growth without deliberately instructing people to self-distance from the trauma. There may be some reasons to expect that growth observed in some of the previous PTG studies was related to self-distancing. First, previous PTG research has relied on recalling a past trauma and evaluating subsequent personal growth. Recalling a past event already involves temporal distancing (Trope & Liberman, 2003) that can affect emotionality and forgiveness (Huynh, Yang, & Grossmann, 2016), and promoting higher scores on PTG measures. Second, people who reflect on past adversity may develop a habit to self-distance from adverse experiences over time (Grossmann et al., 2016; Park et al., 2016). Our study is a starting point for future research that would directly examine the type of perspective people adopt in their post-trauma reflection to conclusively address this issue.

Limitations and future directions

The present work presents the first step in experimentally examining the causal effect of self-reflection perspectives for prospective changes in emotionality. Thus, although we find evidence for an incremental effect of self-distanced reflection on emotionality, we are unable to speak to

the long-term effects of this intervention for personality change. There is reason to believe that the increase in positive emotions following self-distanced reflections may have downstream consequences for improved emotional well-being (Fredrickson & Joiner, 2002) in turn facilitating growth in affect-related personality strengths (e.g., gratitude, hope, inspiration). Positive emotions can also allow for change in appraisals of negative events (e.g., fostering an optimistic perspective on life). Future longitudinal studies may extend the longitudinal aspect of the present design beyond a single month, given that changes in personality are typically observed over longer timespan (Caspi & Roberts, 2001).

Moreover, to address the question of whether self-distanced reflection fosters long-lasting emotional and character growth, it is also important to systematically define and distinguish between growth and related concepts. For example, a clear distinction between PTG, resilience, and coping is necessary for future work examining emotional and personality changes following adversity and trauma. Additionally, future theory and research are needed to quantify the degree of positive change that constitutes growth in personal characteristics such as emotionality. For example, does any positive change beyond a post-traumatic low point reflects growth? Or does growth entail an increase in positive characteristics beyond one's pre-trauma levels?

One important question for future research concerns the process through which self-distanced (vs. self-immersed) reflection affects emotionality. Supplementary analyses (see section 2.c) show that merely recalling an adverse experience from a self-distanced (vs. self-immersed) perspective did not reduce emotionality in participants' (written) reflections. This preliminary evidence suggests that regulation of adversity-related emotions occurs after reflection. Future experimental work should conclusively address this question.

Another intriguing question concerns the persistence (vs. reduction) in negative emotionality following self-distancing over time. Consistent with prior work on self-distancing and expressive writing (e.g., Park et. al., 2016), we observed lower emotionality rating following self-distanced reflection as compared to self-immersed reflection at the beginning of the diary experiment. However, the trajectory of change appeared to be limited to positive emotions. Self-distancing may be more likely to promote growth in up-regulation of positive emotions, allowing people to see the “bigger picture” of the emotionally charged experience, rather than in down-regulation of negative emotions. It is also possible people are more realistic in their emotional appraisal of negative events, continuing to recognize the negative emotional aspects of negative events. As the current study is a first step in investigating the effects of experimentally manipulated self-distancing over time, we focused on social adversity and on positive and negative emotionality. Future research should examine the effects of repeated self-distancing exercises for different types of adverse events (e.g., economic setbacks, health-related issues, and major traumatic experiences) and on the trajectory of specific types of positive and negative emotions (e.g., moral emotions; Stellar et al., 2017; self-conscious emotions, Katzir & Eyal, 2013).

Conclusion

The combination of experimental and micro-longitudinal approaches has great potential to deepen our understanding of post-traumatic trajectories and the psychological mechanisms that facilitate or hinder changes in personal characteristics such as emotionality. Combining these approaches, the current research found that people who reflected on everyday adversity from a self-distanced perspective experienced growth in their positive emotionality, while people who reflected on everyday adversity from a self-immersed perspective did not. Importantly, self-

distancing appears to lose its effectiveness in promoting positive personal change after three weeks of repeated exercise.

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Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Appendix Self-reflection Instructions

Self-immersed condition.

Please describe your *stream of thoughts* about today's social event from a **first person perspective** in detail below. To help you take the first person perspective, use the pronouns **I/me** as much as possible as you describe the event and your stream of thoughts. For example, you might write, "**I** think ... **I** feel ..."

Self-distanced condition.

Please describe your *stream of thoughts* about today's social event from a **third person perspective** in detail below. To help you take the third person perspective, use your **name** as much as possible as you describe the event and your stream of thoughts. For example, if your name were Chris, you might write, "**Chris** thinks ... **Chris** feels ..."

Emotional rating instruction.

Please rate how you feel about this event.

A rating of 0 means that you do not experience that feeling at all. A rating of 6 means that this feeling is a very important part of how you feel about this event now.