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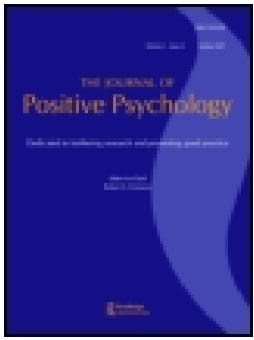
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To cite this article: Sean C. Murphy & Brock Bastian (2019): Emotionally extreme life experiences are more meaningful, The Journal of Positive Psychology, DOI: [10.1080/17439760.2019.1639795](https://doi.org/10.1080/17439760.2019.1639795)

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Emotionally extreme life experiences are more meaningful

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ABSTRACT

What makes an experience meaningful? Diverse lines of research have provided contrasting evidence; that either positive or negative events are found particularly meaningful. In this paper, we propose that the extremity of an event, rather than its valence per se, may drive meaning, and test multiple mechanisms that might explain this effect. Across three studies (including one that was pre-registered), we show for the first time a quadratic relationship between event valence and meaningfulness, such that both extremely painful and extremely pleasant events are more meaningful than milder events. Furthermore, we show that this effect is partly mediated by shared features of extreme events; their emotional intensity and tendency to induce contemplation. While extreme positive and extreme negative events differ in many important ways, this research shows that they share key characteristics (including their extremity) that lead people to find them more meaningful.

ARTICLE HISTORY

Received 15 October 2018
Accepted 11 June 2019

KEYWORDS

Meaning; positive psychology; negative affect; positive affect; pain

What makes some experiences in life seem meaningful, while others fade into the background? While there is no single answer to this question, research from several avenues of inquiry suggest *valence* is a key factor: The extent to which events are positive or negative appears to be one of the most important determinants of whether they are found to be meaningful (Fivush, Hazzard, McDermott Sales, Sarfati, & Brown, 2003; King, Hicks, Krull, & Del Gaiso, 2006; Tov & Lee, 2016). Different theories conflict, however, in predicting *which* end of the valence spectrum is most strongly related to meaningfulness, leading researchers to focus on either positive or negative experiences alone, or to compare one to the other. Critically, this approach has meant that the role of experience extremity (independent of valence) has been relatively under-explored. Furthermore, it has led to a focus on differences rather than similarities in how the positivity and negativity of experiences are related to meaningfulness. In this paper, we explore the possibility that *both* extremely pleasant and extremely painful events might be especially likely to be found meaningful, relative to more neutral events – for some of the same reasons.

Why are positive and negative events meaningful?

Narrative identity theory suggests that our life story (and thus our sense of who we are), is not an objective history, but rather is made up of a carefully curated

selection of key events from our lives (McAdams, 2008). In a very real sense then, the events we find meaningful (and thus worth incorporating into this story) determine how we see ourselves and our place in the world, and subsequently how meaningful we find our lives (Beike & Crone, 2012). A key question arising from this understanding of the self is which kinds of experiences are more likely to contribute to our life story.

Empirical work within the positive psychology literature has largely indicated that positive events will be found particularly meaningful. For instance, when individuals are asked to recount extremely meaningful events from their lives, they are most likely to recount positive events, often featuring themes of rewarding social interactions and significant life transitions (Baum, 1988).

In recent years, evidence in favour of this possibility has also accumulated from studies that ask people about their experience, activities, and sense that life is meaningful, on a regular basis. Individuals appear to feel more meaning in their lives on days when they experience positive events or affect, and less meaning when they experience negative events or affect (King et al., 2006; Machell, Kashdan, Short, & Nezlek, 2015; Tov & Lee, 2016).

Outside the positive psychology literature, however, several rich theories instead predict that negatively valenced events should be found particularly

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meaningful. Theories of meaning-making, for instance, suggest that traumatic events may shake individuals' global understanding of the world – by challenging the notion that life is fair, or that things happen for a reason. Individuals must then make concerted efforts to either alter their understanding of the event to fit within their global meaning framework, or alter their framework to incorporate the event (Park, 2010). While this theory does not speak to whether meaning-making leads these events to be found more meaningful than others in an absolute sense (Park, 2010), expending effort often increases the value individuals see in an experience (Inzlicht, Shenav, & Olivola, 2018). Evidence suggests that individuals *are* highly motivated to search for meaning in traumatic events, with many feeling that they find it (Sommer, Baumeister, & Stillman, 1998).

The theoretical case for meaningful negative events is further supported by narrative identity theory. McLean, Pasupathi, and Pals (2007) propose that disruptive and challenging events make for better elements of a life story, as they allow an individual to react in ways that are diagnostic of self-characteristics, gain life lessons or insights, or overcome difficulties. For instance, children from violent neighbourhoods recall negative events more coherently and with more reference to their feelings and thoughts than they do positive events (Fivush et al., 2003).

We suggest that these two literatures may *both* be at least partly right. Asking which side of the valence spectrum is associated with greater meaningfulness may be the wrong question; perhaps both positive and negatively valenced events are found particularly meaningful compared to more affectively neutral events. A handful of studies provide evidence which points in this direction. For instance, Baumeister, Vohs, Aaker, and Garbinsky (2013) found that the reported overall frequency of *both* positive and negative life events was related to a sense of global meaning in life. Other work by Bohanek, Fivush, and Walker (2005) found that *both* positive and negative experiences of high emotional intensity were especially vivid and memorable compared to those of mild emotional intensity.

Some authors have indeed worked to integrate the two literatures, suggesting that both positive and negative events will be found more meaningful, but for *different* reasons. For instance, positive events might reinforce expectations of stability and order in the world around us, while negative events force us to confront our ideas about what is truly meaningful (King & Hicks, 2009). Surprisingly, though, there has been little investigation into the possibility that positive and negative life events may be meaningful for some of

the *same* reasons. In this paper, we propose a more parsimonious hypothesis; that highly positive and negative events may both be particularly meaningful in part because of the very extremity of valence (i.e. the distance from the neutral mid-point of a valence scale) that they share.

What makes extreme events meaningful?

Emotionally extreme events share a number of characteristics that might lead them to be found more meaningful, independent of their valence. Perhaps the most obvious of these is their intensity. Emotional intensity is second of two factors in the valence-intensity model of emotion. It is theoretically distinct from extremity, but more extreme emotions do tend to also be more intense (Kuppens, Tuerlinckx, Russell, & Barrett, 2013). For example, feelings of depression and feelings of terror might have been equally emotionally extreme (in terms of their distance from a neutral valence point), but the latter is likely to be much more emotionally intense. Experiences that are intense in this way represent emotional peaks (Fredrickson, 2000; see also Maslow, 1964), that are particularly likely to shape the meaning we attribute to an event, and by extension may figure more prominently in our life story (Fredrickson, 2000).

A related possibility is that the perceived uniqueness of events may play a role. Bohanek et al., (2005) found that emotionally extreme events of either valence were felt to be more unique to the individual. Events that are felt to be rare or not to have happened to others may stand out in memory, and be more likely to be incorporated in the life story and found meaningful.

Social relatedness and strong connections to others are also commonly thought to be key factors in driving feelings of meaning (Heine, Proulx, & Vohs, 2006). While positive events (such as weddings and births) are often associated with social closeness, particularly negative experiences may also drive such bonding. Jong, Whitehouse, Kavanagh, and Lane (2015) found that traumatic experiences can lead to a strong sense of shared social identity, and Bastian, Jetten, and Ferris (2014) found that sharing a painful experience in the lab increased social bonding and cooperative behaviour. If emotionally extreme events on both sides of the valence spectrum can lead to an increased sense of social bonding, this may be a shared path through which they are found meaningful.

Another such path may be through contemplation. A substantial body of work suggests that individuals tend to contemplate negative events for some time after the fact (Morris & Shakespeare-Finch, 2011).

While research on the contemplation of positive events remains sparse, one series of studies suggests that *any* strong emotions induce contemplation after the fact (Rimé, Philippot, Boca, & Mesquita, 1992). By deepening the web of connections between a specific occurrence and broader elements of an individual's life, contemplation may link events to personal values, giving the event significance within a person's life narrative.

The current studies

Drawing on the preceding analysis, we set out to test for the first time whether both positive and negative experiences might be found more meaningful than neutral experiences, for some of the same reasons. Across three studies, we elicited reports of key life experiences across a continuous spectrum of valence, and measured the meaningfulness of these experiences. This allowed us to simultaneously model, and thus disentangle, the impacts of event valence and extremity on perceived meaningfulness. We also measured event qualities that might mediate the predicted impact of emotional extremity on meaningfulness.

Study 1a and 1b

Study 1 consisted of two iterations on the same design, designated 1a and 1b. In this study, we prompted participants to reflect on the most significant event in their lives over the previous year (1a) or three months (1b).¹ We asked this way to elicit events across the valence spectrum that were memorable, and because sampling events completely at random might result in recollections for which some of our questions might make little sense (such as driving to work).

As a sense of life having significance has been suggested to be a key component in meaning (Martela & Steger, 2016), this approach has the potential drawback of oversampling highly meaningful events. However, we believed that there would still be sufficient natural variation to conduct our investigation.²

For each experience, we measured event valence and meaningfulness, both on continuous scales. We also measured our proposed mediators of extremity; emotional intensity, event contemplation, sociality, and uniqueness. In addition, we measured the extent to which each event was felt to reflect personal growth and a sense that it was part of an individual's fate (or had a 'higher purpose'). We did not have any specific predictions about these two factors, but included them as they had previously been theorised as key to generating meaning in life events (Sommer et al., 1998).

Methods

Across all studies, we report all manipulations and data exclusions. In studies 1a, 1b, and 2, participants completed a number of measures not reported here, as part of a separate project investigating the relationship between trait rumination and meaning. In Study 3, which was pre-registered, we report all measures collected.

Participants

For Study 1a, we recruited 253 participants through Amazon Mechanical Turk (MTurk) for a study described as being about significant life experiences. Participants were paid \$1.50 USD. Three participants were removed for failing two or more of our three attention check questions, one because their experience was copied from online sources, and three for writing less than 20 words. This left 246 participants (114 female, 132 male, $M = 35.38$) for the analyses. For Study 1b, the same procedures were followed, except participants were paid \$1.80. Here, 226 participants were recruited, five were removed for failing attention checks, and one for copying their experience from the internet, leaving 220 participants (99 female, 121 male, $M = 35.06$) for the analyses.

Materials

Experience

Participants were asked to think back on their most significant experience over the past year (*three months in 1b*), and to describe the experience in a paragraph or so, including what made it significant to them.

Meaning

Participants were next asked to rate how meaningful the experience was, from 0 ('a meaningless experience') to 10 ('the most meaningful experience you can think of', or, in Study 1b, 'the most meaningful experience you can imagine anyone having.').

Valence

Participants were separately asked to rate both the extent to which the event was pleasant, and painful, each measured from 1 ('Not at all') to 7 ('Very'). To prompt answers about the experience of the event rather than retrospective feelings, participants separately made these ratings for: 'the events leading up to the experience', 'the actual moment or moments of experience', and 'the events that followed after the experience.' We used ratings of pleasantness and painfulness *during* the event as valence measures.

Emotional intensity

This was a single item 'This experience was emotionally intense', rated from 1 ('Completely disagree') to 7 ('Completely agree').

Social connection

Two items measured social connection; 'To what extent was this experience shared with others?' and 'To what extent did this experience make you feel closer to others?' from 1 ('Not at all') to 7 ('Very much'; $\alpha = .82$ and $\alpha = .75$).

Contemplation

This scale consisted of three items; 'I find myself going over this experience in my mind repeatedly', 'I find myself analyzing this experience to try to make sense of it', and 'I am still trying to understand this experience' from 1 ('Completely disagree') to 7 ('Completely agree'; $\alpha = .77$ and $\alpha = .79$).

Uniqueness

This was a single item 'To what extent was this experience unique to you (that is, very few other people would have had a similar experience)' from 1 ('Not at all') to 7 ('Very much').

Fate

Two items measured the belief that the event happened for a reason. 'This experience happened for a reason', and 'This experience was part of my fate/destiny', from 1 ('Completely disagree') to 7 ('Completely agree'; $\alpha = .75$ and $\alpha = .66$).

Personal growth

Personal growth was measured with three items: 'This experience made me a better person.', 'This experience shaped me as a person' and 'This experience made me the person I am today' from 1 ('Completely disagree') to 7 ('Completely agree'; $\alpha = .87$ and $\alpha = .87$).

Results

Wherever relevant, results from Study 1a and 1b are reported together and in order. We originally intended to use pleasantness and painfulness as separate indicators of valence because positive and negatively valenced ratings are often relatively independent (Watson, Clark, & Tellegen, 1988). In this case, however, the two ratings were very highly correlated ($r(242) = -.79, p < .001$ and $r(218) = -.77, p < .001$), suggesting they were best modelled as opposite ends of a bipolar scale (Russell & Carroll, 1999). We thus reverse-coded pleasantness, then averaged it with painfulness to create a single score measuring event valence.

Means, standard deviations, and zero-order correlations are reported in Tables S1 and S2 (see Supplementary Material).

We first tested for a main effect of valence on meaningfulness. Event valence was not associated with ratings of meaning in either sample. We next tested our hypothesis that valence extremity was related to meaningfulness. To do so, we fit a regression model including both the linear and quadratic effects of event valence in predicting meaning, centering at the mid-point of the valence scale (4). While the linear relationship between valence and meaning remained non-significant, the quadratic terms were significant ($\beta = .23, p < .001$, and $\beta = .16, p = .020$). This indicated that while painful and pleasant experiences did not differ in meaningfulness overall, experiences at the ends of the valence spectrum were indeed found more meaningful than milder events (see Figure 1).

Mediations

We next explored what factors might mediate the effect of valence extremity on meaningfulness. To do so, we tested for quadratic mediation; effectively, whether each factor was higher at extreme levels of valence, and also positively related to meaningfulness (or vice versa).

The most consistent and strongest mediator was emotional intensity. While this was higher for more painful events across both studies ($\beta = .33, p < .001$ & $\beta = .45, p < .001$), there was also a significant quadratic effect such that it was higher at more extreme levels of valence ($\beta = .22, p = .002$ & $\beta = .13, p = .046$), see Figure 2. Bootstrapped mediation tests (all mediations through the paper use 1000 bootstraps) revealed a significant indirect effect in the first sample and marginal indirect effect in the second (IE = .09, [.04,.15], $p = .002$ & IE = .05, [.01,.10], $p = .061$). This indicated that particularly painful and particularly pleasant events may *both* be meaningful, in part, because of their shared tendency to be experienced as emotionally intense.

Event sociality and contemplation both showed similar (though weaker) patterns of mediation. Sociality was lower for more painful events in both studies ($\beta = -.27, p < .001$ & $\beta = -.32, p < .001$), but was also higher at the extreme levels of valence (though only significantly in Study 1b; $\beta = .10, p = .124$ & $\beta = .21, p = .002$). This led to positive indirect effects (again only significant in Study 1b; IE = .03, [-.01,.06], $p = .147$, IE = .05, [.01,.11], $p = .015$). Event contemplation was also higher after more painful events overall ($\beta = .35, p < .001$ & $\beta = .45, p < .001$), but showed a quadratic effect

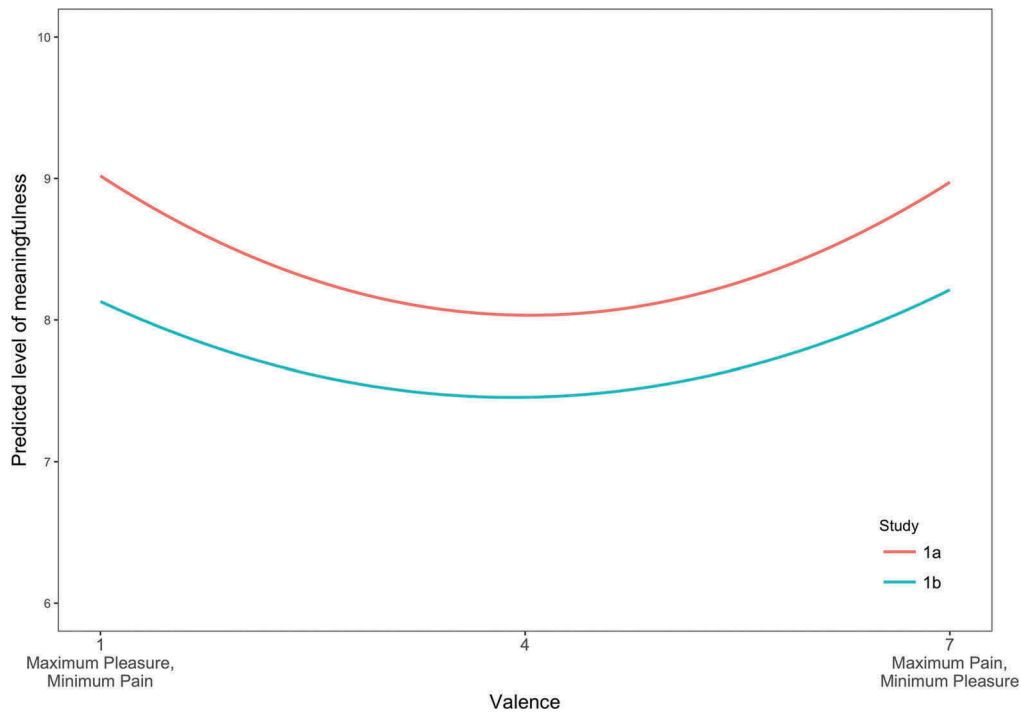


Figure 1. Fitted quadratic curves showing predicted levels of meaningfulness as a function of valence in Studies 1a and 1b.

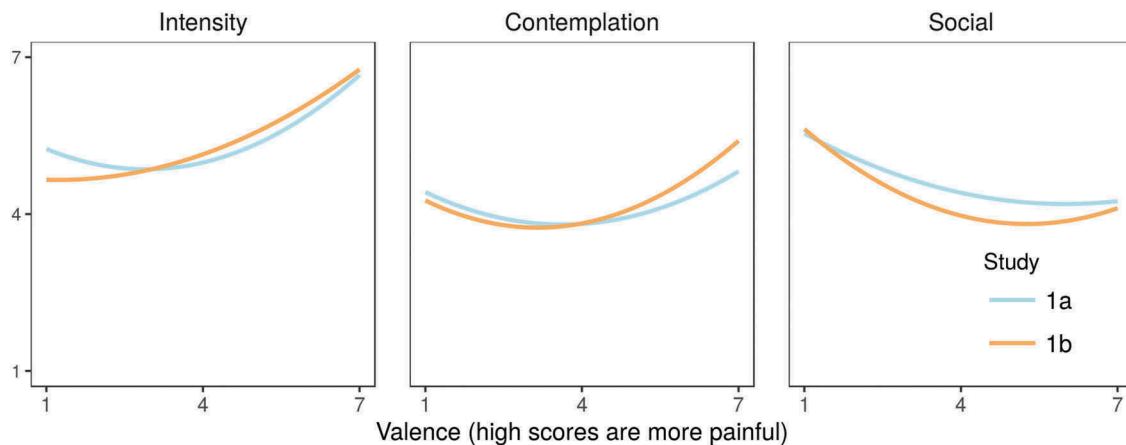


Figure 2. Fitted quadratic curves showing predicted levels of intensity, contemplation (single item), and sociality as a function of valence in Studies 1a and 1b.

such that it was highest for events of extreme valence (though only significant in Study 1b; $\beta = .06$, $p = .370$ & $\beta = .15$, $p = .021$, $IE = .01$, $[-.02, .04]$, $p = .389$, $IE = .06$, $[.00, .12]$, $p = .032$). Thus, there was initial (if mixed) evidence that extremely valenced events at both ends of the spectrum may have been found more social and contemplated more than neutral events, which in part may have explained their shared tendency to be found more meaningful. Event uniqueness, personal growth, and fate were not related to

valence extremity, and so did not emerge as potential mediators.

Post-hoc examination of the contemplation scale items led us to believe that two of the three items ('I am still trying to understand this experience' and 'I find myself analysing this experience to try to make sense of it') indexed a lack of understanding of the event, rather than contemplation itself. When examining the single remaining item ('I find myself going over this experience in my mind repeatedly'), both samples exhibited a quadratic

relationship, ($\beta = .15, p = .023$ & $.21, p = .002$), which led to significant indirect effects (IE = .05, [.01,.09] $p = .037$, IE = .08, [.02,.13], $p = .007$). We thus decided to measure this aspect of contemplation specifically in later studies.

Discussion

This Study provided an important first step in developing a more nuanced understanding of the role of valence in the meaning of events. While several studies have contrasted the manner and extent to which positive and negative events become meaningful, this is the first evidence that strongly valenced events at either end of the spectrum may share *common* features that make them increasingly meaningful. This is also the first time that the curvilinear relationship between valence and event meaningfulness has been clearly revealed, showing that the data appears to fit a clear U-shaped curve, with more neutral events occupying a 'valley' of meaning.

We also found initial evidence that three of our theoretically-derived factors were plausible mediators of the effect of valence extremity on meaning. While these findings should be interpreted with caution, as some relationships were only significant in one of the two studies, they are exciting. Aspects of these relationships have previously been reported, but this is the first time that a potential link has been drawn showing that sociality, contemplation and the emotional intensity of events may all be factors shared by extreme positive and negative events, and key reasons why both are particularly meaningful. In addition, the main effects in our studies provided the first direct evidence that events felt to be unique, emotionally intense, and that received substantial contemplation were found to be more meaningful.

This collection of initial findings provides a rich picture of what it takes to create a meaningful event. However, given that the strength of evidence for our mediated pathways varied across Studies 1a and 1b, we conducted a replication in Study 2 to establish whether these patterns of results were reliable.

Study 2

To conduct this replication, we added a second item to measure contemplation, excluding the two items indexing a lack of understanding. To make room for new trait measures introduced in service of our separate rumination project, social connectedness and

uniqueness were dropped from this study; we return to social connectedness in Study 3.

Methods

The methods for this Study were identical to Study 1b, with one exception. To tap contemplation more directly, we added the item '*I thought about this event a lot*' to the contemplation scale. Factor analysis of the resulting four items indicated that they formed two separate scales; a two-factor model fit substantially better than a single-factor model ($\chi^2(1) = 117.27, df = 1, p < .001$). We use this new two-item scale as 'contemplation' for the remainder of the paper ($\alpha = .71$).

We recruited 406 MTurk participants, each paid \$1.80 USD. Six were removed for failing two attention checks, and five for writing under 20 words, leaving 395 (185 female, 210 male, $M = 36.08$). We once again measured painfulness, pleasantness, meaning, emotional intensity, fate ($\alpha = .63$), and growth ($\alpha = .84$). As in the previous study, we collapse pleasantness and painfulness ($r(390) = .75, p < .001$) into a single measure of valence. Means, standard deviations, and zero-order correlations are reported in Table S3.

Results

We replicated the association between event valence and meaning found in both Study 1 samples, with no linear relationship with valence ($\beta = -.02, p = .574$), but a significant quadratic relationship ($\beta = .19, p < .001$) indicating that more extremely valenced events were found more meaningful. We next moved on to testing whether other event factors could mediate these associations with valence extremity.

Once again, while fate, growth, contemplation and intensity were all positively associated with meaning, only contemplation and emotional intensity emerged as plausible mediators of valence. The more painful an event was, the more it was contemplated and found emotionally intense overall ($\beta = .17, p < .001$ and $\beta = .36, p < .001$, respectively), but quadratic relationships indicated that both were also highest for events at extremes of the valence spectrum ($\beta = .18, p < .001$ and $\beta = .18, p < .001$, respectively), while these relationships were null for fate and growth. This led to significant indirect effects of valence extremity on meaningfulness through only contemplation (IE = .06, [.03,.10], $p = .002$) and intensity (IE = .07, [.03,.10], $p = .001$) see [Figure 3](#).

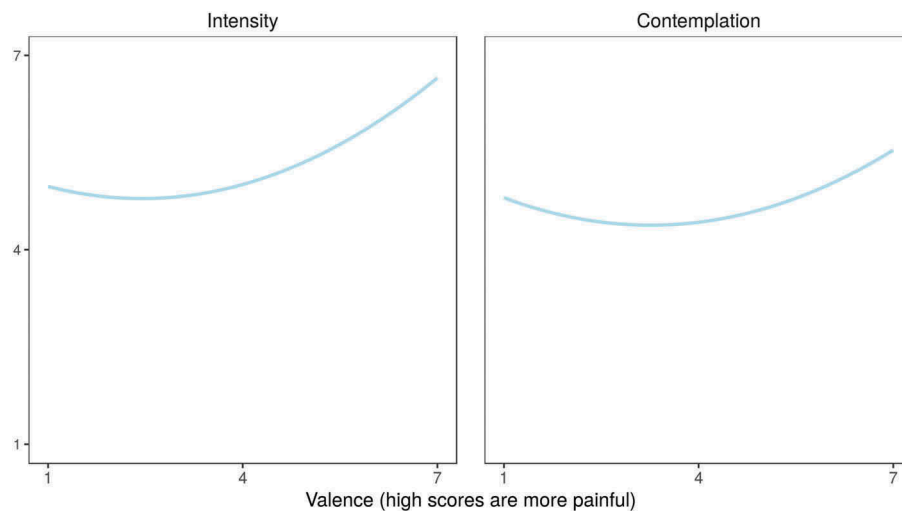


Figure 3. Fitted quadratic curves showing predicted levels of intensity and contemplation as a function of valence in Study 2.

Discussion

The results from Study 2 confirmed the role played by both emotional intensity and contemplation in driving the curvilinear association between event valence and meaning. Events on either end of the valence spectrum were experienced as more emotionally intense and contemplated more, and this in part explained their increased meaningfulness. The clearer pattern of results with the new contemplation measure suggests this pattern is characteristic of contemplation itself, and not rumination caused by a lack of understanding of the event. This makes sense; work on post-traumatic growth suggests that a search for understanding may lead painful events to be found more meaningful (Michael & Snyder, 2005), but this is unlikely to be a shared cause of meaning across pleasant and painful events. We next extended our work into a within-subjects design that allowed us to replicate these findings with more control.

Study 3

In the first two studies, we asked individuals to report significant events in their lives. This allowed us to study life events that varied naturally across both valence and our other factors, and were representative of the events people found significant. However, this design came with potential drawbacks; primarily, the potential for selective reporting of life events.

People who report a painful event as their most significant may differ systematically from those who choose a pleasant one. If these differences included trait levels of meaning, for instance, these person-level associations might have masqueraded as event-level associations.

An additional concern was that, in the first two studies, approximately two-thirds of reported events fell on the

‘pleasant’ half of the valence scale. Thus, while the reported painful events were just as meaningful as the pleasant ones, they may not have been representative of the average painful event.

To address these issues, we moved to a repeated-measures design in which each participant reported both a highly positive and highly negative event. This allowed us to compare experiences within the same people, removing person-level confounding variables. It also made sure we were characterizing differences between events of similar frequencies, rather than comparing rarer significant painful events to more frequent pleasant events. Our goal was to repeat our analyses from Study 2 under these improved conditions. We also re-incorporated an improved measure of event-related social bonding.

Pre-registration

We originally ran a slightly different version of Study 3 (which is now Study 3S in supplementary material) using largely the same outcome measures as in Study 2. After receiving editorial feedback concerned with the single-item measures of meaningfulness and emotional intensity, we re-ran the study with new and improved measures of these constructs. This Study was pre-registered to solidify the confirmatory nature of the hypotheses. The pre-registration, including all measures and full analysis plan, can be found at <https://osf.io/94ex6/>.

Methods

Participants

We recruited 521 participants through MTurk for a study described as involving writing about their most pleasant

and painful life experiences in the last year. Participants were paid \$2.50 USD. We then removed responses in accordance with our pre-registered plan. Thirteen responses were removed as they did not contain codes to indicate they were generated from our Mturk link, and contained experiences clearly incoherent or copied from the internet. Six participants were removed for failing both attention checks, and thirty because at least one experience was shorter than 20 words. This left 472 participants (228 female, 240 male, 4 undisclosed, $M = 35.53$).

Materials and procedure

Experience

Participants responded to two experience prompts in counter-balanced order. In one, they were asked to report on their 'most rewarding, enjoyable, or pleasant' experience in the past year.³ In the other, their 'most adverse, challenging, or painful' experience. After describing each experience, participants completed our experience-related questions from Study 2.

Meaning

In order to increase reliability, we turned our outcome measure of meaning into a three-item scale. This now consisted of asking participants 'How meaningful was the experience', 'To what extent was this experience an important moment in your life', and 'How significant was the experience', on a scale from 0 'Not at all' to 10 'Extremely'; $\alpha = .87$.

Valence

While we now manipulated the valence of reported events, we still collected subjective ratings, as we intended to use the naturally occurring variation to examine the curvilinear associations between valence and other variables. Analysis of our earlier studies indicated that ratings of valence before, during, and after events were highly similar. Thus, to reduce burden on participants, they were now asked only to answer to what extent the experience was Pleasant and to what extent it was Painful on scales from 1 ('Not at all') to 7 ('Very'). These two measures were highly related ($\beta = -.88, p < .001$) and were collapsed into a single valence measure, coded so higher scores were more painful.

Social

To measure how much events facilitated social closeness, we used an altered version of the scale from Study 1. We wanted to tap participants' feelings of social connection, rather than event characteristics. Thus, we removed the question about how much the experience was shared with others and instead added 'This experience made me feel more connected to others' and 'This experience made

me feel bonded with others', measured on a scale from 1 ('Completely Disagree') to 7 ('Completely Agree'; $\alpha = .95$).

Emotional intensity

To increase the reliability of our emotional intensity measure, we expanded it to three items. We added 'This experience was very emotional' and 'this experience made me feel strong emotions' ($\alpha = .87$).

We also once again measured fate ($\alpha = .69$) and growth ($\alpha = .84$), as in Study 2. Means, standard deviations, and zero-order correlations are reported in Table S5.

Results

We first conducted a manipulation check, with paired t-tests confirming that experiences in the negative valence condition were rated as significantly more painful ($M = 6.02, SD = 1.28$) than in the positive valence condition ($M = 1.8, SD = 1.21, t(471) = 52.02, \beta = 1.72, p < .001$).

Curvilinear effects

While our manipulation ensured that each participant recorded both a positive and negatively valenced event, there was substantial variation within conditions, with responses given across the entire valence spectrum.⁴ Thus, we used our continuous measure of reported valence to replicate previous curvilinear associations and to once again examine mediating pathways.

As we needed to model the data accounting for the dependencies induced by our repeated-measures design, we ran a series of mixed-effects regression models using the lme4 package in the R statistical software (R Core Team, 2017). Each of these models included a random intercept for participant.

First, we examined the direct relationship between valence and meaningfulness. Contrary to previous studies, reported painfulness was associated with lower levels of event meaning on average ($\beta = -.14, p < .001$). However, we once again found a strong curvilinear effect such that extreme levels of valence were associated with higher levels of meaning ($\beta = .20, p < .001$).

As in previous studies, we found that reported valence curvilinearly predicted both emotional intensity and contemplation, but not fate and growth. Emotional intensity was associated with increased painfulness, while contemplation was not, ($\beta = .27, p < .001$ and $\beta = .03, p = .249$, respectively), however they each increased as events approached the extremes of the valence spectrum ($\beta = .21, p < .001$ and $\beta = .12, p < .001$, respectively). Clarifying the mixed pattern of results from Study 1, reported valence was not curvilinearly associated with social closeness; there was a strong tendency for the reported pleasantness of events to

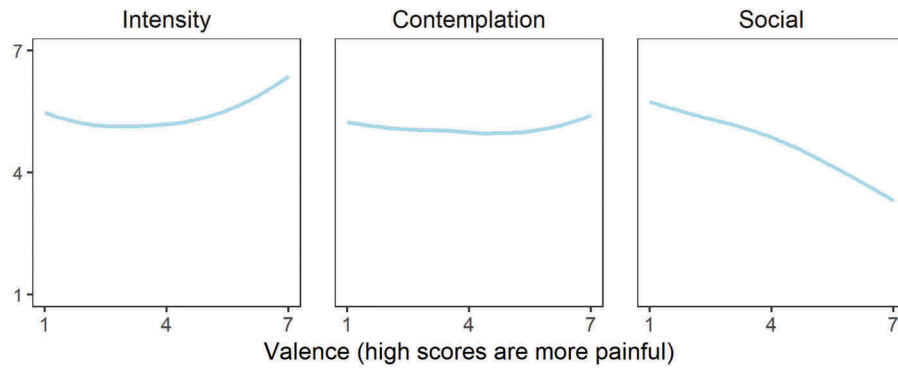


Figure 4. Fitted quadratic curves showing outcomes as a function of valence in Study 3.

be associated with social closeness ($\beta = -.50$, $p < .001$), but social closeness neither increased nor decreased as events became more extreme in valence ($\beta = -.04$, $p = .175$; See Figure 4).

We used the mediation package in R along with the lme4 package to test mediation while accounting for the repeated measurement of participants. Results indicated that contemplation ($IE = .06$, $[.02, .09]$, $p < .001$), and emotional intensity ($IE = .12$, $[.08, .16]$, $p < .001$) were significant mediators of the relationship between valence and meaning, while social closeness was not ($IE = -.01$, $[-.03, .01]$, $p = .200$).

Linear effects

In previous studies, we focused on curvilinear relationships between valence and meaning, as these were key to

testing our theoretical questions. However, the design of this study also allows us to clearly characterise the linear effects of our valence manipulation. We include these in Figure 5 for completeness, but also to illustrate what can be missed with this approach. When treating valence as binary, we see only linear effects, such as painful events being characterised as more emotionally intense, or contemplation apparently not varying as a function of valence.⁵ The curvilinear results reported above, by contrast, show far more nuance in the effects of valence on these variables.

Discussion

Study 3 advanced upon our earlier efforts, as the use of a within-subjects design eliminated several possible alternative explanations for our results. We also made several key measures more robust using highly reliable

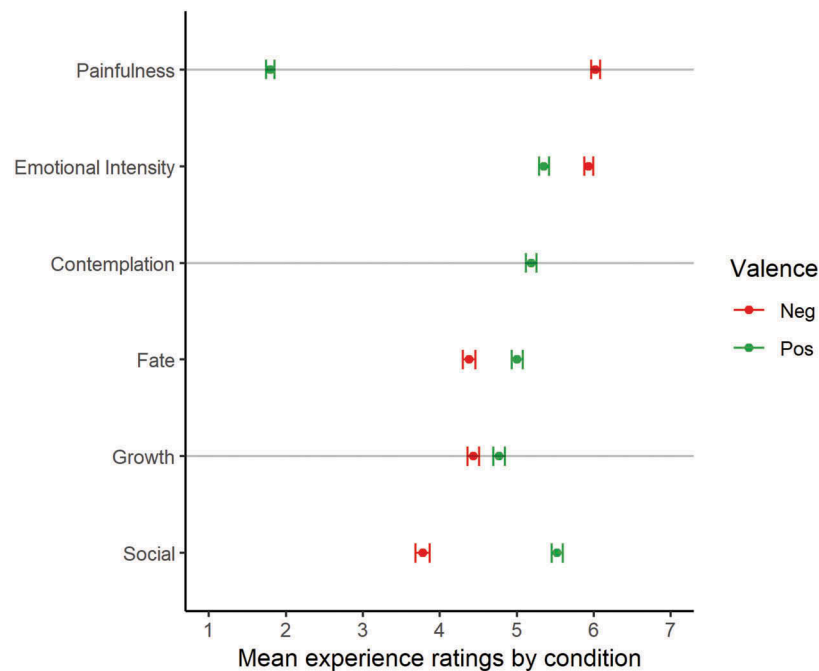


Figure 5. Mean differences in event characteristics across valence conditions in Study 3, with 95% confidence intervals.

scales in place of single items, and pre-registered all analyses to establish these results as confirmatory. We thus confirmed, in this experimentally controlled and balanced replication of earlier studies, that events characterised by more extreme valence were found more meaningful. We also confirmed that this was, in part, because these events were more likely to be characterised by high levels of emotional intensity and inspire greater contemplation. Clarifying mixed findings from earlier studies, this study indicated that there was no detectable curvilinear effect of valence on social bonding.

Events in the positive condition were found more meaningful overall in this Study, where there had been no difference previously. It seems plausible that this deviation was due to the requirement that each participant recall both types of experience. In previous studies, two-thirds of reported experiences were more pleasant than painful. This suggests that significant (and thus meaningful) painful events may be experienced more rarely than significant pleasant events, and thus in this balanced sample, a higher proportion of non-significant painful events were reported. However, it is encouraging to note that even in this balanced sample, all other results replicated as expected.

General discussion

Across three studies, we used a novel design to model curvilinear relationships between valence and meaning, thus disentangling the directional effects of valence from those of emotional extremity. In doing so, we uncovered relationships that had gone undetected previously. Our findings provide strong support for the hypothesis that emotional extremity of an event plays a key role in whether events are found meaningful, as the most meaningful events in our studies were those that were either extremely pleasant or extremely painful. Importantly, our results also suggest that research focusing only on the effects of valence may have conflated these with effects of extremity.

This work thus ties together separate literatures which have previously focused largely on either positive or negative events exclusively. There are undoubtedly processes at work when individuals develop an understanding of meaning after traumatic events that are not present when meaning is garnered from joyful and life-affirming events, and vice versa. While we agree that insight into these unique processes is important, if studied in isolation, researchers risk creating divergent literatures that miss important commonalities.

Indeed, we found that these commonalities may reveal a more complete and nuanced picture about

what determines the events we find meaningful and memorable. Extreme events were found more meaningful, in part, because of their emotional intensity, as well as the contemplation they inspire. Thus, while [Figure 5](#) shows that highly positive and highly negative events differ in a great many ways on average, our models revealed commonalities that help explain why both types of events are found especially meaningful.

Some of these commonalities are quite surprising. We consistently found that positive and negative events inspired contemplation to roughly the same degree. This stands in stark contrast to the strong focus on negative events in most previous research on contemplation, and adds to a recent trend in seeking to also understand how people contemplate positive events (Feldman, Joormann, & Johnson, 2008).

Our findings also point to the importance of intensity (or arousal) in building meaning in life. Alongside valence, intensity is a key dimension relied on in mapping the emotional space (Kuppens et al., 2013) and extremely positive or negative events also tend to be experienced as more intense – our findings show that this intensity is an important mediator of the effect of valence extremity on meaning. This serves as a counterpoint to the current trend of viewing low-arousal positive experiences as most conducive to well-being (e.g. Van Dam et al., 2018). Though mindfulness, meditation, and feelings like calmness may be beneficial across several domains, they may also be less likely to create experiences that contribute to a person's life story. Rather, intense or peak experiences may be more likely to define who we are, providing some insight into why people at times behave in counter-hedonic ways, seeking out objectively unpleasant experiences (e.g. Bastian, 2018; Rozin, Guillot, Fincher, Rozin, & Tsukayama, 2013).

Contrasts with past research

To our knowledge, only one other study has tested for nonlinear relationships between valence and meaning. Tov and Lee (2016) studied the relationship between daily positive and negative affect and a sense that life is meaningful, and found little evidence of a quadratic relationship. Instead, their results suggested simply that individuals felt more meaning on days when they felt more positive.

The key difference between the two investigations appears to be time-scale. Tov and Lee (2016) modelled the relationship between valence and a global sense of meaning on a given day, while we investigated discrete events in the past. This suggests that positive events may be found meaningful immediately, while negative

events 'catch up' over time, eventually creating the u-shaped curve revealed in our studies. This gels with theoretical suggestions that meaning is more likely to be constructed effortfully over time in the case of negative events (King & Hicks, 2009), but does not explain why contemplation did not then differ by valence in our studies. Future research might examine whether the valence of an event determines what function contemplating that event serves. It may be that positive events elicit something closer to savouring, while in negative events contemplation may be driven by efforts to accommodate the event into one's life narrative.

This disparity leads into a broader question of how the experience of meaningfulness differs across temporal levels. We know very little about how the experience of meaningfulness in discrete, memorable events resembles that of daily events, or how this meaning, once generated, propagates to the global level. While we have posited that a life filled with meaningful events will lead to a richer life story and thus a greater sense of meaning in life, empirical tests of this idea have yet to be conducted. The study of meaning is growing at all levels, but how these different 'layers' relate remains largely unexplored.

Another area of interest is the 'live' process by which individuals come to find events meaningful. One limitation of our study was that all reports were retrospective; individuals had already established the events we asked about as meaningful, and we could not observe the mental processes which drove this. As this design cannot establish causality, it leaves open the possibility that reciprocal processes influence our results; emotional intensity may drive meaning in events, but meaningful events may also come to be seen as more intense over time, for instance. While we do not feel this would diminish the importance of the link between the two, establishing directionality more firmly would further improve our understanding of how valence and extremity shape, and are perhaps shaped by, meaning. To answer this question would be costly (requiring longitudinal investigations that probe individuals shortly after significant events, and at subsequent intervals), but highly valuable.

A further limitation of our work is that it relied only on American MTurk workers. While our sample was diverse in age and gender, it is unclear whether our results would generalise to other cultures that may place different value on the intensity of experiences. To the extent that what seems meaningful can be strongly influenced by culture (Baumeister et al., 2013), this is an important area for future research.

Conclusions

In this paper, we found that both extremely pleasant and extremely painful events are more meaningful than neutral events, for some of the same reasons. These findings suggest that pleasant and painful events may have more in common when it comes to meaning than previously thought, and that we may need to rethink how we study the link between valence and meaning in the future. When it comes to the search for meaning, the most extreme experiences may be the best places to look.

Notes

1. To counteract possible ceiling effects, we changed from a year to three months in Study 1b and adjusted the meaningfulness question.
2. This was the case; see Figure S3 for histograms of meaning variation across all Studies.
3. We asked about the previous year because of previous participants wished to talk about older events; pilot testing indicated that asking about valenced events led to less skewed meaning ratings than significant events.
4. At least 20 experiences were reported at every value of valence; see Figure S4 for histograms. For wordclouds of what was written, see Figures S5 and S6.
5. See Table S6 for effect sizes.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by an Australian Research Council Discovery Project grant awarded to Brock Bastian, grant number DP140103716.

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