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Boredom Begg to Differ:

Differentiation From Other Negative Emotions

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### **Abstract**

Boredom research is booming. Nonetheless, a comprehensive understanding of boredom in relation to other negative emotions is lacking. This ambiguity impedes accurate interpretation of boredom's causes and consequences. To gain more insights into boredom, we examined in detail how it differs from a range of other negative experiences, namely sadness, anger, frustration, fear, disgust, depression, guilt, shame, regret, and disappointment. Our research indicates that the appraisals associated with boredom distinguish it clearly from other negative emotions; conceptually (Study 1), in terms of state experiences (Study 2), and in terms of individual differences in these experiences (Study 3). Our findings suggest that boredom is mild in negative valence, low in arousal, is associated with low perceived challenge, low perceived meaningfulness, and has low relevance to moral judgment and behavior. Boredom also involves low attention given to situations and tasks, and the lack of perceived meaningfulness and attention associated with boredom emerged as particularly distinctive characteristics. The findings underscore the importance of carefully discriminating boredom from other emotions in experimental induction, psychometric assessment, and conceptual discussion.

*Keywords:* boredom; emotion; negative affect; appraisal; meaning

### Boredom Begg to Differ:

#### Differentiation from Other Negative Emotions

Between 1926 and 1980, on average less than one psychology paper per year was published on boredom (Smith, 1981; Fahlman, Mercer, Gaskocski, Eastwood, & Eastwood, 2009). Between 2010 and 2015, no fewer than 1,422 psychology journal articles were published on boredom according to *ScienceDirect* ([www.sciencedirect.com](http://www.sciencedirect.com)). Of these, as many as 326 were published in 2015 alone. Clearly, boredom research is gradually moving from the fringes of psychological science towards the mainstream. Yet, the surge in popularity of boredom research also increasingly exposes its key weakness: It is unclear how boredom differs from other negative affective states. This raises fundamental questions about the nature of boredom and the validity of its study: Does boredom differ relatively little or much from other emotions in terms of lay concept, as state experience, and on the basis of individual differences? Further, what characterizes these potential differences between boredom and other emotions? Inspired by initial forays into boredom's distinctiveness (e.g., Goldberg, Eastwood, Laguardia, & Danckert, 2011; Smith & Ellsworth, 1985; Van Tilburg & Igou, 2012), and given the recent rise in popularity of research on boredom, investigating these issues is urgently needed. Before we set out our approach, we will first review the relevant boredom literature.

#### **Boredom**

Boredom has been a topic of scholarly discussion primarily within philosophy before it entered the realm of empirical study. In this philosophical literature, boredom was often treated as evidence of existential turmoil. Heidegger extensively discussed boredom in his work, and described it as an "insidious creature [that] maintains its monstrous essence in our Dasein" (cited in Thiele, 1997, p. 491). He linked boredom to modernism and people's desire for technological change. An existential view of boredom can also be found in the writings of Schopenhauer, who dramatically claimed that the human capacity to experience boredom attests to the absurdity of life:

Human life must be some kind of mistake. The truth of this will be sufficiently obvious if we only remember that man is a compound of needs and necessities hard to

satisfy; and that even when they are satisfied, all he obtains is a state of painlessness, where nothing remains to him but abandonment to boredom. This is direct proof that existence has no real value in itself; for what is boredom but the feeling of the emptiness of life? (Schopenhauer, 1851, trans. 2009, p. 357)

Fromm (1955) held a likewise unpleasant view of boredom, stating that “among all evils of life, there are few which are as painful as boredom” (p. 202). “I am convinced that boredom is one of the greatest tortures. If I were to imagine Hell, it would be the place where you were continually bored” (1963/2004, p. 150). Fromm believed that boredom resulted from people’s feelings of alienation, a state of lacking meaningful activities and relationships, and that boredom was a lead cause of aggression and destruction in society (Fromm 1972; 1991).

Other philosophers, including Sartre, Kierkegaard, and Kuhn (Martin, Sadlo, & Stew, 2006), similarly cast boredom as a phenomenon intimately related to a lack of meaning and purpose, and this proposition resonates with Barbalet’s (1999) more recent sociological discussion of boredom, stating that “boredom is anxiety about the absence of meaning in a person’s activities or circumstances” (p. 641). Essentially, this literature emphasizes that boredom accompanies the negation of life’s meaning and purpose.

### **From the Fringes Towards the Mainstream**

Boredom has received due empirical study in recent years. Much of this research focused on the psychometrics of boredom measures (Leong & Schneller, 1993; Vodanovich, 2003; Fahlman Mercer-Lynn, Flora, & Eastwood, 2013). Other research focused on the relationships that boredom holds with relevant interpersonal (Dahlen, Martin, Ragan, & Kuhlman, 2004), educational (Watt & Vodanovich, 1999), psychopathological (Blaszczynski, McConaghy, & Frankova, 1990), or work-related variables (Kass, Vodanovich, & Callender, 2001).

Within this emerging field in psychology, boredom was recently defined as “the aversive experience of wanting, but being unable, to engage in satisfying activity” (Eastwood, Frischen, Fenske, & Smilek, 2012, 482). It is a common (Larson & Richards, 1991) and unpleasant emotion (Van Tilburg & Igou, 2011). Boredom is physically expressed with a

collapsed upper body, leaning head, and limited bodily movement (Walbott, 1998). Its prototypical psychological signature features low arousal (Smith & Ellsworth, 1985; cf. Goetz, Frenzel, Hall, Nett, Pekrun, & Lipnevich, 2014), a lack of perceived meaning and challenge in the activity at hand (Van Tilburg, Igou, & Sedikides, 2013), mind-wandering (Kane, Brown, McVay, Silvia, Myin-Germeys, & Kwapil, 2007), low attention (Eastwood et al., 2012), and the desire to change the current activity or to disengage from it (Van Tilburg & Igou, 2012).

Correlational approaches to state boredom and boredom proneness confirm boredom's undesirable character, evidencing correlates such as aggression, pathological gambling, depression, loneliness, anxiety, negative affect, reduced positive affect, hostility, anger, reduced work enjoyment, unhealthy eating, risky driving behavior, and many more (e.g., Blaszczynski et al., 1990; Buss & Perry, 1990; Farmer & Sundberg, 1986; Kass et al., 2001; Koball, Meers, Storfer-Isser, Domoff, & Musher-Eizenman, 2012; Vodanovich, Verner, & Gilbride 1991). These phenomena are usually assumed to be consequences of boredom proneness, possibly propelled by variables such as sensation seeking or a lack of impulse control (Dahlen et al., 2004).

Experimental studies of boredom, which have been far less numerous than correlational investigations, demonstrate that boredom is nonetheless functional: It facilitates important self-regulatory processes, for better or worse. For example, the lack of perceived challenge entailed in the boredom experience (Csikszentmihalyi, 2000) facilitates the search for more challenging activity (Van Tilburg & Igou, 2012). Likewise, boredom “emotionally registers an absence of meaning and leads the actor in question towards meaning” (Barbalet, 1999, p. 631), which can produce behaviors aimed at restoring a sense of personal meaningfulness. For example, boredom produces in-group favoritism and out-group derogation (Van Tilburg & Igou, 2011), nostalgic reverie (Van Tilburg et al., 2013), more extreme political orientations (Van Tilburg & Igou, 2016), and sometimes even prosocial intentions (Van Tilburg & Igou, in press)—psychological responses that serve to increase a sense of purpose (Heine, Proulx, & Vohs, 2006; Routledge, Wildschut, Sedikides, Juhl, & Arndt, 2012; Van Tilburg, Sedikides, & Wildschut, 2016). Further highlighting the self-

regulatory processes that boredom instigates, research by Sansone, Weir, Harpster, and Morgan (1992) documented that boredom inspires task variations that regulate interest in activity. Moreover, recent findings indicate that boredom can even promote healthy eating behavior (Moynihan, Van Tilburg, Igou, Wisman, Donnelly, & Mulcaire, 2015), *provided* that the food in question is relatively exciting, a condition that is usually reserved for unhealthy food (e.g., Craeynest, Crombez, Koster, Haerens, & De Bourdeaudhuij, 2008). These experimental findings indicate that notwithstanding the various detrimental correlates and consequences that boredom has, it can also facilitate adaptive self-regulatory processes (Elpidorou, 2014).

### **How Does Boredom Compare to Other Emotions?**

Despite the increased scientific interest in boredom and its wide scope of implications, the current understanding of boredom is unsatisfactory; an issue that many scholars have raised (see Eastwood et al., 2012; Leary, Rogers, Canfield, & Coe, 1986; Van Tilburg & Igou, 2012; Vodanovich, 2003). Particularly striking is the lack of knowledge about the differences of boredom in relation to other negative emotions, with only a handful of studies considering other emotions alongside boredom (e.g., Goldberg et al., 2011; Smith & Ellsworth, 1985; Van Tilburg & Igou, 2012).

The few studies that measure boredom alongside other negative emotions indicate that boredom proneness correlates positively with, for example, anger, frustration, sadness, and feelings of depression (e.g., Van Tilburg & Igou, 2012; Vodanovich et al., 1991). In his book *La Nauséa*, Sartre sketches the contemplations of protagonist Antoine Roquentin, whose feelings of meaninglessness and boredom express themselves in a sense of nausea (e.g., Erfani, 2004). This work hints that even disgust, characterized by nausea (Schnall, Haidt, Clore, & Jordan, 2008), may overlap with boredom. The fact that boredom correlates with other negative emotions need not mean that boredom cannot be adequately distinguished from other negative emotions—it could well be that the typical circumstances that elicit boredom occasionally foster anger, frustration, sadness, feelings of depression, and possibly disgust. Unfortunately, however, the correlations between boredom and other negative emotions are accompanied by an overlap in several of their correlates and consequences. For

example, boredom proneness predicts aggression (Dahlen et al., 2004), but so do frustration (e.g., Miller, 1941) and anger (Maiuro, Vitaliano, & Cahn, 1987). Furthermore, although empirical work has confirmed that boredom involves a sense of meaninglessness (Fahlman, Mercer, Gaskocski, Eastwood, & Eastwood, 2009; Van Tilburg & Igou, 2012), so do sadness and feelings of depression (Steger, Frazier, Oishi, & Kaler, 2006). Likewise, boredom is linked to withdrawal behavior (Geiwitz, 1966), but so is disgust (Harlé, & Sanfey, 2010). These findings ultimately raise the question which features boredom shares with these other emotions and which features distinguishes boredom from them.

Prior studies that plotted boredom against other emotions generally portrayed boredom as relatively distinct from other affective states. However, these studies are scarce and the methodologies used in them cast doubt on the conclusiveness of the results. For example, participants were typically supplied with various explicit dimensions on which emotions were compared, such as cognitive appraisals (Smith & Ellsworth, 1985), or feelings and behavioral tendencies (Van Tilburg & Igou, 2012). Although these studies are important and insightful, they include crucial limitations: Examining differences/similarities among emotions on explicit comparison dimensions raises the risk of under- or overestimating the extent to which boredom differs from other negative emotions. For example, boredom significantly differs from sadness on ratings of perceived challenge (Van Tilburg & Igou, 2012). Yet, it could be that compared to the similarities between boredom and sadness the dimension of perceived challenge differentiates very little between the emotions. Reversely, the absence of a significant difference between boredom and disgust on ratings of pleasantness (e.g., Smith & Ellsworth, 1985) does not take away the possibility that these emotions differ in many other important facets.

In addition, the few studies that examined whether boredom can be distinguished from other affective states included a very limited set of other states (anger, frustration, and sadness: Van Tilburg & Igou, 2012; apathy, anhedonia, and depression: Goldberg et al., 2011). Furthermore, studies on boredom usually focus on *either* boredom as lay concept, state experienced boredom, or individual differences in boredom proneness, limiting the possibility

for obtaining convergent perspectives from different levels of analyses. Although these studies are valuable, they are unfortunately also limited in scope.

We sought to establish the much needed empirical firmament for the study of boredom. We attempted to develop a foothold for understanding boredom by empirically testing whether and to which degree boredom could be differentiated from a range of other negative emotions. In the present undertaking, we examined boredom's position relative to other negative emotions using three common classifications for boredom: as a concept (Barbalet, 1999), as a state experience (Fahlman, Mercer-Lynn, Flora, & Eastwood, 2013), and at the level of individual differences (Vodanovich, 2003).

In studying how boredom compares to other emotions, we adopted a 'prototype' view of emotions (e.g., Fehr & Russell, 1984), where we see 'boredom', and other emotions, as encompassing a range of prototypical features that tend to cluster together (e.g., Hepper, Ritchie, Sedikides, & Wildschut, 2012). Experiences sharing fewer (or less pronounced) prototypical features are judged as less representative of that emotion (e.g., less boring). What does this mean for the 'distinctiveness' of emotions? Although our prototype view does not assume strict boundaries between emotions, they can nonetheless be characterized as more or less different from each other.

## **Current Research**

### **Differentiating Boredom**

In three Studies, we tested whether boredom can be differentiated (to a considerable degree) from a wide range of other negative affective states. Different from past studies, we did not start off with having participants compare boredom and other negative emotions on an explicit set of comparison dimensions. Rather, we *first* assessed the differences and similarities among negative emotions based on lay concept comparisons (Study 1), state level correlations (Study 2), and correlations between individual differences (Study 3), using a multidimensional scaling approach (Kruskal & Wish, 1978; Shepard, 1980). *Afterwards* we tested whether or not various comparison dimensions drawn from existing boredom literature corresponded to these obtained differences/similarities (Study 1-3; Rusbult, Onizuka, & Lipkus, 1993).

Resonating with the different levels of analyses in prior research (concept, state, individual differences), we examined boredom's differences/similarities amongst negative emotions at these levels. In Study 1, we explored how different/similar people consider the *concept* of boredom to be relative to 10 other negative emotions (sadness, anger, frustration, fear, disgust, feeling depressed<sup>1</sup>, guilt, shame, regret, and disappointment). In Study 2, we tested how different boredom emerges as *state* based on its correlations with these other negative emotions. In Study 3, we explored how boredom differs from these other negative emotions based on correlations among *individual differences* in people's tendencies to experience these emotions.

### **Qualifying Boredom's Distinctiveness**

After exploring and estimating the differences/similarities of boredom among other negative emotions, we sought to qualify these differences. Specifically, we examined in each study whether differences between the negative emotions were related to five appraisals that have been frequently associated with boredom in past research, including *affective valence* (i.e. pleasantness; Smith & Ellsworth, 1985), *arousal* (Mikulas & Vodanovich, 1993), *perceived challenge* (Csikszentmihalyi, 2000), *perceived meaningfulness* (Van Tilburg & Igou, 2012), and *attention* (Eastwood et al., 2012).

Of the 11 emotions, no less than four (anger, disgust, guilt, shame) have been linked to moral judgments in previous research (Haidt, 2003). Although we are not aware of empirical research indicating a direct link between moral judgment and boredom, some scholars have proposed that boredom breeds morally reprehensible behavior (e.g., *destructiveness*, see Fromm, 1963/2004; *monstrous essence*, see Heidegger, in Thiele, 1997). Moreover, boredom correlates such as aggression and out-group derogation (Dahlen et al., 2006; Van Tilburg & Igou, 2011) might reflect some moral dimension to boredom. Thus, we also included a *relevance to morality* dimension (Van Tilburg et al., 2016) to account for the

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<sup>1</sup> One may question if feeling depressed is an emotion. However, given that boredom is often implicated as correlate or precursor to depressive feelings in psychology (e.g., Erfani, 2004; Goldberg et al., 2011), we felt that it was valuable to nonetheless include it.

potential role that morality might play in characterizing the differences/similarities among the emotions.

We used the appraisal evaluations of the emotions in two ways: First, we examined how boredom and the other emotions differed on them, thus gaining a descriptive profile of boredom versus the other emotions. Second, we tested how much variance the appraisals accounted for in characterizing the differences between the emotions when *including* versus *excluding* boredom. This second step helped to identify what boredom uniquely ‘brings to the table’ among the emotions. That is, by comparing the explanatory value of the appraisals for all emotions versus all emotion except boredom, we were able to identify the most informative appraisals for distinguishing boredom in particular.

### Method

The three studies followed a similar approach with each consisting of two parts: In a first part, we assessed the differences between boredom and 10 other negative experiences, namely, sadness, anger, frustration, fear, disgust, depression, guilt, shame, regret, and disappointment. These *differences/similarities* were examined at the level of emotion lay concepts (Study 1), state experiences (Study 2), or individual differences (Study 3). In the second part of each study, participants evaluated the emotions on six appraisal dimensions that may characterize the differences/similarities between the emotions obtained in the first part. Afterwards, participants reported demographic information and were debriefed.

#### Emotion Differences/Similarities

**Study 1.** One hundred one participants (39 women, 62 men;  $M_{age} = 35.50$ ,  $SD_{age} = 13.04$ ) from the United States of America were recruited via *MTurk* ([www.MTurk.com](http://www.MTurk.com)). They indicated the extent to which each pair of the 11 emotions were different/similar to each other (“How different or similar do you consider the following emotions to be?”; 1=*very different*, 10=*very similar*). The order of the resultant 55 comparisons was randomized. The data originating from these comparisons were organized in an  $11 \times 11$  similarity matrix for each participant containing a similarity score for each of the emotion pairs.

**Study 2.** In this study we sought to test to what extent state boredom can be differentiated from other emotions based on their correlations. For this purpose, 136

University of Southampton psychology undergraduates (109 women, 25 men, 2 undisclosed;  $M_{age} = 19.72$ ,  $SD_{age} = 1.72$ ) were recruited for course credit. To ensure sufficient variation in these state experiences, we subjected participants to a context that was likely to elicit a range of emotions. They first watched an eight minute video clip<sup>2</sup>, after which they indicated their state experiences of the 11 emotions (e.g., “How intensely do you experience the following emotion, at this moment?”; 1 = *not at all*, 10 = *extremely intensely*). The order of these 11 questions was randomized.

We calculated the pair-wise correlations between each pair of emotions (Table 1) and used their absolute values as a proxy of difference/similarity between the emotions (Kruskal & Wish, 1978; Shepard, 1980). High correlations are analogous to a high level of similarity between two emotions, whereas low correlations are analogous to a high level of dissimilarity. Different from Study 1, in which each participant contributed an  $11 \times 11$  similarity matrix, we thus obtained a single  $11 \times 11$  similarity matrix in Study 2, containing absolute correlation coefficients.

**Study 3.** Two hundred four participants (88 women, 113 men, 3 undeclared;  $M_{age} = 36.39$ ,  $SD_{age} = 11.49$ ) from the United States of America were recruited using *MTurk*. Each indicated the extent to which they tended to experience the 11 emotions as a person (“How often do you experience the following emotion as a person?”; 1 = *not often at all*, 10 = *extremely often*). The order of these 11 questions was randomized. A correlation matrix was created (Table 3) based on the pair-wise associations between the emotions. The absolute correlations served as  $11 \times 11$  similarity matrix (Kruskal & Wish, 1978; Shepard, 1980) of individual differences in the proclivity to experience the emotions.

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<sup>2</sup> The video clip consisted of a documentary excerpt on Milgram’s (1963) famous behavioral study of obedience. We selected this clip because of the rich range of negative emotions it likely triggers (e.g., sadness, anger, disgust, etc.). Importantly, this clip had been shown on several occasions during the students’ psychology education, leading to experiences of boredom, as some students communicated. This capacity to elicit boredom as well as various other emotions thus made the clip an ideal for studying negative emotions at the state level. Indeed, this task sufficiently solicited boredom and the other emotions: descriptive statistics confirmed for each of the 11 emotions reasonable averages (each  $M \geq 3.04$  and  $M \leq 5.15$ ) with considerable standard deviations (all  $SD \geq 2.14$ ).

### Appraisal Dimensions

In the second part of each study, participants evaluated the 11 emotions on five appraisal dimensions derived from research on boredom: *affective valence* (i.e. pleasantness; Smith & Ellsworth, 1985), *arousal* (Mikulas & Vodanovich, 1993), *perceived challenge* (Csikszentmihalyi, 2000), *perceived meaningfulness* (Van Tilburg & Igou, 2012), and *attention* (Eastwood et al., 2012). Given that some of the emotions have been linked to moral judgments in earlier research and that boredom might affect moral judgment, we deemed it informative to also compare the emotions on *relevance to morality* (Van Tilburg et al., 2016), bringing the amount of evaluated appraisals to a total of six.

Before participants evaluated the emotions on each of the six appraisals, we gave them short descriptions of the appraisal constructs. This was done to facilitate participants' understanding of the particular appraisals. Participants read "Some emotions are associated with negative feelings whereas other emotions are associated with positive feelings" before evaluating the emotions' affective valence. They then read "Some emotions are associated with high levels of arousal (i.e., these emotions are very intense and make one feel alert) whereas other emotions are associated with low levels of arousal" before evaluating the emotions' arousal. Participants read "Some emotions are associated with feeling that you are doing something unchallenging whereas other emotions are associated with feeling that you are doing something challenging" before evaluating challenge. They read "Some emotions are associated with high levels of attention for what is going on whereas other emotions are associated with low levels of attention for what is going on" before evaluating attention. Participants read "Some emotions are associated with feeling that you are doing something meaningless whereas other emotions are associated with feeling that you are doing something meaningful" before evaluating meaning. They read "Some emotions are associated with morality (i.e., these emotions relate to the question of what makes a good or bad person) whereas other emotions are not associated with morality" prior to evaluating the emotions' relevance to morality (Van Tilburg et al., 2016).

After these descriptions, they then evaluated the emotions (e.g., for valence: "Please rate the positivity or negativity of the emotions listed below." 1 = *extremely negative*, 10 =

*extremely positive*). The order of the 11 emotions was randomized for each dimension; also the order of the evaluated appraisals was randomized.

## Results and Discussion

### Emotion Similarities/Differences

In Study 1, the comparison of emotions produced several similarity matrices. Study 2 and 3 each produced one similarity matrix. In Study 1, the matrixes consisted of explicit comparisons between emotions. In Study 2 and 3, the matrixes consisted of correlations between the emotions, with higher correlations reflecting greater similarity (e.g., Shepard, 1980). We subjected the matrices to interval-level multidimensional scaling analyses (Kruskal & Wish, 1978). A repeated structure was specified for the analysis of Study 1 given that each participant provided a separate similarity matrix.

Multidimensional scaling produces a spatial model of differences between variables using 1 or more dimensions, and the modeled distance between two variables within the resultant dimensional space is analogous to the estimated difference between the variables. The *Stress* associated with the models indicates how well a particular dimensional representation fits the observed data. *Stress* increases with fewer dimensions at the cost of model comprehensibility; *Stress* below .15 reflects adequate fit and turns into an excellent fit when below .10 (Kruskal and Wish, 1978; Jaworska & Chupetlovska-Anastasova, 2009). For each Study, a two-dimensional representation yielded sufficiently low *Stress* (*Stress* = 0.104, .014, and .035, respectively). These models are represented in Figure 1 through 3. We next performed 200 bootstraps to estimate the emotions' 95% confidence regions (Jacoby & Armstrong, 2014) as well as the confidence regions of the *differences* between boredom and each of the other emotions.<sup>3</sup>

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<sup>3</sup> For Study 1, each bootstrap contained 101 randomly selected similarity matrixes. For Study 2 and 3, each bootstrap contained an absolute correlation matrix based on 136 (Study 2) and 204 (Study 3) randomly selected participants. To obtain confidence regions, we followed Jacoby and Armstrong (2014): each of the bootstrapped matrixes were/was subjected to a multidimensional scaling analysis followed by Procrustean similarity transformations (Schöneman & Carroll, 1970). 95% confidence ellipsoids were drawn using the eigenvalues of the emotions' variance/covariance matrix containing these 200 transformed coordinates. To test whether boredom significantly differed from the other emotions we additionally

The multidimensional scaling analyses consistently placed boredom at a significant distance from each of the other emotions (all  $p < .05$ , in every study). Moreover, the models were surprisingly consistent in their results for boredom across the three levels of analyses. Across the three Studies, boredom was each time located the furthest away from the origin (0,0) of all 11 emotions. In case of the state emotions (Study 2) boredom even yielded a distance to the origin that was more than *twice* that of the next most distant emotion (regret). This pattern clearly indicates that boredom is comparatively distinct, whether examined as concept, state, or individual difference.<sup>4</sup>

The concept of boredom (Study 1) was considered to be least different from sadness, frustration, and feeling depressed, whereas disgust, anger, shame, guilt regret, and fear were considerably more different. This pattern of results was largely consistent with boredom's differentiation at the level of individual differences (Study 3), which similarly cast boredom as relatively less dissimilar to sadness, frustration, and feeling depressed, and further included disappointment as least dissimilar emotion. Results were somewhat different for state boredom (Study 2), where boredom differed extensively from all other emotions, being least different to feeling depressed, though far from similar.<sup>5</sup>

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estimated 95% confidence regions based on the *difference* in coordinates between boredom and the other emotions. None of these latter ellipsoids contained the coordinate (0,0).

<sup>4</sup> Note that the emotion similarities/differences (Study 1: lay comparisons, Study 2-3: correlations) are the basis for the derived spatial models and not the appraisals. Appraisals were rated after we assessed the emotions similarities/differences and in the analyses they were fitted to the models after the emotion coordinates were already determined. Thus, participants' ratings of the emotions on the appraisals did not determine the emotions' spatial coordinates; rather, the emotions' coordinates were based on the similarity matrices.

<sup>5</sup> To verify that results of Study 2 were not limited to the specific state boredom context, we also analyzed pilot data from 84 *MTurk* participants (41 women, 33 men, 10 undeclared;  $M_{\text{age}} = 37.16$ ,  $SD = 12.91$ ) from the United States of America. These participants performed either one of two boring tasks: Some ( $N = 30$ ) connected pairs of circles within 15 groups of 4-7 circles using non-intersecting lines (Van Tilburg & Igou, 2011); others ( $N = 54$ ) transcribed 10 references to literature about concrete (e.g., "S. H. Kosmatka & W. C. Panarese, 1988, Design and Control of Concrete Mixtures, Skokie, IL: Portland Cement Association"; Van Tilburg et al., 2013). As those in the main sample, they then indicated their state experiences, in random order, of the 11 emotions. The results again located boredom on the far right side of the primary (horizontal) axis, significantly distinct from all the other emotions. Details are available on request.

Boredom differed comparatively much from the other emotions at each level of analysis (concept, state, individual difference). Intriguingly, these differences were particularly strong for state boredom. Indeed, state boredom did not significantly correlate with any of the 11 other emotions (Table 1), whereas boredom positively correlated with all other emotions when examined as individual difference (Table 2). This finding suggests that the study of boredom at the state level—an approach that has recently intensified (Fahlman et al., 2013; Van Tilburg & Igou, 2012)—is particularly effective in order to understand its unique characteristics.

### Appraisal Dimensions

**Specific appraisal differences.** Thus far, we discussed only the relative spatial positioning of boredom among the 11 negative emotions. Next, we sought to identify *what underlies* these differences, based on the appraisal dimensions that participants evaluated. To this end, we subjected participants' ratings of each of the appraisals to within-subjects ANOVAs with the evaluated emotion as within-subjects factor.

In each of the three studies the emotions varied significantly and substantially from each other on *affective valence* (all  $p < .001$ , all  $\eta^2 \geq .14$ ), *arousal* (all  $p < .001$ , all  $\eta^2 \geq .41$ ), *relevance to morality* (all  $p < .001$ , all  $\eta^2 \geq .38$ ), *perceived challenge* (all  $p < .001$ , all  $\eta^2 \geq .32$ ), *perceived meaningfulness* (all  $p < .001$ , all  $\eta^2 \geq .15$ ), and *attention* (all  $p < .001$ , all  $\eta^2 \geq .33$ ). Furthermore, in each of the studies boredom was rated as significantly higher than *each* single other emotions on *affective valence* (all  $p < .001$ , all  $\eta^2 \geq .14$ ), and significantly lower on *arousal* (all  $p \leq .004$ , all  $\eta^2 \geq .08$ ), *relevance to morality* (all  $p < .001$ , all  $\eta^2 \geq .12$ ), *perceived challenge* (all  $p < .001$ , all  $\eta^2 \geq .14$ ), *perceived meaningfulness* (all  $p < .001$ , all  $\eta^2 \geq .16$ ), and *attention* (all  $p < .001$ , all  $\eta^2 \geq .16$ ).<sup>6</sup> These results clearly indicate that boredom can be differentiated from other emotions on the assessed appraisals. Overall, boredom was consistently characterized by relatively mild negative valence<sup>7</sup>, combined with low arousal,

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<sup>6</sup> Further descriptive and inferential statistics are available on request.

<sup>7</sup> Relatively mild *negative valence* is a more appropriate label than *positive valence* given that boredom received valence ratings that were below the scale midpoint. The other emotions scored even more negative.

low perceived challenge, low perceived meaningfulness, little attention, and little relevance to morality.

**Distinguishing emotions via appraisal models.** Above we examined the extent of the appraisal differences, not their utility for distinguishing the various emotions. For example, it could be that even though the emotions differ in the extent to which they are relevant to moral judgment and behavior, this ‘morality’ dimension may prove to be of relatively low importance for characterizing the overall differences between the emotions compared to, say, valence. Accordingly, we examined the utility of the appraisals for differentiations between the emotions by considering the two-dimensional models. Separately for each study and each appraisal, the appraisal ratings were regressed on the emotions’ dimensional coordinates in the multidimensional scaling models. The resultant standardized regression coefficients yield coordinates that define a vector starting at the models’ origins (Rusbult et al., 1993). The orientations of these appraisal vectors, superimposed in Figure 1, 2 and 3, reflect the angle at which these appraisals run through the two-dimensional space, whereas their lengths indicate how well they fit into the two-dimensional models (equivalent to the roots of their total explained variances). For example, *affective valence* roughly followed the horizontal axes, indicating that valence is more positive (or less negative) the more emotions are positioned to the left of the models. *Arousal*, on the other hand, roughly pointed towards the top-left corner in Figure 1 and 3. To clarify, this implies that the emotions above the diagonal originating at the bottom-left are relatively high in arousal, whereas those below the diagonal are relatively low in arousal. The orientations of the various appraisal vectors were strikingly similar across Study 1 and 3, describing differences in emotion concepts and individual differences respectively. The vectors in Study 2 were more or less the horizontally mirrored equivalents of those in Study 1 and 3.

The explained variances associated with the regressed appraisals are provided in Table 3 (“Total  $R^2$ ”). These explained variances indicate how well a given appraisal corresponds to the differences/similarities between the emotions in the models. Whereas the earlier analyses tested whether the emotions *differed* on the appraisals, the explained variances in Table 3 thus indicate how *useful* the appraisals are in characterizing the

differences/similarities among the emotions. Each of the appraisal vectors explained the relative differences between the emotions to a considerable degree (all  $R^2 \geq .24$ ).

In terms of lay concepts (Study 1), the emotions were particularly distinctive in terms of *arousal*, *relevance to morality*, and *attention*. *Affective valence*, *perceived challenge*, and *perceived meaningfulness* described the emotions' differences to a lesser extent. A somewhat similar picture emerged in relation to the emotions' dissimilarities/similarities in terms of individual differences (Study 3): *arousal* and *attention* corresponded well to the distances among the emotion, though *relevance to morality* did so to a lesser extent, followed by *perceived meaningfulness*, *perceived challenge*, and *affective valence*. For state emotions (Study 2), *attention* again corresponded well to the differences/similarities. However, here *perceive meaningfulness* emerged as particularly well-fitting appraisal. The other four appraisals, *valence*, *perceived challenge*, *relevance to morality*, and *arousal*, characterized the differences/similarities among emotion states to a lesser degree.

**Distinguishing boredom.** In the previous section we discussed the utility of the appraisals to characterize the two-dimensional models *in general*. Next, we tested which appraisals were useful for distinguishing boredom *in particular*. For that purpose, we again regressed the appraisals on the dimension coordinates of the emotions, but now *excluding* boredom. The subsequent change in explained variance then becomes a proxy for usefulness of a particular appraisal in differentiating boredom from the remaining emotions. The results of these analyses are reported in Table 3 (" $R^2$  Without Boredom" and " $R^2$  Difference").

Consistent with the prior analyses, boredom could be differentiated from the other emotions most easily as state, reflected in relatively high changes in explained variances across the appraisals in the corresponding Study 2. Strikingly, one appraisal was consistently the most useful, or second most useful in case of the concept comparisons, for distinguishing boredom from the other emotions: *perceived meaningfulness*. Across the models, the explained variance of perceived meaningfulness dropped considerably (relative to the differences in explained variances associated with the other appraisals) after excluding boredom. Besides *perceived meaningfulness*, also *attention* emerged as key appraisal that distinguished boredom from the other emotions, with the exception of the concept

differences/similarities in Study 1. *Arousal*, *relevance to morality*, and *perceived challenge* emerged as less important distinguishing features of boredom, at least in comparison to the other appraisals. *Affective valence* evidenced high utility in distinguishing boredom from the other emotions as concept, but less so at the level of state or individual difference. In all, these results indicate that in particular a perceived lack of meaningfulness and lack of attention set boredom apart from other negative emotions.

### **General Discussion**

We systematically examined whether boredom can be sufficiently differentiated from other negative emotions at the level of lay emotion concepts (Study 1), state experiences (Study 2), and individual differences (Study 3). We first examined the relative differences/similarities among 11 negative emotions, including boredom, and then examined how well six appraisals corresponded to these differences/similarities. Results consistently indicated that the concept of boredom as well as boredom experiences differ comparatively much from other negative emotions, more so than the other emotions tend to differ from each other. In terms of appraisals, boredom was evaluated as mild in negative affective valence, relatively low in arousal, with little relevance to morality, associated with low perceived challenge, low perceived meaningfulness, and low attention.

A considerable amount of literature has focused on boredom's existential connotations (e.g., Barbalet, 1999; Fahlman, et al., 2009; Van Tilburg et al., 2013). Our present results confirm that boredom involves low *perceived meaningfulness*. This existential feature of boredom is, moreover, highly useful to distinguish boredom from other negative emotions as concept, state, or individual difference. Especially on the basis of this feature, boredom differs from other negative emotions.

*Attention* emerged as appraisal that could consistently characterize the differences/similarities among the negative emotions across the three levels of analysis, each time boasting considerably high explained variance (65% and above). Eastwood and colleagues (2012) proposed that attention related processes are fundamental to understating what boredom is and what it does. Our findings corroborate this view from the perspective

that attention differentiated boredom considerably from other negative emotions, at least as state and individual difference.

Among all negative emotions, boredom was characterized by the least negative *affective valence*. Relative to other negative emotions boredom is only mildly unpleasant. This finding is broadly consistent with findings by Smith and Ellsworth (1985). Different from these researchers' findings, however, boredom's valence was not similar to that of disgust. It should be noted that although affective valence characterized the differences/similarities among the emotions in our three studies to a moderate degree, it did so much less than most of the other appraisals. Furthermore, affective valence was relatively ineffective for distinguishing boredom in particular from the other emotions, safe in terms of conceptual comparisons. This suggests that differentiating boredom from other emotions based on valence appraisals is not particularly fruitful.

The role of *arousal* in boredom has been much debated. Some researchers have argued that boredom is characterized by low arousal (e.g., Smith & Ellsworth, 1985; Vodanovich, 2003), whereas others suggested that boredom could be high in arousal (London, Schubert, & Washburn, 1972), that some but not all expressions of boredom involve high arousal (Goetz et al., 2014), or that boredom is mixed in arousal (Merrifield & Danckert, 2014). Our findings are consistent with the suggestion that boredom is characterized by *low* arousal. Relative to 10 other emotions, boredom consistently yielded least arousal. However, although arousal was useful for characterizing the differences among *all* 11 negative emotions, arousal was of relatively little utility for distinguishing boredom in particular. Specifically, other appraisals (perceived meaningfulness, attention) were more effective.

Our results further indicate that people consider boredom to be relatively unrelated to moral judgments and behaviors, at least significantly less than each of the other emotions. Likewise, boredom scored significantly lower than all other emotions in perceived challenge. However, *relevance to morality* and *perceived challenge* did not emerge as the most useful dimension to differentiate boredom. The results indicate that these features of boredom are only moderately instrumental for differencing boredom from other negative emotions.

### **Implications, Limitations, and Future Directions**

Overall, we chose a broad, integrative approach to examine differences between boredom and other negative emotions. Specifically, we considered lay perceptions of boredom as well as actual experiences of boredom by measuring both perceived differences and experienced emotions. After representing how similar or different the emotions were on the basis of people's perceptions (Study 1) and in terms of their concurrence in experience (Study 2 & 3), we then examined that perceived appraisals corresponded to these differences between emotions. We posed that boredom is an emotion that differs considerably from other emotions. The results of our studies support this notion: boredom was perceived as more dissimilar to other negative emotions than any other pair of negative emotions (Study 1). Likewise, the state experience of boredom (Study 2) or individual proclivity to experience boredom (Study 3) coincided comparatively little with other negative emotions.

We found striking consistency in the dissimilarity/similarity models, despite the three different levels of analysis we employed. Boredom was each time characterized by mild negative valence, low arousal, low perceived meaningfulness and challenge, and little relevance to morality. Whereas the different levels of analysis led some of the other negative emotions to take different positions in the models (e.g., fear, anger), boredom's location remained almost identical. This consistency suggests that while other negative emotions become more or less similar depending on whether examined as concept, state, or individual difference, boredom remains highly distinct regardless of its level of analysis.

Our findings take boredom back to early reflections on its nature and impact (e.g., Fromm, 1955; Martin et al., 2005; Thiele, 1997): boredom is an existential emotion that is characterized and differentiated based on the lack of perceived meaning that it entails. The finding that boredom involves a lack of perceived meaning is consistent with earlier theorizing (Barbalet, 1999) and empirical findings (e.g., Fahlman et al., 2009; Van Tilburg & Igou, 2011; Van Tilburg et al., 2013); our current work demonstrates that it is this existential element makes it also most distinct from negative emotions. Perhaps the uniqueness of the existential challenges signaled by boredom illuminates its social or evolutionary role.

Speculatively, the lack of purpose that boredom registers developed to regulate goal-pursuit, for example, by temporarily increasing people's sensitivity to the value of alternative goals.

Eastwood and colleagues (2012) argued that a lack of attention is the defining characteristic of boredom. In particular, these researchers articulated that boredom involves being aware of the inability "to successfully engage attention with internal (e.g., thoughts or feelings) or external (e.g., environmental stimuli) information required for participating in satisfying activity" (p. 484). People subsequently blame the (social) environment for their boredom. Our findings corroborate the proposed key role of attention and further show that a lack of attention distinguishes boredom from other negative emotions. Perhaps, boredom's lack of attention indicates that attention shifts elsewhere, for example directed towards identifying more meaningful courses of action (Van Tilburg & Igou, 2012).

Boring activities can lead to mind-wandering (Kane et al., 2007), or "stimulus-independent thought" (Killingsworth & Gilbert, 2010), due to a lack of engaging task-features that should sustain a person's attention (Eastwood et al., 2012). To be clear, although boredom may often lead to mind-wandering, a wandering mind may not necessarily feel bored, for example when people daydream (Schupak & Rosenthal, 2009). Although mind-wandering can prove detrimental to performance (see Mooneyham & Schooler, 2013), it can also foster inspiration and creativity (Baird, Smallwood, Mrazek, Kam, Franklin, & Schooler, 2012). In fact, Mooneyham and Schooler (2013) proposed that mind-wandering may serve a range of functions, including attention shifts to maintain goal-relevant behavior, brief moments of dishabituation to increase benefits from learning, or, indeed, relief from boredom.

Our finding that boredom is strongly characterized by a lack of attention *and* a lack of meaning may shed some light on the link between mind-wandering and boredom. We (Van Tilburg & Igou, 2011, 2016, in press) and others (Barbelet, 1999; Bench & Lench, 2013; Elpidorou, 2014) suggested that boredom's psychological functionality may be to steer people away from little rewarding (purposeless) activity towards more rewarding activity that facilitates (perceived) pursuit of high-value goals. Subjectively, behaviors that are perceived as instrumental in the pursuit of high-value goals are meaningful (Van Tilburg & Igou, 2013). Perhaps, mind-wandering in response to boredom fulfills exactly this role. Consistent with

Mooneyham and Schooler (2013), mind-wandering may offer bored people a tool for shifting attention towards potentially more valuable goals and their corresponding behaviors, facilitation self-regulation and mitigating boredom through the perceived meaning that such activity offers. Interestingly, some tentative support for this proposition was obtained in experimental and correlational work on *nostalgia*, a sentimental longing for the past (Wildschut, Sedikides, Arndt, & Routledge, 2006) and an antidote to boredom (Van Tilburg et al., 2013). These researchers found that bored people who were allowed to reflect freely on their past spontaneously engaged in nostalgic reverie. This impact of boredom was mediated by bored people's increased desire to engage in meaningful activity. Nostalgia, indeed, offered people a sense of meaning, potentially alleviating boredom (see also Sedikides, Wildschut, Arndt, & Routledge, 2008). Possibly, nostalgia here reflects a special case of more general mind-wandering strategies that people adopt in response to boredom.

The mind-wandering literature makes the distinction between spontaneous versus deliberate mind-wandering (Seli et al., 2014). Our measure of attention was not designed to distinguish between the two types of mind-wandering. It would be interesting for future research to further divide attention into two corresponding forms: intentional (in)attention versus unintentional (in)attention. Doing so may grant a deeper understanding of the type of mind-wandering with which boredom may be associated.

Given that boredom is different from the other negative emotions, one might raise the question whether boredom *is* in fact an emotion. The existing evidence indicates that it is. Emotions can be described from a componential perspective where many components (and sometimes all of them) are present across different emotions (e.g., Scherer, 1984), which is what Frijda (1988) referred to as a constitution of emotions that contains various 'laws.' Particularly noteworthy prototypical components include (a) a relatively coherent set of cognitive appraisals (Roseman, Spindel, & Jose, 1990), (b) a bodily/physiological component (Wallbott, 1998), (c) relevance to motivational processes (Roseman, Wiest, & Swartz, 1994), and (d) an identifiable cause (Beedie, Terry, & Lane, 2005). Boredom satisfies each of these features: (a: Smith & Ellsworth, 1985; b: Merrifield & Danckert, 2014, Wallbott, 1998; c: Van Tilburg & Igou, 2012; d: Van Tilburg et al., 2013). Consistently, several emotion experts

have treated (state) boredom as an emotion (e.g., Leary et al., 1986; Russell & Bullock, 1985; Smith & Ellsworth, 1985).

In the current research we examined boredom's differentiation from other negative emotions based on lay concept comparisons, correlations amongst states, and correlations amongst individual differences. We did not examine whether boredom can similarly be differentiated in terms of its antecedents or implications. Future research will do well to examine differentiations at the level of emotions' causes and consequences. For example, boredom may foster more meaning seeking behavior relative to disgust and anger, two emotions that consistently scored high on perceived meaning. Likewise, guilt and shame, two emotions highly relevant to morality may have a more pronounced impact on ethical decision making than boredom (see also Haidt, 2003).

We assessed the differences/similarities of boredom among negative emotions using single item assessment. We decided to use highly face valid single items that were consistent in phrasing to prevent potential method bias resulting from the use of a differently phrased emotion-specific measures. Although the use of single items can, though need not, reduce measurement validity, the relatively good fit and consistency of our models suggests that the single items measurement unlikely distorted our results. Indeed, individual differences research on boredom and anger, sadness, and feeling depressed (e.g., Dahlen et al., 2011; Vodanovich et al., 1991) yielded correlations with boredom that are comparable to those in the current research (Study 3).

In particular the findings that perceived challenge and arousal hold limited utility for differentiating boredom from the other negative emotions is striking: Prior research has focused much on these two or closely related aspects of boredom (e.g., Smith & Ellsworth, 1985; Van Tilburg & Igou, 2012; Vodanovich, 2003), typically emphasizing how these elements make boredom different from other states. To be clear, boredom does differ from the other emotions in terms of arousal and perceived challenge. Importantly, however, these aspects of boredom are not particularly helpful in distinguishing it from the other emotions. These results further emphasize the importance of differentiating boredom among other emotions without pre-imposing a set of dimensions on which this differentiation has to occur.

Specifically, arousal and perceived (lack of) challenge seem important distinguishing features of boredom as evident from significant differences on these dimensions compared to other emotions (e.g., Van Tilburg & Igou, 2012). Yet, when boredom is compared to other emotions without specifying what set of criteria people have to use in these comparisons, as we did currently, then other, more diagnostic appraisals surface (i.e. perceived meaning and attention).

Our findings indicate that people consider boredom to be a low arousal state. That is to say, participants evaluated arousal to be least intense for boredom compared to the other emotions. It may well be that the role of arousal within boredom is particularly complex, however. Research by Goetz and colleagues (2014) suggests that boredom sometimes involves comparatively high arousal. Further, Merrifield and Danckert (2014) found indications of both high and low arousal among bored individuals: relatively to controls, boredom increased heart rate and cortisol levels (both markers of high arousal) but decreased skin conductance (reflecting of low arousal). In addition, individual differences in boredom seem related to both behavioral approach motivations and inhibition motivations (see: Mercer-Lynn, Bar, & Eastwood, 2014). Might it be possible that boredom features both high and low arousal? Perhaps, over time (e.g., Goetz & Frenzel, 2006) state boredom develops from a low arousal state associated with assessment of the current situation (e.g., perceived lack of meaning, lack of challenge, and little attention), to a comparatively high arousal state characterized by a search for meaningful engagement, more challenge, and more stimulation (Eastwood et al., 2012; Merrifield & Danckert, 2013; Van Tilburg & Igou, 2012). This possibility is consistent with Inzlicht and Legault's (2014) notion that distress in the face of conflicting goals is a key feature of *emotion induced motivation* (see also Carver & Scheier, 2011). Clearly, the role of arousal within boredom remains an important direction for future study.

After we estimated the spatial models of the negative emotions in our research, we examined how the emotions' spatial positions corresponded to six appraisals. We selected these appraisals—valence, arousal, challenge, attention, meaning, and relevance to morality—based on earlier work on boredom that suggested their importance. Of course,

there may be other appraisals that can prove insightful in characterizing the differences between boredom and the other emotions, such as restlessness, irritability or apathy (e.g., Goetz et al., 2014; Van Tilburg & Igou, 2012). Although assessing different appraisals would not change the spatial coordinates of the emotions in our models, they could reveal other important differences among the emotions. Future research should examine complementary appraisals and test if lack of attention and perceived meaninglessness remain comparatively powerful in characterizing boredom's differences with other emotions. Likewise, it is worthwhile to test if the differences between boredom the other emotions can be characterized by other emotion features than appraisals, such as differences in facial expressions and physiology.

Our samples varied somewhat in gender ratio. Might this have affected our results? Average levels of boredom are usually higher for men than for women (e.g., Vodanovich & Kass, 1990), however, our analyses were not based on average levels of boredom but rather on boredom's perceived similarity to (Study 1), or correlations with (Study 2-3), other emotions. Future research should examine whether relevant individual differences, such as emotional intelligence (Salovey & Mayer, 1990), self-awareness (Moynihan et al., 2015), and gender, relate to the relative positioning of boredom amongst the other negative emotions.

In the present studies, we focused on negative emotions. As boredom is usually characterized as an unpleasant emotion (Eastwood et al., 2012; Van Tilburg & Igou, 2012; Vodanovich, 2003), we deemed it particularly worthwhile to include negative emotions as benchmarks for establishing boredom's distinctiveness. Nonetheless, it would be interesting for future research to examine also boredom's position relative to positive emotions. Such research could examine whether states such as curiosity, nostalgia, passion, or awe—each perhaps associated focused attention and finding meaning (e.g., Van Tilburg, Sedikides, & Wildschut, 2015)—emerge as spatial 'antagonists' of boredom.

In all, our research suggests that across different levels of analysis, lack of perceived meaning and low levels of attention contribute greatly to a differentiation of boredom in comparison to a range of negative emotions. Using multidimensional scaling, we could confirm earlier findings on characteristics of boredom, in particular that research of Eastwood

and colleagues (2012) and Van Tilburg & Igou (2011, 2012; Van Tilburg, Igou, & Sedikides, 2013). Arousal (Vodanovich, 2003), valence (e.g., Smith & Ellsworth, 1985) perceived challenge (e.g., Van Tilburg & Igou, 2011) and relevance to moral judgments and behavior (Van Tilburg et al., 2015) are comparably less helpful in distinguishing boredom from other negative emotions. Clarifying this relative distinctiveness of boredom amongst negative emotions, and identifying sources of this distinctiveness, is not only essential for developing theoretical understandings of boredom, but also provides opportunities for identifying and subsequently addressing undesirable behaviors stemming from boredom.

### **Conclusion**

Boredom and its consequences receive increasing attention in psychological science. Unfortunately, boredom remained relatively poorly understood and its operationalizations varied greatly. At the heart of this ambiguity lies the question whether boredom can be reasonably distinguished from other negative emotions, and if so, how. We tested boredom's distinctiveness relative to other negative emotions at the level of lay concepts (Study 1), state experiences (Study 2), and individual differences (Study 3). Our multidimensional scaling analyses consistently indicated that boredom is considerably different from other negative emotions. Furthermore, appraisal evaluations reflect that boredom boasts relatively mild negative valence, low arousal, low relevance to morality, low perceived challenge, low perceived meaning, and low attention. In particular the lack of meaningfulness and attention effectively differentiate boredom from other negative emotions.

These results lead to two key recommendations for researchers who investigate boredom, or who plan to join its increasingly popular study. First, we offer a reassurance: boredom is considerably distinct from other negative emotions and its specific scientific study is therefore deserving. Second, we set a challenge: because boredom is quite distinct, we urge boredom researchers—which include ourselves—to more carefully prevent confounding or confusing boredom with other emotions in future experimental induction, psychometric assessment, or conceptual discussion. We understand our research as constructive criticism of prior research, including our own work, to further advance and improve the validity of boredom research.

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Table 1: *Correlation Matrix of State Emotions (Study 2)*

	1	2	3	4	5	6	7	8	9	10
1 Boredom	-									
2 Sadness	-.012	-								
3 Anger	.064	.664	-							
4 Frustration	.114	.618	.718	-						
5 Fear	.116	.641	.553	.431	-					
6 Disgust	.026	.581	.698	.639	.439	-				
7 Feeling Depressed	.152	.559	.462	.433	.474	.317	-			
8 Guilt	.137	.479	.475	.468	.571	.303	.509	-		
9 Shame	.103	.654	.543	.521	.589	.570	.470	.654	-	
10 Regret	.158	.479	.416	.333	.593	.227	.571	.721	.519	-
11 Disappointment	.083	.631	.682	.592	.538	.717	.401	.379	.647	.357

*Note:* Correlation coefficients larger than .17 are significant at the .05-level.

Table 2: *Correlation Matrix of Individual Differences in Emotions (Study 3)*

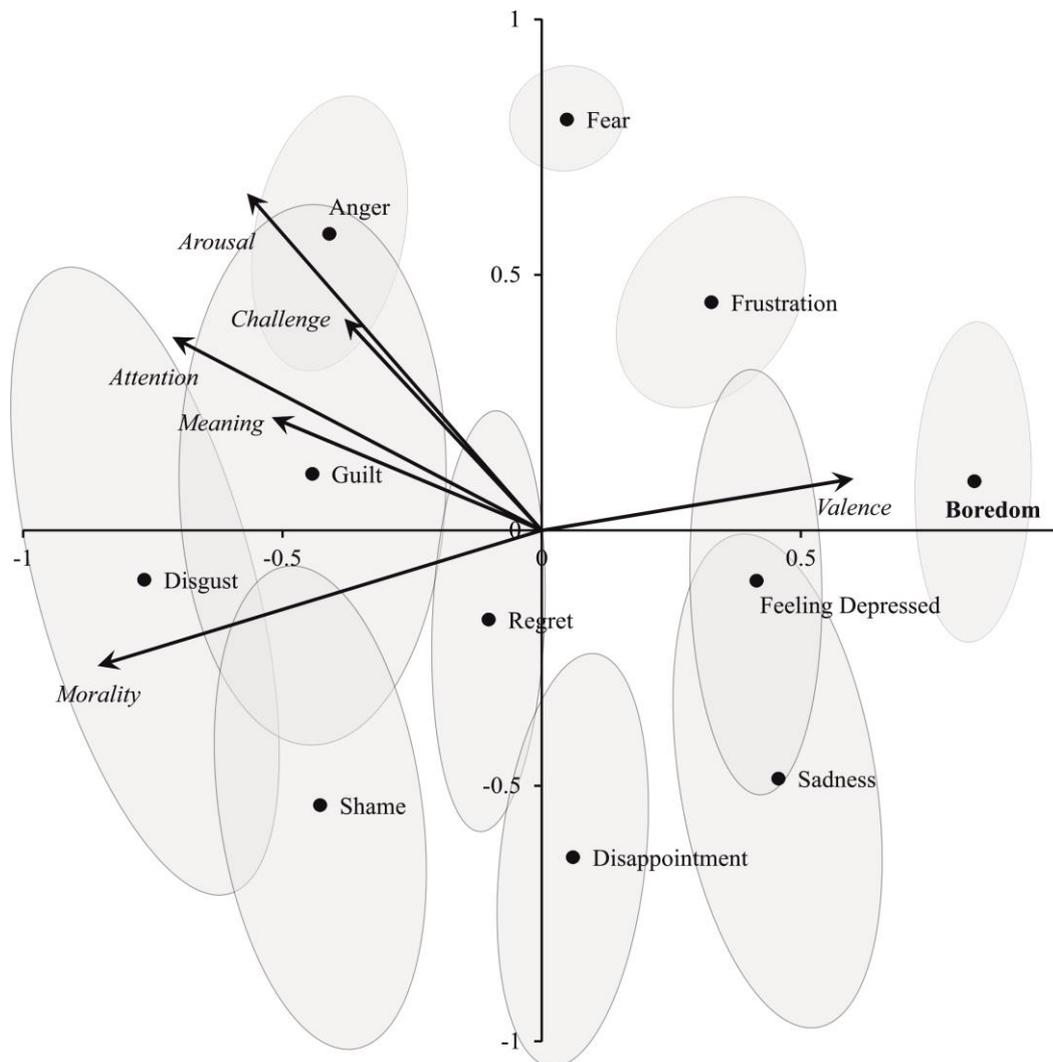
	1	2	3	4	5	6	7	8	9	10
1 Boredom	-									
2 Sadness	.379	-								
3 Anger	.414	.570	-							
4 Frustration	.452	.728	.602	-						
5 Fear	.354	.665	.557	.571	-					
6 Disgust	.402	.584	.614	.553	.524	-				
7 Feeling Depressed	.483	.831	.493	.721	.574	.495	-			
8 Guilt	.413	.584	.490	.583	.639	.625	.596	-		
9 Shame	.375	.521	.447	.496	.625	.604	.528	.819	-	
10 Regret	.469	.671	.510	.650	.561	.604	.662	.719	.671	-
11 Disappointment	.532	.748	.589	.738	.557	.572	.704	.602	.567	.745

*Note:* All correlation coefficients are significant at the .05-level.

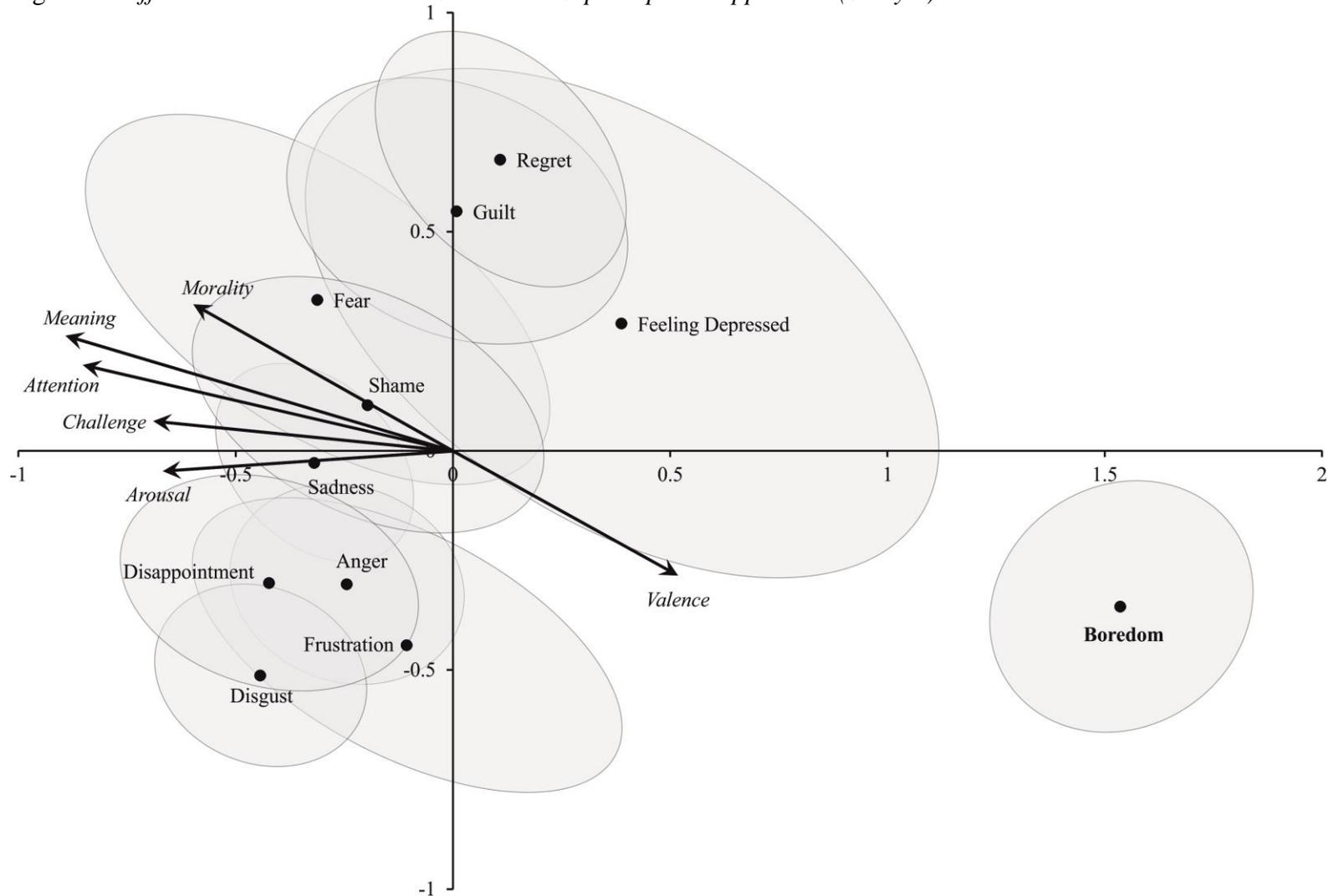
Table 3: *Explained Variance of the Appraisals Across Studies*

	Study 1			Study 2			Study 3		
	Total $R^2$	$R^2$ Without Boredom	$R^2$ Difference	Total $R^2$	$R^2$ Without Boredom	$R^2$ Difference	Total $R^2$	$R^2$ Without Boredom	$R^2$ Difference
Valence	0.37	0.10	0.28 <sub>1</sub>	0.35	0.23	0.12 <sub>6</sub>	0.24	0.13	0.12 <sub>5</sub>
Arousal	0.76	0.78	-0.02 <sub>5</sub>	0.45	0.16	0.29 <sub>5</sub>	0.66	0.55	0.11 <sub>6</sub>
Morality	0.80	0.73	0.07 <sub>3</sub>	0.47	0.11	0.36 <sub>4</sub>	0.47	0.32	0.15 <sub>4</sub>
Challenge	0.32	0.34	-0.03 <sub>6</sub>	0.48	0.05	0.44 <sub>3</sub>	0.31	0.13	0.17 <sub>3</sub>
Meaning	0.32	0.21	0.11 <sub>2</sub>	0.86	0.19	0.67 <sub>1</sub>	0.37	0.03	0.35 <sub>1</sub>
Attention	0.65	0.67	-0.02 <sub>4</sub>	0.76	0.26	0.50 <sub>2</sub>	0.70	0.43	0.27 <sub>2</sub>

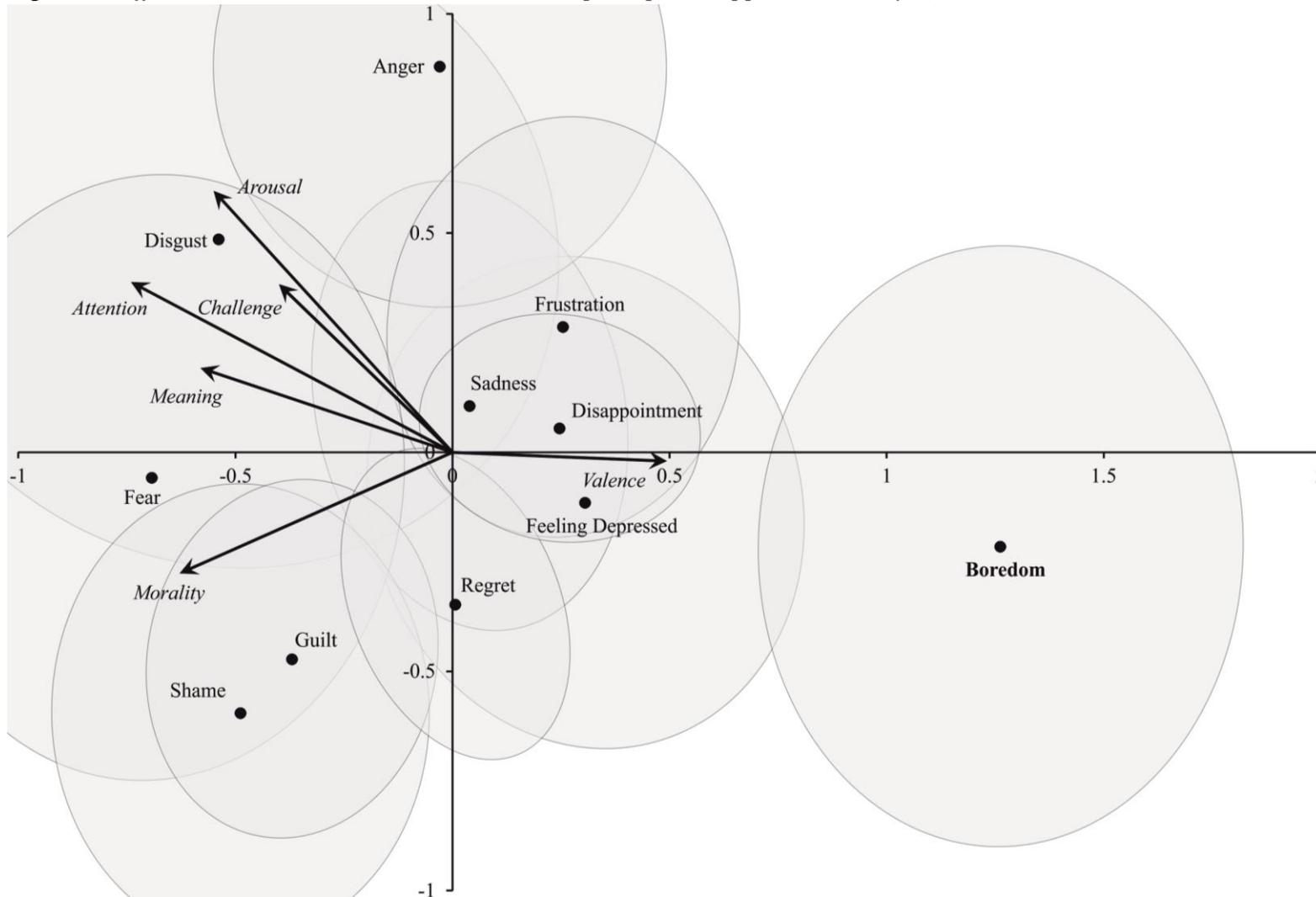
*Note:* Subscripts indicate the relative size of Difference in  $R^2$ , from highest (1) to lowest (6) within each study.

Figure 1: *Differences between Emotion Concepts with Superimposed Appraisals (Study 1)*

*Note:* Dots represent emotion positions on dimension 1 (horizontal) and 2 (vertical). Ellipses around emotions represent their bootstrapped 95% confidence regions. Vectors indicate orientation (angle) and fit (length) of superimposed appraisals, with italicized labels.

Figure 2: *Differences between Emotion States with Superimposed Appraisals (Study 2)*

*Note:* Dots represent emotion positions on dimension 1 (horizontal) and 2 (vertical). Ellipses around emotions represent their bootstrapped 95% confidence regions. Vectors indicate orientation (angle) and fit (length) of superimposed appraisals, with italicized labels.

Figure 3: *Differences between Emotion States with Superimposed Appraisals (Study 3)*

*Note:* Dots represent emotion positions on dimension 1 (horizontal) and 2 (vertical). Ellipses around emotions represent their bootstrapped 95% confidence regions. Vectors indicate orientation (angle) and fit (length) of superimposed appraisals, with italicized labels.