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The Unengaged Mind: Defining Boredom in Terms of Attention

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Abstract

Our central goal is to provide a definition of boredom in terms of the underlying mental processes that occur during an instance of boredom. Through the synthesis of psychodynamic, existential, arousal, and cognitive theories of boredom, we argue that boredom is universally conceptualized as "the aversive experience of wanting, but being unable, to engage in satisfying activity." We propose to map this conceptualization onto underlying mental processes. Specifically, we propose that boredom be defined in terms of *attention*. That is, boredom is the aversive state that occurs when we (a) are not able to successfully engage attention with internal (e.g., thoughts or feelings) or external (e.g., environmental stimuli) information required for participating in satisfying activity, (b) are focused on the fact that we are not able to engage attention and participate in satisfying activity, and (c) attribute the cause of our aversive state to the environment. We believe that our definition of boredom fully accounts for the phenomenal experience of boredom, brings existing theories of boredom into dialogue with one another, and suggests specific directions for future research on boredom and attention.

Keywords

boredom, attention, emotion

Boredom is Not Trivial

You are sitting in the reception area of your doctor's office awaiting your appointment. You've been waiting a long time. The magazines are uninteresting. The pictures on the wall are dull. You find yourself repeatedly looking at the clock on the wall, watching the second hand move so excruciatingly slowly that you are sure it must be broken. It's not. You feel depleted and irritated about being stuck in this seemingly endless moment. You want to be engaged by something—anything—when the thought, so familiar from childhood, comes to mind: "I'm bored!"

Boredom is a common problem. In a survey of North American youth, 91% of respondents reported that they experience boredom (The National Center on Addiction and Substance Abuse, 2003). It is often perceived as a fairly trivial and temporary discomfort that can be alleviated by a simple change in circumstances, such as finally being called into the doctor's examining room. However, boredom can also be a chronic and pervasive stressor with significant psychosocial consequences. Indeed, boredom is even associated with mortality, lending grim weight to the popular phrase "bored to death" (Bloomfield & Kennedy, 2006; Britton & Shipley, 2010; Maltsberger, 2000).

Research has shown that boredom and the propensity to experience boredom are associated with a range of psychological, social, and physical health difficulties. For example, boredom is correlated with mental health symptoms, such as depression and anxiety (Goldberg, Eastwood, LaGuardia, & Danckert, 2011; LePera, 2011; Sommers & Vodanovich, 2000), alexithymia (Eastwood, Cavaliere, Fahlman, & Eastwood, 2007), and somatization complaints (Sommers & Vodanovich, 2000). Furthermore, boredom has been identified as a complicating factor in the psychiatric rehabilitation of mental disorders, such as schizophrenia (Newell, Harries, & Ayers, 2011; Todman, 2003), and in recovery from traumatic brain injury (Kreutzer, Seel, & Gourley, 2001; Oddy, Humphrey, & Uttley, 1978; Seel & Kreutzer, 2003). Boredom is also negatively correlated with a sense of purpose in life (Fahlman, Mercer, Gaskovski, Eastwood, & Eastwood, 2009; Melton & Schulenberg, 2007; van Tilburg & Igou, 2011). On a behavioral

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level, boredom is linked with impulse control deficits such as overeating and binge eating (Stickney & Miltenberger, 1999), drug and alcohol abuse (Lee, Neighbors, & Woods, 2007; LePera, 2011; Wiesbeck et al., 1996), and problem gambling (Mercer & Eastwood, 2010). Boredom at work (Fisher, in press) can cause serious accidents if safety depends on continuous vigilance, as in medical monitoring or long-haul truck driving (Kass, Beede, & Vodanovich, 2010; O'Hanlon, 1981; Weinger, 1999). It is clear, therefore, that far from being trivial, boredom can be a serious problem. Unfortunately, the scientific study of boredom remains a relatively obscure niche and boredom itself is still poorly understood.

The central purpose of this article is to provide a definition of boredom in terms of the underlying mental processes that occur during an instance of boredom. Currently, boredom is typically defined somewhat imprecisely in terms of what it feels like to be bored—that is, the experiential components of boredom. In this article, we seek to map these experiential components onto their underlying mental processes. We believe that our definition of boredom will be satisfying to the full spectrum of boredom researchers and, given its precision, will support empirical research that would otherwise not be possible. We view the task of offering a definition of boredom to be an important but distinct task from the goal of explaining the cause of boredom. In this article, we first establish a common definition of boredom, and then explore the attention-boredom link in detail and synthesize research findings. We also argue that defining boredom with attention at the core can account for the diverse experiential aspects of boredom. We briefly embed our definition of boredom into a broader framework that includes the possible causes of boredom. Finally, we conclude with recommendations for future research. See Figure 1 for a schematic summary.

Existing Theories and a Common Definition of Boredom

Lipps (1903) proposed one of the earliest psychodynamic definitions of boredom: "Boredom is a feeling of unpleasure arising out of a conflict between a need for intense mental activity and

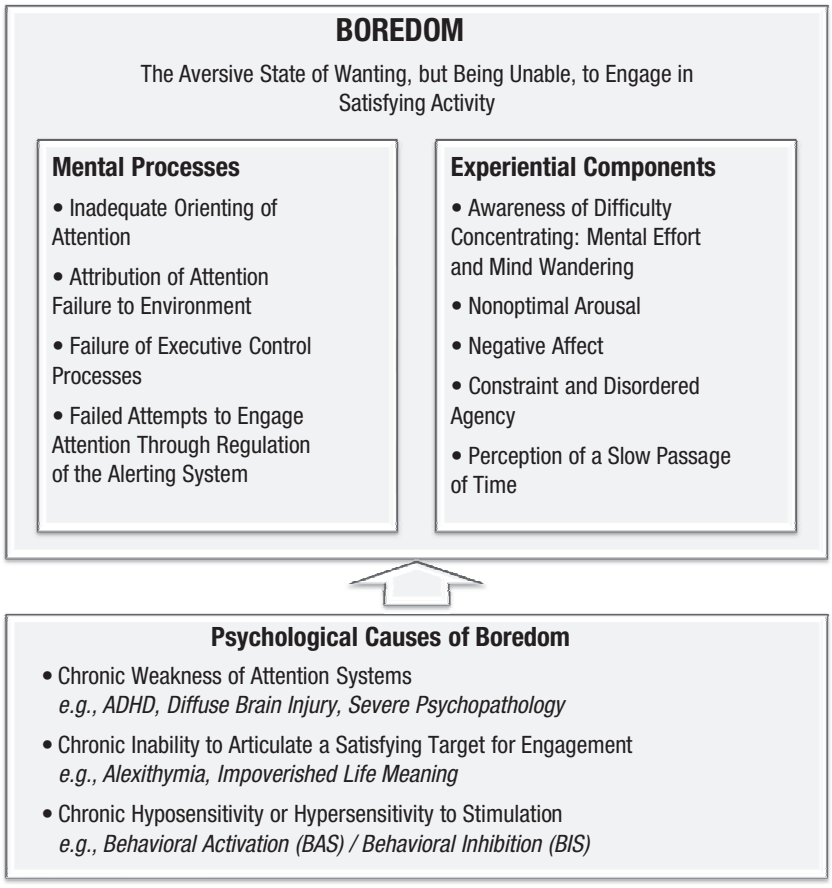

Fig. 1. A schematic representation of the central aspects of the article. The top panel summarizes the proposed definition of boredom and the relation between the mental processes and the experiential components that define the state of boredom. The bottom panel summarizes potential psychological causes of boredom entailed by existing boredom theories (related individual difference traits are italicized). Note that environmental factors such as the level and type of stimulation that is available are likely important external variables that influence whether or not an individual experiences boredom in a given situation, but these are not the focus of the present model.

lack of incitement to it, or inability to be incited" (cited in Fenichel, 1953, p. 292). Subsequent psychoanalytic writers (e.g., Fenichel, 1953; Greenson, 1953; Lewinsky, 1943) also argued that boredom involves the desire for mental engagement and the simultaneous inhibition of such engagement; however, they further emphasized that the bored individual is unable to articulate what it is that he or she desires or wants to do. In sum, to be bored, according to the psychodynamic theory, is to be in a state of longing for activity but unaware of what it is that one desires and to look to the world to solve the impasse.

Most existential definitions of boredom include a sense of emptiness, meaninglessness and a paralysis of agency—the bored individual is unable to find impetus for action, is withdrawn from the world, and experiences life as meaningless (e.g., Frankl, 1984; Maddi, 1970). For example, Maddi (1970) proposed a malady called "existential sickness or neurosis," which he described as "a settled, continuous state of meaningless, apathy, and aimlessness" that involves a "general absence of emotions, pleasant or unpleasant, with the exception of boredom" (p. 140). Thus, the definition of boredom from the existential tradition emphasizes the aversive experience of inaction, emptiness, paralysis of will, and meaning not realized.

Arousal theories define boredom as the state of nonoptimal arousal that ensues when there is a mismatch between an individual's needed arousal and the availability of environmental stimulation. More specifically, the environment may present too much or too little challenge and thus does not afford satisfying activity (e.g., Berlyne, 1960; Csikszentmihalyi, 1975, 1990; De Chenne, 1988; Hebb, 1966; O'Hanlon, 1981; Zuckerman, 1979). Thus, according to arousal theories, boredom is the aversive state that occurs when it is not possible to achieve an optimal level of arousal through engagement with the environment.

Whereas arousal theories focus on the stimulating qualities of the environment itself, cognitive theories focus on the individuals' perception of their environment as monotonous (e.g., Hamilton, Haier, & Buchsbaum, 1984; Hill & Perkins, 1985) or uninteresting (Fisher, 1993; Sundberg, Latkin, Farmer, & Saoud, 1991). In addition, cognitive theories of boredom emphasize that bored individuals suffer from poor concentration and are forced to control their attention with effort (Fisher, 1993; Hamilton, 1981; Harris, 2000; Todman, 2003). Thus, the definition of boredom from the cognitive perspective emphasizes both attributions about the environment lacking opportunities for satisfying activity, as well as the impaired ability to concentrate.

Although the psychodynamic, existential, arousal, and cognitive theories differ in important ways, they agree that, by definition, the bored person wishes to, but is unable to, become engrossed in satisfying activity. Boredom is the experience of being disengaged and stuck in an endless dissatisfying present. Although the bored person typically laments an impoverished environment, the reality is that "'boringness' isn't out there; it is between there and us" (Conrad, 1997; p. 474). In the next section, we characterize the disengagement that is a central component of boredom in terms of attention.

Attention Failure as the Defining Underlying Mental Process in Boredom

We propose to define boredom as the aversive state that occurs when we (a) are not able to successfully engage attention with internal (e.g., thoughts or feelings) or external (e.g., environmental stimuli) information required for participating in satisfying activity; (b) are aware of the fact that we are not able to engage attention and participate in satisfying activity, which can take the form of either awareness of a high degree of mental effort expended in an attempt to engage with the task at hand or awareness of engagement with task-unrelated concerns (e.g., mind wandering); and (c) attribute the cause of our aversive state to the environment (e.g., "this task is boring", "there is nothing to do"). We will now organize our review of existing research on attention and boredom according to the three broad networks of attention that have been identified (M. I. Posner & Petersen, 1990; see M. I. Posner & Rothbart, 2007, for a review); namely, the orienting, executive, and alerting attention networks.

Inadequate orienting of attention and attribution of attention difficulties to the environment

The orienting network selectively allocates attention to task-relevant or otherwise salient information. We argue that misallocation of attention that disrupts adequate engagement with information pertaining to the current activity can lead to boredom. Two studies that experimentally manipulated the level of distraction that occurred while participants performed a task (Damrad-Frye & Laird, 1989; Fisher, 1998) provide tentative evidence in favor of this view.

In Damrad-Frye and Laird's (1989) study, participants were asked to listen to the reading of a moderately interesting article with the aim of remembering its content. During this task, a TV in the adjacent room played an unrelated program at a loud and clearly noticeable volume level, a moderate and barely noticeable level, or while muted. Participants were then asked to rate their current levels of interest and boredom, as well as their enjoyment of the primary task. Those who had been exposed to barely noticeable noise levels were unaware of the source of distraction but reported greater levels of boredom and found the task less interesting than did participants in the loud and muted conditions. This shows that subtle distraction can be associated with higher levels of boredom.

Fisher (1998) also examined the impact of distraction on boredom, additionally manipulating the level of attentional demands of the primary task and the emotional salience of the distraction. Participants performed either a repetitive assembly task that required little attention, a proofreading task that

was uninteresting and required sustained monitoring, or a complex management task that demanded attention but was designed to be diverse and interesting. Interruptions occurred in the form of conversations among other people in the same room; these were of a personal nature, prompting participants to reflect on their own feelings (i.e., affectively salient), or of a technical nature (i.e., not salient). Participants were then asked about their perception of the task, including level of interest, feelings of enjoyment or frustration, and amount of mind wandering. Whereas levels of boredom in the Damrad-Frye and Laird (1989) study depended on the salience of the interruptions, boredom levels in Fisher's (1998) study were influenced by the degree of the attentional demand of the primary task. Participants who were disrupted while performing the task requiring low levels of attention reported lower boredom ratings than did participants in a control condition without distraction. Distraction had no effect on boredom ratings during the tasks that required more substantial engagement of attention. This finding suggests that boredom during a task that can be completed without focused attention may be reduced by distraction because the individual can let their mind focus on more rewarding mental activity.

At first glance, the results of these two studies appear contradictory in terms of the nature of the effect of distraction on boredom: Damrad-Frye and Laird (1989) reported elevated levels of boredom in the presence of distraction, whereas Fisher (1998) observed reduced boredom. Although actual task performance was not measured in either study, a reasonable interpretation is that boredom may be elevated when distracting attention is detrimental to the task at hand but may be mitigated by distraction when the task does not require focused attention in the first place. Both sets of authors explain their findings in terms of the participants' attribution of their attentional failure. In Damrad-Frye and Laird's study, participants who were exposed to barely noticeable noise attributed their distractibility to the "boring" task material, whereas those in the loud condition who experienced less boredom accurately blamed the television. In Fisher's study, the source of distraction was always blatant and unambiguous, akin to Damrad-Frye and Laird's loud condition. Indeed, Fisher suggested that this factor was the likely reason for the lack of elevated boredom levels during the attentionally demanding tasks. In support of this notion, a recent study that manipulated mind wandering during a task found that boredom did not occur when participants were aware of the true locus of their distraction (Critcher & Gilovich, 2010).

In sum, the evidence regarding the role of the orienting network supports the view that distracting attention can lead to boredom. However, merely distracting attention appears to be an insufficient condition for experiencing boredom; boredom also seems to depend on performance failures and the attribution of difficulties to the current activity. This may be an erroneous attribution, such as when an unrelated external source covertly diverts attention (Damrad-Frye & Laird, 1989), or it may be an appropriate attribution, such as when sustained attention is required for a task that offers few incentives for continued engagement.

Failure of executive control processes and awareness of difficulty concentrating: Mental effort and mind wandering

Tasks that involve monitoring for rare and randomly occurring events rely greatly on the executive network of attention because they require controlled deployment of attention over extended intervals and are associated with mental effort (Deaton & Parasuraman, 1993). A typical vigilance task is long (e.g., 90 min; Pattyn, Neyt, Henderickx, & Soetens, 2008) and monotonous, requiring participants to continuously monitor a display for detection signals that are rare and difficult to spot. Due to the rare occurrence and the low signal-to-noise ratio of critical events, sustained attention (vigilance) tasks are largely devoid of exogenous support for keeping attention focused. Thus, they provide a measure of the ability to self-sustain attention over time by assessing the quality of performance as a function of task duration; a decline in performance (called *vigilance decrement*; Davies & Parasuraman, 1982) reflects a failure to sustain attention. The vigilance task is the epitome of a boring task, and thus has been employed to examine the relationship between boredom and sustained attention.

Most research findings indicate a clear association between boredom and vigilance decrement. For example, Thackray, Bailey, and Touchstone (1977) showed that participants who reported high levels of boredom performed worse on a vigilance task than those who were not bored. Scerbo (1998) conducted a series of studies likewise demonstrating a close correlation between boredom and vigilance decrement. As participants monitored a display for occasional stimulus changes, levels of boredom consistently increased in tandem with a decline in overt performance (see also Pattyn et al., 2008). When participants monitored a display for stimulus changes that were either easily noticeable or inconspicuous, boredom ratings were similar for both versions of the task, even though overall performance was better in the easy task. However, as task performance declined over time, levels of boredom increased in both tasks (Scerbo, 1998). This finding implies that boredom may be more strongly linked to a dynamic change in the ability to sustain attention over time rather than the absolute demand for sustained attention at any given moment.

There is one study, however, that questions the extent to which boredom is related to attentional vigilance. Hitchcock, Dember, Warm, Moroney, and See (1999) used a vigilance task that included "difficult" and "easy" conditions. Both conditions involved tedious tasks, but a cue signaled the imminent arrival of the target in one condition, whereas the target was uncued in the other condition. Vigilance decrements were obtained in the uncued condition but not in the cued condition. Despite these performance differences, boredom scores, assessed by

Scerbo's (1998) task-related boredom scale, were similar in each condition.

In Hitchcock et al.'s (1999) experiment, the cue was 100% valid, thereby completely eliminating the need to monitor displays throughout the experiment. In other words, participants could do the task successfully and yet disengage attention from the task in the cued condition. Furthermore, participants were asked to report the boringness of the task itself. Thus, although participants may well have entertained themselves with daydreaming because there was no need to continuously attend to the task, the task itself would have been perceived as boring. These two aspects of the task—100% cue validity and the task appraisal measure—could explain the elevated boredom ratings despite an apparent lack of sustained attentional failure in the cued condition.

An unresolved issue is whether it is the ability to sustain attention per se or the concomitant perceived effort that drives the relationship between boredom and vigilance tasks. All vigilance tasks require effort, and perceived effort will typically increase as performance decreases. In Thackray et al.'s (1977) study, participants who were bored also found performing the task more effortful, indicating an increased demand on executive attention processes when bored. However, research has not yet attempted to disentangle effort and performance.

The relationship between sustained attention failure and boredom may depend to some degree on ongoing performance monitoring. This notion is consistent with the evidence that the relationship between failures of the orienting system and boredom may be moderated by task appraisal as described above. It is possible that awareness of increased effort and/or task-unrelated mind wandering signals a failure of sustained attention and contributes to the experience of boredom rather than the attentional failure itself. Indeed, recent neuroimaging results indicate that activity within a ventral region of the posterior cingulate cortex (vPCC) may reflect the extent to which attention is diverted to off-task internally generated thought (Leech, Kamourieh, Beckmann, & Sharp, 2011). Fluctuations of activity within such a neural circuit may reflect failures to prevent mind wandering. This may explain why individuals with high sustained-attention skills show a relatively lower incidence of such vPCC activity fluctuations than do their poorer performing counterparts and why they show relatively greater functional connectivity between the vPCC and the temporal-parietal junction component of the attention orienting system (Pagnoni, 2012).

It is important to make a distinction between task-unrelated mind wandering and task-related imagination. For example, although daydreaming can be experienced as pleasant, instances of task-unrelated mind wandering that are associated with failures to engage attention with the ongoing task have in fact been linked with negative mood (e.g., Carriere, Cheyne, & Smilek, 2008; Killingsworth & Gilbert, 2010; Smallwood, O'Connor, Sudbery, & Obonsawin, 2007). It is also worth noting that task-unrelated mind wandering (Smallwood & Schooler, 2006) can project the individual to more pleasant scenarios than the one to which they are currently confined. With the exception of situations in which the individual is fully immersed in his or her fantasy world and thus unable to reflect on the fact that their mind wandering is "off-topic", mind wandering would emphasize the discrepancy between the dullness of the current condition and an unfulfilled yearning for more desirable activity. This discrepancy would exacerbate the sense of constraint or being trapped in an unwanted situation that is one of the hallmarks of boredom (cf. Todman, 2003). Indeed, Critcher and Gilovich (2010) found that letting the mind wander to enjoyable scenarios—rather than scenarios with negative connotations—reduces satisfaction with the current activity and leads to perceptions of task boredom.

In contrast, task-related imagination, such as turning the task at hand into a game or mental cinema, may serve to increase the degree of intrinsic interest in the task. Indeed, when the content of imagination is related to the task at hand, then less negative mood is experienced (Csikszentmihalyi, 1978). Furthermore, imagination that is related to the task may improve task performance by promoting successful engagement with the current task. Task-relevant imagination could thus facilitate absorption and thereby attenuate the experience of attentional failure and effort, as well as, by extension, levels of boredom.

In sum, boredom is particularly likely to occur when a task provides little external support for keeping attention engaged, such that performance relies instead on self-sustained attention. Whether or not boredom is experienced in such situations is likely influenced by meta-awareness of the inadequacy of attentional engagement, which may be signaled by the increased effort involved in pursuing the current activity or by task-unrelated mind wandering. When fully absorbed in task-unrelated mind wandering, an individual may not feel bored at the time, but he or she will still report that the task itself was boring after the fact. Further, task-related imagination might serve to bolster absorption in the task at hand and thus decrease boredom.

Failed attempts to engage attention through regulation of the alerting system

Arousal is a state of physiological reactivity, ranging from low (calm) to high (excitement) and is a crucial component of attention as it fuels higher-level attentional operations. The diffuse brain regions thought to be central for regulating levels of arousal are referred to as the alerting network. Organisms generally strive to achieve an optimal level of arousal that is relative to the demands of the current situation, whereby both underarousal and overarousal are detrimental to attention, task performance, and well-being (e.g., Freeman, Mikulka, Scerbo, & Scott, 2004). Accordingly, we propose that low or high levels of arousal render efforts to engage attention ineffective and thus result in boredom.

Boredom is often defined as a negative mood state characterized by low arousal due to inadequate external stimulation

(e.g., Hebb, 1966; Mikulas & Vodanovich, 1993; J. Posner, Russell, & Peterson, 2005). However, evidence and theory suggests that boredom comprises states of high arousal as well. On the one hand, participants report lethargy and a "dispiriting lack of energy" (e.g., Martin, Sadlo, & Stew, 2006, p. 206) during boredom, which is consistent with low arousal; on the other hand, it is reported that boredom involves feelings of restlessness and irritability, which is consistent with elevated arousal (e.g., Harris, 2000; Martin et al., 2006). Indeed, consistent with theory and qualitative findings, boredom has been linked to both decreasing and increasing levels of arousal during tasks that require continuous monitoring for rare target events (London, Schubert, & Washburn, 1972; Pattyn et al., 2008). Pattyn et al.'s (2008) participants performed a prolonged target detection task with low target probability, during which heart rate and respiration were measured. Participants reported being bothered by the long duration of the experiment and increasingly engaging in mind wandering, suggesting that they grew bored as the task dragged on. Heart rate decreased over time, indicating diminishing arousal as boredom increased. However, increased arousal has also been observed in conjunction with boring tasks (Lundberg, Melin, Evans, & Holmberg, 1993; Ohsuga, Shimono, & Genno, 2001). For example, London et al. (1972) reported elevated galvanic skin responses and heart rate during monotonous tasks that were perceived as boring.

We suspect that that low and high arousal may occur during different stages of a given episode of boredom and depend on the nature of the situation that gives rise to boredom. When an individual is aware that they are failing to effectively engage attention, they may attempt to bolster attentional processes by increasing arousal. Inadequate external stimulation may require that the individual exert effortful control over their focus of attention to compensate for the lack of exogenous engagement of attention (see Fisher (in press) for a broader discussion of regulating boredom). In this regard, boredom can be characterized by low arousal associated with inadequate external stimulation, as well as high internal arousal and frustration associated with the struggle to keep attention focused (see Berlyne, 1960; Hamilton, 1981; O'Hanlon, 1981; Smith, 1981; and Thackray, 1981, for similar arguments).

Attention and the Defining Experiential Components of Boredom

The diverse range of experiences that boredom encompasses can be grouped into the following broad categories: awareness of difficulty concentrating; nonoptimal arousal; a negative, aversive emotional state; constraint and disrupted agency; and a perceived slow passage of time (see also Fahlman, Mercer-Lynn, Flora, & Eastwood, 2011). The first two experiential components of boredom—difficulty concentrating and nonoptimal arousal—have already been examined in detail above and are explained by our conceptualization of attentional problems as the final mediating mechanism of boredom; thus, these components will not be addressed further. We will now explore how attention can account for the remaining defining experiential components of boredom: negative affect, disruption of agency, and the perception that time is passing slowly.

Negative affect

Boredom is an aversive state that is characterized by feelings of displeasure, sadness, emptiness, anxiety, and even anger (Bailey, Thackray, Pearl, & Parish, 1976; Csikszentmihalyi, 1975; Fahlman et al., 2011; Greenson, 1953; Hartocollis, 1972; Hill & Perkins, 1985; Vodanovich, Verner, & Gilbride, 1991). At first glance, it may be difficult to see how attention factors into these affective experiences. In fact, attention is closely linked to emotion (Ribot, 1890; Vuilleumier & Driver, 2007; Yiend, 2010). For example, growing evidence suggests that selective attention has affective consequences. In particular, stimuli from which attention is withdrawn are subsequently evaluated more negatively than novel items or stimuli that have previously been the focus of attention (for reviews, see Fenske & Raymond, 2006; Raymond, 2009).

With regard to boredom, the finding that unattended stimuli are disliked (Raymond, Fenske, & Tavassoli, 2003) mirrors Damrad-Frye and Laird's (1989) observation that diverting attention away from the task at hand leads to its negative appraisal as boring. More fundamentally, we propose that misallocation or inadequate focus of attention can also account for the negative emotional states within the individual.

Successful allocation of attention yields fluent information processing by reducing interference and facilitating goal-related cognitive processes as information flows from sensory encoding to response selection and execution stages. Smooth processing is akin to the sense of "flow," in which an individual is fully absorbed in the current activity and experiences positive affect and a rewarding sense of intrinsic enjoyment (e.g., Nakamura & Csikszentmihalyi, 2002; Rogatko, 2009; and Winkielman, Schwartz, & Nowak, 2002). Winkielman et al. (2002) argued that metacognitive reward mechanisms provide cognitive and affective feedback about the efficiency and effectiveness of ongoing processing operations. They suggested that fluency is associated with positive affect because it is intrinsically rewarding and indicates consistency between processing operations on the one hand and current goals and expectations on the other (see also Weber, Tamborini, Westcott-Baker, & Kantor, 2009). This fluency generates positive feelings of competence and a sense of connectedness and engagement. Indeed, it has even been proposed that there is a basic human motivation to experience such "effectance" (R. W. White, 1959).

In contrast, maladaptive allocation of attention disrupts the smooth flow of information processing and results in cognitive errors, effort, and negative affect. Csikszentmihalyi (1978) conducted studies on flow deprivation that demonstrated that the inability to focus attention results in negative affect. Participants who were prevented from engaging in

absorbing activities became irritated, depressed, and experienced a drop in creativity. He notes that these forms of disrupted cognition and negative affect, if left unchecked, can eventually result in psychopathology. Thus, we propose that inadequate attention functioning per se generates negative affect that is opposite to the positive affect associated with perceptual fluency and flow (see Hamilton, 1981).

Finally, it should be noted that the negative affect experienced during an episode of boredom might cause further impairment in cognitive functioning, thus intensifying the problem. For example, a study by Smallwood, Fitzgerald, Miles, and Phillips (2009) demonstrated that negative mood induction led to a greater frequency of errors on a sustained attention task and less inclination to slow down responses following an error, suggesting that negative mood reduces the ability to sustain and reengage attention following a lapse (see also Smallwood & O'Connor, 2011).

Kuhl's (1987) action control theory provides further support for the notion that negative affect may impair attentional engagement. Specifically, Kuhl (1981) found that a disruption of active engagement occurred after experiences of failure in individuals with a propensity towards rumination. Based on these findings, Kuhl has developed a theory of action control in which negative affect may prevent individuals from engaging in adaptive, goal-oriented activity. Such individuals are referred to within this framework as "state-oriented" because of their failure to act due to a maladaptive attentional focus on affective states. State orientation has been shown to correlate with a propensity to experience boredom in male undergraduate students (Blunt & Pychyl, 1998). Thus, it would appear that the negative affect associated with boredom could hamper continued or renewed engagement of attention with the current activity, resulting in a sustained episode of boredom.

In summary, our definition of boredom in terms of attention can account for the fact that boredom is a negative emotional experience. Things that are not within the focus of attention are disliked, and thus unattended activity is subject to negative attributions ("this task is horrible and boring"). Inadequate attentional engagement also disrupts the sense of flow that would accompany fluent information processing, resulting in negative internal mood states ("I am irritated, dissatisfied, etc.").

Constraint and disordered agency

Feelings of constraint and disordered agency are central to the experience of boredom. The bored individual feels constrained: They must do what they do not want to do or cannot do what they want to do (e.g., Fahlman et al., 2011; Fenichel, 1951; Todman, 2003). That is, they are stuck or constrained so that their will cannot be executed. Moreover, the chronically bored individual often cannot articulate what it is that they want to do. We argue that the feelings of constraint and disordered agency in boredom can be accounted for within our attention-based definition.

In the first case—not being able to do what one wants or being forced to do what one does not want—the individual is unable to freely choose how they will deploy attention. Instead, the experience is that some outside force has determined what will be the focus of attention. Fisher (1993) argued that the mere presence of salient external constraints can cause a loss of interest in a task, thereby perpetuating difficulties to properly engage with the task. Csikszentmihalyi (1978), in his empirical studies of flow deprivation mentioned earlier, emphasized that it is the inability to focus attention voluntarily that is detrimental to psychological well-being. Although we are in full agreement with this view, we suggest that, in the case of boredom, the concept of *voluntary* requires further specification.

We argue that the term *voluntary* should not be simply equated with *intentional* or *desired*—it should also encompass the notion "without subjective effort." Consider the following two situations. First, imagine a philosophy student who wants to read Kant's (1785) *Groundwork of the Metaphysics of Morals*. When seeking out the original text, she will find herself confronted with page-long nested sentences that are very difficult to comprehend. Thus, even though she has every intention of focusing on the text, the student will have to exert effort and force herself to concentrate. She will become aware that she is struggling to stay engaged and that she is exerting a high degree of mental effort. If she attributes her difficulty to the external world (i.e., "this book is poorly written"), she would likely deem the book boring and declare herself to be bored even if she wanted to read the book.

Now imagine a second scenario. The philosophy student is invited to watch a movie with her friend. Unfortunately, the movie is not at all interesting to her. Her friend has to cajole her into coming along because she does not want to attend the movie. As the movie begins, she may even resist paying attention. However, by the time the movie has ended 2 hours later, she may be surprised to find herself effortlessly absorbed in the plot and characters without intending to do so. In this situation, she would likely not report experiencing boredom, even though initially she did not want to watch the movie.

In addition to the issue of constraint, theorists have pointed out that chronic boredom is also related to a disruption in agency (e.g., Bernstein, 1975; Greenson, 1953). Bernstein (1975), for example, noted that individuals who often feel bored describe themselves as "phonies" because they are "always observers of the passing scene, watching it all happen as though from some distant vantage point" (p. 517) rather than engaging in life. Greenson (1953) similarly described the bored individuals' "passive, expectant attitude with the hope that the external world will supply the satisfaction" (p. 7). Bored individuals in qualitative studies also report disordered agency and diminished self-determination (e.g., Bargdill, 2000; Kanevsky & Keighley, 2003; Martin et al., 2006). In addition, research findings have demonstrated a correlation between the trait of boredom proneness and constructs related to agency such as locus of control (e.g., Hunter & Csikszentmihalyi, 2003), assertiveness (e.g.,

Tolor, 1989), psychosocial development (Watt & Vodanovich, 1999), self-actualization (e.g., McLeod & Vodanovich, 1991), and procrastination (e.g., Blunt & Pychyl, 1998).

We argue that disordered agency (e.g., not knowing what it is that one wants to do) occurs because of repeated failures of effortful deployment of attention. Here, we draw on the classic work of James (1890/1913) on attention, effort, and will. James argued that "[t]he essential achievement of the will, in short, when it is most 'voluntary,' is to ATTEND to a difficult object and hold it fast before the mind" (p. 561). Thus, in keeping with James' notion that "effort of attention is. . . the essential phenomenon of will" (p. 562), we propose that our sense of will or agency arises from multiple experiences of being able to engage attention. That is, the ability to successfully exert control to utilize attention provides the foundation for our elaborated sense of agency and, conversely, the inability to engage attention results in a self that is blocked or inarticulate.

In summary, boredom often involves the feeling of constraint, and chronic boredom often involves the feeling of disordered agency. We argue that it is both a failure in the deployment of attention and the subjective sense of effort that is at the root of such feelings of constraint and disordered agency. If attention is successfully engaged, then low effort and low metacognitive awareness is associated with a sense of flow, whereas high effort and high metacognitive awareness is linked with an enhanced sense of agency. However, if attention is not successfully engaged, then low effort and low metacognitive awareness is associated with absorbed mind wandering, whereas high mental effort and high metacognitive awareness is associated with boredom.

Perception of a slow passage of time

A distorted sense of time, where time is perceived to pass slowly, is a prominent feature of boredom. Indeed, the German term for "boredom" is *langeweile*, which literally translates as "long period of time." Wangh (1975) stated that, in a state of boredom, "time seems endless, there is no distinction between past, present, and future. There seems to be only an endless present" (p. 541). Greenson (1953) stated that boredom is associated with "a distorted sense of time in which time seems to stand still" (p. 7), and emphasized that boredom involves "torturous waiting, and the painful slowness of the passage of time" (1951, p. 346). Hartocollis (1972), a psychodynamic theorist who focused a great deal on the perception of time, saw boredom as an endless present. He argued that boredom is "experienced as a disturbance in the sense of time" (p. 96) more so than other affects. For example, he noted that whereas fear is oriented toward the future and sadness is oriented toward the past, boredom is specifically displeasure with the present.

Participants in qualitative studies similarly report a slow passage of time when bored. This experience is sometimes associated with feelings of guilt at "wasting time" rather than pursuing productive activities (Martin et al., 2006; O'Connor, 1967). It therefore seems that when individuals are unable to occupy themselves with meaningful activity, having endlessly dragging time on their hands becomes the unsatisfying focus of their awareness. Furthermore, people who have a high propensity to become bored tend to make errors in judging the duration of perceptual events, suggesting that distortions in time perception could contribute to the likelihood that boredom is experienced (Danckert & Allman, 2005). Indeed, it has been shown that the mere perception that time is moving slowly can result in negative judgments of experiences in general (Sackett, Meyvis, Nelson, Converse, & Sackett, 2010) and of feelings of boredom in particular (London & Monello, 1974). In a study by London and Monello (1974), participants carried out a task in view of a clock that was running slower or faster than objectively measured time. Participants reported more boredom when the clock indicated that they had only been working on the task for 10 minutes when in actuality they had been working on it for 20 minutes than when the clock indicated that they had been working on the task for 30 minutes when in actually they had been working on it for 20 minutes.

Models of time perception (e.g., Treisman, 1963; Zakay, 1992) posit that attention is required to process cues regarding the passage of time, such as changes in the position of the hands of a clock or in ambient lighting. An internal counter keeps track of such cues as "units" of time that have passed. If attention is absorbed by the current activity instead of being allocated to monitoring the passage of time, temporal cues are likely to be missed and duration will be underestimated (Grondin & Macar, 1992; Hicks & Brundige, 1974). This explanation may account for why reading a book while travelling on the train can make the journey seem relatively fast. In contrast, the journey may seem longer when looking out the window and keeping track of all the stations; that is, if attention is focused on temporal cues, time is perceived to move slowly (Fraisse, 1963; Thomas & Brown, 1974).

Indeed, the more that attention is allocated to an ongoing task—limiting the availability of attention to temporal cues—the less time seems to drag (Brown & Boltz, 2002; Fraisse, 1984). For instance, Chaston and Kingstone (2004) manipulated the degree of attentional engagement during a task. Participants performed a visual search task for either salient targets that "popped out" effortlessly or targets that were much more difficult to find. Participants were then asked to estimate the duration of the task. Results showed that as the demand for attentional engagement increased, the duration of the task was increasingly underestimated.

In summary, the perceived slow passage of time during episodes of boredom may arise from a failure to fully engage attention with the current activity. Instead, attention is allocated to temporal cues, leading to conscious perception of the passage of time, which therefore appears to drag.

Causes of Boredom

We have reviewed existing boredom theories in order to develop a common definition of boredom. In this section, we

attempt to summarize the distinct psychological causes of boredom entailed by the various theories (i.e., we exclude external or environmental causes); however, it should be noted that existing theories sometimes do not draw a sharp and clear distinction between the causal and definitional aspects of boredom.

Psychodynamic theories argue that boredom is caused by an inability to consciously determine what is desired because the desire is threatening and therefore repressed. As a result, the bored individual looks to the external world to find satisfaction, but inevitably feels deprived and frustrated when the external world does not resolve the problem (Fenichel, 1953; Greenson, 1953; Wangh, 1975). Existential theories argue that boredom is caused by a lack of life meaning or purpose; boredom ensues when an individual gives up on or fails to articulate and participate in activities that are consistent with his values (Bargdill, 2000; Fahlman et al., 2009; Frankl, 1984; Maddi, 1967, 1970; A. White, 1998). Arousal theories propose that boredom is caused by a mismatch between an individual's need for arousal and the availability of environmental stimulation (Berlyne, 1960; Csikszentmihalyi, 1975, 1990; De Chenne, 1988; Hebb, 1966; Klapp, 1986; Zuckerman, 1979). The psychological causal factors implied by the arousal theory are an individual's dispositional arousal "set point" and response to stimulation. These factors can be partially captured by the systems that control appetitive and aversive motivation; namely, the behavioral activation system that promotes approach behavior toward rewarding stimuli, and the behavioral inhibition system that facilitates withdrawal in response to aversive situations (Carver & White, 1994; Gray, 1972). Finally, cognitive theories propose that boredom is caused by a failure of attentional processes resulting in an inability to focus or engage attention (Fisher, 1993; Hamilton, 1981).

Cognitive theories require further comment, especially given that we have thus far defined boredom in terms of attention. At first glance, it may seem conceptually problematic to consider attention to be both definitional of the boredom state and also a possible cause of that state. We resolve this apparent problem by distinguishing between momentary failures of attention and more chronic (i.e., trait) deficiencies of attention. We treat momentary failures of attention as being definitional of boredom, and the more chronic deficiencies of attentional mechanisms as a possible cause of these momentary failures (and thus boredom). According to this distinction, it is possible to experience boredom, defined in part by a momentary failure of attention, with or without having this momentary state being caused by a chronically defective attention mechanism. In this way, it is possible to reconcile attention as a cause, as proposed by cognitive theories, with attention also as part of the definition of boredom.

This summary of the causes of boredom should not be considered a critical or exhaustive review of the literature. Rather, we have only briefly summarized previously proposed causes of boredom in order to situate our definition within a larger framework and to alert readers to the distinct issue of understanding what causes boredom. Indeed, in our view, a thorough review of the causes of boredom is an important next step in the study of boredom (see Fisher, in press, for a review of causes of workplace boredom). Below we present other directions for future research.

Directions for Future Research

Manipulating attention

Many studies exploring the relationship between boredom and attention are correlational in nature. Although some attempts have been made to manipulate attention and then measure boredom (e.g., Damrad-Frye & Laird, 1989), these studies lack validated measures of state boredom and are nonspecific with regard to the component of attention that is manipulated. We have identified attentional networks (alerting, orienting, and executive attention) that should be specifically targeted. As noted, although there is tentative evidence that these different components of attention may underlie boredom, it is not yet clear whether their influence on boredom levels is an immediate one or to what degree it is mediated by other factors such as perceived effort or awareness of attentional difficulties. Furthermore, careful manipulations of attention should be applied in different circumstances that may give rise to boredom. Whereas boredom during forced performance of constrained tasks is particularly suitable for controlled laboratory studies, the role of attention in boredom that is experienced during leisure time where one is free to engage in activities of choice has not been probed.

Manipulating boredom

Our central proposal is that ineffectual deployment of attention is the final mediating mechanism in the boredom experience, and we note that a self-perpetuating, positive feedback loop can exacerbate the problem. Indeed, negative mood has been shown to impair sustained attention performance (Smallwood et al., 2009). To the best of our knowledge, however, the effect of boredom on attentional functions has never been investigated. To investigate the effect of boredom on attention, participants that have been subjected to controlled boredom manipulations could subsequently perform attention tasks that assess the different components of attention that we have identified. More broadly, the study of boredom would be significantly advanced by experimental designs that actually manipulate state boredom to investigate the consequences of boredom.

Measuring boredom

It is important to keep in mind the distinction between the actual experience of boredom and the dispositional tendency to become bored. "Boredom" is defined as a current and transient state, and yet the boredom literature relies heavily on subjective self-report measures of trait-like propensity to

experience boredom instead of measurements of the phenomenon itself (Mercer-Lynn, Flora, Fahlman, & Eastwood, 2011).

Fahlman et al. (2011) recently developed a theoretically driven and psychometrically sound measure of state boredom: the Multidimensional State Boredom Scale (MSBS). In that study, MSBS scores successfully distinguished between individuals who had been induced into a state of boredom and those who had not, suggesting that the MSBS is a promising tool for investigating the actual phenomenon of boredom.

In addition to subjective self-report measures, objective measures of overt signs of boredom are needed. Such measures could include behavioral observations such as monitoring for changes in posture (e.g., slouching or leaning on elbow; see Wallbott, 1998), doodling (Mann & Robinson, 2009), or fidgeting and rhythmic limb movement (D'Mello & Graesser, 2009). Also, more targeted investigations of physiological reactivity (such as heart rate or skin conductance levels) should aim at distinguishing boredom from other negative emotional states, such as depression or anxiety.

Boredom as a confounding factor in cognitive research

Research into cognitive processes, and in particular attention, relies heavily on artificially constrained and monotonous laboratory tasks (Kingstone, Smilek, & Eastwood, 2008). Thus, attention research is an ideal breeding ground for boredom to arise. Therefore, boredom may emerge as an important, yet largely neglected, confounding variable within cognitive neuroscience research. Indeed, a study by Cherrier, Small, Komo, and La Rue (1997) highlighted methodological concerns about boredom in participants. Specifically, they showed that state boredom was correlated with asymmetries in brain activity; consequently, the authors concluded that individuals undergoing brain imaging procedures may become bored, which may in turn influence the results of the study. Similarly, D'Angiulli and LeBeau (2002) noted that experimental procedures might unintentionally lead to feelings of boredom in participants and thereby influence the data being collected. Such a possibility may limit the generalizability of laboratory findings regarding the way attention operates in more ecologically valid situations. Furthermore, because attention is critically involved in virtually all cognitive processes, artificially constraining how attention operates in boring experiments could also undermine cognitive research that does not specifically target attention. Utilizing measures of state boredom would allow researchers to at least take into account variability related to boredom that could influence the effects of the primary variables of interest.

Neural correlates of boredom and the propensity to experience boredom

To the best of our knowledge, no study to date has specifically investigated the neural correlates of boredom or the propensity to experience boredom. This issue is potentially important because, as described above, boredom likely affects participants in neuroimaging studies, and brain activity related to such boredom may obscure effects that are under investigation. Further, understanding the neural correlates of boredom will inform our understanding of boredom itself. Neuropsychological research has revealed that levels and frequency of boredom appear exacerbated after traumatic brain injury (Kreutzer et al., 2001; Oddy et al., 1978). However, such studies are not reliable indicators of the neural systems involved in boredom because they use small samples comprising a wide range of affected brain areas; also, boredom in these samples may be a function of reduced mobility, hospitalization, or some other indirect consequence of brain damage.

A growing number of studies have examined brain activation in a so-called "default network" when a participant is not currently occupied with a specific external task, but rather engages in spontaneous mental activities such as daydreaming or other associative thought processes (Bar, Aminoff, Mason, & Fenske, 2007; Mason et al., 2007; see Buckner, Andrews-Hanna, & Schacter, 2008, for a review). The default network specifically comprises ventromedial prefrontal cortex, the anterior cingulate cortex, precuneus, medial-parietal cortex, medial temporal lobe, and lateral parietal cortical regions (Bar et al., 2007). Thus, although the default network overlaps to some degree with the executive attention network, the two seem to be distinct. Indeed, when a participant is actively engaged in a demanding task, activity in the executive network typically increases while activity in the default network decreases (Greicius, Krasnow, Reiss, & Menon, 2003; Mason et al., 2007; Weissman, Roberts, Visscher, & Woldorff, 2006). Although at first glance it might be tempting to conclude that default network activation correlates with boredom, it should be noted that brain regions associated with this network are activated when a person is absorbed with internal, imaginative thought (e.g., Spreng, Mar, & Kim, 2009). Activation of the network in this context might even reflect a boredom coping strategy: When the individual fails to engage attention with an unrewarding external environment, they focus instead on more rewarding internal thought processes. In any case, it appears simplistic to equate default network activation with boredom.

Another approach is to examine neural activity in response to attention-related tasks in individuals who differ in their propensity to experience boredom. For example, high-sensation seekers strive for novelty but are easily bored with, and disengage their attention from, repetitive events. A study by Jiang et al. (2009) recorded event-related potentials while high- and low-sensation seekers performed a simple task involving repeated presentations of visual stimuli. Participants with high boredom susceptibility scores (a subfactor of the sensation seeking construct) showed delayed and less pronounced brain potentials over lateral frontal cortex, suggesting that these individuals habituated more quickly to repeated presentations of stimuli. Habituation of cortical arousal in response to

repetitive stimulation has been suggested by other authors to contribute to the likelihood that boredom is experienced (Hamilton, 1981; O'Hanlon, 1981; Zuckerman, 1979).

It is a challenge for future research to disentangle neural activity related to boredom from activity related to efforts to mitigate boredom and to pinpoint individual differences in neural responses regarding boredom-related traits. Gaining insight into the neural structures and pathways involved in boredom and the propensity to experience boredom will inform our understanding of how boredom is linked to attention and other cognitive processes.

Concluding Remarks

Boredom affects almost everybody at some point in their lives. Although most of us can relate to the boredom of sitting in a waiting room or of other benign situations, it would be misleading to regard boredom as harmless. Empirical evidence clearly demonstrates that boredom and the propensity to experience boredom are linked to a wide range of psychosocial problems, such as drug and alcohol abuse (e.g., LePera, 2011) and problem gambling (Mercer & Eastwood, 2010), not to mention potentially catastrophic performance errors. Bored and boredom-prone airline pilots are more likely to make mistakes related to automation complacency (Bhana, 2010); more worryingly, boredom has been singled out as a risk factor for unreliable performance by nuclear military personnel (Dumas, 2001). The goal of this article is not only to advance our current understanding of boredom, but also to appeal for more targeted research on this important yet vastly underestimated topic. We are confident that integrating the disparate fields of cognitive neuroscience, social psychology, and clinical psychology will prove fruitful in achieving a thorough understanding of the ubiquitous and intimately linked phenomena of boredom and attention. Ultimately, such efforts will aid in the discovery of new strategies to ease the problems of boredom sufferers and will address the potentially dangerous cognitive errors associated with boredom and other disorders of attention and emotion.

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The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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