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The Bored Mind is a Guiding Mind: Toward a regulatory theory of boredom

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1. Introduction

Boredom appears to be ubiquitous. It affects both healthy individuals and patient populations (Binemma, 2004; Eastwood et al., 2007; Hamilton et al., 1984; Seel & Kreutzer, 2003; Vodanovich, 2003). It affects individuals of all genders and ages, and from all cultures (see, e.g., Gana & Akremi, 1998; Musharbash, 2007; Ng et al., 2015; Sundberg et al., 1991; Vodanovich et al., 1997; Weinstein et al., 1995). It finds us at home or at work (Chin et al., 2017; Fisher, 1993; Game, 2007; Grubb, 1975; Iso-Ahola & Weissinger, 1987; Van Hooff & Van Hooft, 2014). It finds drivers behind the wheel, students in classrooms, and inmates in prison (Acee et al., 2010; Belton & Priyadharshini, 2007; Drory, 1982; Grassian, 2006; Larson & Richards, 1991; Mann & Robinson, 2009). One survey found that 91 percept of North American youth experience boredom (The National Center on Addiction and Substance Abuse, 2003; cited in Eastwood et al., 2012), another reported that 51 percent of teenagers are bored easily (GPC Research & Health Canada, 2003; cited in Eastwood et al., 2007), and a third, conducted by PewResearch in 2015, cited our desire to avoid boredom as the second most common reason for using smartphones, and we all know how often we use our smartphones.[1]

To a first approximation, boredom is an aversive experience that signifies a failure to engage with one's environment in a desired manner despite one's motivation to do so (Danckert & Merrifield, 2016; Eastwood et al., 2012). Boredom is such a common affective experience that most of us have little trouble of both recognizing it and distinguishing it from other related emotions and affective states (Goldberg et al., 2011; Van Tilburg & Igou, 2012).

1 http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015/pi_2015-04-01_smartphones_25/

Yet despite its prevalence and our familiarity with it, boredom's precise nature remains to this day elusive. A quick look to the psychology literature on boredom corroborates this judgment. One finds not only no consensus as how to define boredom (Belton & Priyadharshini, 2007; Kanevsky & Keighley, 2003; Vodanovich & Watt, 2015), but also an honest admission that boredom "remains a construct that is difficult to define" (Malkovsky et al., 2012, p. 59; see also Goldberg et al., 2011, p. 649).

The central objective of this article is to contribute to our understanding of the nature of boredom. Given what we know about boredom—its affective character, physiology, antecedents, causes, relationship to cognition and volition, and neurological underpinnings—the article asks: What is boredom exactly? What does it do?

Although boredom used to be a neglected topic of investigation, it is no more. In 2015 alone, there were 326 papers published on boredom (Van Tilburg & Igou, 2017a), compared to an average of less than one paper published per year between 1926 and 1980 (Smith, 1981 cited in Fahlman et al., 2009). Boredom's antecedents, cognitive and perceptual effects and concomitants, experiential profile, and neurophysiological correlates have become topics of active study, and as a consequence a proliferation of claims and findings about boredom has ensued. In light of this situation, there lies great value in offering a comprehensive review of the literature on boredom. Whether we like it or not, boredom is a major part of our human existence. It affects and permeates our social, practical, and even moral existence. It shapes our lives by demarcating the interesting and the meaningful from that which is not. And it sets us in motion insofar as its presence can give rise to a plethora of behaviors. An understanding of human existence demands thus that we address boredom head-on.

By presenting and synthesizing findings on the character of boredom, the present article advances a theoretical account of the character and function of the *state* of boredom that underlines its significance and importance in our everyday lives. It argues that boredom is functional insofar as it is both informative and regulatory of one's behavior: it informs one of the presence of an unsatisfactory situation and, at the same time, it motivates the pursuit of a new goal when the current goal ceases to be satisfactory, attractive, or meaningful. Ultimately, boredom acts as a regulatory state that keeps one in line with one's projects: it promotes the restoration of the perception that one's activities are meaningful and congruent with one's interests and desires (Bench & Lench, 2013; Elpidorou, 2014, 2015, and 2016; Sansone et al., 1992; Smith et al., 2009; Van Tilburg & Igou, 2011 and 2012).

The present article advances the literature on boredom in at least two ways. First, by offering a comprehensive and up-to-date review of the empirical literature on the nature of boredom, it builds upon and updates previous attempts to specify the function of boredom. Hence, it offers a useful reference guide to researchers interested in the functional aspects and capacities of boredom and its role in our everyday lives. Second, the article demonstrates how the adoption of a regulatory perspective on boredom is theoretically advantageous. A regulatory perspective informs our views about boredom and highlights its importance in our mental economy, but it does more than that. It also permits us to synthesize the diverse literature on boredom by making sense of how the different components of boredom correlate and work together in order to promote the exercise of the regulatory function of boredom. Finally, and perhaps most importantly, a regulatory perspective allows us to move forward in our investigation of boredom by opening up unexplored avenues for research. We have much to gain by adopting a regulatory perspective on boredom and the present article is an attempt to show precisely that.

2. State Boredom

The majority of research on boredom has focused on the personality trait of boredom (trait boredom or boredom proneness) (Farmer & Sundberg, 1986; Zuckerman, 1979). Trait boredom is a tendency, propensity, or susceptibility to experience boredom frequently and in a wide range of situations and it is typically assessed by multi-item, self-report scales. Over the last few decades, several measures of trait boredom have been established (Acee et al., 2010; Farmer & Sundberg, 1986; Grubb, 1975; Iso-Ahola & Weissinger, 1987; Lee, 1986; Passik et al., 2003; Ragheb & Merydith, 2001; Zuckerman, 1979) and are now used to study its numerous and often harmful correlates (for reviews see Elpidorou, 2017; Vodanovich, 2003; Vodanovich & Watt, 2015).

From a strictly theoretical perspective, it is somewhat surprising that most research on boredom has focused on trait boredom. The notion of trait boredom as a propensity to experience boredom is conceptually anterior to the notion of state boredom. Trait boredom is predicated on the antecedent experience of boredom: that is, one can be said neither to be prone to boredom nor to possess the trait of boredom if one never experienced boredom. The dependence of trait boredom on state boredom is obvious by the manner in which trait boredom is being measured (Farmer & Sundberg, 1986). Thus, one would expect that

measures of trait boredom would be developed only after both a clear definition and a reliable and valid measurement of the state of boredom have been provided (Fahlman et al., 2013, p. 81). It is a serious shortcoming of the rich and variegated literature on boredom that state boredom has been neglected. In recent years, such a shortcoming of the boredom research has been acknowledged (Vodanovich, 2003) and attempts to explicate and measure state boredom have been proposed (e.g., Fahlman et al., 2013; Todman, 2013; Van Tilburg & Igou, 2012).

What is state boredom? A complete characterization of state boredom would need to proceed at two levels. First, the characterization would need to explain what state boredom is *qua* a psychological state. That is to say, the characterization should delineate the formal properties that state boredom *as a state* possesses and that render it distinct from a personality trait. Second, and most obviously, the characterization needs to explicate the character of the state of boredom. Among other things, the characterization ought to describe its affective nature, its causes and antecedents, its relationship to cognition and volition, and its physiological signature.

2.1. Formal features

Drawing upon the work of Allport (1937), Chaplin et al. (1988), Epstein (1979), Nesselroade (1988), Spielberger (1966a, 1966b, and 1972), Fridhandler (1986), and Zuckerman (1976 and 1983), among others, we can distinguish state boredom from trait boredom in the following four ways.

(a) Duration: State boredom is short-lived or transitory (e.g., Danckert & Allman, 2005; Fisher, 1993; Mikulas & Vodanovich, 1993). Although its duration may vary—seconds, minutes, perhaps even hours— it is much shorter than the corresponding trait that can last for many years. Traits are highly enduring, whereas states are not (Allport, 1961; Costa et al., 1990; Fleeson et al., 2002; Fridhandler, 1986; Norman, 1967; Spielberger, 1972).

(b) Continuity: State boredom is continuous; trait boredom is not (Spielberger, 1966a, 1966b, and 1972). To say that an emotional state such as the state of boredom is continuous is to assert that any given occurrence of the experience of boredom is gap-free. Any break in the manifestation of a state would mean that the state has ended. For example, if one experiences

boredom during time interval 9:00pm – 9:04pm and then again during time interval 9:10pm – 9:15, then one has experienced two episodes (or tokens) of boredom, not one that is discontinuous. In contrast, traits do not have to be continuous. A subject possesses a personality trait even if the trait is not continuously manifested.

(c) Concreteness: State boredom is concrete; trait boredom is abstract (Fahlman et al., 2013, p., 81). To assert that the former is concrete whereas the latter abstract is not to suggest that the latter is somehow less real than the former. An emotional or affective state is concrete insofar as it occurs in a specific timeframe and its presence is directly observable. At the time that a person is experiencing state boredom, such a state must be either introspectively available to the subject or amenable to some kind of behavioral or physiological measurement. On the contrary, no single feeling, thought, behavior, or physiological manifestation is enough to demonstrate the existence of trait boredom. As Fridhandler (1986, p. 170) points out, "states, as generally conceptualized, can be directly detected, whereas a trait, in its common conceptualization, must be inferred."

(d) Susceptibility to situation: Given that state boredom is a state and not a personality trait, it must be capable of both being induced and alleviated by proximal situational factors (see, e.g., Daniels et al., 2015; Fahlman et al., 2013, study 4; Fisher, 1993; Van Tilburg et al., 2013 cf. Neu, 1998; Fenichel, 1951; O'Hanlon, 1981; Todman, 2003). This is not to say that state boredom cannot be brought about by endogenous factors. Rather, this feature of state boredom is singled out in order to underscore the importance of the situation on state boredom. It also demonstrates how state boredom differs from trait boredom insofar as the latter can neither be caused nor taken away by a singular exposure to a certain (boring) situation.

The aforementioned features are properties that state boredom possesses in virtue of the fact that it is a state. A formal characterization of state boredom is important not only because it shows how it differs from trait boredom, but also because such features should be reflected in any measure of state boredom. After all, the measurement of any construct is intimately related to the way in which it is conceptualized (Vodanovich & Watt, 2015).

2.2. The character of state boredom

Definitions of boredom abound in the literature. Even though they contain significant overlap, there is no agreed-upon account of boredom (for detailed reviews see Belton & Priyadharshini, 2007; Eastwood et al., 2012; Kanevsky & Keighley, 2003; Vogel-Walcutt, 2012). Still, what emerges out of a review of the literature is that boredom is a multidimensional construct.

In what follows, my aim is to capture the experiential and physiological signature of boredom. That it to say, I wish to describe what it is like to be in a state of boredom—what it feels like, what is its volitional and cognitive character, and what kind of physiological changes one undergoes when one experiences boredom. Since my aim is neither to provide a new definition of boredom nor to support an existing one, it will not be integral to the discussion to delineate clearly which of the commonly discussed features of boredom are proper parts of the state of boredom or simply its antecedents or consequences. For instance, it is not important to determine whether the perception of meaninglessness should be considered to be a part of the state of boredom or one of its causes (Barbalet, 1999; Binnema, 2004; de Chenne, 1998; Fahlman et al., 2009; Fiske & Maddi, 1961; Perkins & Hall, 1985; Raposa, 1999). For present purposes, a lengthy discussion about how to properly define state boredom is beside the point. The aim of the discussion of the nature of state boredom is to articulate its function and its relationship to self-regulation. Such a task requires only an accurate characterization of boredom and not a settled definition.

A review of the literature reveals the following nine characteristics of the state of boredom:

(a) Dissatisfaction with one's present state: Being in a state of boredom does not feel good; it is unpleasant. Many definitions of boredom emphasize its aversive nature (e.g., Harris, 2000; Hartocollis, 1972; Mikulas & Vodanovich, 1993; Pekrun el al., 2010; Todman, 2003). In fact, in their review of the literature, Vogel-Walcutt et al. (2011) found thirty-six manuscripts that define boredom as an unpleasant state during which the subject experiences dissatisfaction with his or her present state. Furthermore, in a large scale study that captured 1.1 million emotional and time-use reports from almost 4000 subjects, Chin and colleagues (2017) reported that boredom often co-occurs with other negative affective states and emotions (loneliness, anger, sadness, and worry).

(b) Disengagement from the environment: Disengagement from the environment also appears to be an integral part of many definitions and characterizations of boredom (e.g., Anderson, 2007; Fahlman et al., 2009; Fenichel, 1951; Goldberg et al., 2011; Passik et al., 2003). Bored individuals experience a withdrawal from their environment and cannot identify with what the environment is offering them (e.g., Greenson, 1953; Fahlman et al., 2013; Mercer & Eastwood, 2010). Definitions that emphasize the role of monotony and repetition are in agreement with this feature of boredom (DeChenne & Moody, 1988; Hill & Perkins, 1985; O'Hanlon, 1981). And so are approaches to boredom that emphasize the bored individual's desire to engage in some kind of rewarding or stimulating activity even though one is unable to do so (e.g., Eastwood et al., 2012; Fahlman et al., 2013; Greenson, 1953; Fenichel, 1951, Lewinsky, 1943). It is important to emphasize that many theorists take the fact that boredom involves a desire to do something other than what one is currently doing to be a crucial aspect of boredom (Zuckerman, 1979). While bored, one is not content with one's current situation and one wishes to be doing something else (e.g., Berlyne, 1960; Csikszentmihalyi, 1975; De Chenne, 1988; Fahlman et al., 2013; Mikulas & Vodanovich, 1993; Todman, 2003; van Tilburg and Igou, 2012).

(c) Failure to sustain attention: Many definitions of boredom point out that bored individuals experience difficulty in concentrating and maintaining attention (Ahmed, 1990; Hamilton, 1981; Hamilton et al., 1984; Damrad-Frye & Laird, 1989; Eastwood et al., 2012; Fisher, 1993; Gordon et al., 1997; Harris, 2000; Wallace et al., 2003). Some accounts go even as far as to maintain that attentional failure is the underlying mechanism of boredom (Eastwood et al., 2012; cf. Leary et al., 1986; Skowronski, 2012).

Evidence for the importance of attention in boredom comes primarily from findings that show that manipulation of attention can affect the experience of boredom (Damrad-Frye & Laird, 1989) and from the observation that boredom is experienced often by individuals with compromised attentional capacities (Hunter & Eastwood, 2016). Other findings consistent with this hypothesis include the following: (i) tasks that require sustained attention, which are passive in nature, are often perceived as boring (Malkovsky et al., 2012; Pattyn et al., 2008; Scerbo et al., 1992); (ii) people who have jobs that require sustained vigilance tend to perceive their jobs as boring (Charlton and Hertz, 1989; Hitchcock et al., 1999); and (iii) bored

individuals often report inattention and engage in mind-wandering (Game, 2007; Harris, 2000; Martin et al., 2006). The relationship between (task-unrelated and stimulus-independent) mind wandering and boredom is a topic that demands further investigation. It would be important to know whether mind wandering is a precursor or a consequence of boredom. The former would be suggestive of a causal relationship between mind wandering and boredom and would provide us with a reason to discourage mind wandering. But even if mind wandering is only a consequence of boredom, its effects still ought to be explored. For example, it could be that the presence of mind wandering during boredom contributes both to the aversive experience of boredom (Killingsworth & Gilbert, 2010) and to the sense of feeling stuck that is characteristic of boredom (Eastwood et al., 2012). Also, if mind wandering is common during boredom, then it could allow one to think of more fulfilling and meaningful alternatives. In doing so, mind wandering may be a useful tool in allowing bored individuals to figure out what to do next and how to alleviate their boredom.

(d) Altered perception of the passage of time: Many descriptions or definitions of boredom emphasize a distorted sense of time. During a state of boredom, time appears to move slowly, to linger, or even to stand still (Gabriel, 1998; Greenson, 1953; Hartocollis, 1972; Heidegger, 1983/2001; Tze et al., 2013; Wangh, 1975; Watt, 1991). Qualitative studies have found that bored individuals experience such an altered passage of time (Martin et al., 2006). Watt (1991) found that when completing a tedious number-circling task highly boredom-prone individuals perceived time as passing more slowly during the task than low boredom-prone individuals. Furthermore, it was found that the perception of a slow passage of time could give rise to the feeling of boredom. London & Monello (1974) asked subjects to perform a task while manipulating a clock (running fast or slow) that was in their presence. Individuals who were engaged with a task for twenty minutes but the clock indicated that the task lasted only ten minutes reported more boredom than individuals who were engaged with the task for twenty minutes but the clock indicated that the task lasted for thirty minutes. London and Monello argued that subjects in the "ten minute" condition became more bored because time from their perspective passed more slowly—on average, one clock minute was perceived to last two minutes. Finally, individuals who are prone to boredom are likely to make mistakes in judging the duration of perceptual events (Danckert & Allman, 2005). The tendency to misjudge duration could be due to an altered perception of time that is present in the subjective

experience of boredom.

The most successful and commonly used model of our perception of the passage of time has been a cognitive or informational processing model that postulates the existence of an internal clock (e.g., Church, 1984; Gibbon et al., 1984; Meck 1996; Treisman, 1963; Treisman et al., 1990; Zakay & Block 1997). The internal clock consists of a pacemaker that produces pulses or time units at a given rate, a switch that controls how the pulses are gated, and finally an accumulator. When an individual is instructed to measure or estimate the temporal duration of an event, she opens the switch and allows the pulses that are always generated by the pacemaker to enter the accumulator. Once the event is finished, the individual closes the switch and working memory, long-term memory, and decision-making are used in order to estimate the duration. Specifically, the number of pulses that have been recorded during the period and are stored in working memory are being compared with stored representations of temporal duration in long-term memory (Pouthas & Perbal, 2004). The longer the duration of an event is, the more pulses are accumulated. And the more pulses are accumulated, the longer the event is judged to be. Although the internal clock model is widely used, it is lacking in neurological specificity (Matell & Meck, 2000) but attempts to either complement or propose alternative models are currently available (Cordes et al., 2007; Karmarkar & Buonomano, 2007; Matell & Meck, 2004; Wackermann & Ehm, 2006; Wittmann & Wassenhove, 2009).

Focusing on the internal clock model and applying it to boredom one can account for the experience of a seemingly longer boring experience by implicating the role of attention in boredom. When timing a situation, the observer has to divide attentional resources between temporal and non-temporal information (Grondin & Macar, 1992; Hansen & Trope, 2013; Taatgen et al., 2007). In a boring task, the subject will allocate more of her attentional resources to the perception of time. As a result, the subject will perceive (count) more temporal pulses than usual and judge that a boring situation has lasted for longer. This model of accounting for the seemingly longer duration of boring events fits well with characterizations of boredom that emphasize the subject's disengagement with the environment (e.g., Anderson, 2007; Fahlman et al., 2009; Fenichel, 1951; Goldberg et al., 2011; Passik et al., 2003). In a situation in which the subject cannot be entertained by her environment it is expected that more of her attention will be allocated to the passage of time. Furthermore, the internal-clock model also works nicely in tandem with characterizations of

boredom that hold that attention is a key factor or mechanism of boredom (e.g., Eastwood et al., 2012). In fact, an inability to attend to the situation or task at hand would be the main cause of the perception of a slower passage of time.

Two complications must be acknowledged. First, longer time estimates are not only explained by increased attention to the passage of time, but also by increased physiological arousal. During moments of increased physiological arousal the pacemaker will be producing pulses (or time units) at a higher rate. This will result in an increased number of pulses being collected by the accumulator and consequently, in an overestimation of temporal duration. For example, studies in which the physiological arousal of subjects was increased—e.g., by the presentation of high-arousing stimuli (Angrilli et al. 1997; Noulhiane et al. 2007), altering body temperature (Wearden & Penton-Voak, 1995), or the administration of certain drugs that modulate arousal (Meck, 1983)—an overestimation of the duration of time was reported. Somewhat paradoxically it was found that emotional stimuli can both lead to the over- and under-estimation of temporal duration. For example, in a study by Noulhiane et al. (2007) it was found that unpleasant sounds were judged to last longer than pleasant sounds but high-arousing stimuli were perceived to be shorter than low-arousing ones. The authors attributed the overestimation of the duration of unpleasant sounds to the increased arousal and thus pacemaker rate, whereas underestimation of the duration of high-arousing stimuli was accounted in terms of decreased attention to the passage of time (cf. Angrilli et al., 1997).

More work needs to be done in order to determine the precise relationship between attentional influences and arousal. Intuitively, one would expect that all high-arousing stimuli would lead to the overestimation of temporal duration. It is, however, possible that in certain contexts the effects of attention (i.e., the fact that highly arousing emotional stimuli capture the subject's attention and thus direct her attention away from the passage of time) dominate the effects that highly-arousing stimuli have over the pacemaker. This issue relates to boredom in the following way: If boredom is a state of high-arousal (e.g., Bench and Lench, 2013; Berlyne, 1960; Hill & Perkins, 1985; London et al., 1972; Smith, 1981), then there will be two factors that contribute to the overestimation of temporal duration: attention to the passage of time and increased rate of the pacemaker. If, however, boredom is understood as a low-arousal state (e.g., Hebb, 1955; Mikulas & Vodanovich, 1993; Russell, 1980), then the overestimation of temporal duration during a state of boredom must be due to a factor that counteracts the presumed decrease in the rate of the pacemaker. Arguably what would cause

the overestimation would be the fact that in a boring situation one cannot sustain attention on the task at hand (Eastwood et al., 2012) and instead focuses on the passage of time.

The second complication has to do with a distinction between two different types of temporal estimations: prospective versus retrospective estimations (Block & Zakay, 1997; Zakay & Block, 2004). In a prospective time estimation, the individual estimates the duration of an interval or event that is presently experienced and the individual is aware that he or she will have to make a judgment about the duration of the event. In retrospective estimation, the individual estimates the temporal duration of an event that has already passed. The internal-clock model of time estimation is applied to prospective time estimations and a different mechanism is assumed to account for retrospective estimations (Zakay & Block, 2009; Wittmann, 2009). Specifically, retrospective duration judgments are explained by memory-based models which hold that the duration of a past event is reconstructed on the basis of what one remembers (Block & Reed, 1978; Ornstein, 1970; Fraisse, 1963; Flaherty et al., 2005; Poynter, 1983). So, the more variegated, changing, or complicated a past experience is the longer it would be remembered to be. That is why novel activities are often remembered to have lasted longer than routine ones (Avni-Babad & Ritov, 2003).

Initially, such an explanation of retrospective time estimation seems to run counter to the claim that the experience of boredom is one in which time appears to last longer (Gabriel, 1998; Greenson, 1953; Hartocollis, 1972; Heidegger, 1983/2001; Martin et al., 2006; Tze et al., 2013; Wangh, 1975; Watt, 1991). After all, boring experiences are ones during which the subject is disengaged from a situation (either because it is monotonous, repetitive, too easy, or too hard) so presumably not a lot of features of the situation are stored in the subject's memory. So, in trying to recollect the boring situation, it would appear that the situation is shorter compared to more engaging situations. Although this line of reasoning seems coherent, it leads us astray when applied to boring situations (Block & Zakay, 1997; Zakay & Block, 2004). That is because in boring situations, the attention of the individual would be diverted away from the situation (Eastwood et al., 2012) and it would be turned to the passing of time itself. Thus, in retrospective time estimations of boring situations one would recall that time was passing slowly. As a result, one would overestimate the duration of a boring situation even in a retrospective estimation.

(e) Perception of insufficient meaning or non-optimal challenge: Another prominent theme in

characterizations of boredom is the claim that boredom is experienced in situations that are somehow non-optimal for the subject (e.g., Damrad- Frye & Laird, 1989; de Chenne, 1988; Mann & Robinson, 2009; Mikulas & Vodanovich, 1993). Non-optimal can be defined in terms of meaning, complexity, or challenge. Such situations include ones in which are perceived as meaningless or trite (e.g., Barbalet, 1999; Fahlman et al., 2009; Fiske & Maddi, 1961; Perkins & Hall, 1985; Van Tilburg & Igou, 2012); ones that lack challenge or are somehow below the cognitive level of the individual (e.g., Csikszentmihalyi, 1975; Van Tilburg & Igou, 2012); and even ones that are too challenging (e.g., a lecture that is way above one's intellectual level) (e.g., Daschmann et al. 2011; Goetz et al., 2006; Perkun et al., 2010; Robinson, 1975). The observation that too simple or too difficult situations are both capable of inducing boredom relates nicely both to the disengagement theme and to the issue of attention. Too simple or too difficult situations will be ones that fail to grasp the subject's attention and as a result the subject will become disengaged from the situation. Similar remarks seem to apply to situations that are perceived as meaningless. Such situations will not attract the subject and will presumably leave her disengaged.

Studies of optimal experiences indicate that a state of flow is a useful counterpoint to the state of boredom. Flow is a pleasant, effortless, and autotelic experience during which the individual loses track of time, experiences optimal arousal and a loss of self-consciousness, and is attentionally engrossed in the activity (Csikszentmihalyi, 1975 and 1990). Thus, where flow is, boredom is not, and vice versa. Still, it would be a mistake to identify boredom with the opposite of flow. Many emotions or affective states, and not just boredom, are non-optimal experiences. Hence, lack of flow is a feature of boredom, but not a defining characteristic. Furthermore, Csikszentmihalyi's account of flow conceptualizes boredom as a state during which one is underwhelmed by challenges. Given what we know about boredom, it is incorrect to hold that boredom always arises in situations during which our skills are greater than the challenges that we face. At least within academic contexts, boredom may be experienced when academic activities exceed one's skills (Acee et al., 2010; Lohrmann, 2008; Perkun et al., 2010; Robinson, 1975).

(f) Arousal: Undoubtedly, the most contentious feature regarding the character of boredom is its relationship to arousal. Boredom has been described as a state of low arousal (e.g., Hebb, 1955; Mikulas & Vodanovich, 1993; Russell, 1980), high arousal (e.g., Bench and Lench, 2013;

Berlyne, 1960; Fisher, 1993; Hill & Perkins, 1985; London et al., 1972; O'Brien, 2014; Smith, 1981), or both (Bernstein, 1975; Eastwood et al. 2012; Elpidorou, 2014; Fahlman et al., 2013; Fenichel, 1953; Fiske & Maddi, 1961; Goetz et al., 2014; Malkovsky et al., 2012; Van Tilburg & Igou, 2012). A review of the literature indicates that most definitions and characterizations of boredom are ones that render boredom a state of low arousal (see references in Vogel-Walcutt et al., 2012), something that is consistent with the folk understanding of boredom as an apathetic state. However, qualitative data on the character of the experience of boredom (Goetz & Frenzel, 2006; Harris, 2000; Martin et al., 2006) do not provide conclusive support for the claim that boredom should be understood as a low arousal state. Although individuals often comment that in a state of boredom they feel tired and lethargic, they also report feelings of restlessness, anxiety, irritability, and frustration (Harris, 2000; Martin et al., 2006; Steinberger et al., 2016). Furthermore, boredom has been linked to both decreased and increased levels of physiological arousal (e.g., Barmack, 1937; Braby et al., 1992; Geiwitz, 1966; Giakoumis et al., 2010; London et al., 1972; Lundberg et al., 1993; Pattyn et al., 2008). For example, Pattyn et al. (2008) found that during a prolonged target detection task—a task that most likely was found by participants to be boring—participants' heart rate decreased over time. London et al. (1972) reported that a boring task produces an increase in levels of galvanic skin potential (Study I) and heart rate (Study II). Chanel et al. (2008) recorded peripheral physiological activity while participants played Tetris at varying difficulty levels. They reported that in the easy level condition (which was classified as boring), participants showed higher skin resistance, higher skin temperature, but lower heart rate than participants who played the game at medium or hard difficulty levels (cf. Thackray et al., 1977). Merrifield & Danckert (2014) observed that during boredom induction there was an increased in heart rate but a decrease in skin conductance levels.

Faced with such mixed results on the physiological nature of boredom, one can adopt a number of distinct approaches. First, one could identify boredom with a state of high arousal (or low arousal) and then explain away the reported findings that link boredom to low arousal (or high arousal). For instance, Bench and Lench (2013) take low-arousal (apathetic) boredom to be a form of apathy and not boredom. In this way, evidence in support of the view that boredom lowers arousal will be interpreted as evidence showing that apathy is related to low arousal (Bench & Lench, 2013, p.468). Such a reading of the literature removes the tension between the above reported findings, yet it does so at the price of failing to take

seriously more than half of the reported findings on the relationship between arousal and boredom. Given the state of the literature, it seems premature to discount all findings that link boredom to low arousal.

A second approach is to maintain that boredom itself is not a unified construct and there are different types of boredom, some of which are associated with high arousal and some of which are associated with low arousal. Goetz et al. (2014) argue precisely that. Using the experience sampling method in order to collect participants' responses regarding their experiences of boredom and then performing a latent profile analysis on the data, they suggested that five different types of boredom should be distinguished in terms of valence and arousal. Two types of boredom had very low levels of arousal ("indifferent boredom" and "apathetic boredom"), two had medium levels of arousal ("calibrating boredom" and "searching boredom"), and one had a high level of arousal ("reactant boredom"). Further empirical work, however, is needed in order to assess the validity of the findings reported in Goetz et al. (2014). For one, the levels of arousal were measured by self-reports (participants had to complete a 5-point Likert scale ranging from 1 (*calm*) to 5 (*fidgety*)). So, it is possible that the subjects' self-perception of arousal fails to correspond with other measures of arousal such as galvanic skin responses and heart rate that have been used in other studies. Furthermore, the temporal relationship (if any) between the different types of boredom was not investigated. This is a topic that deserves more attention for it might turn out to be that under certain conditions boredom's physiological arousal changes as a function of time (low arousal boredom can become high arousal or vice versa). Finally, and perhaps most problematically, it is unclear whether what the subjects were reporting to be an experience of boredom was in fact boredom and not boredom mixed with other feelings or emotions. Outside of control environments, individuals experience simultaneously a plethora of emotions. Thus, by being asked to report on their experience of boredom it is likely that individuals were reporting implicitly on their emotional experiences in general. For example, if one is both frustrated and bored and is asked to rate the arousal level of his experience of boredom, it is very likely that such rating will reflect the arousal levels of not only his experience of boredom but also of frustration.

For the above reasons, I will not follow Goetz et al. (2014)'s five-fold division of the construct of boredom. Rather, I will adopt a third approach, one which maintains that boredom is a state that can be related to both increases and decreases of physiological arousal

(Eastwood et al., 2012; Merrifield & Danckert, 2014). In support of this interpretation, Eastwood et al. (2012) suggested that in the presence of inadequate external situations the bored individual may try to overcome such lack of exogenous engagement by exerting effort in an attempt to maintain attention (see also Fahlman et al., 2013; Damrad-Frye & Laird, 1989; Hamilton, 1981; O'Hanlon, 1981). As such, boredom can be both a state of low arousal (when the bored individual fails to engage with the environment) and a state of high arousal (when the bored individual makes an internal/endogenous effort). Such a proposal is consistent with optimal arousal theory which (a) posits the existence of person- and situation-relative optimal levels of arousal or challenge and (b) maintains that individuals initiate behavior that will allow them to achieve such optimal levels (Berlyne, 1960 and 1967; Csikszentmihalyi, 1975 and 1993; Csikszentmihalyi & Csikszentmihalyi, 1988; Eysenck, 1967; Klonowicz, 1987; Walker, 1980; Zuckerman, 1979 and 1987). If in a state of boredom an individual is under-aroused, then it is likely that the individual will try to achieve a higher level of arousal. Furthermore, if the boring situation is inescapable, then the individual could experience an increase in arousal while still feeling bored (Berlyne, 1960, pp. 186-92; Steinberger et al., 2016; cf. Chin et al., 2017). This hypothesis could explain findings that show that sensory deprivation and social isolation are often boring, highly aversive experiences of high arousal (Fiske, 1961).

(g) Motor expressions: The motor expressions of an emotion include its facial, vocal, and bodily expressions. In terms of its bodily expressions, Wallbott (1998) reported that bored individuals tend to lean their head backwards (i.e., to raise their chin), to collapse their upper bodies, and to restrain from movement (see also Lhommet and Marsella, 2015). Bull (1987) presents similar findings and adds that during boredom it is common for one to support one's head with one hand. Such characterizations of the bodily expressions of boredom would suggest a state of low arousal. However, Kroes (2005) notes that although bored individuals do not move a lot, when they do move they tend to make sudden movements. Furthermore, Martin et al. (2006)'s phenomenological investigation of boredom reported fidgeting as a response to boredom. Such bodily movements could be construed as attempts to increase one's levels of arousal.

Bored speech is slow and soft, has a low pitch, and exhibits a narrow pitch range (Johnston & Scherer, 2000; Scherer, 2013). Recognition of boredom by its vocal features is

high. For instance, a study by Banse & Scherer (1996) documented that individuals were able to recognize boredom with 76% accuracy.

Lastly, the facial expressions of boredom are still not well understood and extant studies do not give rise to conclusive results. For instance, in a study of the facial features of emotions that accompany deep-level learning of conceptual material, McDaniel et al. (2007) were unable to associate any action units with boredom. However, in a similar study, Craig et al. (2008) reported a significant association between boredom and action unit 43 (i.e., eye closure) (see also Kroes 2005). Scherer and Ellgring (2007) used professional actors to portray different emotions and found that action unit 14 (dimpler) discriminates boredom and shame from other twelve emotions. Raccanello and Bianchetti (2014) represented boredom and other achievement emotions through pictorial representations of their corresponding faces using criteria described by Ekman and Friesen (1978). When they asked children and adult participants to match the names of those achievements emotions to their pictorial representations they found that the participants were able to do so with good accuracy. However, when they asked them to name the emotions, most participants failed to give an accurate linguistic label for the drawing that meant to represent the face of boredom. Thus, even if there is a face of boredom, it does not seem to be one that is easily recognized.

(h) Neural correlates: Tabatabaie et al. (2014) provided evidence that boredom might be correlated with lower beta activity in the left DLPFC. Such a finding supports the close connection between attention and boredom (e.g., Eastwood et al., 2012). Children with ADHD, who suffer from attentional impairments (e.g., Rubia, 2011; Willcutt et al., 2005), exhibit decrease in beta mean frequency (e.g., Chabot & Serfontein, 1996; Clarke et al. 1998; Lazzaro et al., 1998) and this decrease is observed in the left DLPFC (Sangal & Sangal, 2015). Relatedly, Yoshida et al. (2014) found that there was a decrease in oxygen-hemoglobin concentration in the prefrontal cortex in the boredom condition compared to the flow condition.

Oswald (1962) observed that alpha waves are present during boredom. This is consistent with results from studies of the neural correlates of mental fatigue that found an increase in alpha waves (e.g, Barwick et al., 2012; Kecklund & Akerstedt, 1993; Fan et al., 2015; Lal & Craig, 2002; Phipps-Nelson, et al., 2011; Schier, 2000; Zhao et al., 2012).

Danckert & Merrifield (2016) compared fMRI scans of individuals in a resting state,

during boredom mood induction, and during a sustained attention task (Starry Night). In all three conditions, they observed common activation of components of the default mode network (DMN). Their findings suggest that boredom, similar to both the resting state and the sustained attention task, is a state of disengagement from one's environment. Intriguingly, Danckert & Merrifield (2016) noted one difference between observed brain activation in the resting state versus that during boredom induction. Only in the case of the latter was there anticorrelated activity in the anterior insular cortex. They postulate that activity in that region may indicate a failed attempt to engage with the situation. This corroborates the claim that in a state of boredom one is not simply disengaged from the environment but one also strives to find meaning in the environment or to somehow engage with it.

Finally, Jiang et al. (2009) compared the event-related potentials (ERPs) of high sensation seekers to those of low sensation seekers during a classification task that involved repeated visual stimulus exposure. Their results showed that individuals who scored high on the boredom susceptibility subscale of the Sensation Seeking Scale (Zuckerman, 1979) showed delayed frontal LPC responses, something which suggests that these individuals habituated more quickly to repeated presentation of the stimulus (Eastwood et al., 2012; see also, Hamilton, 1981; Zuckerman, 1979).

The neural correlates of the state of boredom are still not well understood. Yet the need to understand them is pressing. As Eastwood and colleagues (2012) point out, figuring out the neural correlates of boredom is important not the least because boredom affects participants in neuroimaging studies. As such, boredom might potentially be influencing or obfuscating the results of such studies.

(i) Constraint and agency: Some characterizations of boredom relate boredom to constraint or lack of agency (e.g., Eastwood et al, 2012; Fahlman et al., 2011; Fenichel, 1951; Geitwitz, 1986; Hill & Perkins, 1985; Todman, 2013; Vodanovich & Kass, 1990). This idea is captured nicely by Fenichel's claim that boredom "arises when we must not do what we want to do, or must do what we do not want to do" (1951, p. 359; quoted in Mikulas & Vodanovich, 1953). Eastwood and colleagues (2012) hold that feelings of constraint are a part of the experiential component of boredom and contribute to the aversive character of boredom. Furthermore, such feelings are likely to cause the bored individual to experience a desire to escape his or her boring situation. Empirical evidence in support of the view that boredom is related to feelings

of constraint comes from the observation that manipulating the control that individuals have over a task can affect their levels of boredom (Troutwine & O'Neil, 1981).

Having said that, we should not insist that a feeling of constraint (or a perceived lack of agency) is either a necessary cause or a necessary feature of the experience of boredom. Boredom may arise not only during leisure (Iso-Ahola & Weissinger, 1987) but also during situations in which we are free to act as we see fit (e.g., flipping through channels while watching television, browsing the internet without a purpose, or aimlessly wandering about).

2.3. Summary

We are now in a position to provide a synthetic characterization of boredom. I propose to divide the experiential character or signature of boredom into four components: affective, cognitive, volitional, and physiological. In terms of its affective character, boredom is a transitory, aversive state. While bored, one experiences feelings of dissatisfaction with one's current situation. One feels weary and often even frustrated. In terms of its cognitive character, boredom is characterized by an inability to sustain attention, the perception of a slower passage of time, mental fatigue, and mind-wandering. In terms of its volitional character, a desire to do something else is both prominent and strong in boredom. Finally, in terms of its physiological character, boredom is characterized by a decrease in arousal, although an increase may also occur. As a low arousal state, boredom is disengaging, whereas as a high arousal state it prepares our body for action or change. All in all, boredom is an unpleasant state from which one seeks escape and solace.

3. Boredom as a Self-Regulatory Emotion

Boredom, I propose, should be understood to be a functional emotion. That is, boredom is an emotion that serves a specific function in our lives. In order to fully present and ultimately defend such an assertion about boredom, I need to explain why I think boredom is an emotion and then specify its function.

3.1. Boredom as an emotion

Emotions form a proper subset of the superordinate class of affective phenomena. They are relatively short-lived, flexible, multicomponent patterns and tendencies that occur in response to specific physical and social situations. They are distinguished from moods (Parkinson et al.,

1996) insofar as they are shorter in duration (Ekman, 1984; Nowlis & Nowlis, 1956), they typically have narrower or more specific intentional objects, and they give rise to specific behavioral response tendencies that are relevant to those objects (Frijda, 1986; Isen, 1984; Morris, 1989; Oatley & Jenkins, 1996). They are distinguished from affective traits insofar as affective traits are predispositions or tendencies to experience certain emotions (Rosenberg, 1998).

Typically, emotions begin with an individual's appraisal or assessment of an event that bears some personal significance to the individual (Frijda, 1986; Oatley & Johnson-Laird, 1987; Roseman, 1984; Scherer, 1993; Smith & Lazarus, 1994; Lazarus, 1991). Such an appraisal can be either conscious or unconscious and it gives rise to a cascade of interrelated responses in the individual, such as changes in subjective (felt) experiences, physiology, motor expressions, cognition, and behavior.

Given the above characterization of emotions, the state of boredom should be understood to be an emotion: boredom, considered as a state and not as a trait, is a transitory, multicomponent response to a situation. Once a subject appraises a situation to be meaningless, non-optimally challenging, incongruous to her goals and desires, or even beyond her control (Pekrun et al., 2010), the subject is likely to experience boredom and thus undergo changes in her subjective, felt experiences (e.g., negative feelings, mental fatigue, feelings of constraint), cognition (e.g., inattention, perception of slower passage of time, mind-wandering), behavior (e.g., changes in posture), and physiology (e.g., low or high arousal, changes in brain waves).

The contention that boredom is an emotion in its own right is corroborated by recent empirical findings that show that boredom can be distinguished from other related emotional states. Van Tilburg & Igou (2012) reported that, compared to sadness, anger, and frustration, boredom has a unique experiential content (study 1): during boredom, one feels unchallenged, thinks that one's situation is meaningless, and desires to engage in an alternative situation. Furthermore, Van Tilburg and Igou demonstrated that the induction of state of boredom (via a repetitive task) resulted in a distinct pattern of experiences characteristic of boredom (those reported in study 1) and that such an induction did not affect the emotional states of anger, sadness, and frustration (study 4). Finally, using structural equation modeling, Goldberg et al. (2011) found boredom to be distinct from three phenomenologically-related: apathy, anhedonia, and depression.

Such findings are important not only because they provide evidence that boredom is an independent affective construct, but also because they suggest that the role that boredom plays in our lives is not likely one that can be played by other related emotional or affective states. As Van Tilburg and Igou (2012) showed, boredom is differentiated from anger, frustration, and sadness insofar as it is the only state that involves a perception that one's situation is meaningless and unchallenging (see also Van Tilburg and Igou, 2016). Boredom thus appears to be uniquely equipped to inform us of the presence of a meaningless and unchallenging situation. In addition, boredom's volitional component differentiates it from apathy, anhedonia, and depression. Whereas apathy, anhedonia, and depression all involve some kind of motivational loss, boredom involves a strong desire to engage in an alternative situation. Boredom is both a "call" to stop doing what we are doing and a "push" to do something else.

3.2. The function of boredom

What does boredom do? My proposal is that the state boredom serves a two-fold function: first, it informs us of the presence of non-interesting situations; second, it promotes escape from such situations. In other words, boredom's function is to get us unstuck when we find ourselves stuck (Fahlman et al. 2013, p. 68). It should be noted that if this is boredom's function, then when boredom fulfills its function it is *self-effacing*. Boredom attempts to get us out of what precisely brings about the state of boredom. Boredom's function is to alleviate us of boring situations.

In order to provide support for the above claims, we need to revisit the specific features of the state of boredom explicated above. Each of the four aspects of the experiential signature of boredom that were highlighted in section 2.2—its affective, cognitive, volitional, and physiological aspects—contributes in its own way to the function of boredom.

First, boredom is an unpleasant state. During boredom, one is often disengaged from one's situation. One feels tired and/or frustrated with his or her situation (e.g., Goetz & Frenzel, 2006; Harris, 2000; Martin et al., 2006). Furthermore, the bored individual experiences feelings of constraint (e.g., Eastwood et al, 2012; Fahlman et al., 2011; Fenichel, 1951; Geitwitz, 1986; Hill & Perkins, 1985; Todman, 2013). Due to its affective character, boredom can be classified as a negative emotion. Negative experiences and events typically have a greater impact on an individual than positive ones (for reviews see Baumeister et al.,

2001; Rozin & Royzman, 2001). For example, negative moods promote more thorough information processing than positive moods (e.g., Clore, Schwarz, & Conway, 1994; Schwarz, 1990); negative events influence impressions more strongly than positive ones (e.g., Anderson, 1965; Peeters & Czapinski, 1990; Skowronski & Carlston, 1989); and there is a greater search for understanding and meaning for bad than good events (Baumeister et al., 2001). As such, the state of boredom is well suited to promote change in one's behavior.

Second, boredom is also characterized by a desire to escape one's current (unsatisfactory) situation (e.g., Berlyne, 1960; Fahlman et al., 2013; Fenichel, 1953; Fiske & Maddi, 1961; Greenson, 1953; Mikulas & Vodanovich, 1993; Pekrun et al., 2010; Todman, 2003; Van Tilburg and Igou, 2012). Thus, not only is boredom unpleasant, but the individual who experiences boredom does not want to be in this state. And the individual will try, if possible, to escape from it. The motivational power of the unpleasantness of boredom is demonstrated by research which found that when participants were forced to spend time alone with only their thoughts, they were willing to self-administer electric shocks (Wilson et al., 2014). Furthermore, Havermans et al. (2015) showed that individuals in a monotonous, boring condition ate more chocolate and shocked themselves both more often and with higher intensity than individuals in a neutral condition. In line with Wilson and colleagues, Havermans et al. (2015) concluded that boredom is such an aversive state that some individuals would choose negative stimuli in order to alleviate it. In yet another study, Nederkoorn et al. (2016) not only confirmed the findings of Wilson et al. (2014) and Havermans et al. (2015), but they also showed that only the onset of boredom and not that of sadness increased the number of voluntary self-administered electric shocks. The authors thus concluded that the reason why individuals chose to self-administer electrics is not to avoid emotional experiences in general but to escape boredom specifically. Lastly, findings that relate risk-taking behavior to boredom proneness (e.g., Dahlen et al., 2005; Kass et al., 2010) also demonstrate the capacity of boredom to motivate individuals to search for situations that will alleviate their experience of boredom, even if such situations are costly to them.

In addition to the affective and volitional aspects of boredom, its cognitive features also contribute to its function. In a state of boredom one is disengaged from one's activities. It is hard to sustain attention on a boring task (e.g., Eastwood et al., 2012). Often one experiences mental fatigue and mind-wanders (Harris, 2000; Martin et al., 2006). The bored individual even experiences a slower passage of time (Gabriel, 1998; Greenson, 1953;

Hartocollis, 1972; Heidegger, 1983/2001; Martin et al., 2006; Tze et al., 2013; Wangh, 1975; Watt, 1991). The cognitive elements of boredom thus render the present situation unsatisfactory. It cannot grab the individual's attention. It is not appealing to one. In turn, given that the individual is not engaged with the situation, the individual is moved to consider alternative situations, goals, and course of actions (Bench & Lench, 2013; Fahlman et al., 2013; Van Tilburg & Igou, 2012). Hence, the cognitive features of boredom contribute to its function (a) by disengaging one from a boring situation and (b) by allowing alternative and potentially more satisfactory and interesting situations to become salient.

Finally, and in terms of its behavioral aspects, during a state of boredom there can be either a decrease or an increase in physiological arousal. The former contributes to the sense of disengagement that the bored individual experiences. The latter facilitates the pursuit of alternative goals and situations (Bench & Lench, 2013). Danckert & Merrifield (2016)'s finding that there is anticorrelated activity in the anterior insular cortex during the state of boredom is a further indication that during boredom one is looking for stimulation, even though one is not currently meaningfully stimulated.

Putting theses elements together makes a strong case for the claim that boredom's function is to move us out of non-stimulating and boring situations and into situations that are stimulating and interesting.

3.3. The end of boredom

A regulatory perspective on boredom strongly suggests that, when it functions optimally, boredom is self-effacing: the goal of boredom is to move us out of the unsatisfactory situation that is the cause of its existence. Understood in this manner, boredom does not seek merely to promote movement but to facilitate a type of goal-directed movement (Elpidorou, forthcoming). While bored, one does not want change for the sake of change. Rather, one seeks change in order to escape boredom. And one escapes boredom only if one finds a situation that is interesting, exciting, fulfilling, or meaningful. Hence, boredom fulfills its function successfully when it motivates us to get out of a state of discontent and helps us to propel ourselves into a state that is closer to our interests and in line with our desires.

Such a feature of boredom is reflected in its volitional character. Bored individuals report a strong desire to escape their current situation. Yet they do not simply wish to replace their situation with *any* alternative situation—say, to move from one boring situation to a

different boring situation. Instead, bored individuals express a desire to do something that is interesting, exciting, or meaningful, and that is the case even when they do not know exactly what that is (Fahlman et al., 2013).

Moreover, past research has explored the self-regulatory processes that may be triggered by the experience of boredom as a way to counteract its causes. For instance, Sansone et al. (1992) reported that individuals who had a reason to persist in a boring task engaged in interest-enhancing strategies that transformed the boring task into something more enjoyable. Roy (1959) observed that workers who are forced to work in extremely monotonous conditions can find ways to occupy themselves by gamifying work procedures (see also Skowronski, 2012). In an intriguing study, van Aart and colleagues (2010) asked participants to play the role of Alice from *Alice in Wonderland* and found that the induction of boredom was followed by an increase of curiosity and agitation. Other work has suggested that a state of boredom may promote creativity (Gasper & Middlewood, 2014; Harris, 2000; Mann & Cadman, 2014)—although such findings should be considered in conjunction with Hunter et al. (2016)'s study which reports that boredom as a personality trait is not predictive of creativity. Finally, in a series of studies, Van Tilburg and Igou found that boredom is not only related to a perception of a lack of meaning, but importantly, it can give rise to various attempts to reestablish a sense of meaningfulness (Van Tilburg & Igou, 2011, 2012, 2016, 2017b; Van Tilburg et al., 2013). All of the aforementioned studies highlight in different ways and to various extents the manner in which boredom acts as a self-regulatory state that promotes the pursuit of activities that are perceived to be meaningful and interesting to the individuals. By doing so, boredom puts us in line with our own projects and promotes a good fit between activities and personal motives, needs, and values (Schueller, 2014).

An appeal to self-determination theory is useful in elucidating further the motivational character of boredom. Self-determination theory (Deci & Ryan, 1985; Ryan & Deci, 2000) draws a distinction between *intrinsic* and *extrinsic* motivation. The construct of intrinsic motivation is meant to capture one's "propensity to engage one's interests and exercise one's capacities, and in so doing, to seek to conquer optimal challenges" (Deci & Ryan, 1985, p. 45). Intrinsic motivation is generated internally (i.e., it is the product of internal tendencies) and does not require the aid of external rewards or punishments in order to drive behavior. When one is intrinsically motivated to engage in an activity, one does so for the sake of the activity itself. Whereas intrinsically motivated behavior is autotelic, extrinsically motivated behavior is

done for reasons external to the activity. That is to say, one is extrinsically motivated to engage in a task if such an engagement may lead to the attainment of an outcome other than the performance of the activity itself. A situation that is perceived by a subject to be boring is clearly not a situation with which one is intrinsically motivated to engage—after all, boredom is characterized by a lack of flow. At the same time, boredom acts as extrinsic motivation to alter one's behavior. In a state of boredom, one is motivated to bring about change in one's behavior (be it physical or mental) in order to escape the aversive experience of boredom.

It is important to emphasize that although boredom can facilitate escape from an unsatisfactory situation and promote the pursuit of tasks that are in line with one's goals and desires, it does not always succeed in doing so. Indeed, boredom will function optimally only when the right conditions (personal or situational) obtain. For one, it is not always obvious what will alleviate our boredom (Fahlman et al., 2013). In our attempt to escape one boring situation it is thus possible to find ourselves in another boring situation. Such a possibility highlights the need for self-awareness. To deal with boredom one needs not only to be able to motivate oneself to change one's situation—when such a change is possible—but also to know what alternative situations will be interesting or meaningful to one. In line with such a contention, previous research has indicated that boredom is best alleviated by activities that produce feelings of competence and self-determination (Weissinger et al., 1992). What those activities are, however, might not be obvious to the bored individual.

Furthermore, depending on the situation, there will be different strategies for dealing with boredom (Cummings et al., 2016; Daniels et al., 2015; Game, 2007). The most obvious strategy is to seek escape from boredom by quitting or disengaging with the activity that is perceived to be the cause of boredom. Of course, it would not always be possible (let alone desirable) for an individual to adopt such a strategy. If behavioral escape is not possible but the individual lacks a sufficient reason to perform the boring activity well (or if the boring activity is easy), one may adopt a cognitive-avoidance strategy by engaging in mind-wandering (Fisher, 1993; Harris, 2000). However, if one is highly motivated to maintain engagement with an activity that is perceived to be boring and which is demanding, one may change the manner in which he or she engages with the activity. This could involve a cognitive reappraisal of the situation. For example, one could try to find meaning or value in the activity by seeing it under a new light (Nett et al., 2010; Tze et al., 2013). Alternatively, one might change the manner in which one is performing the activity in an attempt to make it more interesting or meaningful.

One could, for example, gamify the activity (Hamilton et al., 1984), modify its complexity (Csikszentmihalyi, 1975), change goals (Fisher, 1993), or perform it in novel ways (Sansone et al., 1992; Schweizer, 2006).

Lastly, it should be emphasized that a regulatory stance on boredom does not necessitate that the exercise of the function of boredom *always* promotes one's well-being. There is no guarantee that the more interesting situation into which one moves on account of boredom will be beneficial for the individual. Risk-taking activities are ones that many will find interesting and as such will provide a solace from boredom, but they are also ones associated with potential dangers (e.g., Blaszczynski et al., 1990; Dahlen et al., 2005; Kass et al., 2010; Mercer & Eastwood, 2010). What is more, individuals might find a situation uninteresting and thus experience boredom, but they should not. For example, boredom often arises in academic contexts (Belton & Priyadharshini 2007; Mann & Robinson, 2009; Pekrun et al., 2010; Vogel-Walcutt, et al., 2011). The fact that students find their classes, lessons, readings, or teachers boring is valuable in itself for it is informs the students of the presence of a situation that is not in line with their interests; the presence of boredom can also inform the instructor that certain educational methods are not effective. However, not all such situations should be avoided, even if they are deemed to be boring. Boredom signifies a lack of interest and not a lack of importance. Interest is subjective, but importance is not (at least not necessarily). As a consequence, boredom has to be, at least sometimes, endured (B. Russell, 1996) and thus its "call" for change should be resisted.

4. The value of a regulatory approach

As I hope to have shown, the adoption of a regulatory perspective on boredom contributes to our understanding of boredom by underscoring its function and place in our mental economy. However, in addition to being informative about the state of boredom, a regulatory model on boredom is, as a conceptual approach, theoretically advantageous in the following three respects: it permits the synthesization of the diverse literature on boredom; it is consistent with both functional and evolutionary accounts of emotions; and it opens up unexplored avenues for research.

Comprehensiveness and coherence: Adopting the view that boredom is a regulatory emotion allows us to see how its experiential, cognitive, volitional, and physiological

components work together in facilitating the performance of its function. In doing so, the regulatory model brings together numerous and diverse findings on the character of boredom and offers a natural and compelling explanation of findings that show that the onset of boredom may lead to interest- or meaning-enhancing processes. A regulatory approach thus provides a synoptic picture of our current knowledge of boredom.

What is more, the regulatory model is line with the contention, expressed by some emotion theorists, that emotions require coherence amongst their various components (Reisenzein, 2000; Rosenberg & Ekman, 1994). According to the proposed model, boredom is understood as an essentially unified phenomenon: boredom is a regulatory state precisely because its various components work together in order to execute its function.

Consistency: The account offered is consistent with what is perhaps the most commonly accepted view on emotions: namely, that emotions are functional processes shaped by evolutionary forces (e.g., Hasselton & Ketelaar, 2006; Keltner & Gross, 1999; Keltner & Haidt Keltner et al. 2006; Tooby and Cosmides, 2008). Such a view emphasizes that emotions are responses to problems of physical or social survival and are best understood in terms of the functions that they serve. Clearly, a regulatory approach renders boredom a functional state. What remains to be seen is whether boredom, in addition to serving a function in our mental economy, confers to one an adaptive advantage.

A regulatory approach to boredom provides one with the conceptual tools to consider this important question. Indeed, there are at least three distinct sets of considerations that make it plausible that boredom carries adaptive value. First, self-regulation is crucial for the well-being and survival of an organism (Baumeister et al., 2001). Through self-regulatory processes an organism can adapt to a changing environment by changing itself and such a strategy is bound to be adaptive: an organism that is flexible and malleable in this manner is one that is more likely to survive and eventually to reproduce. Boredom is capable of contributing to the well-being of an organism by promoting self-regulation.

Second, negative emotions tend to narrow our thought-action repertoire (e.g. Frijda, 1986; Lazarus, 1991; Levenson, 1994; Oatley & Jenkins, 1996). Boredom does the same. It pushes us out of an uninteresting situation and promotes the pursuit of alternative situations. It is not implausible to think that what we find meaningful and interesting are situations that matter to us (Hidi & Renninger, 2006). Of course, not all situations that matter to us will be

ones that confer to us an evolutionary advantage. Nor is it true that any situation that alleviates boredom has adaptive value. Still, it is likely that overall an organism that is equipped with a mechanism that allow it to stop wasting resources in a situation that is not meaningful to it is better off than an organism that cannot do that. The latter organism is likely to get stuck in meaningless or irrelevant to it situations. Given that resources are limited (e.g., Baumeister et al., 1998; Muraven & Baumeister, 2000), it would be advantageous for an organism to be equipped with a psychological mechanism that not only signals a need for movement but which also promotes the pursuit of projects that are meaningful to the individual.

Finally, even though boredom is not a positive emotion, it can still promote the experience of the positive emotion of interest (e.g., Fredrickson, 2013; Silvia, 2008). Positive emotions are held to be evolved adaptations whose function is to build lasting and valuable resources for the organism (Fredrickson, 1998; Fredrickson & Cohn, 2008). Interest arises in contexts in which the organism feels safe and allows for exploration and engagement (Izard, 1977; Silvia, 2008). It has been argued that interest helps to expand the self by broadening one's repertoire of thoughts and actions (Cohn et al., 2009; Fredrickson, 2013) and consequently, it can eventually lead to the buildup of durable personal resources. Thus, in line with the broaden-and-build hypothesis developed by Fredrickson and colleagues (e.g., Fredrickson, 1998 and 2013; Fredrickson & Cohn, 2008), boredom can bring about some of the many benefits that are associated with the positive emotion of interest. It can do so not directly, but indirectly insofar as boredom promotes the pursuit of interesting situations.

Fruitfulness and testability: The adoption of a regulatory perspective allows us to draw a connection between the state of boredom and the personality trait of boredom. Once we understand boredom as a functional emotion, we can consider what happens in cases where boredom malfunctions. According to the regulatory account, boredom fails to fulfill its function either because it fails to move us *out* of uninteresting or meaningless situations or because it moves us *into* new situations that are not capable of alleviating our boredom (that is, boredom brings about a change, but such a change is not the desired one). Thus, the regulatory account predicts that when boredom systematically malfunctions one is likely to experience either prolonged or frequent boredom. Given how the personality trait of boredom is measured (e.g., Farmer and Sundberg, 1986), both experiences of boredom would

be assessed to be indicative of the presence of the personality trait of boredom. Consequently, a regulatory approach draws a connection between the dysfunction of the state of boredom and the presence of the personality trait of boredom.

What is important to note is that by drawing a connection between the two constructs, the regulatory approach leads to empirically testable predictions. On the one hand, it predicts that individuals who experience difficulties to initiate behavioral change would experience boredom more frequently—either because they would be incapable of moving out of uninteresting situations when such situations arise, or because they would remain stuck in the same situation for a prolonged period of time and as a result they would lose interest in their situation. On the other hand, the regulatory model predicts that the ability to initiate change and commit resources to carry out such a change should make it less likely that one experiences boredom. Initial confirmation for this prediction comes from evidence that shows that high locomotion is strongly negatively correlated with boredom proneness (Struk et al., 2016). Given the many psychological, bodily, and social harms with which the personality trait of boredom is associated, it is worth investigating this potential relationship between locomotion and boredom further: an induction of a locomotion perspective may turn out to be a way of thwarting trait boredom's influence on one's life.

Lastly, if a systematic failure of the performance of boredom leads to the personality trait of boredom, then the proposal suggests that there might be at least two mechanisms that give rise to the trait of boredom even if measures of this trait are not capable of distinguishing between the two. That is to say, the personality trait of boredom can be due either to motivational difficulties (when one systematically fails to initiate change) or to cognitive or affective difficulties (when one systematically chooses to alleviate boredom in ways that are ultimately unsatisfactory).

5. Conclusion

In this paper, I have offered a theoretical model for understanding boredom. By reviewing the empirical literature on the state of boredom, I described its character and showed that boredom serves a function in our mental economy. As a transitory and often situationally caused affective state, it is unpleasant and a sign of the presence of an unsatisfactory or meaningless situation. Still, boredom contains a way out of itself and into a life that is worth living. By separating the interesting from the non-interesting it has a unique capacity to shape

our world. Given its motivational capacity, it has the power to set us in action and to promote the pursuit of projects and goals that are congruous with our interests, values, and desires.

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