**Is Boredom One or Many?**

**A functional solution to the problem of heterogeneity**

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**Abstract** Despite great progress in our theoretical and empirical investigations of boredom, a basic issue regarding boredom remains unresolved: it is still unclear whether the construct of boredom is a unitary one or not. By surveying the relevant literature on boredom and arousal, the paper makes a case for the unity of the construct of boredom. It argues, first, that extant empirical findings do not support the heterogeneity of boredom, and, second, that a theoretically motivated and empirically grounded model of boredom (the functional account) supports the view that the construct of boredom is a unitary one.

**Keywords** boredom, emotion, arousal, function, ANS

**1. Introduction**

Boredom is a ubiquitous aversive experience that affects humans frequently and in a wide array of situations. As a transitory psychological state, boredom (“state boredom”) has non-negligible effects on cognition and behavior. It changes our attitudes regarding our situation; it can give rise to meaning-reestablishment strategies and to pro-social intentions; it can affect our political orientations and alter our perception of the passage of time; it may lead to mind-wandering; and, almost without fail, it disengages us from the task at hand (see references in Eastwood et al., 2012; Elpidorou 2018b; Fahlman et al. 2013; Van Tilburg & Igou 2012, 2017). Above all, boredom is a powerful drive. It motivates us to act in various ways—moral or immoral, beneficial or harmful, subtle or extreme—all of which share a common aim: to help us escape from what is making us bored (Elpidorou, in press). Perhaps even more significant than the outcomes of state boredom are the correlates of the propensity to experience boredom frequently (“boredom proneness”) (Farmer & Sundberg, 1986). Such a propensity carries important physical, psychological, social, and even moral risks. Depression, anger and aggression, anxiety, loneliness, hopelessness, lower life and job satisfaction, poor interpersonal relations, risk-taking behavior, gambling, and drug and alcohol abuse, just to list a few, have all been reported in the literature as correlates of boredom proneness (for reviews, see Elpidorou, 2017; Vodanovich, 2003; Vodanovich & Watt, 2015).

Three recent advances have acted as catalysts for progress in the scientific study of boredom. First, researchers have developed and validated ways of operationalizing and measuring the presence of boredom. Some of these assess boredom in specific contexts (e.g., Passik et al., 2003). Others are designed to assess one’s general tendency to experience boredom in a wide range of situations (Farmer & Sundberg, 1986). And others measure the occurrence of the transitory experience of state boredom (Baratta & Spence, 2018; Fahlman et al., 2013). All these measures offer researchers ways to determine and assess the presence of boredom and to examine its concomitants, correlates, and effects.

Second, although initially ignored, the neurophysiological correlates of boredom are now actively investigated. Oswald (1962) reported that alpha waves are present during boredom and Tabatabaie et al. (2014) provided evidence that boredom might be correlated with lower beta activity in the left dorsolateral prefrontal cortex. Such findings allow investigators to test hypotheses regarding the relationship between attention, mental effort, and boredom (see e.g., Eastwood et al., 2012; Kurzban et al., 2013). Other studies reported activation of parts of the default mode network during boredom (Danckert & Merrifield, 2016; Ulrich et al., 2014), which could be interpreted as a sign that during a boring task one’s attention is directed toward inner thoughts (Raffaelli, Mills, & Christoff, 2018).

Third, a number of researchers have articulated and defended a functional account of boredom that maintains, first, that boredom plays an important function in our mental economy and, second, that an explication of boredom’s function is necessary for a complete understanding of its nature (Bench & Lench, 2013; Danckert et al., 2018b; Elpidorou 2014, 2018a, 2018b; Kurzban et al., 2013). Boredom, according to the functional account, is what it is because of what it does. The functional account can be developed in various ways, but a recent, theoretically developed, explication of it treats boredom as a regulatory state that aims to promote the pursuit of satisfactory activities: i.e., ones that are perceived by the agent as meaningful, interesting, or engaging (Danckert et al., 2018b; Elpidorou 2018a, 2018b).

It is undeniable that in the last couple of decades the study of boredom has made great advances. All the same, it would be a severe overstatement to claim that the nature of boredom is, more or less, settled. Indeed, there appears to be no consensus when it comes to perhaps one of the most basic issues regarding boredom, namely, whether boredom is a unitary construct or not. If boredom is not one—that is, if there is not just one type of boredom—then different researchers might be speaking of the same boredom only in name. As a consequence, the results, claims, or theories of one study might not be pertinent to the results, claims, or theories of another.

**2. Clarifying the Question**

Even a cursory look at the literature on boredom reveals that the issue of the unity or disunity of boredom has been one of concern and speculation. For instance, Otto Fenichel wrote that “it is probable that the conditions and forms of behavior called ‘boredom’ are psychologically quite heterogeneous” (Fenichel, 1951, p. 349). Martin Doehlemann (1991) proposed a taxonomy of boredom that distinguishes between four distinct types of boredom. In his phenomenological investigation of boredom, Martin Heidegger (1983) drew a distinction between three types of boredom. And Adams Phillips (1993) suggested that we should not speak of boredom but of “boredoms.”

Is boredom a unitary construct or not? There are ways of reading this question according to which the answer comes out to be clearly “no.” For one, if the question is read as one concerning our linguistic practices, then it is clear that we can—and indeed do—mean different things by “boredom:” acedia, tedium, ennui, existential malaise, lethargy, monotony, and indifference have all been called “boredom.” In turn, we also know that “boredom” is often used to refer both to the state of boredom (a transitory affective experience) and to boredom proneness (a propensity to experience boredom often and in a wide range of situations). What is at stake in the present investigation is neither an issue about the use of the word “boredom” nor about the distinction between state boredom and boredom proneness. The focus is on whether *state* boredom is essentially unified or not. Are all instances of that emotion type similar in some important way? And are they amenable to more or less the same kind of scientific and conceptual analyses? Or are they distinct kinds of experiences, each of which ought to be addressed and studied separately?

The present essay addresses such issues head-on and draws a three-fold conclusion. First, the essay makes the case that extant findings on the character of boredom do not support the view that the state of boredom is a heterogeneous construct. Second, it argues against using physiological arousal as a determining characteristic of boredom and in support of the claim that boredom does not necessarily require a specific kind of arousal. Third, it shows how a functional account of boredom supports the view that the construct of boredom is a unitary one. Ultimately, the essay aims to contribute to the rich and growing literature on boredom by focusing on boredom’s relationship to physiological arousal and by offering a theoretical account that can both accommodate and unify important findings regarding the character and effects of boredom.

**3. Heterogeneity in Boredom Proneness**

Why would one think that boredom is not a unitary construct? There are at least two potential sources of such a contention. The first, which will be considered in this section, has to do with the purported multidimensionality of the Boredom Proneness Scale (BPS) (Farmer & Sundberg, 1986). BPS is a self-report measure that is meant both to operationalize and to assess boredom proneness (commonly thought to be a personality trait).

When devising BPS, Farmer and Sundberg (1986) conceived of it as a scale measuring a unitary construct—specifically, the tendency of an individual to become bored. However, the first factor analytic studies on BPS did not confirm their assumption. Both Ahmed (1990) and Gana and Akremi (1991) provided evidence in support of the claim that BPS consisted of two factors. Follow-up exploratory factor analyses complicated matters further. Such analyses suggested the existence of anywhere between two to five factors. For helpful reviews see Vodanovich (2003) and Melton and Schulenberg (2009). It is worth noting that it is hard to draw any meaningful comparisons between different factor analytic studies. That is because such studies differ in important respects: some used the original true-false version of BPS, whereas others employed the revised (7-point Likert-type scale) version; different studies employed different factor analytic rotations; and different studies used different statistical criteria for item inclusions.

Despite these mixed results and lack of clarity as to the precise number of factors, a consensus arose: BPS, it was argued, has *at least* two factors—an internal factor and an external factor (see Struk et al., 2017 for details). The presence of these two factors was taken as support for the existence of two types of boredom. On the one hand, the internal factor of BPS was thought to reflect one’s inability to self-generate interest and was taken to be a measure of *apathetic boredom*. On the other hand, the external factor was thought to reflect one’s inability to engage with the environment in an interesting or fulfilling manner and was taken to be a measure of *agitated boredom*. Thus, through a study of the factors of BPS one could—and in fact some did—claim that there are two types of boredom. This result about the two types of boredom was further supported by a confirmatory factor analysis on BPS conducted by Vodanovich, Wallace, & Kass (2005) that revealed again two factors (“Internal Stimulation” and “External Stimulation”) with six items each. Vodanovich and colleagues argued that the remaining items of the original 28-item BPS should be excluded from the scale and thus offered a shortened version of BPS (BPS-SF).

This conclusion about the factor structure of BPS was proven, however, to be premature. Subsequent factor analyses failed to find support forthe purported multidimensional nature of BPS. In fact, Melton and Schulenberg (2009) concluded that BPS does not have a replicable factor structure. Additionally, by focusing on the short form of BPS (BPS – SF) developed by Vodanovich et al. (2005), Struk and colleagues (2017) argued that the two-factor structure of the scale is an artifact of item wording. The internal factor scale consists exclusively of reverse-worded items. When the wording was altered so that no item required reverse scoring, they found that the scale behaved like a single factor—not only did the two factors behave more like each other, but they also behaved like the total BPS score. As further support for their conclusion, Struk and colleagues devised a new short (8-item) version of BPS (SBPS). Analysis of this new scale showed good evidence in support of its unidimensionality. Struk et al. (2017) concluded that “prior studies that considered BPS to be a multifactorial measure, including our own studies, should be interpreted with care” (p. 356).

 But there is more. In a six-year study that included older participants (mean age > 70), Gana, Broc, & Bailly (2019) explored once again the factorial structure of measures of boredom proneness and examined whether such measures capture trait boredom or whether they are affected by the state of the participants in which they are in when they are completing the measures. Gana and colleagues found no evidence either for the unidimensionality of the original 28-item BPS (as claimed by Farmer & Sundberg, 1986) or for the two-factor models of BPS proposed by Gana & Akremi (1991) and Vodanovich, Wallace & Kass (2005). And although they did confirm the unidimensionality of SBPS,[[1]](#footnote-1) the internal reliability of SBPS (as given by Cronbach’s alpha coefficient) was found to be low (ranging from 0.5 – 0.68).[[2]](#footnote-2) Furthermore, when they applied a trait-state-occasion model to SBPS scores, they reported that only 28% of the variance in the scores across the 6-year period was due to a trait-like component (of the remaining 72%, 8% was due to state boredom and 64% to measurement errors). If less than one third of the variance of the SBPS score can be attributed to a trait component, then SBPS does not seem to be a great measure of trait boredom, at least for the participants of Gana et al.’s study (i.e., elders).

 What do the foregoing considerations show? First, although previous factor analytic studies supported the view that BPS is a multidimensional scale, we now know that such findings were problematic. Second, the most recent studies of the short form of BPS (SBPS) provide initial support for the claim that there is a unitary construct that such scale is trying to capture, although the exact nature of this construct remains obscure. Third, and most importantly, it is unclear what conclusions, if any, one is warranted to draw about the nature of state boredom from factor analytic studies on measures of boredom proneness. Regardless of whether a measure of boredom proneness is unidimensional or multidimensional, there is no immediate passage from the factor structure or dimensionality of that measure to the nature of the construct that the measure is thought to assess. Even worse, there is no easy way of drawing inferences about the nature of *state* boredom from claims regarding the dimensionality of a measure of trait boredom. This is especially the case given uncertainty as to what BPS (or some short form of the scale) is measuring (Danckert et al., 2018a, p. 36; Gana, Broc, & Bailly, 2019) and theoretical disputes regarding the nature of personality traits and the relationship of such traits to states (Matthews, Deary, & Whiteman, 2009). Thus, the best we can conclude from factor analytic studies on measures of boredom proneness is that they give us no reason to think that state boredom is *not* a unitary phenomenon.

**4. The Issue of Arousal**

**4.1 Overview**

In the previous section, it was mentioned that there are two potential sources of support for the claim that state boredom is not a unitary construct. Whereas the first source was related to the purported multidimensionality of BPS, the second concerns the state of boredom directly—it pertains to its relationship to arousal.

Arousal is typically conceived of as a measure of physiological activation, that is, it represents the extent to which our bodies are prepared for action. Arousal is thought to vary on a continuum: from “low arousal,” an activation level that occurs in calm or deactivated states (e.g., relaxation or depression), to “high arousal,” an activation level that occurs in states of excitement and extreme effort (e.g., exuberant joy or anger) (Picard, Fedor, and Ayzenberg, 2015). Different emotions come with different arousal levels insofar as their presence is correlated with various patterns of behavioral, somatovisceral, and cortical activity. Furthermore, our emotional experience is influenced by our awareness of (some of) those physiological changes. Because of such observations, most researchers assume arousal to be essential both to the experience of an emotion (Russell, Feldman, & Barrett, 1999) and to the emotion itself (e.g., Berlyne, 1960; Damasio, 1993; Frijda, 1986).

 Is boredom a state of low or high arousal? The literature offers no definitive answer. Boredom has been described as a state of low arousal, as a state of high arousal, and as a state of mixed arousal (for references, see Elpidorou 2018b). A review of the literature reveals that the majority of definitions and characterizations of boredom render boredom a state of low arousal (see Vogel-Walcutt et al., 2012). Such an attitude is consistent with the pre-theoretical understanding of boredom as an apathetic (or lethargic) state. However, qualitative data on the character of the experience of boredom (Goetz et al., 2014; Harris, 2000; Martin, Sadlo, & Stew, 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, Sadlo, & Stew, 2006). In addition, the correlates or effects of boredom suggest either a state of high arousal, when aggression or stress follow boredom, or a state of low arousal, when depressed feelings or resignation follow (van Hooft & van Hooff, 2018).

 What is more, studies utilizing direct measures of physiological arousal have linked boredom to both decreases and increases in arousal. For example, Pattyn et al. (2008) found that during a prolonged target detection task—a presumably boring task—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). Oshuga, Shimono, & Genno (2001)’s study offers supporting evidence for the claim that boredom gives rise to an increase in autonomic arousal. During the performance of a monotonous task, Oshuga and colleagues observed that irregularity in respiration increased. It should be noted, however, that in their explanation of this finding the authors propose that such an increase might be the result of the subjects’ fighting against sleepiness, something that would suggest that boredom is a mixed state in terms of arousal. 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.

 Merrifield & Danckert (2014) observed that during boredom induction there was a linear increase in heart rate but a linear decrease in skin conductance levels (SCLs). They also found that individuals who scored higher on BPS exhibited higher mean heart rate during boring mood induction. Lastly, Danckert et al. (2018a) asked participants to read both a boring and an interesting story (either in that order or in reverse). During the reading tasks, and at pseudorandom intervals, participants were prompted with questions designed to assess their levels of boredom, mind-wandering, restlessness, and sleepiness. Dackert and colleagues reported a number of intriguing findings. Most relevant for present purposes was the finding that self-reports of sleepiness rose with rising levels of state boredom. This finding provides strong support for the claim that boredom is, at least sometimes, subjectively experienced as a low arousal state. In addition, Danckert and colleagues found that state boredom, mind-wandering, sleepiness, and restlessness were highest for the boring story, if it was read second. (When the boring story was read first, there was no significant difference between restlessness during the boring story and restlessness during the interesting one.) This finding shows that under certain conditions (i.e., when a boring task follows an interesting one), boredom can be experienced as both a low and high arousal state. “Taken together,” the researchers write, “our findings on sleepiness and restlessness suggest that episodes of boredom include both low and high arousal experiences as the individual attempts to engage (or re-engage) with a task at hand.” (Danckert et al., 2018a, p. 35)

**4.2 From Arousal to Heterogeneity? Not So Quick**

The mixed results regarding boredom’s relationship to arousal could be thought of as preliminary support for the claim that depending on their associated level of physiological arousal, different types of boredom exist. Goetz and colleagues (2014) draw precisely this conclusion. In two studies (N=63 and N=80), Goetz and colleagues obtained real-time data regarding the experience of boredom using experience-sampling method and when they analyzed the data with respect to valence and arousal using multilevel latent profile analyses, they found five types of boredom: indifferent, calibrating, searching, reactant, and apathetic boredom. Both indifferent and apathetic boredom were categorized as low arousal states, although they differed in terms of valence—the former (indifferent boredom) had a slightly positive valence whereas the second (apathetic boredom) was negatively valenced. Calibrating, searching, and reactant boredom were all close in terms of valence (they fell somewhere in the middle of the valence scale) but had different levels of arousal, even though all three of them were categorized as *high* arousal states.

 The reported findings are intriguing, they pertain directly to the issue of the heterogeneity of the construct of state boredom, and the study has now become a popular reference point in discussions surrounding the nature of state boredom. All the same, a careful consideration of their study ultimately reveals a number of important concerns with their reasoning that militate against the acceptance of their proposed typology of boredom.

 (i) **Positive valence:** One of the types of boredom (indifferent boredom) reported by Goetz and colleagues is said to have a slightly positive valence. Such a result ought to give us pause. It runs counter to our commonsense understanding of boredom which takes boredom to be an aversive state. It opposes most conceptual accounts of boredom that have placed great emphasis on boredom’s negative character. And it challenges empirical investigations of state boredom, including attempts to devise measures of state boredom (Fahlman et al., 2013). Furthermore, in a large scale study that captured 1.1 million emotional and time-use reports from almost 4000 subjects, Chin et al. (2017) reported that although boredom often co-occurs with other negative affective states and emotions (loneliness, anger, sadness, and worry), it rarely co-occurs with positive emotions. This result is again in conflict with what Goetz and colleagues reported regarding the first type of boredom.

 (ii) **Temporality:** The temporal relationship (if any) between the different types of boredom was not examined by Goetz and colleagues. This is an issue that deserves our 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) (see also Mills & Christoff, 2018). If that is the case, then it becomes much harder to judge whether differences in reported arousal levels are indications of different types of boredom or indications of different phases of one and the same boredom state.

 (iii) **Measures of arousal:** An additional issue with the study is that arousal was measured by self-reports (participants had to complete a 5-point Likert scale ranging from 1 (*calm*) to 5 (*fidgety*)). Consequently, Goetz and et al. rest their case on self-reports of arousal levels. But without additional measures of arousal, we do not know if the divisions that they found are specific to subjective judgments of arousal or replicate for other ways of measuring arousal. It is possible that if other measures were used, one would have obtained a different taxonomy of boredom.

 (iv) **Mixed emotions:** Outside of control environments, individuals experience simultaneously a plethora of emotions. For instance, within academic contexts, it has been shown that anxiety can co-occur with positive emotions such as excitement, happiness, and interest (Moeller, Salmela-Aro, et al., 2015; Pekrun et al., 2002), and, during work, stress was found to be accompanied by positive emotions, at least for some individuals (Simmons & Nelson, 2007). Thus, by being asked to report on their experience of boredom it is possible that individuals were reporting implicitly on their emotional experiences in general. For example, if one is both angry and bored and is asked to rate the arousal level of their experience of boredom, it is likely that such rating will reflect the arousal level of not only their experience of boredom but also of anger. As mentioned above, Chin et al. (2017)’s large-scale study found that boredom co-occurs with a number of negative affective states and emotions. A different large-scale study corroborates this claim. Trampe, Quoidbach, & Taquet (2015) utilized a free mobile application in order to measure various aspects of the users’ psychological experiences by prompting them to answer short questionnaires at random times throughout the day. More than 60,000 users downloaded the application and the researchers collected half a million completed questionnaires. What the researchers found was that, on average, individuals reported experiencing some emotional experience 90% of the time. They also observed that individuals experienced more than one emotion at the same time. Indeed, 33% of the time, individuals experienced at least one positive and one negative emotion simultaneously (cf. Moeller et al. 2018). Taken together, such findings make it hard to draw any definitive conclusions regarding the typology of boredom from Goetz and colleagues’ reports. It is possible that the different types of boredom correspond to mixed emotional experiences—experiences that include boredom in addition to other emotions.

 (v) **Guiding assumption.** The most serious issue with using Goetz et al.’s study as evidence in support of distinct types of boredom has to do with the guiding assumption of their study. Goetz and colleagues take it as an unproblematic datum that differences in arousal are sufficient to individuate between different types of boredom. Their research is guided by the adoption of a circumplex model of affect (Russell, 1980) according to which “discreet affective states are characterized by the orthogonal dimensions of valence and arousal” (Goetz et al., 2014, p. 403). The researchers used latent profile analysis in order to determine the different types of boredom, but their analysis was predicated on the assumption that the relevant variables are those of valence and arousal. Such a guiding hypothesis excludes the possibility of the *same* emotional state with mixed arousal levels (i.e., both high and low). What this means is that Goetz’s et al. study does not show that there are distinct types of boredom. It could only show that if we had already accepted the claim that boredom is an emotion of pure arousal—either low or high. But since it is still an open question whether boredom can be a state of mixed arousal, or even a state that sometimes is low and sometimes high on arousal, all that the study shows is that the experience of boredom can be associated with differing levels of *subjectively reported* arousal.

These five points strongly oppose the adoption of the proposed typology of boredom by Goetz and colleagues. The claim that there are five (distinct) types of boredom is, at this stage, a claim that cannot be accepted on the basis of available evidence.

**5. Beyond Arousal**

If a feature or property *F* is a determining characteristic of an entity *E*, then the absence of *F* allows us to determine the absence of *E*. A determining characteristic in this sense is a necessary but not a sufficient condition for *E*. Hence, if *being a state of low arousal* is a determining characteristic of boredom, then low arousal would be necessary for boredom because all states of boredom would have to exhibit low arousal, but not sufficient for boredom because not all states of low arousal would be states of boredom. The purpose of this section is to argue that arousal (either low or high) should not be taken to be a determining characteristic of boredom. Three reasons are offered in support of this contention.

**5.1 The Construct of Arousal**

Arousal has been traditionally conceived of as a unitary state or construct. Although such a conception of arousal is supported by the observation that the subjective experience of arousal is generally a unified experience, research over the past half century demonstrates that arousal is a matter of tremendous complexity and unlikely to be a unitary construct.

 Arousal can be measured via different means. It can be measured subjectively through self-reports. If arousal is operationalized as a physiological state or process, then such a measure will be indirect and will assume that reports of one’s conscious experience track (more or less reliably) physiological arousal. However, individuals do not have immediate and explicit access to autonomic and somatic activity (Barrett et al., 2007), and although subjectively felt arousal is related to physiological activity, the two fail to correlate highly (Barrett et al., 2004; Wiens, 2005). Because of such problems with subjective reports of physiological activation, arousal is usually assessed directly: behavioral measures, autonomic nervous system measures (including respiratory, cardiovascular, and electrodermal measures), general metabolic measures, and measures of cortical arousal have all been used in order to quantify physiological activation. Such direct measures, however, often fail to produce a unified arousal system insofar as they do not correlate highly with one another (Blascovich, 1990, 1992). Early studies illustrated the dissociation between behavioral and cortical measures of arousal (Bradley & Elkes, 1953; Feldman & Waller, 1962). Other studies reported a similar pattern for measures of autonomic arousal­—they co-vary neither highly with each other nor with behavioral performance (e.g., Lacey, 1959, 1967). In addition, Picard and colleagues (2015) reported results from empirical studies that demonstrate clear left versus right asymmetries in emotional arousal, when it is measured through electrodermal activity. As the researchers write, “some kind of arousal is happening on the right [side of the body], and it can be very different from the left” (p. 11). Consequently, traditional measures of electrodermal activity (of only the left side) can lead to misjudgments regarding arousal. Such findings, coupled with the fact that the autonomic nervous system can give rise to differential activity across different end-organ systems (Berntson & Cacioppo, 2007), make it clear that one cannot generalize from measurements of one component of a physiological response system to some other response system.

 What is more, it is now established that the autonomic nervous system can give rise to highly complex patterns of activation that depend upon relatively subtle environmental and psychological factors (for a discussion, see Norman, Berntson, & Cacioppo, 2014). Furthermore, as Berntson and Cacioppo (2007) describe, there are complex interactions between the autonomic, neuroendocrine, and immune systems (see also: Besedovsky & Sorkin, 1985; Kenney & Ganta, 2015). Indeed, given what we currently know about neurophysiology and the effects of drugs on arousal, one cannot deny that multiple regions of the brain and body are involved in arousal (Berntson, Sarter, & Cacioppo, 2003; Brown, Purdon, & van Dort, 2011; Pfaff, Martin, & Faber, 2012). All in all, there is a large body of evidence that makes it clear that arousal is not a unitary phenomenon. The term “arousal” does not pick out one type of activity within our bodies but many different ones.

**5.2 The Role of Arousal in Boredom**

It was already mentioned that results regarding boredom’s relationship to arousal are mixed—some report that boredom is a low arousal state, others that it is a high arousal state, and others that it is (or can be) both. Researchers have offered accounts that aim to explain how boredom can be a state of both low and high arousal, either at the same time or at different moments. Three such accounts—none of which is incompatible with each other—are briefly reviewed.

 **(1)** The physiological expressions of emotions are dynamic processes that unfold over time. As a consequence, both the type of systems that become activated during a given emotion and the intensity of such systems will vary over time (Fox, Kirwan, & Reeb-Sutherland, 2012). One thus might appeal to the temporal profile of boredom and argue that boredom can transform itself from an apathetic state to an agitated one (or vice versa) depending on either endogenous or exogenous factors. Such a suggestion is articulated in Eastwood et al. (2012) and repeated in Danckert et al. (2018a) and Elpidorou (2018b). It holds that, initially, the experience of boredom will be manifested as a state of low arousal because at the beginning stages of that experience subjects will find themselves disengaged. Such a contention gains some support from research that shows that lower SCL is related to decreased engagement of attention (Frith and Allen, 1983). As time progresses, however, bored subjects will make an effort to engage with their environment. Such an attempt for engagement will likely give rise to an increase in arousal, especially if it is unsuccessful. And if one’s attempts for escape continue to be unsuccessful, then one might give up and return to a state of low arousal (see also Mills and Christoff, 2018).

 An appeal to the temporal profile of boredom can explain why there is reported disagreement between direct measures of arousal: results from different measures will depend on when arousal was assessed and on whether or not participants were able to successfully alleviate their experience of boredom during the experiment (through cognitively reassessing their situation, mind-wandering, or gamefying their task). Furthermore, the proposed account can also account for mixed results in subjective experiences of arousal. Given the dynamic nature of the experience of boredom, individuals who report on their experience of boredom may be recalling the first (apathetic) stage of their experience, the second (agitated) state, or both.

 **(2)** One could maintain that boredom’s relationship to arousal is context-dependent. For example, van Hooft & van Hooff (2018) have offered preliminary evidence in support of the claim that boring situations with low perceived task autonomy are more likely to give rise to agitated boredom than boring situations with high perceived task autonomy. Unfortunately, the proposal by van Hooft & van Hooff cannot be the whole story. There is more to boredom’s relationship to arousal than perceived task autonomy. For instance, in the study conducted by Danckert et al. (2018a) the same task (reading a boring story) gave rise to both high and low arousal even though the perceived autonomy of this task remained the same. Hence, if the arousal profile of the state of boredom is to be explained by an appeal to features of our situation, the role of additional situational characteristics (ones other than just perceived autonomy) must be shown to be relevant to physiological arousal.

**(3)** A third possible explanation as to how boredom can be both a high and low arousal state finds recourse in the directional fractionation hypothesis (Lacey 1959; Lacey & Lacey, 1970). According to this hypothesis, it is possible for a state such as boredom to induce differential autonomic changes. Merrifield & Danckert (2014) consider this possibility and explain how boredom can give rise both to high arousal (higher heart rate) and low arousal (decrease in SCL).

In sum, the literature contains different attempts to explain how boredom’s arousal can change, either due to environmental or endogenous factors. If any combination of such accounts turns out to be correct, then there is a way of rendering consistent the mixed results in the literature without demanding that boredom is a heterogeneous construct. More to the point, if it turns out that boredom’s arousal can some times be low and some times high, then such a variability in arousal constitutes an argument against treating arousal as a determining characteristic of boredom—whether arousal is low or high, it may not matter for boredom. It is worth adding that in a study designed to examine how boredom differs from a number of other negative emotional experiences, Van Tilburg and Igou (2017) found that boredom is reported by individuals to be a state of low arousal (Studies 1 and 2). However, the researchers also found that “arousal was of relatively little utility for distinguishing boredom in particular” (p. 317). Other characteristics of boredom, such as perceived meaninglessness during the experience of boredom and its relationship to attention, were far more effective means of individuating boredom.

**5.3 Variation in Emotions**

It is undeniable that many emotions bear in us (our bodies, our brains, or our metabolic systems) their mark and it is through that mark that we come to recognize them. What is far less clear is the precise nature of their physiological mark and the role that such a mark plays both in the experience of emotions and in their individuation.

 Consider first empirical examinations of emotions’ relationship to somatovisceral changes. Cannon (1927) argued that physiological responses were too coarse to account for the specificity and distinctness of experienced emotions, and Schachter and Singer (1962) provided empirical support for the claim that the same pattern of autonomic activity could result in different emotional experiences. Such early work, however, did not settle the issue and published studies by Ekman, Levenson, & Fiesen (1983) and Levenson, Ekman, & Friesen (1990) offered evidence for the claim that autonomic activity can distinguish between emotional experiences. For instance, Ekman and colleagues (1983) recorded heart rate, finger temperature, skin resistance, and forearm muscle tension while subjects completed tasks designed to elicit in them the emotional states of anger, fear, sadness, happiness, surprise, and disgust. The researchers reported that a combination of autonomic activity measures could be used to differentiate between (some) negative emotions. Supporting findings were also reported by Levenson et al. (1990).

 These initial findings proved to be tremendously influential for they gave rise to a research program within psychology dedicated to the investigation of emotion-specific autonomic changes. The ensuing work is too voluminous to be summarized here but meta-analyses conducted by Cacioppo and colleagues (Cacioppo et al. 2000; Cacioppo, Gardner, & Berntson, 1997) provide little evidence for the claim that distinct emotions can be associated with distinct and identifiable patterns of somatovisceral changes. Furthermore, even studies that were published after these meta-analyses failed to offer disconfirming evidence to the conclusions of the meta-analyses. For instance, Kreibig (2010) reviewed 134 studies on the relationship between emotion and peripheral physiological responses. The review did report some evidence in support of the claim that different emotions are associated with different patterns of autonomic activity. Still, the review revealed that no emotion type had a unique autonomic arousal profile and that published studies have yielded conflicting results regarding autonomic activation during emotional experiences. Lastly, two additional studies using multivariate approaches, one by Stephens, Christie, & Friedman (2010) and the other by Kragel and LaBar (2013), found that autonomic variables were able to successfully classify emotions at a rate of 44.6% and 58.0% respectively. Such rates of success, however, do not provide us with strong reasons to believe in the existence of emotion-specific patterns of autonomic activity. In sum, although it is clear that emotions are related to autonomic activity, such activity does not appear to distinguish reliably between different emotional experiences.

 The situation does not change if we move from an examination of autonomic responses to an examination of facial or behavioral changes during emotional experiences. In the case of facial changes, facial electromyography measurements are reliable proxies of negative versus positive affect (Cacioppo et al., 2000) and of the intensity of the affect (Messinger, 2002). Still, they fail to reliably differentiate between distinct emotions (Barrett 2006a). Overt behavior also fails to distinguish between distinct emotion types. Distinct behaviors are associated with the same emotion (think of freezing, fleeing, or tonic immobility in the case of fear) and the same behavior can be associated with distinct emotions (attack behavior can be found both in fear and anger) (Adolphs, 2013; Blanchard & Blanchard, 2003).

 A similar story is told when we turn our attention to the search of neural signatures or correlates of distinct emotions. Despite expectations, meta-analytic studies were unable to find any consistent evidence for distinct and identifiable neural correlates of anger, sadness, disgust, and happiness (Murphy, Nimmo-Smith, & Lawrence, 2003; Phan et al., 2002). Even the often-reported correspondence between the onset of fear and activation in amygdala does not *always* occur. Only 60% of the studies that were considered in the meta-analytic studies noted the fear-amygdala correspondence. Furthermore, such a correspondence can be explained in a way that does not render activation in the amygdala the neural correlate of fear (Barrett, 2006).

 Such findings, most of which are by now well known and much discussed, are presented here not in order to suggest that there is no point in studying the physiological mechanisms of emotions. Nor are they presented in order to signal approval for a conclusion that some have drawn on the basis of these findings, namely, that emotions are not natural kinds (Barrett, 2006). In the present context, these findings are reviewed because collectively they constitute a strong case against the claim that all instances of an emotion type (e.g., fear, boredom, anger) have the same neurophysiological signatures. There is remarkable variability in the manner in which emotions are behaviorally, neurophysiologically, and even phenomenally expressed (Barrett, 2006). The existence of such variability should be taken seriously. In the case of boredom, we ought to try our best to understand it and not to explain it away, either by quickly finding recourse in distinct types of boredom types or by choosing one type of arousal as a necessary condition for boredom.

**5.4 Summary**

The construct of arousal itself does not appear to be a unified one. There is incredible variability when it comes to the neurophysiological and behavioral correlates and antecedents of emotions. And there are theoretical and experimental considerations that suggest that arousal might not be a determining factor of the presence of boredom. This three-fold conclusion does not negate the importance of arousal for the experience of boredom. Elevated activation might prepare us for action and thus help us to move out of a boring situation. Low arousal might be a coping mechanism insofar as it can help us to disengage from a boring situation. The issue of arousal is important but not definitional: it does not settle by itself whether a state should count as a state of boredom or not. If we wish to determine whether there is unity or disunity in boredom we need to look elsewhere.

**6. Unity Through Function**

The functional view can provide an explanation as to why boredom, despite its different behavioral and physiological manifestations, can be considered to be a unitary construct. A functional account of boredom takes boredom to be a state that serves an important function in our everyday lives. It is this function that is a determining characteristic of boredom and not any of its specific features (e.g., valence, arousal, or behavioral manifestations). In fact, those features *are* features of boredom because they contribute to the exercise of the function of boredom. They are unified under one construct, in other words, precisely because they work together and toward the execution of a common function.

 What then is the function of boredom and how does it relate to boredom’s known characteristics? Boredom is a functional emotion insofar as it is both informative and regulatory of one’s behavior (for detailed discussions of this position, see Bench and Lench, 2013; Elpidorou, 2014, 2018a, 2018b; Danckert et al., 2018b). Boredom informs one of the presence of an unsatisfactory situation and, at the same time, motivates one to pursue a new goal when the current goal ceases to be satisfactory, attractive, or meaningful. Boredom is thus both an affective signal and a drive.

 Boredom’s function is movement (physical or mental) (see Elpidorou, 2018a), but not just any type of movement. Boredom aims not simply to move individuals from one situation to another but to facilitate a type of *goal*-directed motion—one that takes agents away from unsatisfactory situations. Bored individuals have a strong desire to escape their current situation and they will go to great lengths to achieve such escape (Elpidorou, in press; Havermans et al., 2015; Nederkoorn et al., 2016; Wilson et al., 2014). However, they do not simply wish to replace their situation with *any* alternative situation. They do not want to move from one boring situation to another. Instead, in a state of boredom, one wishes bothto stop doing what one is currently doing and to engage in a more satisfactory task (Fahlman et al., 2013; Harris, 2000; Van Tilburg & Igou, 2012). Sometimes that more satisfactory task will simply be a task that is novel or different than the current one (Bench and Lench, 2018). At other times, the more satisfactory task will be one that is taken to be meaningful (e.g., reading a book, watching a documentary, spending time with a friend) or one that contributes to one’s enjoyment (e.g., spending time on YouTube, playing a game on one’s phone).

The functional view of boredom is consistent with the results of numerous studies that explored the antecedents, concomitants, and effects (or correlates) of the state of boredom. Boredom is both conceptualized and reported to be an aversive experience. The functional model explains how its aversive character is a necessary element of boredom. If the experience of boredom were not unpleasant, then boredom would not signal dissatisfaction. Importantly, it would also fail to act as a motivating mechanism that promotes the pursuit of goals and activities that are perceived as more interesting, engaging, or meaningful. Thus, boredom’s capacity to move us depends partly upon its negative valence and the information that such negative experience carries about our current situation.

Moreover, boredom is characterized by a strong desire to engage in a task other than the one with which one is currently engaging (Fahlman et al., 2013; Van Tilburg & Igou, 2012). Such a feature of boredom is also accounted by the functional view insofar as it contributes to the exercise of its function: boredom is a state from which we are motivated to seek relief or escape. Indeed, unlike frustration (another negatively-valenced state), which may often act as a drive to continue to pursue the situation that frustrates us (typically, a blocked goal) (Amsel, 1992), boredom acts as a drive to give up on the situation that bores us.

In turn, it has been shown that both attentional difficulties and a perception of meaninglessness can give rise to the experience of boredom (Westgate and Wilson, 2018). It has also been reported that during boredom individuals experience difficulties in concentrating and maintaining attention (Damrad-Frye and Laird 1989; Eastwood et al., 2012; Harris, 2000), that they perceive their situation as meaningless (Chan et al., 2018; Van Tilburg & Igou, 2012), and that they are prone to mind-wandering (Harris, 2000; Martin, Sadlo, & Stew, 2006). The claim that attentional difficulties are likely antecedents of boredom is entirely consistent with the functional view. All that the functional view requires is that boredom arises on account of the perception that our situation is unsatisfactory and does not promote our interests. The inability to pay attention to a situation can give rise precisely to such a perception. A situation with which we cannot cognitively engage is a situation that ceases to be relevant to us and to our goals.

At the same time, the functional model can explain why attentional difficulties are a part of the experience of boredom: they are so because they contribute to the exercise of boredom’s function. In other words, boredom does what it does partly because of the fact that during boredom we cannot pay attention to our situation. Lack of attention disengages us from our current situation, thereby making it more likely for us to seek out an alternative situation. A situation that cannot hold our attention is a situation that appears to be foreign to us. We cannot become invested in it, regardless of our wishes and intentions, and, because of that, we will be motived to pursue a different situation (or goal).

Something similar holds for boredom’s relationship to meaninglessness. The functional model is in line with views that hold that perception of meaninglessness is an antecedent of boredom insofar as such a perception will render our current situation unsatisfactory thereby leading to the experience of boredom (Van Tilburg & Igou, 2012). Perceived lack of meaning might even interact with our ability to pay attention. That is to say, if a situation is perceived as lacking in meaning, it is possible that we will not cognitively engage with it, and vice versa. Still, the influence of perceived lack of meaning can be dissociated from the influence of attentional difficulties (for experimental support, see Westgate & Wilson, 2018). Watching a rerun of Seinfeld for the umpteenth time is likely boring but not because it is hard for us to concentrate or to pay attention to the show. The boringness of such a situation stems from the fact that the show is perceived as meaningless, which is to say that it is not taken to promote any goals that we consider to be important for us.

The functional model also explains why a perception of meaningless is often a part of the experience of boredom (Van Tilburg & Igou, 2017). The perception of meaningless helps us to disengage with our situation insofar as it signals to us that our current situation is lacking in some respect. Such a perception of meaninglessness is not merely a crisis of meaning (i.e., a realization that we are doing something that is not meaningful). It is also a call for a search for meaning. The experience of lack of meaning, in other words, is not an apathetic experience. Instead, it can give rise to various meaning reestablishing strategies, all of which promote the pursuit of a type of goal-directed movement (Van Tilburg & Igou, 2012). Boredom’s capacity to move us is helped by our desire to find meaning and purpose in life (Frankl, 1962).

Lastly, mind-wandering also contributes to the function of boredom. First, it does so by decoupling us from the boring situation that we are facing. Second, it helps to make salient to us alternative situations and goals that we would rather be pursuing (Bench & Lench, 2013; Eastwood et al., 2012; Smallwood & Schooler, 2006). Third, mind-wandering could act as a catalyst for boredom’s ability to promote movement insofar as it may exacerbate the experience of boredom. That is because mind-wandering can lead one to unfavorably compare their current situation to a more enjoyable one. In doing so, one’s experience can become even more aversive (Critcher & Gilovich, 2010).

The functional view thus accounts for all of the characteristics of boredom that the literature has highlighted. More importantly, the functional account does not merely explain the presence of such findings, it also shows how they can all come together to form a unified construct: they are unified precisely because of their role in the function of boredom.

 What about arousal? Does the functional account explain the mixed results reported in the literature? Given the arguments of the previous section, boredom’s relationship to arousal should not be taken to be a determining or individuating characteristic of boredom. In fact, the functional account does not demand any specific neurophysiological or behavioral activation. It is consistent both with findings that report boredom to be either a low arousal or a high arousal state. A state of low arousal will likely help individuals to disengage from situations that are perceived as boring, whereas a state of high arousal will make it more likely that individuals initiate movement (physical or mental) in order to counter the effects of boredom. The functional view is also consistent with findings that report the presence of both low and high arousal during the experience of boredom. This is either because the functional view can appeal to differential activity across end-organ systems during boredom or because it can maintain that, during the experience of boredom, physiological activation fluctuates depending on the presence of various endogenous or exogenous factors. From the perspective of a functional account, measurements of arousal are not very informative. What is informative are the effects that such patterns of physiological activity have on the whole organism. Boredom is not a state of the brain nor one of the nervous system. Instead, boredom arises only at the level of the organism. Consequently, we can only properly understand it at this level. And a study of boredom at that level reveals that its determining characteristic is its function.

**7. A Complication?**

Westgate and Wilson (2018) criticized the functional account of boredom on grounds that it fails to accommodate for findings that demonstrate the involvement of attentional difficulties in boredom. Functional views of boredom, they write, “do not directly account for boredom’s well-documented attentional component: they explain why people feel bored when they don’t *want* to be doing something, but they do not address the critical question of whether people *can* engage in the activity in the first place.” (p. 4)

 Westgate and Wilson maintain that in order to understand boredom one needs to understand both (i) cases in which boredom arises because one does not want to do something; and (ii) cases in which boredom arises because one cannot cognitively engage with a situation despite one’s desire to do so. In their paper, Westgate and Wilson offer evidence in support of this view, what they call “The Meaning and Attention Component (MAC) Model of Boredom.” According to this model, “boredom…is experienced when people feel either *unable* or *unwilling* to cognitively engage with their current activity” (p.5). The problem with functional accounts, Westgate and Wilson contend, is that they only explain boredom as a result of one’s unwillingness to engage with a situation because one deems such a situation to be lacking in meaning. Functional accounts, Westgate and Wilson write, “treat *meaning* as the primary informational function of boredom” (p.4, note 1) and because they do so, they delineate boredom function’s solely in terms of its relationship to meaning: boredom informs one of a meaningless situation and motivates one to pursue situations that are perceived as more meaningful. But if Westgate and Wilson are correct to hold that lack of meaning and attentional difficulties are independent determinants of boredom, then functional accounts of boredom are too limited: they tell us only part of the story. What is more, because of the influence of both lack of meaning and attentional difficulties, there will be three different profiles of boredom: *attentional boredom*, which occurs due to one’s inability to successfully engage one’s attention in a satisfying (or meaningful) activity*; meaningless boredom*, which occurs when one’s activity is perceived as meaningless; and a *mixed* kind of boredom that occurs when both attentional difficulties and the perception of meaninglessness are present.

 Westgate and Wilson conceive of the results of their study as constituting an objection to functional accounts of boredom. The truth, however, is that there is nothing incompatible between Westgate and Wilson’s account and the functional account of boredom, at least as the latter was presented above. It is true that often proponents of the functional account emphasize the role of meaning in boredom (see, e.g., Van Tilburg & Igou, 2012; Elpidorou, 2018a)—they either underline that boredom informs us of the presence of a meaningless situation or highlight boredom’s power to motivate us to pursue more meaningful goals. Still, the functional account, *qua* a functional view, does not demand that boredom’s sole function pertains to meaning. Indeed, some proponents of the functional view do not just talk about meaning but also discuss the role of satisfaction and interest in boredom (Danckert et al., 2018b; Elpidorou, 2018b). Others focus instead primarily on goals (Bench and Lench, 2013) or on opportunity costs (Kurzban et al., 2013). Regardless of how functional accounts have been presented in the past, the functional account can be easily expanded to accommodate Westgate and Wilson’s findings. In fact, in the previous section, it was shown precisely how both attentional difficulties and the perception of meaningless are important aspects of boredom—either as antecedents or as parts of the experience of boredom. There is no single cause of boredom: monotony, repetition, meaningless, simplicity, or complexity can all give rise to boredom. And there is no single way of alleviating boredom: going for a walk, reading a good book, watching a movie, playing a game, shocking oneself, eating a desert, and engaging in risky behavior are all ways of dealing with boredom. Still, all instances of boredom are signs of the presence of our unfulfilled desire to engage with our situation in a desired manner and also a motivation to fulfill that desire by doing something other than what we are currently doing. Understood as such, the functional account of boredom is rendered consisted with Westgate and Wilson’s findings. Not only that but it also explains why the three “profiles” of boredom that Westgate and Wilson highlight are indeed profiles of *boredom* and not distinct types of affective states. They are profiles of boredom because they all share a common function: they attempt to move the subject out of a situation that is not satisfactory (because it is meaningless, because the subject cannot cognitively engage with it, or because of both) and into one that is.

**8. Conclusion**

Previous literature noted that understanding boredom as a functional emotion (or affective state) carries a number of advantages (Elpidorou, 2018b). In this paper, an additional benefit of the functional view was presented. Without having to decide the ontology of emotions, the functional account provides us with the means of understanding boredom as a unitary construct. There might not be something that is neuronally, physiologically, or behaviorally common among all instances of the emotion type that we call “boredom.” All the same, there is still commonality at the level of the organism insofar as all instances of boredom promote a specific type of goal-directed behavior.

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1. This was at least the case when they performed cross-sectional Confirmatory Factor Analyses (CFAs) on the data retrieved from each study. When they instead performed longitudinal CFAs, the single-factor model fit worsened. For the fit indices, see Gana, Broc, and Bailly (2019), p. 251. [↑](#footnote-ref-1)
2. The reported Cronbach’s alphas for SBPS were substantially lower than what Struk et al. (2017) previously reported (namely, 0.88). One possible explanation of this discrepancy might be the fact that Gana et al.’s data comes from studies involving the elderly whereas Struk et al.’s study involved undergraduate students. For some initial support for the relevance of age when interpreting measures of boredom proneness, see Isacescu, Struk & Danckert (2016). [↑](#footnote-ref-2)