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Boredom Increases Impulsiveness: A Meaning-Regulation Perspective

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Abstract

High (vs. low) levels of boredom are associated with greater (vs. lesser) impulsiveness. It is important to examine the psychological processes that link boredom and impulsiveness to understand this relationship. We propose that heightened impulsiveness in response to boredom partly stems from people's attempts to deal with meaninglessness when bored. In Studies 1-2, we found that perceived meaninglessness, characteristic of boredom, mediated the relationship between boredom and impulsiveness. In Study 3, we additionally hypothesized that self-awareness serves as a catalyst of boredom-induced impulsiveness by highlighting meaninglessness. Accordingly, Study 3 showed that manipulated boredom promoted impulsiveness through meaninglessness, particularly at greater self-awareness. These studies support our hypothesis that impulsiveness is a response to boredom and the meaninglessness that boredom signals.

Keywords: boredom, impulsiveness, meaning, self-awareness, existential psychology

Boredom Increases Impulsiveness: A Meaning-Regulation Perspective

Boredom is "the aversive experience of wanting, but being unable, to engage in satisfying activity" (Eastwood, Frischen, Fenske, & Smilek, 2012, p. 482). It is a common, unpleasant emotion (Farmer & Sundberg, 1986; Smith & Ellsworth, 1985). Of note, boredom involves a set of cognitions, feelings, and self-regulatory processes that portray it as a unique, discrete emotion (Goldberg, Eastwood, LaGuardia, & Danckert, 2011; Van Tilburg & Igou, 2012, 2016c). For example, boredom is characterized by feeling disengaged from interesting or meaningful activity (Fahlman, Mercer-Lynn, Flora, & Eastwood, 2011), having low arousal (Kass & Vodanovich, 1990; Mikulas & Vodanovich, 1993), experiencing a sense of purposelessness (Van Tilburg & Igou, 2012), and a lack of attention (Bench & Lench, 2013). In response, boredom triggers a search for more meaningful engagement (Van Tilburg, Igou, & Sedikides, 2013), or, when incapable of finding such, motivates self-stimulation with exciting alternatives (Leary, Rogers, Canfield, & Coe, 1986; Martin, Sadlo, & Stew, 2006; Sansone, Weir, Harpster, & Morgan, 1992; Van Tilburg & Igou, 2012). These alternatives offer distraction from the acute lack of meaningful activity (Moynihan et al., 2015). Indeed, many boredom researchers argue that the increased stimulation-seeking as compensation in response to the lethargy of boredom is crucial to the definition of boredom (e.g., Fahlman et al., 2011; Van Tilburg & Igou, 2012). Thus, addressing meaninglessness and pursuing stimulation are key attributes of boredom (Barbalet, 1999; Todman, 2003; Van Tilburg & Igou, 2012).

Notwithstanding boredom's prevalence, boredom has only recently received increased scientific scrutiny (e.g., Van Tilburg & Igou, 2016c). The lack of research on boredom is particularly striking considering the portfolio of undesirable variables associated with high boredom proneness, including aggression (Dahlen, Martin, Ragan, & Kuhlman, 2004), substance abuse (Lee, Neighbors, & Woods, 2007), unsafe driving (Dahlen, Martin, Ragan,

& Kuhlman, 2005), pathological gambling (Blaszczynski, McConaghy, & Frankova, 1990), unhealthy eating (Moynihan et al., 2015) and many other adverse phenomena (see Vodanovich, 2003). Some scholars speculated that these maladaptive behaviors are specific expressions of the general impulsiveness that boredom breeds (e.g., Gerritsen, Toplak, Sciaraffa, & Eastwood, 2014). Indeed, research confirms that boredom and impulsiveness are correlated (e.g., Dahlen et al., 2004; Fahlman et al., 2011; Leong & Schneller, 1993; Mercer-Lynn, Flora, Fahlman, & Eastwood, 2011; Watt & Vodanovich, 1992). Not surprisingly, a number of researchers turned their attention to the study of impulsiveness as a delinquent boredom consequence that may stand at the basis of several of boredom's adverse effects.

As for most boredom research, past investigations of boredom and impulsiveness looked primarily (e.g., Dahlen et al., 2004), though not exclusively (Fahlman et al., 2011), into boredom proneness rather than *state* boredom experiences. Some researchers (e.g., Gerritsen et al., 2014; Vodanovich, 2003) argue that boredom proneness is too narrow in its scope to understand the relationship between state boredom and impulsiveness. In addition, researching state boredom may hold more promise for wider society, considering its pervasiveness (Eastwood et al., 2012; Larson & Richards, 1991), and the adverse consequences of boredom (Vodanovich, 2003), rather than merely concentrating on a smaller population of those particularly prone to being bored (Goldberg, Eastwood, LaGuardia, & Danckert, 2011; Rupp & Vodanovich, 1997). In this regard, not much is known about the self-regulatory processes underlying the link between state boredom and impulsiveness and conditions under which the link is more (vs. less) pronounced (moderators; e.g., Gerritsen et al., 2014; Rupp & Vodanovich, 1997).

The current research focuses on two psychological variables that we propose underlie and qualify the effect of state boredom on impulsiveness, at least in part. We tested whether the increased impulsiveness that boredom breeds can partly be attributed to a *lack of perceived meaning* associated with boredom (Studies 1-3). Further, consistent with our general approach, we hypothesized that *self-awareness* acts as a catalyst of this proposed pathway (Study 3).

Meaninglessness and Self-Awareness

The Role of Meaninglessness

A defining aspect that sets boredom apart from correlated emotions (e.g., anger, frustration, sadness) is its strong existential connotation (Van Tilburg & Igou, 2012; see also Barbalet, 1999; Fromm, 1973). Boredom involves, among other experiences, feeling dissatisfied, restless, and unchallenged because bored people interpret their actions as purposeless (Fahlman et al., 2011; Mikulas & Vodanovich, 1993; Van Tilburg & Igou, 2012). That is, when people feel bored, they experience a sense of meaninglessness (Van Tilburg & Igou, 2012, 2016c); they cannot find meaning in their current activities or circumstances (e.g., Barbalet, 1999; Csikzentmihalyi, 2000). The fundamental conception that life should be meaningful, should make sense, and should hold some kind of purpose (Greenberg, Koole, & Pyszczynski, 2004; Heine, Proulx, & Vohs, 2006; Moynihan, Igou, & Van Tilburg, 2017) is thus challenged, as boredom provides an experiential cue that existence, at least in the moment, has been rendered meaningless. Therefore, boredom can be considered to be an existential threat (Barbalet, 1999; Fromm, 1973; Van Tilburg & Igou, 2011, 2012; 2016c).

The fact that perceived meaninglessness is pivotal to boredom does not mean that these are identical entities. For instance, one may be confronted with a lack of meaning (e.g., after considering one's inevitable mortality; Greenberg et al., 1990) without necessarily being bored. Indeed, experiences unlikely to feature boredom (e.g., mortality salience) also promote

a sense of meaninglessness (e.g., Landau, Greenberg, Solomon, Pyszczynski, & Martens, 2006; Simon, Arndt, Greenberg, Pyszczynski, & Solomon, 1998; Routledge & Juhl, 2010). Thus, not all meaningless experiences are boring, yet experiences of boredom seem inherently characterized by a lack of perceived meaning. Consistently, a lack of meaning is one of the hallmark cognitive appraisals of boredom (Van Tilburg & Igou, 2012, 2016c).

As compensation, bored people attempt more meaningful activities, provided that these are available (Bench & Lench, 2013; Van Tilburg & Igou, 2011, 2012). For example, boredom fosters social identification (Van Tilburg & Igou, 2011), political polarization (Van Tilburg & Igou, 2016a), appreciation of heroes (Coughlan, Igou, Van Tilburg, Kinsella, & Ritchie, in press), intentions to help others (Van Tilburg & Igou, 2016b), and nostalgic reverie (Van Tilburg et al., 2013), all sources of meaning in life, in response to the meaninglessness of boredom (Van Tilburg & Igou, 2011). Specifically, boredom serves the self-regulatory function of directing people's cognitions and behaviors towards addressing the lack of meaning at hand by pursuing more meaningful or stimulating activity (Van Tilburg & Igou, 2012, 2016a, 2016b).

However, in the absence of meaningful engagement, bored people also tend to distract themselves from their adverse state. A potent, albeit potentially harmful, way to address perceived meaninglessness is by yielding to hedonic impulses (e.g., hedonic food consumption; Moynihan et al., 2015; interest in sex; Wisman & Goldenberg, 2005; alcohol consumption; Wisman, Heflick, & Goldenberg, 2015; see also Wisman, 2006). Indeed, several studies indicate that meaning threats in general—such as social exclusion and mortality salience—promote impulsiveness (e.g., Baumeister, Ciarocco, DeWall, & Twenge, 2005; DeWall, Twenge, Bushman, Im, & Williams, 2010; Friese & Hofmann, 2008; Twenge, Catanese, & Baumeister, 2003). In particular, bored people may engage in impulsive activities in an attempt to avoid thinking about the state of perceived meaninglessness that

they find themselves in. Effectively, impulsiveness may be used to deal with acute perceptions of meaninglessness while bored.

The Role of Self-Awareness

The appeal of impulsiveness in the face of boredom is particularly likely to occur when people possess high levels of self-awareness. Self-awareness is a form of consciousness that enables the self to become an object of evaluation to oneself (Kesebir & Pyszczynski, 2012). Thus, self-awareness promotes attentiveness to internal, personal aspects of one's self (e.g., feelings, experiences, Govern & Marsch, 2001). Indeed, self-awareness impacts on people's unpleasant existential concerns (e.g., challenges to perceived meaning), including boredom (Moynihan et al., 2015). In the context of meaning threats, self-awareness is adverse because it highlights perceptions of meaninglessness (Sedikides & Skowronski, 2003; Taubman Ben-Ari & Noy, 2010). This is because directing attention toward the self seems to initiate a self-evaluative process, in which one's current state on a salient psychological dimension (i.e., meaninglessness) is compared with ideal standards (i.e., meaningful) (Duval & Wicklund, 1972). In this way, perceptions of meaning threats are enhanced under conditions of greater self-awareness (Arndt, Greenberg, Simon, Pyszczynski, & Solomon, 1998; Silvia, 2001; Taubman Ben-Ari & Noy, 2010).

The discrepancy between people's current state and ideal standards, highlighted by self-awareness, makes the need to address existential threats more urgent (Carver, 1975; Gollwitzer & Wicklund, 1985; Silvia & Duval, 2001; Wicklund & Duval, 1971). These self-regulatory processes are consistent with clinical models on self-protection (e.g., Hepper, Gramzow, & Sedikides, 2010). In the context of boredom, people experiencing this state may act more pressingly to address perceptions of meaninglessness under conditions of high self-awareness.

Accordingly, we propose that self-awareness amplifies the impact of boredom on impulsiveness, given that self-awareness makes the need to address meaninglessness more pressing and since impulsiveness is a strategy that people enact to try and reduce threats to perceived meaning (see Wisman, 2006). Consequently, we predicted that the effect of boredom on impulsiveness would be stronger for people with a high (vs. low) self-awareness disposition. However, to our knowledge, no research to date has demonstrated that the relationship between boredom and impulsiveness is mediated by perceived meaninglessness or that this relationship is amplified among those high in self-awareness.

Overview

We conducted three studies to examine the role of perceived meaninglessness and self-awareness in the boredom-impulsiveness link. Studies 1a, 1b, and 2 were correlational studies that tested if the relationship between state boredom and impulsiveness is indeed mediated by a perceived lack of meaning. In Study 3, using an experimental procedure, we again tested whether boredom increases impulsiveness, mediated by a perceived lack of meaning. Given that the impact of meaninglessness is more pronounced for people high in self-awareness (e.g., Sedikdes & Skowronski, 2003; Taubman Ben-Ari & Noy, 2010), we also tested whether individuals high in self-awareness were particularly likely to be impulsive when bored and whether the role of meaninglessness was qualified by proclivity to self-awareness. That is, we expected a moderated mediation pattern in Study 3. Furthermore, Study 3, to our knowledge, was the first experiment to test a relationship between state boredom and impulsiveness.

Study 1a: Boredom Breeds Impulsiveness via Meaninglessness

In Study 1a, we investigated the relationship between state boredom, perceived meaninglessness, and impulsiveness using a correlational design. We predicted that the relationship between boredom and impulsiveness would be mediated, at least in part, by the perceived meaninglessness that characterizes boredom.

Method

Participants and design. One hundred participants were recruited at *ProlificAcademic.co.uk* (M_{age} = 27.15, *SD* = 9.33, age range = 18-64; 45 women, 54 men, 1 undeclared) in exchange for €0.35 each. Prolific Academic is a data collection website, founded by academic researchers, where participants can complete surveys for payment. All participants reported acceptable English language ability.

We used the effect sizes from previous literature (Van Tilburg & Igou, 2011, 2012; Van Tilburg et al., 2013) as guidance for an appropriate sample size for Study 1 (see also footnote 2). Our sample size allowed us to detect standardized regression coefficients of β = 0.39 or more with a power of 0.8 when adopting a Type-I error rate of $\alpha \leq .05$ (two-tailed; Fritz & MacKinnion, 2007).

Materials and procedure. Participants gave informed consent and reported demographics followed, in random order, by measures of state boredom, perceived meaninglessness, and impulsiveness. We measured state boredom using Van Tilburg and Igou's (2012; Study 2) seven-item scale (e.g., "I feel restless and unchallenged at the moment"; 1 = *not at all*, 7 = *very much*; *M* = 4.17, *SD* = 1.33, α = .85). This scale measures key and distinctive attributes of boredom in particular and does not seem to measure sadness, anger, or frustration.

We measured perceived meaninglessness using five items adapted from earlier research to measure state meaningless experiences (e.g., "I am experiencing a sense of meaninglessness"; 1 = *not at all*, 7 = *very much*; $M = 3.44$, $SD = 1.79$, $\alpha = .94$; Van Tilburg & Igou, 2011).

Consistent with prior research on boredom and impulsiveness (e.g., Dahlen et al., 2004; Fahlman et al., 2011), we assessed impulsiveness with the Barrett Impulsiveness Scale – Version 11 (BIS-11; Patton, Stanford, & Barrett, 1995). The 30-item scale was modified to a state measure for the current research (e.g., "I feel like doing things without thinking right now"; 1 = *not at all*, 4 = *a lot*; $M = 2.11$, $SD = 0.41$) and was reliable ($\alpha = .86$). Although the BIS-11 is a self-report measure, it correlates with more implicit, behavioral expressions of impulsivity such as risk-taking, aggression, alcohol consumption, drug-taking, drink driving (Dahlen et al., 2004; Stanford, Greve, Boudreanx, Mathias, & Brumbelow, 1996), sensation-seeking, disinhibition, difficulty with executive functioning, and problems sustaining attention (Stanford et al., 2009); it also differentiates between normal and clinical samples known to be more impulsive (Patton et al., 1995). Descriptive statistics are reported in Table 1. Afterwards, participants were debriefed, thanked, and rewarded.

Results and Discussion

Zero-order correlations. Boredom correlated positively and significantly with impulsiveness, $r(97) = .30$, $p = .003$, and with perceived meaninglessness, $r(97) = .58$, $p < .001$. Perceived meaninglessness also correlated significantly with impulsiveness, $r(97) = .49$, $p < .001$. The effect sizes were medium and large, respectively.[1] These findings were consistent with our predictions.

Boredom, meaning, and impulsiveness. We proposed that boredom is associated with impulsiveness, at least in part, due to the perceived meaninglessness that boredom signals. To test if the data were consistent with this hypothesis, we conducted a mediation

analysis using Hayes's (2012, Model 4) PROCESS macro. Boredom was entered as the independent variable in the model, perceived meaninglessness as the mediator, and impulsiveness as the outcome variable (Figure 1). All scores were standardized. As predicted, the indirect effect of boredom on impulsiveness via meaninglessness was significant, ab = 0.28, SE = 0.07 95% CI = [0.16, 0.45], estimated using 10,000 bias-corrected bootstraps. The direct effect of boredom on impulsiveness was no longer significant after controlling for meaninglessness, B = 0.02, SE = 0.11, p = .86. These findings are consistent with our proposition that the lack of perceived meaning inherent to boredom is responsible, at least in part, for boredom's association with impulsiveness.[2]

Study 1b: Behavioral Measure of Impulsiveness

Study 1a supported our hypothesis that impulsiveness may, in part, be enacted in response to the perceived meaninglessness of boredom. However, we used a self-report measure of impulsiveness. Initially, we believed that this measure of impulsiveness was appropriate to investigate with regards to state boredom, considering the lack of research on the relationship between these constructs; trait impulsiveness has largely been related to boredom proneness (e.g., Dahlen et al., 2004; 2005). Our impulsiveness measure in Study 1a had excellent content validity which lacks in other scales and behavioral measures of impulsiveness (Patton et al., 1995). Furthermore, the BIS-11 is again associated with drug-taking, alcohol consumption, and disinhibition among other risky behaviors (e.g., Baumeister, Vohs, & Funder, 2007; Stanford et al., 1996; Stanford et al., 2009). Nevertheless, we thought it was important to examine a behavioral expression of impulsiveness rather than solely using a self-report measure.

Accordingly, we examined the relationships between boredom, meaninglessness and a more implicit, behavioral measure of impulsiveness: a temporal discounting task. For this task, participants were initially asked if they wanted to wait for two minutes to receive an

extra $0.08 bonus that would involve completing a short task or skip this question in exchange for a $0.01 bonus. Four trials of this task were completed in which the bonus for waiting decreased by $0.02 per trial. Afterwards, participants were asked to what extent they found the two minute waiting tasks boring and meaningless. Consistent with Study 1a, we expected an indirect effect of the boredom of the waiting periods on participants' impulsive responses via the meaninglessness of the waiting periods.

Method

Participants and design. Two hundred and ninety-four participants were recruited at MTurk (M_{age} = 33.54, *SD* = 10.85, age range = 18-85; 177 men, 117 women) to take part in a temporal discounting task in exchange for at least $0.28 each. We ensured that participants could not complete the experiment on more than one occasion, using the interface at MTurk. All participants reported acceptable English language ability. Four participants were excluded from analysis for not completing a waiting time task. In addition, six cases that recorded the same IP addresses were deleted, as well as three further cases that were outliers on the average time taken by participants to complete the study (Mahadevan, Gregg, Sedikides, & De Waal-Andrews, 2016). This left a useable sample of two hundred and eighty-one participants (M_{age} = 33.64, *SD* = 11.01, age range = 18-85; 166 men, 115 women).

Our sample size allowed us to detect standardized regression coefficients of $\beta = 0.26$ or more with a power of 0.8 when adopting a Type-I error rate of $\alpha \leq .05$ (two-tailed; Fritz & MacKinnion, 2007).

Materials and procedure. Participants gave their informed consent and reported demographics. Next, participants were told that they would be asked to make a choice between two options on four occasions. Initially, participants were asked if they wanted to wait for two minutes to receive an extra $0.08 bonus that would involve completing a short, two minute task or skip this question in exchange for a $0.01 bonus. Participants who chose

to skip the question were immediately directed to the next trial. Those participants who decided to complete the task in exchange for $0.08 extra were presented with an abstract painting. Participants were asked to type what was displayed in the picture. In this condition, the 'Continue' button was programmed to appear after two minutes.

In the second trial, participants were asked if they wanted to wait for two minutes to receive an extra $0.06 bonus that would involve completing a short, two minute task or skip this question in exchange for a $0.01 bonus. Again, participants who chose to skip the question were immediately directed to the next trial. Those participants who decided to complete the task in exchange for $0.06 extra were asked to type about an ordinary event that happened in their past. The 'Continue' button was also programmed to appear after two minutes.

In the final two trials, the same experimental procedure was adapted. Participants were asked if they wanted to wait for two minutes in exchange for an extra $0.04 and $0.02 or to skip both questions in exchange for an extra $0.01. Participants who chose to wait in exchange for an extra $0.04 were presented with a word search puzzle and asked to report how many animals' names they could find in the letter matrix. Participants who chose to wait in exchange for an extra $0.02 were presented with nine roughly sketched pictures and asked to type a story that accompanied the scenes. The total number of participants' impulsive responses (i.e., the number of times participants skipped a waiting task for a lower bonus payment) served as our dependent measure (M = 1.46, SD = 1.12).

Afterwards, all participants were asked to what extent participants found the two minute waiting tasks boring ("Did you find the 2 minute task(s) boring? (select 'NA' if you did not complete any)"; 1 = *not at all*, 7 = *very much*, NA = *not applicable*; M = 3.33, SD = 2.15) and meaningless ("Did you find the 2 minute task(s) meaningless? (select 'NA' if you did not complete any)"; 1 = *not at all*, 7 = *very much*, NA = *not applicable*; M = 3.61, SD =

2.14). Participants who did not complete any waiting task were excluded from analyses using these measures. Descriptive statistics are reported in Table 2. Finally, participants were debriefed, thanked, and rewarded.

Results and Discussion

Zero-order correlations. First, we investigated the correlations between boredom, meaninglessness, and the number of impulsive responses participants provided. Consistent with Study 1a, we found that the boredom of the waiting periods correlated positively and significantly with participants' total impulsive responses, $r(243) = .28$, $p < .001$. Similarly, in accordance with previous research (e.g., Van Tilburg & Igou, 2012, 2016), we found a significant, positive correlation between boredom and meaninglessness, $r(242) = .70$, $p < .001$. Furthermore, we found a significant, positive correlation between the participants' impulsive responses and the meaninglessness of the waiting periods, $r(242) = .26$, $p < .001$. The effect sizes were small, large, and small respectively.

Multinomial logistic regression analyses. Next, we conducted two multinomial logistic regression analyses to examine whether participants' impulsive responses could be predicted based on boredom and meaninglessness. As expected, boredom, χ^2 (3) = 25.78, $p < .001$, and meaninglessness, χ^2 (3) = 20.20, $p < .001$, were significant predictors of participants' impulsive responses. No impulsive responses were used as the reference category for the embedded binary logistic regression comparisons. Boredom emerged as a significant predictor of three impulsive responses as opposed to none, Wald χ^2 (1) = 15.54, $p < .001$. Similarly, meaninglessness emerged as a significant predictor of three impulsive responses as opposed to none, Wald χ^2 (1) = 16.44, $p < .001$.

Poisson log-linear regression analyses. Poisson log-linear regression analyses for count data analyses were also conducted to assess if the boredom and meaninglessness of the waiting periods significantly predicted participants' impulsive responses. As expected,

boredom associated with the waiting periods significantly predicted participants' impulsive responses, Wald χ^2 (1) = 16.10, $p < .001$. Similarly, the meaninglessness of the waiting periods significantly predicted participants' impulsive responses, Wald χ^2 (1) = 14.41, $p < .001$.

Boredom, meaning, and impulsiveness. In line with Study 1a, we predicted that the boring ratings of the waiting periods would predict increased impulsive responses via the meaningless ratings of the waiting periods. To test if the data were consistent with this hypothesis, we conducted a mediation analysis using Hayes's (2012, Model 4) PROCESS macro. Each variable's scores were standardized. The boring ratings were entered as the independent variable, meaningless ratings as the mediator, and the total number of impulsive responses was entered as the outcome variable (Figure 2). The indirect effect of boredom on impulsiveness via meaninglessness was $ab = 0.09$, $SE = 0.06$ 95% CI = [-0.03, 0.21], estimated using 10,000 bias-corrected bootstraps. The direct effect of the boredom on impulsive responses remained significant after controlling for meaninglessness, $B = 0.20$, $SE = 0.09$, $p = .02$. Although marginally significant, the pattern of findings is consistent with our proposition that the lack of perceived meaning, inherent to boredom, is responsible, at least in part, for boredom's association with impulsiveness.

In summary, Study 1b extended on Study 1a by including a behavioral expression of impulsiveness rather than a self-report measure. In a temporal discounting task, participants were asked on four occasions to choose between two options. These choices involved waiting for two minutes for a bonus payment or to skip to the next question. We asked participants to rate how boring and meaningless were the waiting periods. We found positive and significant correlations between the boredom, meaninglessness, and total impulsive responses in the task, as expected, and a marginally significant indirect effect. Although marginally significant, the pattern of results was consistent with Study 1a. We suspect that marginal

significance could be due to using a behavioral measure, as this measure may be less sensitive to contextual variations. Further, it may be due to fact that the maximum number of impulsive responses given by participants could not be included in our main analysis as their ratings of boredom and meaninglessness of the waiting periods would not be applicable. In addition, future research might benefit from recruiting larger samples for greater statistical power, considering the effect size of path b in our mediation model (Fritz & MacKinnion, 2007). Thus, we recommend that our model needs further validation using other behavioral measures, with good convergent validity to established impulsiveness measures, in future research (e.g., Gawronski & De Houwer, 2014). Nevertheless, Study 1b provides preliminary evidence for a relationship to actual impulsive behavior.

Study 2: Boredom Breeds Impulsiveness via Meaninglessness

In Study 1a and 1b, we found patterns of relationships between state boredom, impulsiveness, and lack of perceived meaning that were consistent with our hypothesis. In Study 2, we aimed to replicate these findings by looking at different facets of state boredom. In this regard, we employed a different theoretical and empirically-grounded measure of state boredom in Study 2.

Method

Participants and design. Two hundred and one participants were recruited at *ProlificAcademic.co.uk* (M_{age} = 31.85, *SD* = 9.81, age range = 18-61; 88 women, 112 men, 1 undeclared). Study 2 was programmed such that participants from Study 1a were excluded from participating in Study 2, using the interface on *ProlificAcademic.co.uk*. Participants were remunerated with €0.44. All participants reported acceptable English language ability.

We used the effect sizes from Studies 1a and 1b as guidance for an appropriate sample size for Study 2. Our sample size allowed us to detect standardized regression

coefficients of $\beta = 0.26$ or more with a power of 0.8 when adopting a Type-I error rate of $\alpha \leq .05$ (two-tailed; Fritz & MacKinnion, 2007).

Materials and procedure. Participants gave their informed consent and reported demographics. Next, three scales were presented to participants in a random order. We measured boredom with the 'multi-dimensional state boredom scale' (Fahlman et al., 2011). This is an extensively validated measure of state boredom that incorporates five subscales: disengagement (e.g., "Everything seems repetitive and routine to me"; 1 = *strongly disagree*, 7 = *strongly agree*; $M = 3.58$, $SD = 1.40$, $\alpha = .92$), high arousal (e.g., "Everything seems to be irritating me right now"; 1 = *strongly disagree*, 7 = *strongly agree*; $M = 3.14$, $SD = 1.44$, $\alpha = .88$), inattention (e.g., "I am easily distracted"; 1 = *strongly disagree*, 7 = *strongly agree*; $M = 3.51$, $SD = 1.59$, $\alpha = .89$), low arousal (e.g., "I feel empty"; 1 = *strongly disagree*, 7 = *strongly agree*; $M = 3.05$, $SD = 1.68$, $\alpha = .93$), and time perception (e.g., "Time is passing by slower than usual"; 1 = *strongly disagree*, 7 = *strongly agree*; $M = 2.72$, $SD = 1.35$, $\alpha = .89$). In total, the subscales consisted of twenty-nine items that were presented in a random order throughout the scale.

We measured perceived meaninglessness with the five items from Study 1a (e.g., "I am experiencing a state of meaninglessness"; 1 = *strongly disagree*, 7 = *strongly agree*; $M = 2.73$, $SD = 1.57$, $\alpha = .93$, Van Tilburg & Igou, 2011). As in Study 1a, our measure of impulsiveness was the BIS-11, consisting of thirty items, modified to a state measure (e.g., "I feel like acting on impulse now"; 1 = *not at all*, 4 = *a lot*; $M = 2.01$, $SD = 0.38$, $\alpha = .83$, Patton et al., 1995). Descriptive statistics are reported in Table 3. Afterwards, participants were debriefed, thanked, and rewarded.

Pilot test. Initially, we investigated the relationship between this state boredom measure and perceived meaninglessness (Van Tilburg & Igou, 2011) in a pilot study ($N = 31$, age range = 18-50; [24] women, [7] men). This pilot was conducted on the same population,

ProlificAcademic.co.uk. The pilot sample was distinct from Study 2's main sample, was recruited, and analyzed separately. Again, the interface at *ProlificAcademic.co.uk* allowed us to exclude participants who took part in Study 1a. (Similarly, participants who participated in Study 2's pilot test were excluded from participating in Study 2's main data collection session). Our meaninglessness measure ($\alpha = .93$) and the disengagement ($\alpha = .88$), high arousal ($\alpha = .85$), inattention ($\alpha = .81$), low arousal ($\alpha = .90$), and time perception ($\alpha = .94$) subscales were all reliable. As predicted, perceived meaninglessness correlated positively and significantly with each subscale of the multi-dimensional state boredom scale: disengagement, $r(28) = .87$, $p < .001$, high arousal, $r(28) = .75$, $p < .001$, inattention, $r(28) = .39$, $p = .04$, low arousal, $r(28) = .79$, $p < .001$, and time perception, $r(28) = .36$, $p = .05$. Having established relationships between these facets of state boredom and meaninglessness, we proceeded to investigate whether the impulsiveness associated with boredom can be attributed to boredom's lack of perceived meaning in particular.[3]

Results and Discussion

Each variable's scores were standardized. Then, we investigated the relationship between each boredom subscale, perceived meaninglessness, and impulsiveness. A summary of the main results can be found in Table 4.

Disengagement. Disengagement correlated positively and significantly with perceived meaninglessness, $r(198) = .71$, $p < .001$, and impulsiveness, $r(197) = .63$, $p < .001$. In addition, perceived meaninglessness correlated positively and significantly with impulsiveness, $r(197) = .54$, $p < .001$. These findings were consistent with our predictions.

Next, we conducted a mediation analysis using Hayes's (2012, Model 4) PROCESS macro to test our hypothesis. Disengagement was entered as the predictor in the model, perceived meaninglessness as the mediator, and state impulsiveness as the outcome variable. As expected, there was a significant indirect effect of disengagement on state impulsiveness

via perceived meaninglessness, *ab* = 0.12, *SE* = 0.06, 95% CI [0.02, 0.24] (Hayes, 2012, Model 4). The direct effect remained significant, *B* = 0.51, *SE* = 0.08, *p* < .001. This finding suggests that perceived meaninglessness is a component of disengagement that is at least partially responsible for increased impulsiveness. These findings were consistent with our predictions.

High arousal. As predicted, high arousal correlated positively and significantly with perceived meaninglessness, *r*(198) = .74, *p* < .001, and impulsiveness, *r*(197) = .63, *p* < .001. As highlighted previously, perceived meaninglessness correlated positively and significantly with impulsiveness, *r*(197) = .54, *p* < .001.

Similarly, we conducted a mediation analysis using Hayes's (2012, Model 4) PROCESS macro to test our hypothesis that the relationship between high arousal and state impulsiveness was significantly mediated by perceived meaninglessness. High arousal was entered as the predictor variable in the model, perceived meaninglessness as the mediator, and state impulsiveness as the outcome variable. Perceived meaninglessness mediated the relationship between high arousal and state impulsiveness with marginal significance, *ab* = 0.12, *SE* = 0.06, 95% CI [-0.004, 0.24] (Hayes, 2012, Model 4). This pattern was consistent with our predictions. The direct effect remained significant, *B* = 0.51, *SE* = 0.08, *p* < .001.

Inattention. Inattention correlated positively and significantly with perceived meaninglessness, *r*(198) = .57, *p* < .001, and impulsiveness, *r*(197) = .70, *p* < .001. In a mediation analysis, inattention was entered as the predictor variable, perceived meaninglessness as the mediator, and state impulsiveness as the outcome variable. As expected, there was a significant indirect effect of inattention on state impulsiveness via perceived meaninglessness, *ab* = 0.12, *SE* = 0.04, 95% CI [0.05, 0.20] (Hayes, 2012, Model 4). This finding was consistent with our predictions. Again, the direct effect remained significant, *B* = 0.58, *SE* = 0.06, *p* < .001.

Low arousal. Low arousal correlated positively and significantly with perceived meaninglessness, $r(198) = .76$, $p < .001$, and impulsiveness, $r(197) = .53$, $p < .001$, as expected. Low arousal was entered as the predictor variable in a mediation analysis with perceived meaninglessness and state impulsiveness entered as the mediator and outcome variables respectively. There was a significant indirect effect of low arousal on state impulsiveness via meaninglessness, $ab = 0.25$, $SE = 0.07$, 95% CI [0.13, 0.38] (Hayes, 2012, Model 4). The direct effect remained significant, $B = 0.28$, $SE = 0.09$, $p = .002$.

Time perception. As predicted, time perception correlated positively and significantly with perceived meaninglessness, $r(198) = .46$, $p < .001$, and impulsiveness, $r(197) = .44$, $p < .001$. Time perception was entered as the predictor in a mediation model, perceived meaninglessness as the mediator, and state impulsiveness as the outcome variable. As predicted, we found a significant indirect effect of time perception on state impulsiveness via perceived meaninglessness, $ab = 0.19$, $SE = 0.04$, 95% CI [0.12, 0.29] (Hayes, 2012, Model 4). In addition, the direct effect remained significant, $B = 0.25$, $SE = 0.07$, $p < .001$.

Collectively, Study 2's findings corroborated our predictions. We found that state boredom, across five different subscales, was associated with impulsiveness and that this association was mediated by the perceived meaninglessness that boredom entails. The findings were also consistent with Study 1a that included a different state boredom measure, suggesting convergent validity of our results. Next, we proceeded to an experiment on state boredom and impulsiveness in response to perceived meaninglessness.

Study 3: The Cultivating Role of Self-Awareness

In the previous studies, we found that the pattern of relationships between state boredom, impulsiveness, and perceived meaninglessness were consistent with our theoretical model. Building on these studies, we sought to replicate this finding in Study 3 using an experimental induction of boredom. Moreover, we tested another important process

component that we hypothesized as partly responsible for the relationship between boredom on impulsiveness. As demonstrated in earlier research, self-awareness increases the effects of boredom (e.g., Moynihan et al., 2015) and perceptions of meaninglessness (Sedikides & Skowronski, 2003; Taubman Ben-Ari & Noy, 2010). Some researchers suggested that self-awareness highlights meaning threats' adverseness by comparing one's current (meaningless) state with ideal standards, thereby making the need to deal with meaninglessness more pressing (e.g., Wisman, 2006). We thus predicted that the effect of boredom on impulsiveness would be stronger for people with a high (vs. low) self-awareness disposition, moderating our proposed mediation model.

Method

Participants and design. One hundred and sixteen participants sourced at *ProlificAcademic.co.uk* (M_{age} = 27.20, *SD* = 7.68, age range = 18-63; 69 men, 47 women) took part in a between-subjects study (boredom: high vs. low) in exchange for €0.59 each. Participants who completed Studies 1a or 2 were excluded from participating in Study 3, using the interface at *ProlificAcademic.co.uk*. All participants reported acceptable English language ability. Five participants did not complete the experimental manipulation and two others produced incomplete data. These cases were excluded from analysis.

Our sample size allowed us to detect standardized regression coefficients of $\beta = 0.14$ or more and a conditional mediated effect with a power of 0.8 when adopting a Type-I error rate of $\alpha \leq .05$ (two-tailed; Chu, 2012).

Materials and procedure. First, participants gave informed consent and reported demographics. Next, participants completed a trait version of Govern and Marsch's (2001) private self-awareness scale. This is a three-item subscale of the situational self-awareness scale ("Usually, I am conscious of my inner feelings"; 1 = *strongly disagree*, 7 = *strongly agree*; *M* = 5.68, *SD* = 0.93, $\alpha = .60$). Items on the private self-awareness scale endorse

attentiveness paid to personal, reflective aspects of the self (Govern & Marsch, 2001). The scale endorses the type of self-awareness used in self-regulation and has been used in previous research to test how people deal with adverse self-awareness associated with meaning threats (Wisman et al., 2015). Internal reliability of this scale typically range from α = .70 – α = .73 (Govern & Marsch, 2001; Wisman et al., 2015).[2]

Then, we randomly allocated participants to one of two boredom conditions. This boredom manipulation required participants to transcribe, in typing, references to literature about concrete (e.g., "Minerals commodity summary – cement - 2007. 2007-06-01. Retrieved 2008-01-16"). In the low boredom condition, participants transcribed one reference, whereas participants transcribed ten in the high boredom condition (Van Tilburg & Igou, 2011; Van Tilburg et al., 2013). This manipulation fosters differences in boredom but does not seem to affect sadness, anger, or frustration (Van Tilburg & Igou, 2012). As manipulation check, participants indicated how bored they felt ("To what extent did you feel bored during the task you completed?"; 1 = *not at all*, 7 = *very much*; *M* = 3.67, *SD* = 2.04; Van Tilburg & Igou, 2011, 2012; Van Tilburg et al., 2013).

Next, participants completed a five-item state meaninglessness scale (e.g., "To what extent did the task you just completed make you feel a sense of meaninglessness?"; α = .88; 1 = *strongly disagree*, 7 = *strongly agree*; *M* = 3.49, *SD* = 1.51; Van Tilburg & Igou, 2013).

Finally, we assessed impulsiveness with a state version of the BIS-11 (Patton et al., 1995). As in Studies 1a and 2, items were re-worded slightly to capture state experiences (e.g., "I feel 'happy-go-lucky' at present"; α = .75; 1= *not at all*, 4 = *a lot*; *M* = 2.13, *SD* = 0.34). In summary, the variables included in Study 3 were trait self-awareness, a boredom manipulation, single-item manipulation check, perceived meaninglessness measure, and impulsiveness measure. Descriptive statistics are reported in Table 5. Afterwards, participants were debriefed, thanked, and rewarded.

Pilot test. First, we conducted a pilot experiment on the effect of boredom on impulsiveness. Our sample was recruited from *ProlificAcademic.co.uk* (*N* = 99, age range = 18-58; [44] women, [55] men). Again, we ensured that participants from Study 3's pilot test were excluded from completing Study 3's main data collection session, using the interface at *ProlificAcademic.co.uk*. The experiment had a between-subjects design with two conditions (low boredom, high boredom). Participants completed an established boredom manipulation, reference transcribing (Van Tilburg & Igou, 2011), and subsequently completed a boredom scale as manipulation check (e.g., "To what extent did you feel bored during the task you completed?"; α = .83; 1 = *not at all*, 7 = *very much*; *M* = 4.88, *SD* = 1.34; Van Tilburg & Igou, 2012), perceived meaninglessness ("To what extent did you experience this task as meaningless?"; α = .93; 1 = *strongly disagree*, 7 = *strongly agree*; *M* = 4.29, *SD* = 1.61; Van Tilburg & Igou, 2011), and state self-awareness scales (e.g., "Right now, I am aware of my innermost thoughts"; α = .83; 1 = *strongly disagree*, 7 = *strongly agree*, *M* = 4.23, *SD* = 1.57; Govern & Marsch, 2001). Impulsiveness was measured using the Barrett impulsiveness scale (e.g., "I have racing thoughts right now"; α = .82; *M* = 2.10, *SD* = 0.39; Patton et al., 1995).

As expected, participants in the high boredom condition (*M* = 5.21, *SD* = 1.36) experienced significantly more boredom than those in the low boredom condition (*M* = 4.51, *SD* = 1.23), $F(1,97) = 7.26$, $p < .01$, $\eta^2 = 0.07$. Interestingly, participants who completed the state self-awareness scale before the dependent measure reported significantly less state self-awareness in the experimental condition (*M* = 3.89, *SD* = 1.48) than in the control condition (*M* = 4.60, *SD* = 1.59), $F(1,96) = 5.20$, $p = .03$, $\eta^2 = 0.05$. (We return to this point in the General Discussion). We also found that our boredom manipulation predicted impulsiveness via perceived meaninglessness with marginal significance, *ab* = 0.02, *SE* = 0.03, 95% CI [-0.01, 0.10] (Hayes, 2012, Model 4).

Results and Discussion

Manipulation check. In our main sample, we entered scores on the boredom manipulation check as the dependent variable in a one-way ANOVA with the boredom condition (low vs. high) as the independent variable. As predicted, participants in the high boredom condition (M = 4.40, SD = 2.04) felt significantly more bored than those in the low boredom condition (M = 2.98, SD = 1.79), $F(1,107) = 14.80$, $p < .001$, $\eta^2 = 0.12$. Thus, our manipulation was effective.[4]

Perceived meaninglessness. A one-way ANOVA indicated that participants experienced significantly more meaninglessness in the high boredom condition (M = 3.99, SD = 1.49) than in the low boredom condition (M = 3.02, SD = 1.38), $F(1,107) = 12.32$, p = .001, $\eta^2 = 0.10$, as expected. Further, perceived meaninglessness correlated positively and significantly with impulsiveness, as predicted, $r(106) = .40$, $p < .001$.[5] In the remaining analyses, all continuous scores were standardized.

Self-awareness × boredom interaction. We tested the proposed interaction between the boredom manipulation (effect-coded; -1 = *low boredom*, 1 = *high boredom*) and self-awareness on impulsiveness, as well as their partial effects, in a multiple regression analysis (Hayes, 2012, Model 1). As predicted, there was a significant interaction between the boredom manipulation and self-awareness on impulsiveness, $B = 0.22$, $SE = 0.10$, $p = .02$. At one SD above the self-awareness scores' mean, the effect of the boredom manipulation on increased impulsiveness was significant, $B = 0.39$, $SE = 0.13$, $p < .005$. The effect size of the interaction on impulsiveness decreased and became marginally significant at the self-awareness scores' mean, $B = 0.16$, $SE = 0.09$, $p = .08$, and not significant at one SD below the mean, $B = -0.06$, $SE = 0.09$, $p = .67$. These results supported our prediction: boredom increases impulsiveness especially amongst those who are high in self-awareness. Additionally, there was not a significant effect of self-awareness on impulsiveness, $B = -0.15$,

SE = 0.10, *p* = .13, yet there was a marginally significant effect of the manipulation on impulsiveness, *B* = 0.17, *SE* = 0.09, *p* = .078 in this model.

Boredom, meaning, and impulsiveness. The boredom manipulation (effect-coded: -1 = *low boredom*, 1 = *high boredom*) predicted increased impulsiveness with marginal significance, *B* = .17, *SE* = 0.10, *p* = .085. As in Studies 1 and 2, we predicted that the relationship between the boredom manipulation and impulsiveness would be mediated by the perceived meaninglessness of state boredom. We tested this hypothesis by conducting a mediation analysis using Hayes's (2012) PROCESS macro. The boredom manipulation (effect-coded: -1 = *low boredom*, 1 = *high boredom*) was entered as the predictor in the model, perceived meaninglessness as the mediator, and state impulsiveness as the outcome variable. As expected, there was a significant indirect effect of the manipulation (effect-coded; -1 = *low boredom*, 1 = *high boredom*) on state impulsiveness through perceived meaninglessness, *ab* = 0.13, *SE* = 0.05, 95% CI [0.06, 0.25]. Further, the direct effect was eliminated controlling for meaninglessness, *B* = 0.04, *SE* = 0.10, *p* = .70 (Figure 3). These results suggested that perceived meaninglessness, a key component of boredom, mediated at least part of the relationship between the boredom manipulation and impulsiveness, similar to Studies 1a and 2.

Next, we tested whether self-awareness moderated the above established model using Hayes's (2012, Model 14) PROCESS macro. Specifically, the previous model was supplemented with self-awareness as a moderator (e.g., a moderated mediation model). As expected, the critical interaction between perceived meaninglessness and self-awareness to predict impulsiveness was significant, *B* = 0.17, *SE* = 0.09, *p* = .04. Further, there were significant conditional indirect effects such that the effect of boredom on impulsiveness in response to perceived meaninglessness was significant at high, but not low, levels of self-awareness (Table 6). These findings indicate that the effect of boredom on impulsiveness as a

result of perceived meaninglessness was dependent on individual differences in self-awareness. Boredom comprises meaninglessness, which in turn predicts increased impulsivity. The extent to which perceived meaninglessness transfers boredom's impact on impulsiveness is, moreover, particularly strong for those high in self-awareness.

In summary, we tested the link between state boredom and impulsiveness using experimental data. We found additional evidence for a relationship between boredom and impulsiveness fostered by perceived meaninglessness, replicating a similar model from Studies 1a and 2. Self-awareness significantly moderated the relationship between meaninglessness, a constituent of boredom, and impulsiveness. Specifically, those participants who reported greater self-awareness were more likely to endorse impulsiveness when bored. Collectively, these results were in accordance with our hypothesis and theoretical framework: impulsiveness in response to boredom seems to be enacted to address the meaninglessness inherent in being bored, the perception of which is enhanced under conditions of greater self-awareness.

General Discussion

We hypothesized that the relationship between boredom and impulsiveness is mediated, at least in part, by perceived meaninglessness. Boredom characteristically involves a sense of meaninglessness (Van Tilburg & Igou, 2011). Yet, boredom is also correlated with impulsiveness (Dahlen et al., 2004; Fahlman et al., 2011). Meaning-threats in general promote impulsive behaviors that in turn help to distract people from a sense of meaninglessness (Wisman, 2006). People's attempt to deal with the lack of perceived meaning, innate to boredom may, therefore, be one of the driving factors underlying the increased impulsiveness stemming from boredom. To test if meaninglessness explained the relationship between boredom and impulsiveness, we conducted three studies (correlational and experimental). In Study 1a, we found that meaninglessness significantly mediated at least

part of the relationship between boredom and impulsiveness. Study 1b provided preliminary evidence for a relationship between boredom, meaninglessness, and an implicit, behavioral measure of impulsivity. We found significant correlations between the boredom and meaninglessness of waiting periods and impulsive responses on a temporal discounting task. Further, we found a marginally significant indirect effect in which the boredom of the waiting periods predicted impulsive responses via the meaninglessness of the waiting periods, a pattern consistent with Study 1a. We expanded on these findings in Study 2 by replicating Study 1a's findings for each of the five subscales of Fahlman and colleagues' (2011) state boredom scale. Similar findings were obtained in Study 3 using an experimental design, adding credibility to our hypothesis and conclusion.

Further, Study 3 included a critical moderator, self-awareness. Self-awareness is believed to make more pressing the need to address the existential threat of meaninglessness (Wisman, 2006) since meaning threats are more prominent under greater self-awareness (Sedikides & Skowronski, 2003; Taubman Ben-Ari & Noy, 2010). Therefore, we predicted that the effect of boredom on impulsiveness would be stronger for people with a high (vs. low) self-awareness disposition. We found that the effect of boredom on impulsiveness, through meaninglessness, was significantly stronger for those individuals who were high (vs. low) on dispositional self-awareness. This finding is compatible with previous literature that emphasizes how people high in self-awareness are particularly likely to address meaning threats with impulsive behaviors (Moynihan et al., 2015; Wisman et al., 2015). To our knowledge, Study 3 is the first study to demonstrate the relationship between state boredom and impulsiveness experimentally.

Implications for Theory

Collectively, our studies contribute to the field by illuminating the psychological processes that link boredom and impulsiveness, with a particular emphasis on state boredom, a gap noted by other researchers (e.g., Fahlman et al., 2011; Gerritsen et al., 2014). Our findings integrate prior research on boredom and impulsiveness amongst those high in self-awareness (Moynihan et al., 2015) by identifying the critical role of meaninglessness perceptions, fundamental to boredom, in this process. Our studies suggest that impulsiveness promoted by boredom is enacted, at least in part, to address the meaninglessness intrinsic to boredom. Further, bored individuals high in self-awareness are particularly prone to behaving impulsively as the perceived meaninglessness of the experience is enhanced under greater self-awareness (Sedikides & Skowronski, 2003).

In addition, our studies incorporate impulsiveness into meaning-regulation theorizing (Wisman, 2006), uniting areas of research that hitherto seemed disparate. This is an important contribution to the psychology of boredom, meaning, and impulsiveness. Earlier research using this framework demonstrated that meaning-threats, including boredom (Moynihan et al., 2015), make people engage in hedonic behavior such as unhealthy eating, drinking alcohol (Wisman et al., 2015), or increasing interest in sex (Wisman & Goldenberg, 2005). These hedonic behaviors are likely expressions of the impulsiveness that boredom breeds (Dahlen et al., 2004, 2005; Rupp & Vodanovich, 1997). Understanding the processes underlying and highlighting that relationship will help prevent boredom's adverse consequences (e.g., designing cognitive rehabilitation programs, Gerritsen et al., 2014; Goldberg et al., 2011).

Limitations

Self-report measures. A limitation of the current research is that in Study 3, our measure of self-awareness had lower than expected internal reliability and our conclusions from this study should thus be treated tentatively. Nevertheless, the findings are consistent with previous research on self-awareness making more prominent the need to address meaning threats (e.g., Moynihan et al., 2015; Wisman et al., 2015). Furthermore, we used self-report measures for the majority of our studies. However, different measures of boredom as a feeling state were used throughout Studies 1-3 (e.g., Fahlman et al., 2011; Van Tilburg & Igou, 2012), indicating convergent validity of our results and conclusions. Further, in most of our correlational studies, measures were presented to participants in a random order. In addition, we also tested our hypothesis experimentally in Study 3 that confirmed findings from our correlational studies. A similar pattern of results was also found in Study 1b that used a behavioral measure of impulsiveness. Therefore, the consistency of our results across the studies, some of which used different measures, lends credibility to our hypothesis and conclusions.

State impulsiveness measure. On a related note, we also employed a self-report measure of state impulsiveness (Patton et al., 1995) throughout Studies 1-3. We believed that state impulsiveness was more appropriate to investigate with regards to state boredom, considering the lack of research on the relationships between these constructs, and since trait impulsiveness has largely been related to boredom proneness (e.g., Dahlen et al., 2004; 2005). Indeed, the propensity to experience impulsiveness is an abstraction that never actually occurs, while state impulsiveness, and also state boredom, is a concrete experience situated in time (e.g., see Fahlman et al., 2011). Simultaneously, it could be argued that those prone to acting impulsively, as originally measured by the BIS-11, more likely experience impulsiveness as a state more often in their daily lives (see Van Tilburg & Igou, 2012,

2016c). Considering these points, state impulsiveness seemed more appropriate to investigate in the current research considering our research question and lack of evidence in this area. Again, although our impulsiveness measure in Studies 1-3 had excellent content validity which lacks in other scales and behavioral measures of impulsiveness (Patton et al., 1995), our measure of state impulsiveness was not extensively validated. Thus, we acknowledge that using this self-report measure of impulsiveness is a minor limitation of Studies 1-3.

Accordingly, we conducted a preliminary study using a behavioral measure of impulsiveness. In Study 1b, we found a marginally significant indirect effect of state boredom on impulsiveness via perceived meaninglessness, consistent with Studies 1a, 2, and 3. Although these are limitations of our studies and more research is required, we believe that the current studies provide an appropriate first step in investigating our theoretical framework.

Future Research Directions

Implicit impulsiveness measures. For future research, it would be important to link impulsiveness associated with boredom and meaninglessness to other constructs known to correlate with those variables (e.g., unhealthy eating, Friese & Hofmann, 2008); impulsiveness as a delinquent boredom consequence may be the basis of several of boredom's adverse effects (Rupp & Vodanovich, 1997). Future research would do well to examine other behavioral expressions of impulsiveness, considering the BIS-11's links to drug-taking, alcohol consumption, and disinhibition among other risky behaviors (e.g., Baumeister, Vohs, & Funder, 2007; Stanford et al., 1996; Stanford et al., 2009). Simultaneously, as Study 1b was a first attempt in this regard, further research that uses different, implicit, behavioral measures of impulsiveness that also investigates the role of self-awareness is needed.

Escaping self-awareness. In addition, our studies' designs and results do not actually tell whether increased impulsiveness allows people to escape self-awareness, the facility that highlights the meaninglessness of boredom. People attempt to deal with adverse self-awareness by engaging in behaviors that suppress introspection (e.g., Duval & Wicklund, 1972). Interestingly, the desire to escape self-awareness has been associated acting more impulsively rather than less, suggesting that impulsiveness may help people to effectively escape from adverse self-awareness (e.g., Heatherton & Baumeister, 1991; Twenge et al., 2003). Indeed, previous research suggests that impulsiveness can prevent adverse self-awareness in response to meaninglessness (McGregor, Nash, Prentice, Hirsh, & Inzlicht, 2012). Impulsiveness can therefore shut out meaninglessness by subduing self-awareness (Goldenberg, Arndt, Hart, & Brown, 2005; Heatherton, Polivy, Herman, & Baumeister, 1993), and this response to meaninglessness, inherent to boredom, may similarly explain boredom's association with impulsiveness.

Indeed, in Study 3's pilot test, we found a significant difference in the subset of participants who completed a state self-awareness scale before completing the impulsiveness measure. Those participants in the high boredom condition recorded significantly lower self-awareness than those in the low boredom condition. When people are confronted with meaninglessness, perceived discrepancies between one's current (meaningless) state and ideal (meaningful) self are noticed, in particular at higher levels of self-awareness (Phillips & Silvia, 2005; Silvia & Duval, 2001; Wicklund & Duval, 1971). These discrepancies arouse negative feelings and may motivate individuals to avoid self-awareness (Duval & Wicklund, 1972), necessary to perceive the meaninglessness inherent in the self (Sedikides & Skowronski, 2003). It is important for future research to investigate, in greater depth, the dynamics of the relationship between impulsiveness and reducing adverse self-awareness, needed to perceive meaninglessness. For example, it is possible that boredom motivates

attempts at escaping self-awareness initially, thus lowering inhibitions required for self-regulation (Baumeister, Heatherton, & Tice, 1994; Tice, Bratslavsky, & Baumeister, 2001; Vohs & Heatherton, 2000) and consequently increasing impulsiveness. Requiring self-awareness for self-regulation (Baumeister, Schmeichel, & Vohs, 2007; Carver & Scheier, 1982), in the context of meaning threats, may make one reluctant to put forth the effort that self-regulation requires as self-awareness highlights meaning threats (Baumeister et al., 2005; Taubman Ben-Ari & Noy, 2010; Twenge et al., 2003). Thus, people experiencing meaning threats may at first be disinclined to think about themselves that ultimately undermines their self-regulation. In sum, people may initially try to abandon the facility needed to perceive meaning threats but do so more effectively by engaging in impulsive behaviors (Kim, Seto, Davis, & Hicks, 2015; Sedikides & Skowronski, 2003). Ultimately, Wisman et al. (2015) note that more longitudinal research is needed to determine these dynamics of our theoretical framework.

Other effects of boredom. Furthermore, although we focused on the existential processes characteristic of boredom, boredom may prompt other psychological responses than those associated with meaning-regulation alone (Eastwood et al., 2012; Van Tilburg & Igou, 2011; 2012). These responses may also be associated with impulsive behaviors (e.g., sensation-seeking, Watt & Vodanovich, 1992). In this regard, Dahlen et al. (2004) found that the relationship between trait boredom and aggression was maintained after controlling for impulsiveness, measured by the BIS-11 (Patton et al., 1995). Indeed, other boredom research found that boredom also promotes interest-promotion strategies and looking for challenges (Nett, Goetz, & Daniels, 2010; Nett, Goetz, & Hall, 2011; Sansone et al., 1992). Although these constructs share some similarities with impulsiveness, they may not be interchangeable with it and further, it is likely that there are many facets of impulsiveness (Carver & White, 1994).

Different types of impulsivity. In this context, it would be interesting to investigate the relationship between boredom and functional and dysfunctional impulsivity. Research has shown how different rewarding tendencies (components of the Behavioral Activation System, e.g., Carver and White, 1994) are differently related to functional vs dysfunctional impulsive tendencies (e.g., Leone & Russo, 2009). Future research on boredom may benefit from considering the rewarding motivations underpinning impulsivity in general, and specific manifestations of impulsivity. In summary, different processes and different forms of impulsiveness (e.g., decreased reasoned action) that link boredom and meaninglessness to specific behaviors requires further investigation.

Role of other meaning sources. In addition, it is also important to note that impulsiveness in response to boredom may only occur in specific circumstances. Some boredom researchers have speculated that alternative, more meaningful behaviors might be enacted in response to boredom when available (Bench & Lench, 2013; Van Tilburg & Igou, 2011, 2012). For example, Wisman (2006) postulates that those with strong, coherent worldviews may mitigate meaning-threats by bolstering worldviews. This strategy counteracts the threat through adherence to meaning-laden worldviews (Heine et al., 2006). Those with weaker, less coherent worldviews or who feel incompetent to adhere to the standards set by cultural norms may be incapable of regulating meaning through worldview defense or similar sources of meaning. Therefore, such people may be particularly inclined to deal with boredom's meaning threat by avoiding self-awareness (Wisman, 2006).

Conclusion

We believe that our studies are the first to demonstrate a clear link between state boredom and impulsiveness. Understanding this relationship is important as both constructs have been associated with adverse outcomes for both individuals and society (e.g., Vodanovich, 2003). Further, we incorporated both meaninglessness and self-awareness into

this model to delineate how and why this relationship occurs. Our studies indicate that boredom has an effect on impulsiveness in response to meaninglessness, but particularly amongst those people high in trait self-awareness, as demonstrated in Study 3. In this context, boredom appears to promote impulsiveness to deal with the perceived meaninglessness of boredom (Van Tilburg & Igou, 2012). Further, the perception of meaninglessness and its consequent actions are enhanced under greater self-awareness (Sedikides & Skowronski, 2003; Wisman et al., 2015). Although this research has its limitations, our studies contribute to understanding why boredom potentially promotes adverse consequences. As outlined by Gerritsen et al. (2014), understanding the processes through which boredom promotes impulsiveness will help to identify targets for clinical intervention (e.g., by providing adaptive coping resources, Dahlen et al., 2005).

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Footnotes

[1] To assess if multicollinearity was evident in our data, we examined the Variance Inflation Factor (VIF) values for each path in our proposed mediation models across Studies 1-3. For each regression coefficient in our proposed models, the VIF value was 1.00, below the recommended threshold of 10 (Tabachnick & Fidell, 2013). Collectively, these results suggested that multicollinearity was not a problem in our analyses throughout Studies 1-3.

[2] Study 1a's sample was created by collapsing pilot and main samples. We ensured that participants from Study 1a's pilot test were excluded from Study 1a's main data collection session, using the interface at *ProlificAcademic.co.uk*. In the pilot test as an initial investigation of our proposed mediation model (N = 40, [16] women, [24] men, age range = 19-55), measures of state boredom (α = .77; Van Tilburg & Igou, 2012), perceived meaninglessness (α = .94; Van Tilburg & Igou, 2011), and impulsiveness (α = .89; Patton et al., 1995) were distributed to participants in a random order. As expected, we found a significant indirect effect of boredom on increased impulsiveness via perceptions of meaninglessness, ab = 0.29, SE = 0.15, 95% CI [0.09, 0.68], estimated using 10,000 bias-corrected bootstraps (Hayes, 2012, Model 4).

In Study 1a's main sample (N = 60, [29] women, [30] men, age range = 18-64), similar measures used in its pilot, state boredom (α = .86; Van Tilburg & Igou, 2012), perceived meaninglessness (α = .94; Van Tilburg & Igou, 2011), and impulsiveness (α = .84; Patton et al., 1995), were distributed to participants in a random order. Again, we found a significant indirect effect of state boredom on increased impulsiveness via perceived meaninglessness, ab = 0.25, SE = 0.10, 95% CI = [0.09, 0.48], estimated using 10,000 bias-corrected bootstraps (Hayes, 2012, Model 4).

[3] For exploratory purposes, we combined scores from Study 2's pilot and main samples for the subscales of the multi-dimensional state boredom scale and perceived meaninglessness (N = 232, age range = 18-61; [112] women, [119] men, [1] undeclared). In this combined sample, our meaninglessness measure (α = .93) and the disengagement (α = .91), high arousal (α = .88), inattention (α = .89), low arousal (α = .93), and time perception (α = .90) subscales were all reliable. Consistent with findings from Study 2's pilot and main samples, perceived meaninglessness correlated positively and significantly with each subscale of the multi-dimensional state boredom scale in the combined sample: disengagement, $r(228) = .73$, $p < .001$, high arousal, $r(228) = .74$, $p < .001$, inattention, $r(228) = .56$, $p < .001$, low arousal, $r(228) = .77$, $p < .001$, and time perception, $r(228) = .46$, $p < .001$.

[4] A regression analysis with the boredom induction (-1 = *low*, 1 = *high*), standardized self-awareness, and their interaction as predictors of the manipulation check indicated that the manipulation check results were not qualified by self-awareness, $B = 0.26$, $SE = 0.19$, $p = .17$.

[5] A regression analysis with the boredom induction (-1 = *low*, 1 = *high*), standardized self-awareness, and their interaction as predictors of meaninglessness indicated that the meaninglessness results were not qualified by self-awareness, $B = 0.12$, $SE = 0.14$, $p = .40$.

Table 1

Descriptive Statistics (Study 1a)

Variables	*M*	*SD*	Max	Min
State Boredom	4.17	1.33	6.86	1.00
Perceived Meaninglessness	3.44	1.79	7.00	1.00
State Impulsiveness	2.11	0.41	3.10	1.23

Note. M = Mean, *SD* = Standard Deviation

Table 2

Descriptive Statistics (Study 1b)

Variables	*M*	*SD*	Max	Min
Boredom	3.33	2.15	7.00	1.00
Meaninglessness	3.61	2.14	7.00	1.00
Impulsive Responses	1.46	1.12	3.00	0.00

Note. M = Mean, *SD* = Standard Deviation

Table 3

Descriptive Statistics (Study 2)

Variables	*M*	*SD*	Max	Min
Disengagement	3.58	1.40	6.70	1.00
High Arousal	3.14	1.44	6.60	1.00
Inattention	3.51	1.59	6.75	1.00
Low Arousal	3.05	1.68	7.00	1.00
Time Perception	2.72	1.35	7.00	1.00
Perceived Meaninglessness	2.73	1.57	6.80	1.00
State Impulsiveness	2.01	0.38	2.97	1.10

Note. *M* = Mean, *SD* = Standard Deviation

Table 4

Mediation Analyses (Study 2)

Predictors	*Path a*	*Path b*	*ab*	*95% CI*
Disengagement	0.71**	0.18*	0.12	[0.02, 0.24]
High Arousal	0.74**	0.16*	0.12	[-0.004, 0.24]
Inattention	0.57**	0.21**	0.12	[0.05, 0.20]
Low Arousal	0.76**	0.32**	0.25	[0.13, 0.38]
Time Perception	0.46**	0.42**	0.19	[0.12, 0.29]

Note. *Path a* = Effect of State Boredom Subscale on Perceived Meaninglessness, *Path b* = Effect of Perceived Meaninglessness on State Impulsiveness, *ab* = Indirect Effect, *95% CI* = 95% Confidence Interval, * = $p < .05$, ** = $p < .001$.

Table 5

Descriptive Statistics (Study 3)

Variables	*M*	*SD*	Max	Min
State Boredom	3.67	2.04	7.00	1.00
Perceived Meaninglessness	3.49	1.51	7.00	1.00
Self-Awareness	5.68	0.93	7.00	2.67
State Impulsiveness	2.13	0.34	3.10	1.40

Note. M = Mean, *SD* = Standard Deviation

Table 6

Conditional Indirect Effects of the Boredom Manipulation on Impulsiveness, Mediated by Meaninglessness, at Levels of Self-Awareness (Study 3)

Self-Awareness	Effect	*SE*	95% CI
-1.01	0.07	0.05	[-0.02, 0.20]
-0.01	0.12	0.05	[0.05, 0.23]
0.98	0.18	0.07	[0.07, 0.37]

Note. SE= standard error. CI = confidence interval.

Figure 1: *Conceptual Representation of the Mediation Model (Study 1a)*

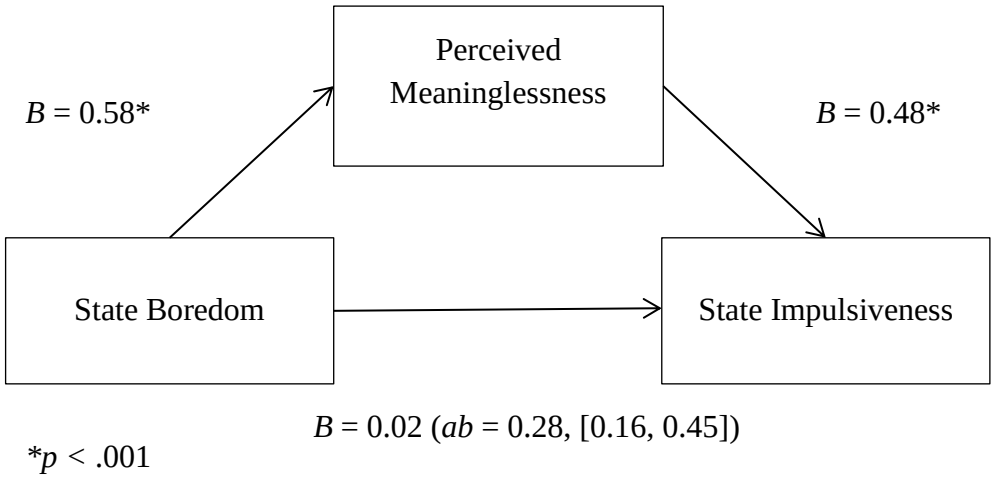


Figure 1: An outline of the relationship between state boredom and impulsiveness, significantly mediated by perceived meaninglessness.

Figure 2: *Conceptual Representation of the Mediation Model (Study 1b)*

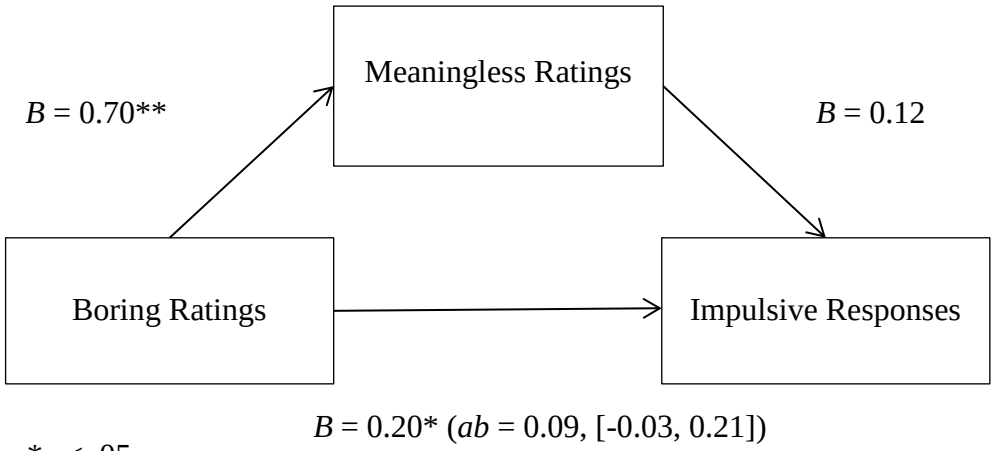
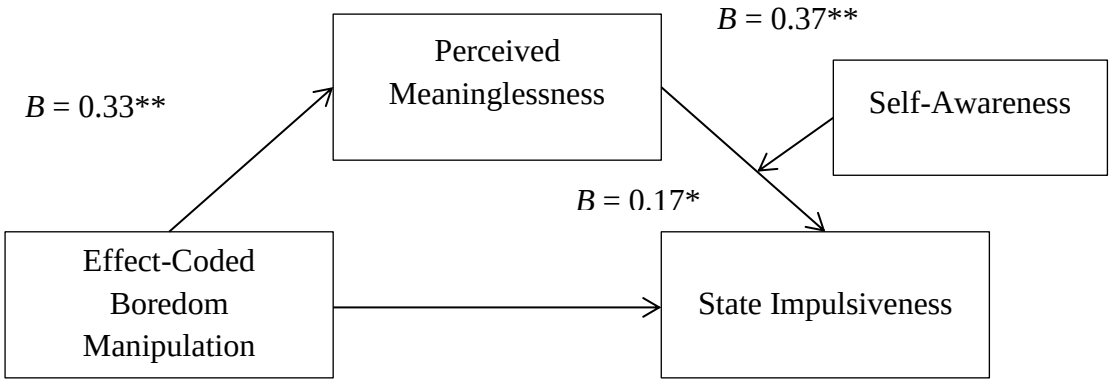


Figure 2: An outline of the relationship between the boring ratings of the waiting periods and impulsiveness, mediated by meaningless ratings of the waiting periods.

Figure 3: *Conceptual Representation of the Moderated Mediation Model (Study 3)*



B = 0.03 (*ab* = 0.13, [0.06, 0.25])

**p* < .05

***p* < .001

Figure 3: An outline of the relationship between the boredom manipulation and impulsiveness, significantly mediated by perceived meaninglessness. The relationship between perceived meaninglessness and impulsiveness was significantly moderated by self-awareness, as predicted.