THE UNDERUSED MIND: THE ROLE OF COGNITION IN TRAIT BOREDOM

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Abstract

Trait boredom is associated with serious psychosocial consequences. It is also associated with poor sustained attention and self-reported executive dysfunction. However, research on trait boredom and cognitive ability beyond sustained attention is limited. One reason is that there has been a lack of theoretically grounded measures of trait boredom. In part 1, we developed a strong, unidimensional measure of trait boredom grounded in a comprehensive definition and theory of state boredom. In part 2, we examined whether participants' cognitive ability on tests of sustained attention, executive function, and processing speed predicted trait boredom. Findings indicated a weak association between cognitive ability and trait boredom. However, trait boredom was associated with poorer sustained attention ability, marginally poorer oral processing speed and better inhibitory control. Findings suggest trait boredom is likely not reflective of poor cognitive ability. Rather, trait boredom may characterize one's reaction to certain cognitive tasks, thereby causing poor performance.

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The Underused Mind: The Role of Cognition in Trait Boredom

Boredom is a common problem, defined as an aversive or uncomfortable feeling of wanting to, but being unable, to engage with the internal or external environment (Eastwood et al., 2012). Boredom is often viewed as a trivial problem, and yet research suggests that it can have serious psychosocial consequences, particularly for people who experience it often. For example, the tendency to be bored is associated with poor job and school performance, gambling, substance use, accidents, depression, anxiety, anger and suicidal ideation (Blaszczynski et al. 1990; LePera 2011; Rupp & Vodanovich, 1997; Sommers & Vodanovich, 2000; Watt & Hargis, 2010). This predisposition is known as trait boredom, and it can be a chronic problem.

Introduction: Trait Boredom and Cognition

Past research consistently points to the links between trait boredom and poor attention ability, as well as self-reported difficulties in other cognitive domains (e.g. executive function). There is a single study examining the relationship between trait boredom and cognitive ability beyond sustained attention. The authors found that poor cognitive ability, as measured by the Abbreviated Mental Test, was associated with trait boredom in older age (Conroy et al., 2010). However, an important limitation is that trait boredom was measured using a single interview item, rather than a well validated measure (Conroy et al., 2010). Overall, to date, there is limited research examining the association between trait boredom and ability on cognitive tasks beyond sustained attention. Furthermore, the existing research on this relationship is limited due to lack of theoretically grounded and psychometrically strong measures of trait boredom. This study will contribute to our understanding of the relationship between trait boredom and cognition. It will help us understand whether trait boredom relates to sustained attention ability specifically, or to

cognition more broadly, and may illuminate the reasons why trait boredom relates to sustained attention (i.e. due to poor attention ability, or lack of persistence, etc.).

Cognitive Theories of Boredom

The feeling of boredom is underpinned by the state of being mentally unoccupied; that is, having cognitive capacity under utilized (Eastwood et al., 2012). The bored individual *wants* to be engaged but is unable to do so- they are incapable of wanting to do what is available. These two factors, an unoccupied mind and a desire bind, are the mental processes underlying the feeling of boredom (Eastwood & Gorelik, in press).

Cognitive theories offer explanations for *why* these mental processes come about. They posit that individuals become bored because they are unable to focus their attention and thus are unable to stay engaged (Eastwood et al., 2012; Fisher, 1993). They suggest that the bored individual cannot focus their attention, is aware of that, and tries to force their attention back to the task -either due to momentary distractions, or due to more chronic cognitive deficits affecting their attention ability.

Several studies provide evidence supporting that the inability to focus attention can lead to boredom. In a study by Damrad-Fyre and Laird (1989), participants were instructed to listen to a moderately interesting article. Participants were also randomly assigned to one of three distraction groups: the first group heard a loud TV program playing in the adjacent room, the second group heard the same TV program as the first group, but now at a lower, just noticeable volume. The third group heard no sound from the adjacent room. Following this, they were asked to indicate what they remembered from the article, as well as to rate how interesting or boring it was. The authors found that the group that heard the "just noticeable" noise reported higher levels of boredom than the other two groups. Although this group reported no distraction from

the TV, they seem to have attributed the subtle distraction to the article, which they indicated was less interesting compared to the other two groups. This subtle distraction seems to have led them to feel more bored than participants in the other two groups (Damrad-Fyre & Laird, 1989). Overall, this study shows that the inability to focus attention (especially when there is no clear reason for it, such as a loud TV which is clearly distracting) can lead to higher levels of boredom. A study by Fisher (1998) tested the hypothesis that internal (i.e. mind wandering) and external distractions would lead to attentional disengagement, which would then cause an individual to feel bored. However, the author used tasks which varied in their attentional demands. Fisher (1998) found that for tasks that were low on attention demand, external distraction lowered boredom levels of participants. However, there was no effect on boredom levels in tasks that were highly attentionally demanding. Importantly, the author included only distractions that were very obvious, unlike Damrad-Fyre and Laird (1989) who included subtle interruptions as well. Perhaps participants had a clear external attribution for their attentional disengagement in Fisher's (1998) study, and thus did not experience higher boredom levels. A possible interpretation of these findings is that when distraction is detrimental to the task and not attributable to a particular source, boredom increases. However, for tasks where distraction does not interfere with task performance, boredom decreases. Recent research supports the notion that a lack of awareness on the source of distraction is key in the experience of boredom. A study by Critcher and Gilovich (2010) manipulated mind wandering and found that when participants knew the source of their distraction, they did not experience boredom.

In another study, Fisher (1998) presented participants with a job description of an employee as well as his diary from 10 time points in one day. Following their review of the material, participants rated the employee's boredom and satisfaction. The frequency of the

employee's task unrelated thoughts was manipulated (never, occasionally, and frequently), as well as the reason for the thoughts (good vs. poor) and job type (blue collar vs. managerial). The author found participants rated those who are often distracted by non-task related thoughts for an unjustifiable reason as more bored. This finding indicates that attention difficulties, especially for an unclear or unjustifiable reason, are seen as indicative of greater boredom. Overall, this research suggests that attentional disengagement or distraction, particularly when attributed to the task and when detrimental to performance, is associated with greater boredom.

Importantly, the cognitive theory suggests that in the more chronic trait-boredom, these momentary failures of attention are caused by trait deficiencies of cognitive abilities needed for attentional engagement (Eastwood et al., 2012). Hamilton (1981) suggested that trait boredom results when one has an "underdeveloped attention control mechanism". Evidence from individuals with traumatic brain injury shows they often face difficulty sustaining attention, and also report high levels of trait boredom (Seel & Kreutzer, 2003; cited in Isacescu & Danckert, 2018; Goldberg & Danckert, 2013). Individuals with ADHD (Barkley 2006; Malkovsky et al., 2012) and psychopathology involving attention ability (e.g. schizophrenia; Eastwood et al., 2012; Newell, Harries, & Ayers, 2012) also experience greater levels of boredom. The fact that these individuals have impaired attention abilities and they show greater boredom suggests that attentional impairments might be the root of boredom.

Cognitive theories also suggest that attentional disengagement fully explains the experiential components of boredom. That is, disengagement explains the negative affect, perceived slow passage of time, oscillating arousal, difficulty concentrating, sense of purposelessness, and the lack of agency components of boredom (Eastwood et al., 2012). First, attentional disengagement can explain the negative affect characteristic of boredom, including

displeasure, sadness, anger, or anxiety (Eastwood et al., 2012). An inability to concentrate or properly allocate attention interrupts the flow of information (Eastwood et al., 2012; Csikszentmihalyi, 1978). These interruptions are experienced as highly unpleasant, leading to negative affect. Carver and Scheier (1990) suggested that interruptions lead to negative affect when they slow down one's progress toward their goals (Fisher, 1998). Kirmeyer (1988) suggested that greater interruptions experienced by police dispatchers was associated with an increased sense of overload and stress. Attentional disengagement can also explain the perception that time is passing slowly. This perception is an important part of the experience of boredom, where there seems to be an endless present and a painful passage of time (Eastwood et al., 2012). Attention is required to accurately perceive the passage of time by the monitoring of temporal cues (Zakay, 1992). When one is absorbed in a task, those cues are often missed, and one perceives time as moving quickly. However, paying attention to all temporal cues often leads to the perception that time is moving slowly (Eastwood et al., 2012; Zakay, 1992). Thus, the more one pays attention to the passage of time, the longer it is perceived to pass (Zakay, 1992). Furthermore, attentional disengagement contributes to the fluctuating arousal seen in boredom. When an individual experiences low arousal and is aware of being attentionally disengaged, they may attempt to heighten their level of arousal to try and stay engaged with a task. This struggle to keep attention focused is characterized by high arousal and often includes frustration and negative affect (Eastwood et al., 2012; Berlyne, 1960; Hamilton, 1981; O'Hanlon, 1981; Smith, 1981; and Thackray, 1981). When one's attempts to engage with a task are unsuccessful, one might attempt to exert more effort to engage. Boredom can occur if one becomes aware of this increased effort and unsuccessful attempts to engage (Eastwood et al., 2012). Also, the inability

to engage contributes to a sense that what one is doing lacks purpose or meaning. One wants to, but is unable to engage, leaving one unchallenged and feeling the situation serves no purpose.

Lastly, part of the boredom experience is a feeling of a lack of agency. The bored individual searches for engagement but fails to find something they want to engage with. This brings about a sense that one is passively watching the world pass them by, rather than being an agent who is able to actively engage with life. The ability to choose and successfully engage attention is important in bringing about a sense that one has control and autonomy in life (Eastwood et al., 2012). Overall, the cognitive theory of boredom fully explains the experiential components of boredom. This is an important strength of the cognitive model because it suggests attentional disengagement may be the root of boredom.[1]

State Boredom and Sustained Attention

Boredom has been most frequently studied in the context of sustained attention and vigilance tasks. Sustained attention or vigilance refers to the ability to stay focused on a task for a long period of time. In vigilance or sustained attention tasks, participants are typically asked to monitor a display and detect critical signals. One of the earlier studies on state boredom and vigilance was by Barmack (1937). Barmack (1937) had participants perform several vigilance tasks (i.e. pursuit rotor task and a repetitive addition task) and found that individuals who experienced greater boredom also tended to make more errors on the tasks. Thackray et al. (1977) had participants perform a simulated air traffic control task for one hour. Participants were asked to respond to rarely occurring changes in alphanumeric characters. Individuals who were more bored had a greater decline in attentiveness to the task and took longer to respond to

[1] Whereas the theories outlined above focus on thought process causing the experience of boredom, another kind of cognitive theory emphasizes the appraisal aspect of boredom. According to this theory individuals become bored because they perceive their environment as being monotonous or uninteresting (Eastwood et al., 2012). This second theory suggests that individuals attribute their inability to engage to the environment, rather than to internal sources.

stimuli (Thackray et al., 1977). Mark Scerbo was another researcher interested in the relationship between boredom and vigilance. He noted that participants become extremely bored when completing vigilance tasks. In one of his studies, he found that boredom levels peak quickly in sustained attention tasks (Scerbo and Holcomb, 1993). He also found that feelings of boredom correlated with poor performance on vigilance tasks (Scerbo, 1992). Specifically, participants who reported the highest levels of boredom also demonstrated the sharpest declines in performance on the vigilance task (Scerbo, 1992). More recently, Pattyn and colleagues (2008) used psychophysiological measures to investigate the vigilance decrement. They found that the vigilance decrement is associated with a state of under-arousal and boredom (Pattyn et al., 2008). These studies all suggest that boredom has an important relationship with vigilance decrements. A more recent study found a relationship between state boredom and poor performance on the Sustained Attention to Response Task (SART; Hunter & Eastwood, 2018). The authors measured state boredom after each of the three blocks of the SART to assess whether state boredom is a cause or a consequence of sustained attention failures (Hunter & Eastwood, 2018). Looking at the effect of sustained attention performance and state boredom on each other over time, the authors found evidence for the idea that state boredom causes and is a consequence of, sustained attention failures. However, Hunter and Eastwood (2018) found stronger support for the idea that sustained attention failures cause state boredom. Although state boredom has been shown to be associated with poor sustained attention performance, research suggests that individual differences contributing to state boredom (i.e. trait boredom) are also associated with attention.

Trait Boredom and Attention

Trait boredom is closely linked to attention. Farmer and Sundberg (1986) found that students high on trait boredom were significantly less attentive to a lecture. Individuals high on trait boredom also report daily attention lapses or cognitive errors (e.g. pouring juice on cereal, misplacing keys; Cheyne et al., 2006)., and self-reported symptoms of ADHD (Kass, Wallace & Vodanovich, 2003). Trait boredom is also associated with poor performance on sustained attention tasks. A study by Sawin and Scerbo (1995) found that participants who are boredom-prone (as measured by the BPS) perform worse on a vigilance task than participants who are low on boredom proneness. Kass et al. (2001) also found a relationship between trait boredom and poor performance (measured by sensory efficiency- the ability to detect a signal from background noise) on a clock-monitoring vigilance task, but only for the first 10 minutes of the task. Malkovsky et al. (2012) examined the relationship between trait boredom (measured by the BPS), sustained attention, symptoms of ADHD and other self-report measures of attention. They found that trait boredom was positively correlated with self-reported attention lapses, everyday cognitive errors and symptoms of ADHD (Malkovsky et al., 2012). Although they found no relationship between boredom proneness and errors on the SART, they found that those high on trait boredom were less sensitive to errors they made on the task. That is, those low on trait boredom slowed down significantly after having made a commission error, but those high on trait boredom did not (Malkovsky et al., 2012). More recently, Hunter and Eastwood (2018) found that trait boredom negatively predicts performance on the Sustained Attention to Response Task. Hunter and Eastwood (2018) showed that trait boredom predicts SART commission errors over and above depressive symptoms, as well as self-reported attention problems.

Sustained attention is a crucial component of cognitive performance (Sarter et al., 2001). It determines the effectiveness of higher cognitive processes and cognitive capacity more broadly

(Sarter et al., 2001). Because individuals high on trait boredom struggle with sustained attention, they may struggle with cognitive performance more broadly. Although the majority of research focused on trait boredom's links with sustained attention, there is evidence that it is also linked with other, "higher" cognitive processes.

Trait Boredom and Self-Reported Executive Function

Research suggests there is a relationship between trait boredom and self-reported difficulties with executive function. Several studies found a relationship between trait boredom and self- reported difficulties with goal-directed behavior, an important aspect of executive function that involves the ability to plan and execute chosen goals (Carriere, Cheyne & Smilek, 2008; Gerritsen et al., 2014; Goldberg, Eastwood, LaGuardia, and Danckert, 2011; Kuhl, 1994; Wallace, Vodanovich, and Restino, 2003). Gerritsen and colleagues (2014) measured participants' executive function using several self-report measures including the Behavior Rating Inventory of Executive Function for Adults (BRIEF-A), behavioral assessment of the dysexecutive syndrome: Dysexecutive Scale (DEX), and the frontal systems behavior scale (FrSBe). They found a significant correlation between trait boredom (measured by the Multidimensional Trait Boredom Scale- disengagement (MTBS-d) and the composite score on the executive function measures. Using a commonality analysis, the authors examined the unique and shared variance in MTBS-d that can be explained by the cognitive measures (including hyperactivity, inattention, executive function). They found that while executive function uniquely explained some variance in MTBS-d scores, most of the variance accounted for in the scores was shared between two or three of the cognitive measures (Gerritsen et al., 2014).

Trait Boredom and Broader Cognitive Ability

One study examined the relationship between trait boredom and broader cognition. Conroy and colleagues (2010) measured cognitive ability in older participants using the Abbreviated Mental Test- a measure similar to the Mini Mental State Examination. The authors found that poor cognitive ability was associated with trait boredom (Conroy et al., 2010). However, trait boredom was measured using a single interview item (i.e. "I often find that I am bored, or I have time on my hands that I don't know how to fill"). The lack of a well-validated, multi item measure of trait boredom is an important limitation of this study.

Summary: Trait Boredom and Cognition

Past research shows that boredom is clearly associated with poor attention performance. There is also theoretical and empirical evidence to suggest that trait boredom is associated with broader cognition. The empirical evidence shows trait boredom is associated with cognitive ability in older age, and with self-reported executive dysfunction. However, past research did not extensively examine the links between trait boredom and cognitive ability beyond attention. Assessing broader cognitive ability is important to better understand whether trait boredom relates to attention specifically, or to cognition more broadly. A theoretically grounded and psychometrically strong measure of trait boredom is required to thoroughly investigate these issues. However, there is currently a lack of theoretically grounded and psychometrically sound measures of trait boredom.

Existing Measures of Trait Boredom

Boredom Proneness Scale (BPS). The most widely used and researched measure of trait boredom is the Boredom Proneness Scale (BPS; Farmer & Sundberg, 1986). This was the first full scale measure of trait boredom. This scale includes 28 items. Some researchers use the true-false format, and some use a 7-point Likert scale, ranging from "highly disagree" to "highly

agree" (Vodanovich & Watt, 2016). It was designed to measure one's tendency to experience boredom. More specifically, the authors suggested that the scale assesses one's connectedness with the environment in different situations, and one's ability to access resources to successfully accomplish things (Farmer & Sundberg, 1986). The internal consistency reliabilities of the true-false format of the BPS ranged from .75 o .78 (Vodanovich & Watt, 2016; Culp, 2006; Nichols & Nicki, 2004), and the internal consistency reliabilities of the 7-point scale BPS have ranged from .79 to .91 (Vodanovich & Watt, 2016; Carriere, Cheyne, & Smilek, 2008; Cheyne, Carriere, & Smilek, 2006; Dahlen et al., 2004; Gerritsen, Toplak, Sciaraffa, & Eastwood, 2014; Melton & Schulenberg, 2009; Mercer & Eastwood, 2010; Watt & Hargis, 2010; Workman & Studak, 2005). The BPS appears to be a multifactorial scale, involving multiple factors or subscales (Struk et al., 2017; Ahmed, 1990; Vodanovich & Kass, 1990). One significant problem with the BPS is that it has an inconsistent factor structure. Specifically, previous studies suggested anywhere from two to five factors (see review in Vodanovich & Watt, 2016).

Short-Form BPS Scales. To address inconsistencies in its factor structure, Vodanovich, Wallace & Kass (2005) created a short version of the BPS, which includes 12 items. The authors found this short form to be comprised of two factors: internal and external stimulation (Vodanovich, Wallace & Kass, 2005). The authors postulated that internal stimulation refers to an apathetic, indifferent, state of boredom, whereas the external stimulation refers to a more restless, agitated state of wanting to engage, but being unable to do so. In their 12-item short form of the scale, six items loaded onto each factor. However, a later study revealed that it too showed an inconsistent factor structure (Melton & Schulenberg, 2009) and inconsistent reliability (Vodanovich & Watt, 2016).

A recent study by Struk, Carriere, Cheyne & Danckert (2017) further investigated the validity and factor structure of the 12-item short-form BPS and the full BPS. The authors suggested that previous inconsistencies in the BPS factor structure are primarily due to reverse scored items, and that modifying those would yield a single factor scale (Struk et al., 2017). They argued that while reverse wording is often used to safeguard against response bias, it may contribute to artificial factor structures and to reduced validity and reliability of scales (Struk et al., 2017; Harvey, Billings, & Nilan, 1985; Schriesheim & Hill, 1981; van Sonderen, Sanderman, & Coyne, 2013). Specifically, the authors suggested that the internal stimulation factor was formed s a result of reverse-worded items (as all the items loading on this factor were reverse scored), not due to item content. In their study, the authors reduced the 28-item BPS to an 8-item scale comprised of a single factor (Struk et al., 2017). The 8-item scale showed good reliability, validity, and model fit (Struk et al., 2017). Struk and colleagues (2017) argue that the scale demonstrates good face validity and is consistent with current models of boredom.

However, Vodanovich and Wallace (2016) suggested that some of the items on the BPS include terms that may be difficult to understand for individuals for whom English is a second language, or to be translated to other languages. These items continue to be part of the SF-BPS. For example, the item "I often find myself at 'loose ends,' not knowing what to do", or "Unless I am doing something exciting, even dangerous, I feel half-dead and dull."

Gana, Broc and Bailly (2019) evaluated whether the 8-item BPS scale captures trait boredom, or whether it is confounded by participants' level of boredom when they complete it (i.e. state boredom). In a longitudinal study, a sample of elderly participants completed the French version of the 28-item BPS (Gana & Akremi, 1998) at four time points over six years. The authors utilized a trait-state-occasion model (TSO; a model aimed at disentangling state

from trait components of a measure) to assess and parse out the variance explained in BPS scores. Gana and colleagues (2019) found that 64% of the variance was unexplained (error variance), 28% was due to trait boredom, and 8% was due to state boredom. These authors also replicated the uncertain factor structure of the full BPS. Since most of the variance in the 8-item BPS is unaccounted for by either state or trait components, this study casts doubt on whether this scale truly assesses trait boredom (Gana, Broc & Bailly, 2019). Accordingly, the authors questioned the psychometric properties of the scale (Gana, Broc & Bailly, 2019). Overall, Gana and colleagues (2019) suggested that an important limitation of the BPS is that it lacks a theoretical foundation- it is not based on a clear definition of boredom. The good psychometric properties of the 8-item BPS may not be sufficient to create a strong measure when it lacks a theoretical foundation. The authors cautioned against developing measures of trait boredom prior to establishing a strong theoretical foundation for it, as doing so risks reducing a construct to its measure (Gana, Broc & Bailly, 2019).

Studies evaluating the validity of the BPS suggested it relates to measures of negative affect including depression (Vodanovich & Watt, 2016; Carriere et al., 2008; Goldberg, Eastwood, Laguardia, & Danckert, 2011; Mercer-Lynn, Flora, Fahlman, & Eastwood, 2011; Malkovsky et al., 2012), apathy, anhedonia and dysphoria (Vodanovich & Watt, 2016; Goldberg et al., 2011; Mercer-Lynn et al., 2011), anxiety (Vodanovich & Watt, 2016; Eakman, 2011; Fahlman, Mercer-Lynn, Flora, & Eastwood, 2013; Fahlman et al., 2009; Newell, Harries, & Ayers, 2012), anger and aggression (Vodanovich & Watt, 2016; Fahlman, Mercer-Lynn, Flora, & Eastwood, 2013; Mercer-Lynn et al., 2011; Mercer-Lynn et al., 2013), and hostility (Vodanovich & Watt, 2016; Dahlen et al., 2004). Prior research points to a relationship between boredom proneness and major personality dimensions. For example, a study by Hill (1975)

found a significant positive correlation between boredom proneness, as measured by the BPS, and Neuroticism. This is consistent with other studies that linked boredom proneness with negative affect including depression, hopelessness, anxiety, hostility and aggression (Barnett & Klitzing, 2006; Ahmed, 1990; Farmer & Sundberg, 1986; Gordon et al., 1997; Sommers & Vodanovich, 2000; Mercer-Lynn, Flora, Fahlman & Eastwood, 2011). Another study by Gana, Deletang, and Metais (2000) found a significant relationship between boredom proneness, as measured by the BPS, and introspectiveness. A study by Culp (2006) examined the relationship between boredom proneness and the 96-item HEXACO-PI. Results showed a negative correlation between the Boredom Proneness Scale and all six subscales of the HEXACO-PI. However, the correlation with Emotionality was not significant (Culp, 2006). A more recent study by Hunter and colleagues (2016) found that boredom proneness had a significant negative correlation with Honesty-Humility, Extraversion, Agreeableness, Conscientiousness and Openness to Experience. However, they found a significant positive correlation with Emotionality. These studies show that the BPS is related to measures of negative affect as well as personality, suggesting the BPS has good criterion validity. However, the BPS lacks good content validity- the items are not based on a well-grounded definition and theory of trait boredom. This is a significant limitation of the BPS, which limits the interpretation of its criterion validity.

Zuckerman Boredom Susceptibility Scale (ZBS). The Boredom Susceptibility Scale is a subscale of the Zuckerman Sensation Seeking scale. The ZBS contains 10 items with two response options each. The ZBS primarily taps into one's need for variety, sensation seeking and boredom resulting from repetition and monotony (Vodanovich & Watt, 2016; Zuckerman, 1979).

Multiple studies suggested the ZBS has low internal consistency ranging from .52 to .62 (Vodanovich & Watt, 2016; Mercer-Lynn et al., 2011; Deditius-Island & Caruso, 2002).

Scores on the ZBS have been linked to aggressive driving (Harris et al., 2014), drug use (Dubey & Arora, 2008), alcohol problems (Mercer-Lynn et al., 2011), and gambling problems (Vodanovich & Watt, 2016; Gupta, Derevensky, & Ellenbogen, 2006; Mercer & Eastwood, 2010). The ZBS was also found to be negatively associated with neuroticism (Mercer-Lynn et al., 2011). The ZBS is thus limited in having low internal consistency and in focusing on only one specific aspect of trait boredom (i.e. sensation seeking; Vodanovich & Watt, 2016).

Overall Problems of the BPS and ZBS. The BPS and the ZBS scales each have their own limitations as outlined above. Moreover, the scales are not highly correlated (i.e. correlations range between .17 and .24; Vodanovich & Watt, 2016; Mercer-Lynn et al., 2014; Mercer & Eastwood, 2010), and they focus on different aspects of trait boredom. That is, the BPS assesses one's difficulty connecting to or engaging with the environment and accessing internal resources to accomplish things, whereas the ZBS focuses on one's tendency to seek external stimulation and variety, and to struggle with monotony (Mercer-Lynn et al., 2011). This idea was corroborated by Mercer-Lynn and colleagues (2011), who found that the BPS and ZBS were correlated with different issues. Specifically, the BPS was associated with depression and anxiety (i.e. internalizing issues), whereas the ZBS was associated with gambling and alcohol problems (i.e. externalizing issues). The unreliable factor structure of the BPS, low internal consistency of the ZBS, and the fact that the ZBS and BPS are assessing different psychological constructs points to the inconsistency and lack of clarity among measures of trait boredom, which in turns hinders the ability to truly understand its causes and correlates.

As outlined above, the current and commonly used measures of trait boredom are limited. This is another reason for the limited understanding of the links between trait boredom and cognitive ability. Thus, a new comprehensive, theoretically and empirically grounded measure must be developed.

A New Measure of Trait Boredom

One way of developing a new, theoretically grounded measure of trait boredom would be to construct it using our more thorough understanding of state boredom. In contrast to the underdeveloped and problematic measures of trait boredom, state boredom has been more thoroughly conceptualized and measured. One comprehensive measure is the MSBS (Fahlman et al., 2013) - the first full-scale measure of state boredom. It is a strong measure of boredom for several reasons. First, the definition of boredom its based on was constructed from a thorough review of the theoretical literature. The authors defined boredom as "the aversive experience of having an unfulfilled desire to be engaged in satisfying activity" (Falhman et al., 2013). Second, the authors empirically confirmed the theoretically grounded definition of boredom by conducting a modified grounded theory analysis (Fahlman et al., 2013). This is a qualitative analysis, where they asked participants to report what the experience of boredom meant to them, and what they think, feel or experience while bored. Using the participants' descriptions, the authors created a pool of items for the scale (Fahlman et al., 2013). All items were worded in the same direction to avoid creating artificial factors (Fahlman et al., 2013; DeVellis, 2003). After removing items, the authors arrived at a 29-item scale with five factors (i.e. Disengagement, High Arousal, Low Arousal, Inattention, and Time Perception) and a high reliability and validity (Fahlman et al., 2013). With respect to the reliability of the entire scale, Fahlman and colleagues (2013) found a Cronbach's alpha of .95. The reliability of each subscale was .88 for

Disengagement, .84 for High Arousal, .86 for Low Arousal, .80 for Inattention, and .92 for Time Perception. Other studies also back up the high reliability of the MSBS. For example, studies by Liu and colleagues (2013) and Song and colleagues (2013) evaluated the MSBS in samples of Chinese students. They found the reliability of the scale to be .91, while the subscale reliability values ranged from .65 to .81. The multidimensional factor structure of the MSBS was also replicated by Baratta and Spence (2015). This study found support for the multidimensional nature of the scale (Baratta & Spence, 2015).

Fahlman and colleagues (2013) also found the MSBS has high validity. The MSBS total score and subscale scores correlated with the Boredom Proneness Scale (BPS). The total score and subscale scores were significantly positively correlated with measures of state and trait depression, anxiety, anger, ADHD inattention scores, neuroticism and impulsivity, and negatively correlated with a measure of purpose in life and life satisfaction (Fahlman et al., 2013). Other studies also supported the validity of the MSBS. For example, Mercer-Lynn and colleagues (2014) found the MSBS total score was correlated with the BPS. Another study found MSBS score were correlated with apathy and depression (Goldberg et al., 2011). Furthermore, several studies suggest that the MSBS can reliably differentiate between people who are placed in a boredom induction versus a non-boredom condition. Fahlman et al (2013) found that MSBS scores predicted group membership in bored vs. non-bored conditions over and above depression, trait boredom, and negative affect. Hunter and colleagues (2015) found the MSBS can correctly identify 68% to 84% of individuals who were induced into a state of boredom versus non-boredom, suggesting the MSBS has good convergent validity.

The MSBS has also been translated into multiple languages and evaluated cross-culturally. Alda and colleagues (2015) translated the MSBS to Spanish and then evaluated its

psychometric properties using a sample of 303 patients from primary care settings in the city of Zaragoza. A confirmatory factor analysis showed good fit of the original five-factor model (Alda et al., 2015). Their analysis also replicated the second order factor of general boredom that was found in the original study by Fahlman and colleagues (2013). It also showed that the Spanish version of the MSBS has high reliability, with a Cronbach's alpha of .89 for the total score and ranging from .75 to .83 for the subscales (Alda et al., 2015). To test for test-retest reliability, the authors randomly selected a subsample of 123 participants from the original sample and interviewed them around one to two weeks later (Alda et al., 2015). The MSBS showed a test retest reliability measured with an ICC of .90 and ranging from .81 to .89 for the subscales. The MSBS total score and subscales significantly correlated with a measure of general health (which screens for minor psychiatric disorders) and its four subscales (somatic symptoms, anxiety and insomnia, social dysfunction and depression), and the MSBS total score significantly correlated with a measure of negative affect (PANAS-Negative). The MSBS total score was significantly negatively correlated with a measure of positive affect (PANAS-Positive) and mindfulness (Alda et al., 2015). The MSBS has also been translated into Chinese (Liu et al., 2013), where its factor structure was replicated. However, a study by Ng, Eastwood, Liu and Chen (2014) found that the factor structure of the MSBS was not comparable across European Canadians and Chinese participants. Only after eliminating 10 items from the MSBS was the factor structure equivalent across the two samples (Ng, Eastwood, Liu & Chen, 2014). This 19-item MSBS was now missing the High Arousal subscale, suggesting high arousal is less characteristic of boredom in Chinese participants than in European participants (Ng, Eastwood, Liu & Chen, 2014). More recently the MSBS was translated into Italian (Craparo et al., 2017). The authors found the Italian version of the MSBS to have a factor structure consistent with the English version (i.e.

five factors and one higher order factor of general boredom). The scale's reliability was also high- .95 for the full scale and ranging from .80 to .89 for the subscales (Craparo et al., 2017). Craparo and colleagues (2017) found that the Italian MSBS total score and subscale scores were significantly correlated with the BPS. The Italian MSBS total score and subscales were all significantly positively correlated with depression, anxiety, neuroticism, ADHD, dissociative experiences, and the Behavioral Activation and Behavioral Inhibition System (BAS/BIS; Craparo et al., 2017). This suggested the Italian MSBS has good construct validity, as these findings are consistent with past research (Craparo et al., 2017). Overall, aside from the High Arousal subscale, the MSBS seems to be generalizable across genders and cultures studied so far.

Several researchers have created shorter versions of the MSBS (Barratta & Spence, 2015; Hunter et al., 2016). Barratta and Spence (2015) shortened the MSBS to 15 items. They argued that the 29-item MSBS is problematic, because lengthy measures are prone to bias resulting from participant fatigue and careless responding. The authors used item response theory to select the best items from the MSBS to create a shorter 15 item scale (Baratta & Spence, 2015). In a study by Hunter, Dyer, Cribie & Eastwood (2016), participants were induced into a state of boredom or non-boredom and then completed the MSBS. The authors argued that the 29-item scale is too long for some studies that require a brief evaluation of state boredom. They aimed to develop a short version of the MSBS using items that best discriminated between bored and non-bored individuals (Hunter, Dyer, Cribbie & Eastwood, 2016). An 8-item MSBS was proposed, including seven items that discriminated bored from non-bored individuals and one item added for theoretical reasons (Hunter et al., 2016).

A recent study by Oxtoby, King, Sheridan & Obst (2018) aimed to conduct an independent factor analysis of the original English MSBS, of the short version by Hunter et al. (2016) and the 15-item version by Baratta and Spence (2015) to evaluate their psychometric properties. Although the fit was slightly worse for the full MSBS as compared to the fit in the original study by Fahlman et al (2013), the internal consistency was very high. For the full MSBS, Cronbach's alpha was .976, and ranged from .898 to .944 for the subscales (Oxtoby, King, Sheridan & Obst, 2018). In terms of convergent validity, the MSBS was weakly positively correlated with the ZBS. It was positively correlated with the BPS. The MSBS was strongly positively correlated with depression, anxiety, and stress (measured by the Depression Anxiety Stress Scales). These correlations were very similar to those for the 15-item MSBS and the Short Form MSBS (only slightly weaker). The authors also found a high test-retest reliability for all three scales, suggesting a high consistency in participants' scores across the two time points-over the period of one week (Oxtoby, King, Sheridan & Obst, 2018). Although the authors found the original factor structure was the best fit, it was decent to good. The authors found there was a strong correlation between the full MSBS and the disengagement subscale, which could be one of the reasons for the slightly worse fit compared to the one found by Fahlman et al (2013). This suggests the scale represents disengagement well, but some uncertainty exists with respect to the uniqueness of the other MSBS subscales (Oxtoby, King, Sheridan & Obst, 2018). However, the authors concluded the three scales are strong and recommended other researchers to use them – preferably the 15-item MSBS (Oxtoby, King, Sheridan & Obst, 2018). Overall the MSBS is a reliable, well-validated measure of boredom. It provides a solid foundation on which to build a trait boredom scale.

The Trait Boredom Scale

The Trait Boredom Scale is a new measure primarily based on the disengagement subscale of the Multidimensional State Boredom Scale (MSBS). That is, most items on the TBS are trait versions of items in the MSBS Disengagement subscale. According to Fahlman and colleagues (2013), trait boredom or the propensity to experience boredom is necessarily grounded in the ability to identify concrete instances where an individual felt bored. Thus, by trait boredom we mean the *frequent* experience of boredom. If we are to define trait boredom in this manner, we must develop our measure using a solid understanding and a strong measure of state boredom.

The TBS was first included in a study by Gerritsen and colleagues (2014) for exploratory purposes. This version of the TBS included 10-items, which were all trait versions of the disengagement subscale of the MSBS. The TBS demonstrated some preliminary validity in this study (Gerritsen et al., 2014). It was found to have good reliability (Cronbach's alpha of .88). The TBS also showed good validity. That is, it was significantly correlated with current measures of trait boredom including the ZBS and BPS. Also, the authors demonstrated that the TBS was correlated with self-reported measures of hyperactivity, impulsivity, inattention, and executive dysfunction. Hyperactivity, inattentiveness and executive dysfunction were significant predictors of TBS scores, but impulsivity did not uniquely predict TBS scores (Gerritsen et al., 2014). The authors concluded that the TBS is a broader measure of trait boredom than the BPS or ZBS. The findings from this study are consistent with the literature linking trait boredom with attention problems, thereby demonstrating the validity of the TBS.

The 10-item version of the TBS was used in another study by Britton (2018). The authors investigated the motivational underpinnings of trait boredom, specifically anxious uncertainty and low approach motivation (Britton, 2018). They found that these factors predicted higher

levels of trait boredom and accounted for a significant amount of variance in trait boredom scores (Britton & McGregor, 2018). The TBS was found to have high reliability (Cronbach's alpha of .89) in this study (Britton & McGregor, 2018). Overall, these studies suggest the TBS demonstrates good preliminary validity and reliability.

Present studies

The thesis is divided into two parts. Part 1 consists of study 1 (which itself is composed of 2 distinct data sets, which were combined to increase sample size), study 2 and study 3. The purpose of Part 1 was to refine the Trait Boredom Scale (TBS) incrementally over the course of these 3 studies by examining successive versions of the TBS so as to establish the best version of the TBS to use in Part 2. Part 2 explored what cognitive abilities (i.e. sustained attention, executive function, and processing speed) best predict TBS scores. Part 2 analyses were based on one of the data sets from study 1 of part 1. Thus, although the analyses are different, Parts 1 and 2 share a data set in common.

Part 1

The following three studies aimed to evaluate and revise the Trait Boredom Scale (TBS). Prior to evaluating its psychometric properties, the original 10 item TBS was revised to include additional items. Three items were added from the Boredom Susceptibility Scale (ZBS), 3 better-worded items, and 2 new items to ensure the TBS included all items found in the MSBS-8 (footnote: Recall, the TBS was derived by taking items from the well validated MSBS, a measure of state boredom, and altering them to assess the tendency to often experience the state of boredom), resulting in an 18-item TBS scale.

Study 1

The present study was composed of two combined datasets. The first dataset was part of the GOAL-D study, where data was collected in two cities (Toronto and Ithaca). A second dataset, collected online, was added to create a larger sample size in order to facilitate the psychometric analyses of the TBS.

Methods

Participants

Data Set 1: Goal Directed Cognition: York and Cornell Universities[2]. Participants were recruited at York and Cornell Universities. Across the two sites, 385 participants completed the TBS. We allowed a maximum of one missing response. For participants with only one missing response on the TBS, missing data was replaced with the scale mean of answered items for that participant. Six participants who responded carelessly (i.e. gave an identical response to all items on the TBS) were removed from analyses. The final GOAL-D sample consisted of 379 participants. Participants were English speaking and neurologically healthy. Two cohorts of younger (aged 18-30) and older (aged 60 and over) participants were recruited for this study. At York University, participants were recruited on campus or through the community via flyers, online advertisements, York University's Undergraduate Research Participant Pool (URPP), and the York Research Participant Pool (YRPP). All participants were presented (over the phone or via email) with a comprehensive study description outlining what participation in the study entails, the length of participation, and remuneration information. Participants then took part in an initial interview, in which specific personal information was obtained to ensure eligibility to

[2] The Goal-directed cognition (Goal-D) study aimed to investigate how lifespan changes in cognitive capacity contribute to goal-directed behaviors and the accumulation of experiences across time, into broader mental constructs of self-regulation, imagination, creativity and wisdom. (The interaction of higher cognitive functions is critical for controlled, goal-directed cognition. It enables us to flexibly ring our past experiences to bear on our current behavior in a manner consistent with our long-term goals).

enrol in the study and to gather demographic information. Participants were compensated $10 per hour for a total of approximately 14 hours for older adults, and 10 hours for younger adults. All compensation was prorated to the completed or partially completed half-hour if participation ended early for any reason. At Cornell University, participants were recruited through posters and flyers on campus, throughout the city of Ithaca, and through the Human Services Coalition Listserv (an email listserv where information is shared with the local non-profit community, including upcoming events, job opportunities). Participants were compensated with $10 per hour for behavioral tasks and a flat $30 for the online surveys participants completed at home (taking about 3 hours). Compensation was prorated at the half hour mark. In-lab tests last approximately 6 hours for younger adults and 9 hours for older adults, with an average compensation for the behavioral study of $90 for younger adults and $120 for older adults.

Data set 2: Sample size boost: Seven hundred and ninety-nine participants were recruited through Qualtrics. Of the 799 participants, 152 failed to complete the study, 13 were outside the age restrictions, and 123 completed the study quickly (i.e. those with a completion time of less than 7 minutes were not included in the sample. We allowed a maximum of one missing response on the TBS. For participants with only one missing response on the TBS, missing data was replaced with the scale mean of answered items for that participant. Missing data on the BPS and ZBS was replaced with scale means for a given participant, unless more than 10% of the scale data was missing. If so, the participant's data on that scale was removed. Twenty-six participants who responded carelessly (i.e. gave an identical response to all items on the TBS), and one participant who gave an identical response to all but one item which they left blank (due to mean imputation, this participant would end up having identical responses to all items), were removed from analyses. The final Qualtrics sample consisted of 484 participants.

Participants were recruited through a Qualtrics panel study. A random sample from the population of all Qualtrics panel research participants was drawn for this study. These individuals received an email invitation to participate in this study. The sample collected by Qualtrics had the following demographics: Canadians aged 18 to 65, fluent in English, comprised of gender split no more extreme than 60%/40%, and comprised of a mixed education level including: high school experience or less education, high school graduates/GED recipients, some college or university experience, college or university graduates, and individuals with a graduate degree. No other inclusion or exclusion criteria were used in this study. Participants were compensated by Qualtrics, who provided them with financial credit for completing this study. The amount was clearly stated in the invitation email participants received. Participants could redeem this credit for vouchers, which are typically for national retailers.

Final sample. The TBS data from Qualtrics, York and Cornell participants were combined, and the final sample consisted of $N = 863$ (Age range: 18-92, $M_{age} = 46.33$ years, $SD_{age} = 20.10$).

Design and Procedure

Data Set 1: Goal D. Testing consisted of cognitive tasks administered in the lab in two sessions for younger adults (18-30 years of age) and in three sessions for older adults (60 years and older). Each session took about up to four hours, and they were spaced approximately one week apart. At Cornell University, younger adults completed the Trail Making Tests, Symbol Digit Modalities Test, and the SART on day 1, and the NIH cognition measures day 2. Older adults completed the Trail Making Tests and Symbol Digit Modalities test on day 1, the NIH cognition measures on day 2, and the SART on day 3. At York University, younger adults

completed the tasks in the same order as at Cornell. Older adults completed the Trail Making Tests, Symbol Digit Modalities Test, and the NIH cognition measures on day 1, and the SART on day 3. Testing also consisted of self-report measures, which were completed online in the intervening week. Self-report measures (including the TBS) were administered in three packets of questionnaires over one week between the cognitive assessments[3]. Each packet took about 1-1.5 hours.

Data Set 2: Sample Size Boost: The study was completed entirely online, and it took participants approximately 20 minutes to complete it. Participants first read an informed consent form and indicated their consent by selecting the "I agree" option. Participation was encouraged by informing participants that questions require careful thought and asking them to give their best effort in answering all questions. Following this, participants completed demographic questions on age, gender, and ethnicity. Participants then completed the Meaning in Life Questionnaire (not used in the present analyses), Trait Boredom Scale, Boredom Proneness Scale, Boredom Susceptibility Scale, and the anticipatory meaning exercise (an exploratory measure that was not used in the present analyses)**.** Lastly, participants were presented with a debrief form which described the study in detail.

Measures

[3] Self report measures included: Survey of Autobiographical Memory, 3-Dimensional Wisdom Scale, Satisfaction with Life Scale, U.C.L.A Loneliness Inventory, Delayed Gratification Inventory-10, BIS/BAS Scale, Moral Dilemmas, Health Buffering, VIMM, Fashion Opinion Leadership, Interpersonal Reactivity Index, Ruminative Responses Scale, Adult Self-Transcendence Inventory, Self-assessed Wisdom Scale, Experience in Close Relationships-Revised, Author Recognition Test, Reading the Mind in the Eyes Task, Big Five Aspects Scale, Self-liking/Competence Scale Revised, Toronto Alexithymia Scale, Moral Foundations Questionnaire, Toronto Empathy Questionnaire, Spiritual Well-being Scale, Behavioral Risk Factor Surveillance Questionnaire-Tobacco Use, The Goal Processing Questionnaire, Support Network Index, Physical Activity Scale for the Elderly, Subthreshold Autism Trait Questionnaire, Moral Judgment Task, Binge Eating Scale, Cognitive Reflection Test, The Spiritual Transcendence Index, Sense of Coherence 13-Item Scale, Future Anhedonia, References of Framing, Dietary Patterns Screener, Cognitive Effort Questionnaire, and the Wise Thinking and Acting Questionnaire.

Data Set 1: Goal D.

Trait Boredom Scale. This questionnaire measures one's experience of boredom. Participants were presented with 18 questions and were asked to respond to each question indicating how they generally feel about themselves and their lives, even if different from how they feel now. Participants answered the questions on a Likert scale, from 1 *(=strongly disagree)* to 7 *(=strongly agree)*. The TBS is a new measure derived from the MTBS-disengagement scale used by Gerritsen et al. (2014). The TBS includes questions such as "I often do not know what I want to do" and "I often feel bored". A higher score on this scale refers to greater trait boredom. [4]

Data Set 2: Sample Size Boost

Trait Boredom Scale. Same as above.

Boredom Susceptibility Scale (ZBS; Zuckerman, 1979). This questionnaire measures one's inability to tolerate monotonous environmental stimulations. Participants were presented with 10 questions, and they had to choose either option A or option B to answer each question. The ZBS includes items arranged in a dichotomous format, such as "I have no patience with dull or boring persons" versus "I find something interesting in almost every person I talk to". Cronbach's alpha reliability for the current study was .57.

Boredom Proneness Scale (BPS; Farmer & Sundberg, 1986). This questionnaire measures one's connectedness with the environment in different situations, and one's ability to access resources to successfully accomplish things. Participants were presented with 28 items and were asked to respond on a Likert scale from 1 *(=highly disagree)* to 7 *(=highly agree)*. The BPS includes items such as "it is easy for me to concentrate on my activities" and "when I was young, I was often in monotonous and tiresome situations". Cronbach's alpha reliability for the current study was .89.

[4] The cognitive tasks administered at York and Cornell will be discussed in part 2.

Results. Items 2, 13 and 17 were removed a priori due to poor wording. Each of these items had a better worded item in the scale (i.e. items 2b, 13b, and 17b). Then, an analysis of the psychometric properties of the items was conducted. Items 30 and 32 were removed due to having the highest skew (.92 and .81 respectively). Items 7 and 33 were removed as they had the lowest item total correlations (.66 and .63 respectively). The revised TBS included 11 items (2b, 9, 10, 13b, 17b, 19, 22, 24, 28, 31, 34).

Table 1. Psychometric Properties of the 15-item TBS.

Item number	**Skew**	**Item Total Correlation**
2b	.20	.71
7	.06	.66
9	.38	.71
10	.15	.75
13b	.34	.69
17b	.55	.74
19	-.27	.74
22	-.09	.76
24	-.06	.78
28	.24	.81
30	.92	.71
31	.73	.75
32	.81	.30
33	.22	.63
34	.20	.73

N = 863.

Confirmatory Factor Analysis

A confirmatory factor analysis was conducted for a one factor model. The overall model was significant, χ^2 (44) =552.453, $p < .001$. Fit indices suggested that the model fit was poor for the 11-item TBS, CFI = .923, TLI = .904, RMSEA = .116, SRMR = .042. One reason for low fit was

that some items shared variance in common that was not related to the latent factor. Due to the exploratory nature of the study, a decision was made to consider modification indices, which may suggest ways to improve the fit of the model. The highest modification index (MI = 212.638) was for items 2b ("I am often stuck doing meaningless things") and 9 ("I seem to be forced to do things that have no value to me"), suggesting the fit of the model would improve if the errors of items 2b and 9 were correlated. These two items essentially ask two questions (i.e. feeling "forced" or "stuck" and having "no value"), making them more related to each other than the other items. A confirmatory factor analysis with correlated errors of items 2b and 9 indicated the fit improved, χ^2 (43) =326.449, $p < .001$, CFI = .957, TLI = .945, RMSEA = .087, SRMR = .031. Although the chi-square results suggest the model fit is poor, this measure is particularly influenced by large sample sizes and its usefulness has thus been questioned (Struk et al., 2017; Bentler & Bonett, 1980; Brown, 2006). Thus, items 2b and 9 were removed from the scale, creating a 9-item version of the TBS, to avoid the problem suggested by modification indices.

Study 2

This study aimed to evaluate the psychometric properties of the 9- item TBS.

Methods

Participants

Two-hundred and one participants completed the study in the lab at York University. Participants were drawn from York University's Undergraduate Research Participant Pool (URPP) and received 1.5 research credits for participation. Other undergraduate participants were recruited through campus advertisements placed across York University and through online posts on social media (i.e. Facebook). Non-URPP participants were compensated $15 for their participation. Six participants were excluded due to careless responding, and one participant was

excluded as they did not sign the debriefing form (i.e. she did not want her data included in analyses upon being told the purpose of the study). The final sample consisted of $N = 195$ (Age range: 17-57, $M_{age} = 20.41$, $SD = 5.26$). Participants identified with the following ethnicities: 18.46% Caucasian, 13.33% African American, 2.56% Latin American, 21.03% South Asian, 8.72% East Asian, 6.67% South East Asian, 12.31% Arab/West Asian, 0.51% Aboriginal, 9.23% Multi-racial, and 7.18% identified as other.

Design and Procedure

Informed consent was first obtained from all participants. Then, participants completed a brief demographic questionnaire. They proceeded to complete the 9 item TBS, Short-Form BPS, ZBS, and IPIP-NEO-PI (Conscientiousness Subscale) and other individual difference measures[5]. Participants then completed one of two emotion probes to assess their current affect. They were then assigned to watch either a boring or a non-boring (amusing) video. Following this, they completed a second emotion probe. To ensure high quality data, they answered a final question asking if they were able to follow study instructions. Finally, participants were provided with a debriefing letter, which outlined the purpose of the study and completed the debriefing consent form[6].

Tasks / Measures

Trait Boredom Scale.

Short-Form Boredom Proneness Scale (Struk et al., 2015). The SF-BPS is an 8-item questionnaire designed to measure the propensity for experiencing boredom. It was derived from the full 28-item BPS by changing reverse scored items and removing poor items to create a one

[5]The following measures were not included in analyses: Short-Form Multidimensional State Boredom Scale, Brief Self-Control Survey, Action Control Scale, Regulatory Mode Questionnaire, Tridimensional Personality Questionnaire Items, and the Behavior Identification Form.

[6] These measures will not be analyzed. Only the TBS, SF-BPS, ZBS, and IPIP-NEO-PI (Conscientiousness Subscale) will be included in analyses.

factor scale. The SF-BPS was created to fix the earlier inconsistencies in the factor structure of the full BPS. The SF-BPS includes items such as "I find it hard to entertain myself". The items are measured on a 7-point Likert scale, ranging from 1 ("Strongly Disagree") to 7 ("Strongly Agree"). It has been shown to have good internal consistency, with a Cronbach's alpha of .88 (Struk et al., 2015). Cronbach's alpha reliability for the current study was .88.

***Boredom Susceptibility Scale*.** Cronbach's alpha reliability for the current study was .42.

***International Personality Item Pool of the NEO-Personality Inventory (Conscientiousness Subscale)*.** The Conscientiousness subscale of the IPIP-NEO-PI includes 60 items rated on a 5-point Likert scale ranging from 1 ("Very Inaccurate") to 5("Very Accurate"). The Conscientiousness Subscale consists of six subscales, each of which includes 10 items: Self-Efficacy, Orderliness, Dutifulness, Achievement-Striving, Self-Discipline, and Cautiousness. Cronbach's alpha reliabilities for the current study were .84 for Self-Efficacy, .82 for Orderliness, .75 for Dutifulness, .86 for Achievement Striving, .89 for Self-Discipline, .82 for Cautiousness, and .91 for the total Conscientiousness subscale.

Results

The psychometric properties of the nine items were examined. Item 19 ("I often wish I were doing something more exciting") was removed from the scale as it had the worst psychometric properties of the 9 – item TBS (i.e. skew of -.81 and item total correlation of .61). Upon further review of item content, item 24 ("I often feel like I want something to happen but I'm not sure what") was taken out as it included two ideas (i.e. "wanting something to happen", and "not sure what"). Thus, resulting in a 7-item TBS.

Study 3

Given the TBS had been significantly refined, this study aimed to conduct a confirmatory factor analysis of the 7- item TBS.

Methods

Participants

All participants were York University students and received course credit for participation. One participant who responded carelessly on the TBS (i.e. gave same response across entire scale) was removed. Another participant who had more than one missing response on the TBS was removed. For all measures other than the HEXACO, participants who had more than 10% of that scale data missing had their data removed from that scale. For those who had less than 10% of their data on a scale missing, the missing data was imputed using scale mean for that participant. On the HEXACO-60, we removed participants who had any missing data on a subscale. Because each subscale of the HEXACO-60 consists of only 10 items, and because it was rare that participants left questions unanswered, a decision was made to not impute scores. However, the participants' data on other subscales was kept if they had completed all 10 items. Participants (N = 496) had an average age of 19.63 years (Age range: 17-38, SD = 3.04). The total sample contained 103 individuals who identified their gender as male (20.77%); 389 individuals who identified their gender as female (78.43%); 1 individual who identified their gender as other, 1 individual who indicated that they preferred not to answer, and 2 individuals who did not respond (0.81%). Participants identified with the following ethnicities: 23.79% South Asian, 21.98% White/Caucasian, 12.10% Arab/West Asian, 11.49% Black, 7.46% multiracial, 6.05% Filipino, 5.04% Chinese, 4.03% South East Asian, 3.23% Latin American, 3.63% Other, and 0.40% Korean. Four individuals (0.81%) indicated that they preferred not to report their ethnicity.

Design and Procedure

After providing informed consent, participants completed demographic questions. Participants then completed the Trait Boredom Scale, the Boredom Proneness Scale, the Boredom Susceptibility Scale, and the HEXACO-60 personality inventory. After these questionnaires, participants were provided with a debriefing statement describing the purpose of the study and thanking them for participating. Participants then completed the debriefing consent form.

Tasks

Trait Boredom Scale. Cronbach's alpha reliability for the current study was .85.

Boredom Proneness Scale. Cronbach's alpha reliability for the current study was .80.

Boredom Susceptibility Scale. Cronbach's alpha reliability for the current study was .54.

HEXACO-60 (Ashton & Lee, 2009). The HEXACO-60 is a measure of six dimensions of personality. Each dimension is assessed by 10 items, for a total of 60 items in the scale. The six subscales are: Honesty-Humility (H), Emotionality (E), Extraversion (X), Agreeableness (A), Conscientiousness (C), and Openness to Experience (O). A high score on Honesty-Humility suggests a concern with sincerity, fairness and modesty. A high score on Emotionality refers to someone who is fearful and prone to negative emotions. A high score on Extraversion refers to an individual who is sociable and energetic. An individual high on Agreeableness tends to be forgiving, flexible and patient. A high score on Conscientiousness refers to an individual who is organized, diligent and cautious. Lastly, a high score on Openness to experience refers to an individual who appreciates aesthetic experience and unconventional ideas and is curious. Cronbach's alpha reliabilities for the current study were: .66 for Honesty-Humility, .68 for

Emotionality, .78 for Extraversion, .72 for Agreeableness, .76 for Conscientiousness, and .72 for Openness to Experience.

Results

The psychometric properties of the 7 – item TBS were examined.

Confirmatory Factor Analysis. A confirmatory factor analysis for a one factor model suggested good fit, χ^2 (14) = 53.157, $p < .001$, CFI = .967, TLI = .951, RMSEA = .075, SRMR = .035.

Reliability and validity. The scale had high internal consistency (α=.85) and was correlated with the BPS, $r = .74$, and with the ZBS, $r = .27$, p's < .001. The TBS was also correlated with all subscales of the HEXACO-60. It was negatively correlated with Honesty-Humility ($r = -.15$, $p < .001$), Extraversion ($r = -.40$, $p < .001$), Agreeableness ($r = -.21$, $p < .001$), Conscientiousness ($r = -.36$, $p < .001$), Openness ($r = -.08$, $p = .07$), and positively correlated with Emotionality ($r = .21$, $p < .001$). The BPS was similarly correlated with the subscales of the HEXACO-60. The BPS was negatively correlated with Honesty-Humility ($r = -.26$, $p < .001$), Extraversion ($r = -.40$, $p < .001$), Agreeableness ($r = -.28$, $p < .001$), Conscientiousness ($r = -.52$, $p < .001$), and Openness ($r = -.20$, $p < .001$). However, the BPS was not significantly correlated with Emotionality, $r = .06$, $p = .17$.

Confirmatory Factor and Validity Analysis of 7-item TBS from Studies 1 and 2

The following analyses aimed to verify the fit of the 7-item TBS in the samples used in studies 1 and 2.

Study 1. A confirmatory factor analysis revealed good fit, CFI = .980, TLI = .970, RMSEA= .076, SRMR= .025. Although the chi-square result was significant, χ^2 (14) =84.508, $p < .001$, it's

use is problematic with large samples. The scale was highly correlated with BPS (r = .84) and ZBS (r = .34), p's < .001, and had high internal consistency (α = .91).

Study 2. A confirmatory factor analysis suggested good fit, χ^2 (14) =23.018, p = .06, CFI= .984, TLI= .975, RMSEA= .057. SRMR= .033. The scale was highly correlated with the short form BPS (r = .86), p < .001, and ZBS (r = .20), p < .01 and had high internal consistency (α = .87). Correlations between the TBS and the Conscientiousness subscale of the IPIP-NEO-PI were conducted to further evaluate the validity of the 7-item TBS. The TBS was negatively correlated with Conscientiousness (r = -.65, p < .001). It was also negatively correlated with all the subscales of Conscientiousness: the Self-Efficacy subscale (r = -.48, p < .001), Orderliness subscale (r = -.26, p < .001), Dutifulness (r = -.44, p < .001), Achievement-Striving (r = -.55, p < .001), Self-Discipline (r = -.63, p < .001), and Cautiousness (r = -.43, p < .001).

Table 2a. Fit Indices and Internal Consistency for 7-item TBS.

	Study 1	Study 2	Study 3
CFI	.980	.984	.967
TLI	.970	.975	.951
RMSEA	.076	.057	.075
SRMR	.025	.033	.035
Cronbach's Alpha	.91	.87	.85

Table 2b. Standardized Factor Loadings for 7-item TBS.

Item	Study 1	Study 2	Study 3
10	.758	.709	.675
13b	.744	.689	.664
17b	.762	.601	.644
22	.770	.729	.664
28	.839	.773	.710
31	.775	.726	.723

34	.754	.708	.639

Table 3. Correlations between 7-item TBS and existing measures.

	Study 1	Study 2	Study 3
BPS	.84***	.86***	.74***
ZBS	.34***	.20**	.27***

** $p < .01$; *** $p < .001$.

Table 4. Correlations between 7-item TBS and IPIP-NEO Conscientiousness (study 2).

	7-Item TBS	SF-BPS	ZBS
Self-Efficacy	-.48***	-.52***	-.04
Orderliness	-.26***	-.17*	-.15*
Dutifulness	-.44***	-.40***	-.31***
Achievement-Striving	-.55***	-.58***	-.08
Self-Discipline	-.63***	-.66***	-.18*
Cautiousness	-.43***	-.42***	-.14*
Total Conscientiousness	-.65***	-.65***	-.21**

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 5. Correlations between Trait Boredom Measures and HEXACO-60 (study 3).

	7-item TBS	BPS	ZBS
Honesty-Humility	-.15***	-.26***	-.23***
Extraversion	-.40***	-.40***	-.02
Agreeableness	-.21***	-.28***	-.25***
Conscientiousness	-.36***	-.52***	-.18***
Openness	-.08	-.20***	.002
Emotionality	.21***	.06	-.20***

*** $p < .001$.

Discussion

The present studies provide evidence for a strong, unidimensional measure of trait boredom. The Trait Boredom Scale (TBS) is theoretically stronger and has better psychometric properties than existing measures of trait boredom, the Boredom Proneness Scale (BPS) and the Boredom Susceptibility Scale (ZBS). These scales have several problems. Specifically, the BPS (and its short forms) seems to have questionable validity, as it is not based on a well-grounded definition and theory of trait boredom. A recent study found that the majority of the variance in the 8-item short form BPS scores is unaccounted for by either state or trait boredom, casting doubt on whether this scale truly assesses trait boredom (Gana, Broc & Bailly, 2019). The ZBS is also limited. It has poor internal consistency (Vodanovich & Watt, 2016; Mercer-Lynn et al., 2011; Deditius-Island & Caruso, 2002), and it focuses on only one aspect of trait boredom, namely sensation seeking (Vodanovich & Watt, 2016). The TBS, on the other hand, is based on a strong definition and theory of trait boredom. The TBS was built on the idea trait boredom is necessarily grounded in the state of boredom (Fahlmam et al., 2013). Trait boredom was concretely defined as the frequent experience of state boredom. Furthermore, the TBS was developed primarily from the Multidimensional State Boredom Scale (MSBS)- a well validated, comprehensive measure, built on a theoretically grounded definition and a qualitative analysis of state boredom (Fahlman et al., 2013). This represents an important advantage of the TBS, because current measures lack a theoretical foundation of trait boredom which may reduce the construct to its measure (Gana, Broc & Bailly, 2019). The TBS also demonstrated good psychometric properties in a confirmatory factor analysis and had high internal consistency. The TBS was correlated with the two commonly used measures of trait boredom, the BPS and ZBS.

Trait Boredom and Personality

The present study illuminates the association between trait boredom and personality. Correlations between the Trait Boredom Scale (TBS) and HEXACO-60, as well as IPIP-NEO Conscientiousness, revealed that trait boredom was related to lower conscientiousness. The correlations with the IPIP-NEO Conscientiousness subscale further suggested that individuals with high scores on the TBS tended to feel less confidence in their ability to accomplish things (self-efficacy), were more disorganized (orderliness), had less of a sense of obligation and found rules to be overly limiting (dutifulness), were more satisfied with a minimal amount of work (achievement-striving), had less will-power to persist in tasks and thus may be less likely to follow through and complete them (self-discipline), and were less likely to deliberate or think through options before acting (cautiousness). Correlations between the TBS and the HEXACO-60 revealed that those with high scores on the TBS tended to be less sincere and modest (honesty-humility), experienced more negative emotions and were likely to be oversensitive and vulnerable (emotionality), were less forgiving and patient (agreeableness), and were more interpersonally withdrawn (extraversion). Contrary to the BPS, scores on the TBS were not associated with openness to experience. These findings are consistent with past research on state boredom. For example, state boredom as measured by the Multidimensional State Boredom Scale (MSBS) was found to be associated with negative affect such as depression, anxiety, and neuroticism (Fahlman et al., 2013; Goldberg et al., 2011; Alda et al., 2015). The MSBS was also associated with increased impulsivity and anger (Fahlman et al., 2013), and with the Behavioral Inhibition and Behavioral Activation Systems (BIS/BAS, Craparo et al., 2017). Thus, individuals who experience boredom frequently may be more likely to demonstrate the patterns of personality suggested by the HEXACO-60 and the IPIP-NEO.

Trait boredom measured by the Boredom Proneness Scale (BPS) was also associated with lower overall conscientiousness (both the short and full BPS; SF-BPS and BPS respectively), lower honesty, extraversion and agreeableness. However, contrary to the TBS, correlations between the BPS and HEXACO-60 showed that those with high scores on the BPS were less intellectually curious or appreciative of aesthetic experience (openness to experience). Lastly, unlike the TBS, the BPS was not associated with a proneness for negative emotions. Past research on the BPS and emotionality is mixed, with one study finding no relationship (Culp, 2006) and another finding a positive relationship (Hunter et al., 2016).

The relationship between the Boredom Susceptibility Scale (ZBS) and personality was quite distinct from that of the other trait boredom scales. Although the ZBS was associated with generally lower conscientiousness, agreeableness and honesty, it was not associated with extraversion and contrary to the TBS, associated with lower proneness for negative emotions. This is consistent with the idea that the ZBS measures a disposition for sensation seeking, a tendency to go out into the world to seek stimulation (Mercer-Lynn et al., 2011). The ZBS is associated with higher impulsivity, higher sensitivity to reward and lower sensitivity to punishment, and lower neuroticism (Mercer-Lynn et al., 2011). The ZBS was also unrelated to self efficacy or achievement-striving.

The findings on the relationship between trait boredom measures and personality suggests these scales may assess different constructs. The BPS and ZBS have been shown to assess different types of trait boredom in past research (Mercer-Lynn et al., 2011). In the present study, the ZBS was shown to be differently correlated with personality compared to the other two scales, the BPS and TBS. The TBS and BPS were similarly associated with personality constructs, with the exception of emotionality and openness to experience.

Future Directions for the Trait Boredom Scale

Although the present study utilized the 7-item TBS, a 9-item TBS is currently in development. This version of the TBS includes revised versions of items 2b and 9, which were removed in study 1 due to problems suggested by modification indices[7]. The new items 2b and 9 were revised to include only one idea (item 2b: "I often feel that what I am doing is irrelevant", item 9: "I often feel forced to do things that I do not want to do"). The 9-item TBS showed good psychometric properties and validity and should be evaluated in future research.

Although the TBS shows promise, more research is needed to establish its validity and utility as a new trait boredom scale. Future research should focus on obtaining a large sample with which to evaluate the psychometric properties and validity of the TBS. It should include a more comprehensive set of measures known to be associated with trait boredom (i.e. the tendency to frequently experience state boredom), including negative affect, hostility, etc. Qualitative data should also be collected to assess participants' interpretation of the items on the TBS to help further evaluate the TBS.

Part 2

The aim of Part 2 was to examine which cognitive abilities predict trait boredom as measured by the 7-item TBS. Specifically, participants' cognitive ability on tests of sustained attention, executive function (including working memory, inhibition, and task switching), and processing speed were used to predict levels of trait boredom. Hypotheses were as follows: 1) consistent with past research, poor sustained attention will predict trait boredom, 2) based on past research with self report data suggesting poor reported executive function was associated with

[7] Note that the 7-item TBS will be used in part 2 of this thesis because the 9-item TBS was prepared after the cognitive data was already collected.

trait boredom (Gerritsen et al., 2014), we predicted that poor executive function ability will predict trait boredom, and 3) based on research showing that self-reported executive function explained greater variance in trait boredom scores than inattention (Gerritsen et al., 2014), we hypothesized that executive function will predict trait boredom more strongly than sustained attention. As part of exploratory analyses, I examined whether processing speed ability predicts trait boredom.

Methods

Participants

This study used dataset 1: Goal-D, from study 1 of part 1. We had no control over the procedure used in the Goal-D study. The current study was added on to the Goal-D project. There were a total of 363 participants who completed both the TBS and at least one cognitive performance measure. There were two age groups, one between the ages of 18 and 34, and the other ages 52 to 92. Participants had an average age of 43.64 years (*SD* = 23.88). The total sample contained 138 individuals who identified their gender as male (38.02%); 186 individuals who identified their gender as female (51.24%), and 39 individuals who did not respond (10.74%). Participants identified with the following ethnicities: 50.14% Caucasian, 6.89% Asian, 2.75% African American, 1.93% Other, 1.65% multiracial, and 0.28% Arab (36.36% had no ethnicity data).

Tasks

Mini Mental State Examination (MMSE; Folstein, Folstein & McHugh, 1975). The MMSE is measure designed to assess cognitive impairment. It includes eleven questions and takes between 5 to 10 minutes to administer. The examination begins with an assessment of orientation to time and place (maximum of 10 points). Then, two aspects of memory are tested: immediate

recall for three objects presented orally, and a serial sevens task to assess attention, concentration and calculation as well as to prevent the individual from rehearsing the three objects previously learned (maximum of 11 points). The last section tests functions of naming, repetition, understanding a three-stage command, reading, writing and copying a drawing (maximum of 9 points). The total possible MMSE score is 30 points.

Trait Boredom Scale (TBS). Cronbach's alpha reliability for the current study was .9.

Processing Speed: Symbol Digit Modalities Test (**SDMT; Smith, 1982**). In the written version, participants were given a reference key, and had to pair specific numbers with given geometric figures by writing down the corresponding number for each figure. Participants first completed a practice block. They were then given 90 seconds to complete as many pairings as possible (maximum score was 110). In the oral version, participants received a new blank response sheet. Participants had to complete the same task but now say the number out loud. They were not given a practice session- the few boxes that were previously used for practice were now part of the 90 second test. The score was the number of items answered correctly within 90 seconds, for a maximum score of 120.

Sustained attention: Sustained Attention to Response Task (SART; Robertson et al., 1997). Participants were presented with single digits ranging from 1 to 9 on a computer screen. They were asked to press the left mouse button for every digit they saw, except the digit 3. When the digit 3 appeared on the screen, they were to press nothing. A total of 225 single digits (25 of each of the nine digits) were presented over a 4.3-minute period. Each digit was presented for 250 milliseconds and followed by a 900-millisecond mask. Each digit was presented 25 times for a total of 225 trials. The period from digit onset to digit onset was 1150 milliseconds. The mask following each digit consisted of a ring with a diagonal cross in the middle. The session was

preceded by a practice trial consisting of 18 presentations of digits, two of which were targets. Participants could use their preferred hand. They were asked to respond as quickly and accurately as possible for the duration of the task. **Scoring**. Errors of commission occurred when participants pressed the key when they should not have (i.e. when they saw the number 3, a "no-go trial", where they should have withheld their response). Commission errors were calculated by dividing the number of errors by 25 (the number 3 appeared 25 times) and multiplying by 100 to obtain a percentage of errors. Errors of omission occurred when participants did not press the key when they should have pressed it (i.e. when they saw any number other than a 3, a "go trial"). Omission errors were calculated by dividing the number of errors by 200 (all digits other than the number 3 appeared 200 times) and multiplying by 100 to obtain a percentage of errors.

Executive functioning (working memory): Trail Making Tests (Reitan, 1958).

Trail Making Test A. Participants were presented with a sheet of paper containing 25 circles numbered from 1 to 25. Participants were required to draw lines to connect the numbers in ascending order as quickly as possible, without lifting the pen or pencil from the paper. Participants were given a practice trial. If participants made any errors during the real task, the examiner showed him or her the mistake, struck through it with a pencil, and asked participants to continue. Time of completion was recorded. Participants were allowed a maximum of 240 seconds (4 minutes) for the task. Scoring was based on time of completion, with higher numbers indicating worse performance. **Trail Making Test B**. Participants were presented with a sheet of paper containing circles with both numbers (1-13) and letters (A-L). They were instructed to draw lines to connect the circles in an ascending pattern, while alternating between the numbers and letters (1-A-2-B-3-C, etc.). They were asked to do so as quickly as possible without lifting the pen or pencil from the paper. Participants were given a practice trial. Time of completion was

recorded. Scoring was based on time of completion, with higher numbers indicating worse performance. The time of completion on Trails A was subtracted from the time of completion on Trails B to obtain a measure of executive function. The Trails B-A time was used in this study.

National Institutes of Health Toolbox Cognition Battery (NIHTB-CB).

Executive function (Inhibition): Flanker Inhibitory Control and Attention Test. Participants were asked to focus on a given stimulus while inhibiting attention to stimuli (arrows). Sometimes the middle arrow was pointing in the same direction as the other arrows (congruent trial), and sometimes it was pointing in the opposite direction (incongruent trials). Participants were asked to press a button that indicated the way the middle arrow was pointing. One block of twenty trials was administered in total, taking approximately three minutes to administer. Participants were instructed to use their index or pointer finger to choose one of two buttons on the screen that corresponded to the direction in which the middle arrow was pointing. Four practice trials were given. If participant responded incorrectly, a computer voice prompted him or her to choose the correct button. Participant were required to get at least three out of four practice trials correct to advance to the test trials. **Scoring**. The score was a combination of accuracy and reaction time. For accuracy, individuals received 20 points automatically (since participants were all older than 8 years of age) and could score an additional of up to 20 points, for a total of 40 possible accuracy points. The number of correct responses out of 40 is then multiplied by 0.125 (5 points divided by 40 trials) to obtain a flanker accuracy score ranging from 0 to 5. Accuracy scores were considered first when determining the final computed score, such that if accuracy was less than or equal to 80%, the computed score was equal to the accuracy score. If accuracy was more than 80%, the reaction time and accuracy scores are combined. Reaction time also generates a score ranging from 0 to 5. They are generated using individuals' raw, incongruent median

reaction time score (median reaction times are computed using only correct trials with reaction times greater than or equal to 100ms and reaction times no larger than 3 standard deviations away from the individual's mean). The computed score was calculated next, and it ranges from 0 to 10. This score is then converted to a scale score with a mean of 100 and standard deviation of 15. Higher scale scores indicate higher levels of ability to attend to relevant stimuli and inhibit attention from irrelevant stimuli.[8] Participants' unadjusted scale scores were used in this study. The unadjusted scale scores are based on the NIH Toolbox nationally representative sample.[9]

Executive function (Working memory): List Sorting Working Memory Test. This task required participants to sequence and recall various visually and orally presented stimuli. Participants were presented with pictures of foods and animals, along with audio recording and text representing the stimuli. They were first asked to recall and sequence, from smallest to largest, only within one category (e.g. foods; called 1-List), and then alternating between the two categories (e.g. foods, then animals; called 2-List). The test takes seven minutes to administer.

Scoring. This task was scored by summing all correctly recalled and sequenced items on 1- and 2-List. The score ranges from 0-26. This score is then converted to a nationally normed scale score. The unadjusted scale score was used. Higher scores on this task indicated higher levels of working memory.

Executive function (Task switching): Dimensional Change Card Sort Test (DCCS).

Participants were presented with two target pictures that varied in terms of shape and color. They were then shown two test pictures (e.g. yellow balls and blue trucks) and were asked to match those to the target picture. First, they were asked to match by one dimension (e.g. color) and then

[8] Note that in calculating the scaled score, the median reaction time scores are reversed, such that smaller reaction time log values are at the upper end of the 0-5 range, and larger reaction times are at the lower end of the range. Thus, participants receive more points for faster reaction times.

[9] For more information on scoring, refer to NIH Toolbox Scoring and Interpretation Guide.

by the other dimension (e.g. shape). At times participants were required to switch between shape and color quickly. For example, they were asked to match by shape on four trials, then by color on one trial, and then by shape on the next trial. This test took approximately four minutes to administer. **Scoring**. The score was a combination of accuracy and reaction time. The accuracy score was considered first, and for participants whose accuracy is less than or equal to 80%, the total score equaled the accuracy score. If participants' accuracy was more than 80%, the accuracy and reaction time scores were combined. For accuracy, participants could obtain a maximum of 40 points. Individuals who were 8 years of age or older automatically obtained 10 accuracy points for the pre-switch and post-switch trials. On mixed trials individuals could obtain up to 30 additional points. The number of correct responses out of 40 was then multiplied by .125 to obtain an accuracy score of 0 to 5 points. The reaction time score ranged from 0 to 5, and it was generated using individuals' median reaction time for the non-dominant dimension- the dimension participants were asked to sort less frequently. Median reaction times were only computed for correct trials that have reaction times of 100ms or more, and those no greater than 3 standard deviations away from the individual's mean for that trial type. The total score (accuracy and reaction time combined if accuracy is greater than 80%, or accuracy only for those whose accuracy is less than or equal to 80%) is then converted to a scale score with a mean of 100 and standard deviation of 15. The unadjusted scale score was used. Higher scores on this task indicated higher levels of cognitive flexibility.

Data Management.

Participants who did not complete the TBS were removed from analyses. Six participants who responded carelessly on the TBS (i.e. gave an identical response across the entire scale) were also removed. For five participants with only one missing response on the TBS, missing data was

replaced with the scale mean of answered items for that participant. The SART data of three participants with commission errors (i.e. no-go errors) of 100%, and 35 participants with omission errors (i.e. go errors) of more than 10% was removed. Trails data was removed for one participant who had extensive experience completing the task, and for one participant with a Trails B-A score of -109 as it took them significantly longer to complete Trails A than Trails B. This is unusual, given that Trails A measures psychomotor speed and visual attention and should often take less time than the more complex Trails B task. Data of three participants on the NIH List Sorting Working Memory task, and one participant on the NIH Dimensional Change Card Sort was removed because they had a score of zero. Finally, six participants whose Mini Mental State Examination (MMSE) scores were 24 or below were removed from analyses.

Results

Confirmatory Factor Analysis. The dataset used in part 2 is a subset of the dataset used in study 1 of part 1. The fit of the TBS data was examined for the total sample and for younger and older participants. A confirmatory factor analysis for the total sample indicated that a one factor model was an adequate fit χ^2 (14) = 59.732, p < .001, CFI = .964, TLI= .946, RMSEA= .095, SRMR= .038). The scale had high internal consistency (α=.9). The fit was also examined by age group. For the 18 to 34 group, the fit was adequate, χ^2 (14) = 37.044, *p* = .001, CFI = .951, TLI = .927, RMSEA = .096, SRMR = .045. The internal consistency for the younger age group was α = .86. For the 52 and older age group, the fit was poor, χ^2 (14) = 48.118, *p* < .001, CFI = .933, TLI = .900, RMSEA = .128, SRMR = .054. The internal consistency for the older age group was α = .88.

Cognitive Ability and Trait Boredom. Pearson correlations among all measures are presented in Table 7. There was a strong negative correlation between age and trait boredom (see Table 7). This is consistent with past research suggesting that trait boredom generally declines with age (e.g. Giambra, Camp & Grodsky, 1992). Cognitive performance on processing speed and executive function tasks is also known to decline with age (see Murman, 2015 for a review). Age was significantly negatively correlated with cognitive performance on all tasks aside from SART commission errors. This is consistent with past research suggesting SART performance may improve with age (Carriere, Cheyne, Solman & Smilek, 2010). Carriere and colleagues (2010) found that older individuals responded to stimuli on the SART more slowly and made less commission errors. The authors suggested that older adults strategically compensate by slowing down on the task, and that their sustained attention ability remains unchanged compared to other cognitive abilities (Carriere et al., 2010). Due to the associations between age and both cognitive performance and trait boredom, partial correlations between cognitive ability and trait boredom were obtained, controlling for age (see Table 8). SART Omission errors were significantly correlated with trait boredom, $r = .13$, $p = .03$, and the performance on the Flanker was significantly correlated with trait boredom, $r = .12$, $p = .035$. Performance on the oral Symbol Digit Modalities test was marginally associated with trait boredom, $r = -.10$, $p = .06$. All other tasks were not significantly associated with trait boredom after controlling for age.

A multiple regression was conducted in which trait boredom was regressed on all nine predictors (see Table 9). The overall model was significant, $F(9,267) = 8.46$, $p < .001$, $R^2 = .2218$. The only predictors to achieve significance were the Flanker task, $B = .13$, $p = .005$ and age, $B = -.16$, $p < .001$.

Table 6. Means and SDs for all study measures.

	Mean	SD
Trait Boredom Scale	22.09	9.21
SART Commission	41.93	23.29
SART Omission	2.11	2.44
Trails B-A	34.2	22.33
SDMT Written	57.02	13.07
SDMT Oral	66.44	15.31
Flanker	101.81	13.75
List Sorting	111.91	12.5
Dimensional Change	107.37	12.61

Note. SART errors: %; Trails: seconds; SDMT: number of items correct; NIH: scaled scores.

Table 7. Pearson Correlations for all study measures.

	SART Commission	SART Omission	Trails B-A	SDMT Written	SDMT Oral	Flanker	List Sorting: Unadjusted	Dimensional Change: Unadjusted	Age
TBS	.14*	.03	-.09	.28***	.26***	.32***	.18***	.28***	-.46***
SART Commission		.31***	-.04	.07	.07	.07	.03	.04	-.10
SART Omission			.17**	-.32***	-.30***	-.15**	-.25***	-.21***	.17**
Trails B-A				-.34***	-.33***	-.10	-.29***	-.13*	.26***
SDMT-W					.90***	.39***	.56***	.57***	-.69***
SDMT-O						.43***	.57***	.59***	-.70***
Flanker							.35***	.63***	-.51***
List Sorting								.38***	-.49***

Dimensional Change								-.64***

* p <.05; ** p < .01; *** p < .001

Table 8. Partial correlations controlling for age.

	SART Commission	SART Omission	Trails B-A	SDMT Written	SDMT Oral	Flanker	List Sorting	Dimensional Change
TBS	.06	.13*	.04	-.05	-.10†	.12*	-.04	.01

†p < .10; * p <.05

Table 9. Multiple Regression Results.

	B	*SE*	*t*	*p*
SART Commission	.009	.02	.387	.70
SART Omission	.27	.24	1.19	.26
Trails B-A	.004	.02	.198	.84
SDMT Written	.14	.09	1.582	.11
SDMT Oral	-.13	.08	-1.672	.096
Flanker	.13	.05	2.840	.005
List Sorting	-.04	.05	-.727	.47
Dimensional Change	-.05	.06	-.846	.40
Age	-.16	.03	-4.842	<.001

Discussion

In the present study, we replicated past findings on the relationship between trait boredom and poor SART performance. As predicted, trait boredom was associated with greater omission errors (i.e. go errors) on the SART. It was not significantly associated with commission

errors (i.e. no-go errors) after controlling for age. Both omission and commission errors generally increase with the duration of the task when engagement is known to decrease (Cheyne, Solman, Carriere & Smilek, 2009). Omission errors represent complete task disengagement and indicate mind wandering (Cheyne, Solman, Carriere & Smilek, 2009). Commission errors on the other hand represent more momentary attention lapses or slips (Cheyne et al., 2009; Robertson et al., 1997). This finding replicates past research showing a relationship between trait boredom and poor SART performance. Hunter & Eastwood (2018) found trait boredom was associated with more commission and omission errors. They also found that trait boredom predicted SART commission errors over and above depressive symptoms and self-report attention problems (Hunter & Eastwood, 2018). Malkovsky and colleagues (2012) showed that individuals high on trait boredom showed no post error slowing, while those low on trait boredom showed significant slowing after having made a commission error. This finding suggests that trait bored individuals are not as sensitive to having made an error on the SART, similar to individuals suffering from traumatic brain injury (Malkovsky et al., 2012; Robertson et al., 1997). Overall, findings related to the SART suggest that individuals high on trait boredom tend to demonstrate disengagement from the task. To better understand why individuals high on trait boredom perform poorly on sustained attention tasks, it is important to examine how state boredom relates to SART performance.

Hunter and Eastwood (2018, 2019) investigated the relationship between state boredom and SART performance. In both studies, the authors had participants rate their state boredom after each block of the SART. They found that state boredom was both a cause and a consequence of sustained attention failures. However, this research most strongly supports the idea that state boredom causes subsequent sustained attention failures (Hunter & Eastwood,

2019). It is possible that individuals were not mentally engaged with the monotonous SART, which increased their state boredom (Eastwood & Gorelik, in press). The aversive feeling of boredom then contributed to continued task disengagement (e.g. through mind wandering) and consequently to an increase in SART errors. Overall these findings suggest that at the state level, boredom is not primarily caused by attention failures. Rather, it may be that lack of mental engagement contributes to feelings of boredom, motivating participants to escape from the task, which then hinders performance. This idea is consistent with the model of state boredom proposed by Eastwood and Gorelik (in press).

Eastwood and Gorelik (in press) suggested that attentional disengagement may be a key mechanism causing state boredom. The authors laid out a model of boredom as a feeling arising from the way we process information- a feeling associated with a particular mode of thinking (Eastwood & Gorelik, in press). Accordingly, they argued that an underutilized cognitive capacity or the state of being mentally unoccupied causes the unpleasant feeling of boredom. This unpleasant feeling then motivates individuals to either stop engaging with a task or to mind wander to escape this feeling. Because they are no longer focused on or engaged with the task, their performance suffers (Eastwood & Gorelik, in press).

The cognitive theories of trait boredom suggest that a poor cognitive ability results in underused cognitive resources and the feeling of boredom. It suggests individuals high on trait boredom feel bored often because they tend to struggle engaging with tasks. If this was the case, our findings would indicate that individuals high on trait boredom perform poorly on all cognitive tasks. However, our findings suggest a weak link between cognitive ability and trait boredom. Thus, the present findings suggest trait boredom does not represent poor cognitive ability. Instead of having poor cognitive ability, one possible theory is that individuals high on

trait boredom as measured by the TBS may have a negative emotional reaction to some cognitive tasks (particularly those that do not engage their cognitive resources), which in turn impairs their performance. A negative emotional reaction can impair task performance in two ways. First, participants may mind wander, or choose to mentally withdraw from the task. Scerbo (1998) demonstrated that when given the choice, participants who became bored in a vigilance task chose to end the task early. Another possibility is that instead of withdrawing from the task, participants' negative emotional reaction impairs their performance. This idea is consistent with past research by Jefferies, Smilek, Eich & Enns (2008), who showed that participants performed poorly on a visual attention task when they experienced high arousal negative affect. The current findings also suggest that trait boredom represents individuals who tend to be more emotionally sensitive or vulnerable. Thus, it is possible that in the face of having an underused cognitive capacity, individuals high on trait boredom are more likely to experience negative affect. They may then be more likely to try and avoid or escape the task, causing sustained attention failures.

Another possible theory is that trait boredom as measured by the TBS represents a tendency to lack persistence or be more likely to escape from uncomfortable situations. There is some preliminary evidence this theory might explain the relationship between poor sustained attention performance and trait boredom. Hunter & Eastwood (2019) measured trait boredom using the BPS, as well as attentional control and experiential avoidance. Consistent with past work, they found that trait boredom was associated with poor SART performance. When they controlled for self-report attention problems, they found the relationship between the SART and trait boredom remained significant. However, after controlling for experiential avoidance, the relationship between SART performance and trait boredom was meaningfully reduced and no longer significant (Hunter & Eastwood, 2019). This evidence suggests that experiential

avoidance may explain why trait boredom is associated with poor performance on the SART. It is possible that in the face of negative emotions, individuals high on trait boredom = are more likely to escape or avoid the situation. Hunter and Eastwood (2019) suggest that their finding about trait boredom and experiential avoidance is consistent with the theory that both state and trait boredom are rooted in underutilized cognitive capacity, rather than in cognitive or attentional deficits. It is possible that individuals high on trait boredom are more emotionally reactive to some cognitive tasks (tasks where their cognitive resources are underutilized), which they then choose to disengage from.

In addition to poor performance on the SART, trait boredom was associated with marginally poorer oral processing speed. It is possible that like the SART, trait bored individuals' negative emotional reaction or lack of persistence impaired their performance on this task. This could be because these tasks did not fully occupy their executive resources, and they mind wandered or otherwise disengaged. Processing speed tasks are known to be less cognitively demanding (Holdnack et al., 2019). Such tasks often do not require higher level thinking, but rather assess simple decision making in tasks that require processing novel information (Holdnack et al., 2019). Furthermore, the oral processing speed test was always administered following the written processing speed test (Smith, 1982). The tasks are identical, with the exception of writing down numbers or saying them out loud. Because the oral task was always performed second, it was likely repetitive and possibly felt monotonous. Monotonous and repetitive task often do not fully engage one's cognitive resources. When cognitive capacity is underutilized, it leads to an unpleasant feeling of boredom, motivating individuals to either mind wander or disengage from the task, thereby impairing their performance.

Contrary to our predictions, trait boredom was related to better performance on the Flanker task. One potential explanation for this finding is that trait bored participants' negative emotional reaction while completing the Flanker task improved their performance. That is, negative affect may have narrowed participants' attention to the focal stimulus, which improved their ability to ignore the distracting flankers. Easterbrook (1959) argued that emotional arousal narrows down the range of cues one uses. That is, that an individual's uses or pays attention to less peripheral information in the environment. The author argues that this reduction can either improve or hinder performance depending on the task in question (Easterbrook, 1959). Derry-berry and Tucker (1994) argued that negative affect narrows down the scope of attention, while positive affect broadens it. A study by Fenske and Eastwood (2003) examined performance on a modified Flanker task involving positive and negative emotion faces. The authors found that viewing negative faces resulted in a smaller compatibility effect (i.e. generally individuals respond faster when the flanker stimuli are identical or compatible compared to when they are different) compared to viewing positive faces (Fenske & Eastwood, 2003). This suggests that viewing negative faces narrows the focus of attention to the central stimulus better than positive faces (Fenske & Eastwood, 2003). The authors suggested that viewing negative faces narrows participants' focus so they are less likely affected by peripheral information (Fenske & Eastwood, 2003). In another study, the authors induced participants into four mood state that varied by pleasure and arousal (i.e. anxiety, sadness, calmness and happiness; Steenbergen, Band & Hommel, 2010). They found that participants in low pleasure mood states (i.e. anxiety and sadness) demonstrated better cognitive control following Flanker interference (i.e. were better able to adapt to conflict on the Flanker; Steenbergen, Band & Hommel, 2010). The authors

suggest that affect may regulate goal-directed behavior following cognitive conflict (Steenbergen, Band & Hommel, 2010).

In a recent study, Schmidt and colleagues (2018) suggested that anxiety is associated with improved cognitive control. They had participants complete an anxiety inventory, measured their frontal midline theta (FMT) activity (known to increase when cognitive processing or task performance is enhanced) using EEG, and had them complete a risky decision-making game where they had to choose from one of two risk options, one of which was less risky than the other (Schmidt et al., 2018). The authors predicted that anxious participants would try to avoid negative outcomes associated with a riskier decision, and thus would exert more cognitive control when choosing a risk option (Schmidt et al., 2018). The authors found that highly anxious individuals exerted more cognitive control before choosing one of the two risky options. The authors concluded that anxious individuals perceive situations as riskier than low anxious individuals, and thus they exert more cognitive control when making risky decisions. This then results in less risky decisions (Schmidt et al., 2018). Overall, research suggests that negative affect is associated with better inhibitory control. Individuals high on trait boredom as measured by the TBS may be more likely to experience negative affect during cognitive tasks (as they are more prone to experiencing negative emotions), which may have contributed to better performance on the Flanker. While negative affect may hinder performance on some cognitive tasks (i.e. sustained attention tasks), it may improve performance on others (i.e. Flanker task). Overall, it is possible that negative affect facilitated performance on the Flanker inhibitory control task through the narrowing of attention to the focal stimulus and better ability to ignore the distracting flanker arrows.

The present study failed to replicate past findings on self-reported executive dysfunction and trait boredom. One possible explanation for this is rooted in the difference between the constructs measured by self-report versus performance-based measures of cognition. Research suggests that self-report and performance-based measures are not highly correlated, and also measure distinct constructs (Toplak, West & Stanovich, 2013; Nęcka, E., Lech, B., Sobczyk, N., & Śmieja, 2012). Self-report measures assess one's performance in everyday, unstructured settings where there are no strict guidelines to follow, and one must direct his or her own activities and goals (Toplak, West & Stanovich, 2013). However, performance-based measures of cognitive ability are highly structured, and often encourage participants to complete a task as accurately and as quickly as possible. Thus performance-based measures assess cognitive ability in a highly specific and structured context (Toplak, West & Stanovich, 2013). In other words, self-report measures of cognition seem to assess one's typical performance in every day life situations, whereas performance-based measures assess one's maximal cognitive capacities (Necka et al., 2012). Furthermore, performance-based measures require the use of cognitive resources for a short period of time (particularly the NIH cognition measures), while real-life goal pursuit requires prolonged use of resources (Necka et al., 2012). These differences could account for the findings in the current study. Alternatively, it could be that self-reported executive function measures do not reflect cognitive ability. Buchanan (2016) found that self-report executive function measures more likely capture personality variables such as low conscientiousness and high neuroticism, rather than cognitive ability.

Altogether, we found a weak link between cognitive ability and trait boredom. This is consistent with existing findings on cognitive ability- specifically on intelligence- and trait boredom, which are inconclusive. A study by Hill (1975) had participants complete the Raven's

Standard Progressive Matrices task and measured their boredom levels towards the end of 50 consecutive work days. The authors did not find a significant relationship between intelligence and boredom proneness (Hill, 1975). With regard to education level and boredom proneness, Smith (1955) found no relationship, but another study by Drory (1982) found that higher education was positively related to boredom proneness. Fogelman (1976) found that children who are often bored perform more poorly on tests of general ability. A more recent study by Pettiford et al. (2007) found that IQ, as measured by the Kaufman Brief Intelligence Test, was significantly negatively correlated with the Boredom Susceptibility Scale. Overall, it is unclear whether intelligence is associated with trait boredom. Part of the reason for this lack of clarity has to do with the measures of trait boredom used. That is, each study used a different measure of trait boredom, further limiting the interpretation of results on trait boredom and intelligence.

General Discussion

Summary of Findings

The goals of the present research were twofold: first, to revise and evaluate a new measure of trait boredom. Second, to examine whether cognitive ability predicts trait boredom. In part 1, a theoretically and psychometrically strong measure of trait boredom was developed. The Trait Boredom Scale (TBS) was significantly associated with personality dimensions and was correlated with commonly used measures of trait boredom. The scale demonstrated good psychometric properties in a Confirmatory Factor Analysis and had high internal consistency. Importantly, the TBS is grounded in a definition and theory of trait boredom as the frequent experience of state boredom, and most of its items originate from a well-validated state boredom scale (MSBS). With respect to the second goal, we found that cognitive ability was weakly associated with trait boredom. However, consistent with past research trait boredom was

associated with poorer sustained attention. It was marginally associated with poorer oral processing speed and, contrary to expectations, trait boredom was associated with better inhibitory control.

What is Trait Boredom?

The current findings suggest that trait boredom is not primarily a reflection of poor cognitive ability. Rather, a possible theory is that trait boredom reflects a tendency to react to situations or to one's feelings in a particular way. Although the present results do not provide direct evidence for this, they show that individuals high on trait boredom perform more poorly on tasks that are less cognitively engaging and perform better on a task known to benefit from negative affect, suggesting their performance may be mediated by this emotional reaction. Trait boredom may then reflect a tendency to experience more negative emotions while completing some cognitive tasks, a tendency to try and escape from such tasks, or both. The tendency to react this way is likely what affects trait bored individuals' performance on certain cognitive tasks (particularly tasks that do not demand a great deal of cognitive resources, as they contribute to an underutilized cognitive capacity and thus the aversive feeling of boredom). Trait boredom likely works to influence the experience of and reaction to state boredom, which contributes to outcomes. This is also evident from our findings on trait boredom (measured by the TBS) and personality, suggesting it is associated with emotional sensitivity and decreased conscientiousness.

The recently emerging evidence on the conceptualization and causes of state boredom is instrumental in understanding trait boredom (Hunter & Eastwood, 2019; Gorelik & Eastwood, in press). This evidence provides support for the idea that underutilized cognitive capacity causes the unpleasant feeling of boredom, prompting one to mind wander or stop trying, which in turn

contributes to poor performance. Trait boredom then seems to interact with this process to contribute to poor performance. The combination of trait bored individuals' tendency to lack persistence, higher emotionality, and in the moment underutilized cognitive capacity all work together to influence task performance.

Limitations and Future Directions

There are several limitations to the present studies. One limitation was that age was not continuously measured. Age was an important variable in this study, as it was significantly associated with both trait boredom and cognitive performance. Because we did not include participants aged 30 to 60, it is unknown how cognitive performance and trait boredom relate for individuals in that age group. The findings in this study with respect to cognitive performance and trait boredom controlling for age should therefore be interpreted with caution, as they only apply to the age groups utilized here. Future studies should include this age group as well.

Another limitation is that the model fit of the TBS in the GOAL-D dataset used in part 2 was not good, especially for the older age group. This limits the interpretation and generalizability of the results on the relationship between trait boredom and cognitive ability for older adults. Future research should examine the relationship between cognitive ability and trait boredom using a well-validated trait boredom scale with good psychometric properties across all age groups.

One fruitful direction for future research would be to examine the relationship between cognitive ability and trait boredom using more comprehensive tests of cognitive ability. Most measures used in the present study (particularly the NIH toolbox) were designed as brief (often around 5 minutes long) assessments of cognitive ability. These tests were meant to quickly screen participants' ability. If it is true that those high on trait boredom are more emotionally

reactive to certain cognitive tasks, it would be useful to examine their performance on cognitive tasks requiring endurance and use of cognitive resources for a longer period of time. Alternatively, it may be useful to examine how trait bored individuals perform on more ecologically valid cognitive tasks. Such tasks may be more likely to reflect the kind of difficulties trait bored individuals encounter in their daily lives, and thus may provide a deeper understanding of trait boredom and its consequences.

Future research should continue to validate and test the psychometric properties of the TBS. Although it showed promise in the present studies, research should examine its properties using a larger sample, and conduct a qualitative analysis of the items. The utility of the 9-item TBS should also be evaluated in future research.

References

Ahmed, S. M. S. (1990). Psychometric properties of the Boredom Proneness Scale. *Perceptual and Motor Skills, 71*, 963–966.

Alda, M., Minguez, J., Montero-Marin, J., Gili, M., Puebla-Guedea, M., Herrera-Mercadal, P., ... & Garcia-Campayo, J. (2015). Validation of the Spanish version of the multidimensional state boredom scale (MSBS). *Health and quality of life outcomes*, *13*(1), 59.

Baratta, P. L., & Spence, J. R. (2015). A riddle, wrapped in a mystery, inside an enigma ... or just multidimensional? testing the multidimensional structure of boredom. In C. E. J. Härtel, W. J. Zerbe & N. M. Ashkanasy (Eds.), *New ways of studying emotions in organizations; new ways of studying emotions in organizations* (pp. 139-172, Chapter xxiv, 457 Pages) Emerald Group Publishing, Bingley.

Barkley, R. A. (2006). Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment.

Barmack, J. E. (1937). Boredom and other factors in the physiology of mental efforts: An exploratory study. *Archives of Psychology*, 1937,218, 6-81.

Barnett, L. A., & Klitzing, S. W. (2006). Boredom in free time: Relationships with personality, affect, and motivation for different gender, racial and ethnic student groups. *Leisure Sciences*, *28*(3), 223-244.

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological bulletin*, *88*(3), 588.

Berlyne, D. E. (1960). Conflict, arousal and curiosity. New York, NY: McGraw-Hill.

Blaszczynski, A., McConaghy, N., & Frankova, A. (1990). Boredom proneness in pathological gambling. *Psychological Reports, 67*(1), 35-42. doi:http://dx.doi.org/10.2466/PR0.67.5.35-42.

Borgatta, E. F. (1964). The structure of personality characteristics. *Behavioral science, 9*(1), 8-17.

Britton, E. (2018). *Boredom and motivation: from anxious uncertainty and low approach motivation to low self control* (Unpublished master's thesis). University of Waterloo, Waterloo, Canada.

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York, NY: Guilford Press.

Buchanan, T. (2016). Self-report measures of executive function problems correlate with personality, not performance-based executive function measures, in nonclinical samples. *Psychological Assessment*, *28*(4), 372.

Carriere, J. S., Cheyne, J. A., & Smilek, D. (2008). Everyday attention lapses and memory failures: The affective consequences of mindlessness. *Consciousness and cognition*, *17*(3), 835-847.

Carriere, J. S. A., Cheyne, J. A., Solman, G. J. F., & Smilek, D. (2010). Age trends for failures of sustained attention. *Psychology and Aging*, *25*(3), 569-574.

Carver, C. S., & Scheier, M. F. (1990). Origins and functions of positive and negative affect: a control-process view. *Psychological review*, *97*(1), 19.

Cattell, R. B. (1957). *Personality and motivation structure and measurement* World Book Co., Oxford.

Cheyne, J. A., Carriere, J. S., & Smilek, D. (2006). Absent-mindedness: Lapses of conscious awareness and everyday cognitive failures. *Consciousness and cognition*, *15*(3), 578-592.

Connelly, B. S., Ones, D. S., & Chernyshenko, O. S. (2014). Introducing the special section on openness to experience: Review of openness taxonomies, measurement, and nomological net. *Journal of Personality Assessment*, *96*(1), 1-16.

Conroy, R. M., Golden, J., Jeffares, I., O'Neill, D., & McGee, H. (2010). Boredom-proneness, loneliness, social engagement and depression and their association with cognitive function in older people: a population study. *Psychology, health & medicine*, *15*(4), 463-473.

Craparo, G., Faraci, P., Gori, A., Hunter, J. A., Hunter, A., Pileggi, V., . . . Eastwood, J. D. (2017). Validation of the Italian version of the multidimensional state boredom scale (MSBS). *Clinical Neuropsychiatry: Journal of Treatment Evaluation*, *14*(2), 173-182.

Csikszentmihalyi, M. (1978). Attention and the holistic approach to behavior. In *The stream of consciousness* (pp. 335-358). Springer, Boston, MA.

Culp, N. A. (2006). The relations of two facets of boredom proneness with the major dimensions of personality. *Personality and Individual Differences*, *41*(6), 999-1007.

Dahlen, E. R., Martin, R. C., Ragan, K., & Kuhlman, M. M. (2004). Boredom proneness in anger and aggression: Effects of impulsiveness and sensation seeking. *Personality and Individual Differences*, 37, 1615–1627. http://dx.doi.org/10.1016/j.paid.2004.02.016.

Damrad-Frye, R., & Laird, J. D. (1989). The experience of boredom: The role of the self-perception of attention. *Journal of Personality and Social Psychology, 57*(2), 315.

Daneman, M., & Carpenter, P. A. (1980). Individual differences in working memory and reading. *Journal of verbal learning and verbal behavior*, *19*(4), 450-466.

Deditius-Island, H. K., & Caruso, J. C. (2002). An examination of the reliability of scores from Zuckerman's Sensation Seeking Scales, Form V. *Educational and psychological measurement*, *62*(4), 728-734.

Derryberry, D., & Tucker, D. M. (1994). Motivating the focus of attention. In P. M. Niedenthal, & S. Kitayama (Eds.), *The heart's eye: Emotional influences in perception and attention; the heart's eye: Emotional influences in perception and attention* (pp. 167-196, Chapter xiv, 289 Pages) Academic Press, San Diego, CA.

DeVellis, R. F. (2003). *Scale development: Theory and applications*. London, England: Sage.

DeYoung, C. G. (2011). Intelligence and personality. In R. J. Sternberg, & S. B. Kaufman (Eds.), *The cambridge handbook of intelligence; the cambridge handbook of intelligence* (pp. 711-737, Chapter xix, 984 Pages) Cambridge University Press, New York, NY.

Drory, A. (1982). Individual differences in boredom proneness and task effectiveness at work. *Personnel Psychology*, *35*(1), 141-151.

Dubey, C., & Arora, M. (2008). Sensation seeking level and drug of choice. *Journal of the Indian Academy of Applied Psychology*, *34*(1), 73-82.

Eakman, A. M. (2011). Convergent validity of the engagement in meaningful activities survey in a college sample. *OTJR: Occupation, Participation and Health*, 31, 23–33. http://dx.doi.org/10.3928/15394492-20100122-02.

Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review*, 66, 183–201.

Eastwood, J. D., Frischen, A., Fenske, M. J., & Smilek, D. (2012). The unengaged mind: Defining boredom in terms of attention. *Perspectives on Psychological Science, 7*(5), 482-495.

Eastwood, J. D. & Gorelik, D. (in press). Boredom is a feeling of thinking and a double-edged sword. In Josefa Ros Velasco (Ed.), *Boredom is in Your Mind.* Springer.

Fahlman, S. A., Mercer-Lynn, K. B., Flora, D. B., & Eastwood, J. D. (2013). Development and validation of the multidimensional state boredom scale. *Assessment, 20*(1), 68–85. http://dx.doi.org/10.1177/1073191111421303.

Fahlman, S. A., Mercer, K. B., Gaskovski, P., Eastwood, A. E., & Eastwood, J. D. (2009). Does a lack of life meaning cause boredom? Results from psychometric, longitudinal, and experimental analyses. *Journal of Social and Clinical Psychology, 28,* 307–340. http://dx.doi.org/10.1521/jscp.2009.28.3.307.

Farmer, R., & Sundberg, N. D. (1986). Boredom proneness: The development and correlates of a new scale. *Journal of Personality Assessment, 50*(1), 4-17. doi:http://dx.doi.org/10.1207/s15327752jpa5001_2.

Fenske, M. J., & Eastwood, J. D. (2003). Modulation of focused attention by faces expressing emotion: evidence from flanker tasks. *Emotion, 3*(4), 327.

Fisher, C. D. (1993). Boredom at work: A neglected concept. *Human Relations, 46*(3), 395-417. doi:http://dx.doi.org/10.1177/001872679304600305.

Fisher, C. D. (1998). Effects of external and internal interruptions on boredom at work: Two studies. *Journal of Organizational Behavior, 19*(5), 503-522.

Fogelman, K. (1976). Bored eleven-year-olds. *British Journal of Social Work, 6*(2), 201-211.

Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). “Mini-mental state”: a practical method for grading the cognitive state of patients for the clinician. *Journal of psychiatric research*, *12*(3), 189-198.

Giambra, L. M., Camp, C. J., & Grodsky, A. (1992). Curiosity and stimulation seeking across the adult life span: Cross-sectional and 6-to 8-year longitudinal findings. *Psychology and aging*, *7*(1), 150.

Gana, K., & Akremi, M. (1998). French adaptation and validation of the Boredom Proneness Scale (BP). L'Annee Psychologique, 98, 429–450. https://doi.org/10.3406/psy.1998.28576.

Gana, K., Broc, G., & Bailly, N. (2019). Does the Boredom Proneness Scale capture traitness of boredom? Results from a six-year longitudinal trait-state-occasion model. *Personality and Individual Differences*, *139*, 247-253.

Gana, K., Deletang, B., & Metais, L. (2000). Is boredom proneness associated with introspectiveness?. *Social Behavior & Personality: an international journal*, *28*(5).

Gerritsen, C. J., Toplak, M. E., Sciaraffa, J., & Eastwood, J. (2014). I can’t get no satisfaction: Potential causes of boredom. *Consciousness and cognition*, *27*, 27-41.

Goldberg, Y., & Danckert, J. (2013). Traumatic brain injury, boredom and depression. *Behavioral Sciences*, *3*(3), 434-444.

Goldberg, Y. K., Eastwood, J. D., LaGuardia, J., & Danckert, J. (2011). Boredom: An emotional experience distinct from apathy, anhedonia, or depression. *Journal of Social and Clinical Psychology*, *30*(6), 647-666.

Gordon, A., Wilkinson, R., McGown, A., & Jovanoska, S. (1997). The psychometric properties of the Boredom Proneness Scale: An examination of its validity. *Psychological Studies, 42*(2–3),85–97.

Gupta, R., Derevensky, J. L., & Ellenbogen, S. (2006). Personality characteristics and risk-taking tendencies among adolescent gamblers. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement*, *38*(3), 201.

Hamilton, J. A. (1981). Attention, personality, and the self-regulation of mood: Absorbing interest and boredom. Progress in Experimental Personality Research, 10, 281–315.

Harris, P. B., Houston, J. M., Vazquez, J. A., Smither, J. A., Harms, A., Dahlke, J. A., & Sachau, D. A. (2014). The Prosocial and Aggressive Driving Inventory (PADI): A self-report measure of safe and unsafe driving behaviors. *Accident Analysis & Prevention*, *72*, 1-8.

Harvey, R. J., Billings, R. S., & Nilan, K. J. (1985). Confirmatory factor analysis of the Job Diagnostic Survey: Good news and bad news. *Journal of applied psychology*, *70*(3), 461.

Hill, A. B. (1975). Work variety and individual differences in occupational boredom. *Journal of Applied Psychology*, *60(1),* 128–131.

Holdnack, J. A., Prifitera, A., Weiss, L. G., & Saklofske, D. H. (2016). WISC-V and the personalized assessment approach. In L. G. Weiss, D. H. Saklofske, J. A. Holdnack & A. Prifitera (Eds.), *WISC-V assessment and interpretation: Scientist-practitioner perspectives; WISC-V assessment and interpretation: Scientist-practitioner perspectives* (pp. 373-413, Chapter xxix, 425 Pages) Elsevier Academic Press, San Diego, CA.

Hunter, A., & Eastwood, J. D. (2018). Does state boredom cause failures of attention? Examining the relations between trait boredom, state boredom, and sustained attention. *Experimental Brain Research*, *236*(9), 2483-2492.

Hunter, A., & Eastwood, J. (2019, June). *Idle Hands, Listless Minds: Unpacking the Dynamics of Boredom and Attention.* Symposium talk given at the Canadian Society for Brain, Behavior and Cognitive Science Conference, Waterloo, ON.

Hunter, J. A., Abraham, E. H., Hunter, A. G., Goldberg, L. C., & Eastwood, J. D. (2016). Personality and boredom proneness in the prediction of creativity and curiosity. *Thinking Skills and Creativity*, *22*, 48-57.

Hunter, J. A., Dyer, K. J., Cribbie, R. A., & Eastwood, J. D. (2016). Exploring the utility of the multidimensional state boredom scale. *European Journal of Psychological Assessment*, *32*(3), 241-250.

Isacescu, J., & Danckert, J. (2018). Exploring the relationship between boredom proneness and self-control in traumatic brain injury (TBI). *Experimental brain research*, *236*(9), 2493-2505.

Jefferies, L. N., Smilek, D., Eich, E., & Enns, J. T. (2008). Emotional valence and arousal interact in attentional control. *Psychological Science*, *19*(3), 290-295.

Kass, S. J., Vodanovich, S. J., Stanny, C. J., & Taylor, T. M. (2001). Watching the clock: Boredom and vigilance performance. *Perceptual and motor skills*, *92*(3_suppl), 969-976.

Kass, S. J., Wallace, J. C., & Vodanovich, S. J. (2003). Boredom proneness and sleep disorders as predictors of adult attention deficit scores. *Journal of Attention Disorders*, *7*(2), 83-91.

Kirmeyer, S. L. (1988). Coping with competing demands: interruption and the type A pattern. *Journal of Applied Psychology*, *73*(4), 621.

Kuhl, J. (1994). Action versus state orientation: Psychometric properties of the Action Control Scale (ACS-90). *Volition and personality: Action versus state orientation*, *47*, 56.

LePera, N. (2011). Relationships between boredom proneness, mindfulness, anxiety, depression, and substance use. *The New School Psychology Bulletin*, *8*(2), 15-25.

Liu, Y., Chen, J. Z., Jiang, M., Xu, H. Y., Liu, J., Eastwood, J. D., & Mehranvar, S. (2013). The Chinese version of the Multidimensional State Boredom Scale (MSBS): Its applicability in Chinese college students. *Chinese Journal of Clinical Psychology*, *21*(1), 558-562.

Malkovsky, E., Merrifield, C., Goldberg, Y., & Danckert, J. (2012). Exploring the relationship between boredom and sustained attention. *Experimental Brain Research*, *221*(1), 59-67.

Melton, A. M., & Schulenberg, S. E. (2009). A confirmatory factor analysis of the boredom proneness scale. *The Journal of psychology*, *143*(5), 493-508.

Mercer-Lynn, K. B., Bar, R. J., & Eastwood, J. D. (2014). Causes of boredom: The person, the situation, or both?. *Personality and Individual Differences*, *56*, 122-126.

Mercer, K. B., & Eastwood, J. D. (2010). Is boredom associated with problem gambling behaviour? It depends on what you mean by 'boredom'. *International Gambling Studies*, *10*(1), 91-104.

Mercer-Lynn, K. B., Flora, D. B., Fahlman, S. A. & Eastwood, J. D. (2011). The measurement of boredom: Differences between existing self-report scales. *Assessment*, 20(5) 585–596. http://dx.doi.org/ 10.1177/1073191111408229.

Murman D. L. (2015). The Impact of Age on Cognition. *Seminars in hearing*, *36*(3), 111–121. doi:10.1055/s-0035-1555115.

Newell, S. E., Harries, P., & Ayers, S. (2012). Boredom proneness in a psychiatric inpatient population. *International Journal of Social Psychiatry*, *58*(5), 488-495.

Nęcka, E., Lech, B., Sobczyk, N., & Śmieja, M. (2012). How Much Do We Know About Our Own Cognitive Control?. *European Journal of Psychological Assessment*.

Ng, A. H., Liu, Y., Chen, J. Z., & Eastwood, J. D. (2015). Culture and state boredom: A comparison between European Canadians and Chinese. *Personality and individual differences*, *75*, 13-18.

Nichols, L. A., & Nicki, R. (2004). Development of a psychometrically sound internet addiction scale: A preliminary step. *Psychology of Addictive Behaviors*, *18*(4), 381.

O'hanlon, J. F. (1981). Boredom: Practical consequences and a theory. *Acta psychologica*, *49*(1), 53-82.

Oxtoby, J., King, R., Sheridan, J., & Obst, P. (2018). Psychometric analysis of the Multidimensional State Boredom Scale and its condensed versions. *Assessment*, *25*(7), 826-840.

Pattyn, N., Neyt, X., Henderickx, D., & Soetens, E. (2008). Psychophysiological investigation of vigilance decrement: boredom or cognitive fatigue?. *Physiology & behavior*, *93*(1-2), 369-378.

Pettiford, J., Kozink, R. V., Lutz, A. M., Kollins, S. H., Rose, J. E., & McClernon, F. J. (2007). Increases in impulsivity following smoking abstinence are related to baseline nicotine intake and boredom susceptibility. *Addictive Behaviors*, *32*(10), 2351-2357.

Reitan, R. M. (1958). Validity of the Trail Making Test as an indicator of organic brain damage. *Perceptual and motor skills*, *8*(3), 271-276.

Robertson, I. H., Manly, T., Andrade, J., Baddeley, B. T., & Yiend, J. (1997). Oops!': performance correlates of everyday attentional failures in traumatic brain injured and normal subjects. *Neuropsychologia*, *35*(6), 747-758.

Rupp, D. E., & Vodanovich, S. J. (1997). The role of boredom proneness in self-reported anger and aggression. *Journal of Social Behavior and Personality*, *12*(4), 925.

Sarter, M., Givens, B., & Bruno, J. P. (2001). The cognitive neuroscience of sustained attention: where top-down meets bottom-up. *Brain research reviews*, *35*(2), 146-160.

Sawin, D. A., & Scerbo, M. W. (1995). Effects of instruction type and boredom proneness in vigilance: Implications for boredom and workload. *Human factors*, *37*(4), 752-765.

Scerbo, M. W., Greenwald, C. Q., & Sawin, D. A. (1992, October). Vigilance: It's boring, it's difficult, and I can't do anything about it. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (Vol. 36, No. 18, pp. 1508-1512). Sage CA: Los Angeles, CA: SAGE Publications.

Scerbo M.W., & Holcomb J.R. (1993). *Effects of signal conspicuity and time on boredom in vigilance*. Paper presented at the first Mid-Atlantic Human Factors Conference, Reston,VA, February.

Scerbo, M. W. (1998). What's so boring about vigilance? In R. R. Hoffman, M. F. Sherrick, & J. S. Warm (Eds.), *Viewing psychology as a whole: The integrative science of William N. Dember* (pp. 145-166). Washington, DC, US: American Psychological Association.

Schriesheim, C. A., & Hill, K. D. (1981). Controlling acquiescence response bias by item reversals: The effect on questionnaire validity. *Educational and psychological measurement*, *41*(4), 1101-1114.

Seel, R. T., & Kreutzer, J. S. (2003). Depression assessment after traumatic brain injury: an empirically based classification method. *Archives of physical medicine and rehabilitation*, *84*(11), 1621-1628.

Smith, A. (1982). *Symbol digit modalities test* (p. 22). Los Angeles, CA: Western Psychological Services.

Smith, P. C. (1955). The prediction of individual differences in susceptibility to industrial monotony. *Journal of Applied Psychology, 39*(5), 322-329.

Smith, R. P. (1981). Boredom: A review. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 23, 329– 340.

Sommers, J., & Vodanovich, S. J. (2000). Boredom proneness: Its relationship to psychological- and physical-health symptoms. *Journal of clinical psychology*, *56*(1), 149-155.

Song, H. J., Li, Y. M., & Li, Y. X. (2013). The application of the Multidimensional State Boredom Scale in Chinese students. *Chinese Journal of Clinical Psychology, 21*(5), 774–778.

Struk, A. A., Carriere, J. S., Cheyne, J. A., & Danckert, J. (2017). A short Boredom Proneness Scale: Development and psychometric properties. *Assessment*, 24(3), 346-359.

Thackray, R. I., Bailey, J. P., & Touchstone, R. M. (1977). Physiological, subjective, and performance correlates of reported boredom and monotony while performing a simulated radar control task. In R. R. Mackie (Ed.), *Vigilance: Theory, operational performance and physiological correlates* (pp. 203–216). New York, NY: Plenum.

Thackray, R. I. (1981). The stress of boredom and monotony: A consideration of the evidence. *Psychosomatic Medicine*, 43, 165– 167.

Toplak, M. E., West, R. F., & Stanovich, K. E. (2013). Practitioner review: Do performance-based measures and ratings of executive function assess the same construct?. *Journal of Child Psychology and Psychiatry*, *54*(2), 131-143.

Van Sonderen, E., Sanderman, R., & Coyne, J. C. (2013). Ineffectiveness of reverse wording of questionnaire items: Let's learn from cows in the rain. *PloS one*, *8*(7), e68967.

Van Steenbergen, H., Band, G. P., & Hommel, B. (2010). In the mood for adaptation: How affect regulates conflict-driven control. *Psychological Science*, *21*(11), 1629-1634.

Vodanovich, S. J., & Kass, S. J. (1990). A factor analytic study of the boredom proneness scale. *Journal of personality assessment*, *55*(1-2), 115-123.

Vodanovich, S. J., & Watt, J. D. (2016). Self-report measures of boredom: An updated review of the literature. *The Journal of Psychology*, *150*(2), 196-228.

Vodanovich, S. J., Wallace, J. C., & Kass, S. J. (2005). A confirmatory approach to the factor structure of the Boredom Proneness Scale: Evidence for a two-factor short form. *Journal of Personality Assessment*, *85*, 295-303. doi:10.1207/s15327752jpa8503_05.

Wallace, J. C., Vodanovich, S. J., & Restino, B. M. (2003). Predicting cognitive failures from boredom proneness and daytime sleepiness scores: An investigation within military and undergraduate samples. *Personality and Individual Differences*, *34*(4), 635-644.

Watt, J. D., & Hargis, M. B. (2010). Boredom proneness: Its relationship with subjective underemployment, perceived organizational support, and job performance. *Journal of Business and Psychology*, *25*(1), 163-174. doi:http://dx.doi.org/10.1007/s10869-009-9138-9.

Workman, J. E., & Studak, C. M. (2005). Relationships among fashion consumer groups, locus of control, boredom proneness, boredom coping and intrinsic enjoyment. *International Journal of Consumer Studies*, *31*(1), 66-75.

Zuckerman, M. (1979). *Sensation seeking: Beyond the optimal level of arousal*. Hillsdale, NJ: Erlbaum.

Zuckerman, M., Eysenck, S. B., & Eysenck, H. J. (1978). Sensation seeking in England and America: cross-cultural, age, and sex comparisons. *Journal of consulting and clinical psychology*, *46*(1), 139.

Appendix A: Measures

Part 1: Study 1

Dataset 1: Goal D
Trait Boredom Scale

Instructions:
Please respond to each question indicating how you generally feel about yourself and your life, even if it is different from how you feel right now. Use the following choices: 1 = Strongly disagree; 2 = Disagree; 3 = Somewhat disagree; 4 = Neutral; 5 = Somewhat agree; 6 = Agree; and 7 = Strongly agree.

2	I am often stuck in situations that I find irrelevant
2b	I am often stuck doing meaningless things.
7	In general, everything seems repetitive and routine to me.
9	I seem to be forced to do things that have no value to me.
10	I often feel bored.
13	I am typically indecisive or unsure of what to do.
13b	I often do not know what I want to do.
17	I want to do something fun, but nothing usually appeals to me.
17b	I often feel like there is nothing fun to do.
19	I often wish I were doing something more exciting.
22	I often feel like I am wasting time that would be better spent on something else.
24	I often feel like I want something to happen but I'm not sure what.
28	I often feel like I'm sitting around waiting for something to happen.
30	I find it difficult to entertain myself.
31	It is difficult for me to stay interested in what I'm doing.
32	I can't stand watching a movie that I've seen before.
33	I often feel unchallenged.
34	When I am doing one thing I often wish that I were doing something else.

Data Set 2: Sample Size Boost
Boredom Susceptibility Scale (ZBS; Zuckerman, 1979).

1	A	There are some movies I enjoy seeing a second or even a third time.
	B	I can't stand watching a movie that I've seen before.
2	A	I get bored seeing the same old faces.
	B	I like the familiarity of everyday friends.
3	A	I dislike people who do or say anything ust to shock or upset others.
	B	When you can predict almost everything a person will do and say he or she is just a bore.
4	A	I usually don't enjoy a movie or play where I can predict what will happen in advance.
	B	I don't mind watching a movie or play where I can predict what will happen in advance.
5	A	I enjoy looking at home movies or travel slides.
	B	Looking at someone's home movies or travel slides bores me tremendously.
6	A	I prefer friends who are excitingly unpredictable.
	B	I prefer friends who are reliable and predictable.
7	A	I enjoy spending time in the familiar surroundings of home.
	B	I get very restless if I have to stay around home for any length of time.
8	A	The worst social sin is to be rude.
	B	The worst social sin is to be a bore.
9	A	I like people who are sharp and witty even if they do sometimes insult others.
	B	I dislike people who have their fun at the expense of hurting the feelings of others.
10	A	I have no patience with dull or boring persons.
	B	I find something interesting in almost every person I talk with.

Answer key for boredom responses: 1B, 2A, 3B, 4A, 5B, 6A, 7B, 8B, 9A, 10A

Boredom Proneness Scale (Farmer & Sundberg, 1986).

Participants respond on a scale ranging from 1 (highly disagree) to 7 (highly agree). R = reverse scored.

1 It is easy for me to concentrate on my activities. (R)
2 Frequently when I am working I find myself worrying about other things.
3 Time always seems to be passing slowly.
4 I often find myself at "loose ends," not knowing what to do.
5 I am often trapped in situations where I have to do meaningless things.
6 Having to look at someone's home movies or travel slides bores me tremendously.
7 I have projects in mind all the time, things to do. (R)
8 I find it easy to entertain myself. (R)
9 Many things I have to do are repetitive and monotonous.
10 It takes more stimulation to get me going than most people.
11 I get a kick out of most things I do. (R)
12 I am seldom excited about my work.
13 In any situation I can usually find something to do or see to keep me interested. (R)
14 Much of the time I just sit around doing nothing.
15 I am good at waiting patiently. (R)
16 I often find myself with nothing to do–time on my hands.
17 In situations where I have to wait, such as a line, I get very restless.
18 I often wake up with a new idea. (R)
19 It would be very hard for me to find a job that is exciting enough.
20 I would like more challenging things to do in life.
21 I feel that I am working below my abilities most of the time.
22 Many people would say that I am a creative or imaginative person. (R)
23 I have so many interests, I don't have time to do everything. (R)
24 Among my friends, I am the one who keeps doing something the longest. (R)
25 Unless I am doing something exciting, even dangerous, I feel half-dead and dull.
26 It takes a lot of change and variety to keep me really happy.
27 It seems that the same things are on television or at the movies all the time; it's getting old.
28 When I was young, I was often in monotonous and tiresome situations.

Part 1: Study 2

Short-Form Boredom Proneness Scale (Struk et al., 2015).

Please respond to each statement indicating how you generally feel about yourself and your life, even if it is different from how you feel right now. Use the following choices: 1 = Strongly disagree; 2 = Disagree; 3 = Somewhat disagree; 4 = Neither agree nor disagree; 5 = Somewhat agree; 6 = Agree; 7 = Strongly agree.

1	I often find myself at "loose ends", not knowing what to do.
2	Many things I have to do are repetitive and monotonous.
3	It takes more stimulation to get me going than most people.
4	Much of the time I just sit around doing nothing.
5	Unless I am doing something exciting, even dangerous, I feel half-dead and dull.
6	I find it hard to entertain myself.
7	I don't feel motivated by most things that I do.
8	In most situations, it is hard for me to find something to do or see to keep me interested.

9. In any given week, how often would you say you feel bored?

1 – not at all	2 – rarely	3 – not much	4 – a little	5 – often	6 – very often	7 – extremely often

10. When you are bored, how intense would you rate the feeling to be?

1 – not at all intense	2	3	4 – moderately intense	5	6	7 – extremely intense

Conscientiousness Subscale of the IPIP-NEO-PI.

The following items contain phrases describing people's behaviours. Please use the rating scale next to each phrase to describe how accurately each statement describes you. Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. Please read each statement carefully, and then click the circle that corresponds to the accuracy of the statement.

Answer every item. Please make sure that the circle you are choosing corresponds to the question you are considering. If you make a mistake or change your mind, simply click the circle you wish to choose.

Participants used the following choices: 1 = very inaccurate; 2 = moderately inaccurate; 3 = neither accurate not inaccurate; 4 = moderately accurate; 5 = very accurate.

1 Work hard.
2 Do more than what's expected of me.
3 Do just enough work to get by. (R)
4 Put little time and effort into my work. (R)
5 Go straight for the goal.
6 Turn plans into actions.
7 Plunge into tasks with all my heart.
8 Set high standard for myself and others.
9 Demand quality.
10 Am not highly motivated to succeed. (R)
11 Jump into things without thinking. (R)
12 Make rash decisions. (R)
13 Rush into things. (R)
14 Act without thinking. (R)
15 Avoid mistakes.
16 Choose my words with care.
17 Stick to my chosen path.
18 Like to act on a whim. (R)
19 Do crazy things. (R)
20 Often make last-minute plans. (R)
21 Keep my promises.
22 Tell the truth.
23 Break rules. (R)
24 Break my promises. (R)
25 Try to follow the rules.
26 Pay my bills on time.
27 Listen to my conscience.
28 Get other to do my duties. (R)
29 Do the opposite of what is asked. (R)
30 Misrepresent the facts. (R)
31 Like to tidy up.
32 Often forget to put things back in their proper place. (R)
33 Leave a mess in my room. (R)
34 Leave my belongings around. (R)
35 Like order.
36 Want everything to be "just right".
37 Love order and regularity.
38 Do things according to a plan.
39 Am not bothered by messy people. (R)
40 Am not bothered by disorder. (R)
41 Am always prepared.
42 Carry out my plans.
43 Waste my time. (R)
44 Have difficulty starting tasks. (R)
45 Get chores done right away.

46 Start tasks right away.
47 Get to work at once.
48 Find it difficult to get down to work. (R)
49 Need a push to get started. (R)
50 Postpone decisions. (R)
51 Complete tasks successfully.
52 Excel in what I do.
53 Handle tasks smoothly.
54 Know how to get things done.
55 Am sure of my ground.
56 Come up with good solutions.
57 Misjudge situations. (R)
58 Don't understand things. (R)
59 Have little to contribute. (R)
60 Don't see the consequences of things. (R)

Part 1: Study 3

HEXACO-60 (Ashton & Lee, 2009).

On the following pages, you will find a series of statements about you. Please read each statement and decide how much you agree or disagree with that statement. Then indicate your response using the following scale: 1 = strongly disagree; 2 = disagree; 3 = neutral (neither agree nor disagree); 4 = agree; 5 = strongly agree. Please answer every statement, even if you are not completely sure of your response. R = reverse scored.

1 I would be quite bored by a visit to an art gallery. (R)
2 I plan ahead and organize things, to avoid scrambling at the last minute.
3 I rarely hold a grudge, even against people who have badly wronged me.
4 I feel reasonably satisfied with myself overall.
5 I would feel afraid if I had to travel in bad weather conditions.
6 I wouldn't use flattery to get a raise or promotion at work, even if I thought it would succeed.
7 I'm interested in learning about the history and politics of other countries.
8 I often push myself very hard when trying to achieve a goal.
9 People sometimes tell me that I am too critical of others. (R)
10 I rarely express my opinions in group meetings. (R)
11 I sometimes can't help worrying about little things.
12 If I knew that I could never get caught, I would be willing to steal a million dollars.(R)
13 I would enjoy creating a work of art, such as a novel, a song, or a painting.
14 When working on something, I don't pay much attention to small details. (R)
15 When working on something, I don't pay much attention to small details. (R)
16 I prefer jobs that involve active social interaction to those that involve working alone.
17 When I suffer from a painful experience, I need someone to make me feel comfortable.

18 Having a lot of money is not especially important to me.
19 I think that paying attention to radical ideas is a waste of time. (R)
20 I make decisions based on the feeling of the moment rather than on careful thought. (R)
21 People think of me as someone who has a quick temper. (R)
22 On most days, I feel cheerful and optimistic.
23 I feel like crying when I see other people crying.
24 I think that I am entitled to more respect than the average person is. (R)
25 If I had the opportunity, I would like to attend a classical music concert.
26 When working, I sometimes have difficulties due to being disorganized. (R)
27 My attitude toward people who have treated me badly is "forgive and forget."
28 I feel that I am an unpopular person. (R)
29 When it comes to physical danger, I am very fearful.
30 If I want something from someone, I will laugh at that person's worst jokes. (R)
31 I've never really enjoyed looking through an encyclopedia. (R)
32 I do only the minimum amount of work needed to get by. (R)
33 I tend to be lenient in judging other people.
34 In social situations, I'm usually the one who makes the first move.
35 I worry a lot less than most people do. (R)
36 I would never accept a bribe, even if it were very large.
37 People have often told me that I have a good imagination.
38 I always try to be accurate in my work, even at the expense of time.
39 I am usually quite flexible in my opinions when people disagree with me.
40 The first thing that I always do in a new place is to make friends.
41 I can handle difficult situations without needing emotional support from anyone else. (R)
42 I would get a lot of pleasure from owning expensive luxury goods. (R)
43 I like people who have unconventional views.
44 I make a lot of mistakes because I don't think before I act. (R)
45 Most people tend to get angry more quickly than I do.
46 Most people are more upbeat and dynamic than I generally am. (R)
47 I feel strong emotions when someone close to me is going away for a long time.
48 I want people to know that I am an important person of high status. (R)
49 I don't think of myself as the artistic or creative type. (R)
50 People often call me a perfectionist.
51 Even when people make a lot of mistakes, I rarely say anything negative.
52 I sometimes feel that I am a worthless person. (R)
53 Even in an emergency I wouldn't feel like panicking. (R)
54 I wouldn't pretend to like someone just to get that person to do favors for me.
55 I find it boring to discuss philosophy. (R)
56 I prefer to do whatever comes to mind, rather than stick to a plan. (R)
57 When people tell me that I'm wrong, my first reaction is to argue with them. (R)
58 When I'm in a group of people, I'm often the one who speaks on behalf of the group.
59 I remain unemotional even in situations where most people get very sentimental. (R)
60 I'd be tempted to use counterfeit money, if I were sure I could get away with it. (R)

Versions of Revised Trait Boredom Scales
Part 1: Study 2

10	I often feel bored.
13b	I often do not know what I want to do.
17b	I often feel like there is nothing fun to do.
19	I often wish I were doing something more exciting.
22	I often feel like I am wasting time that would be better spent on something else.
24	I often feel like I want something to happen but I'm not sure what.
28	I often feel like I'm sitting around waiting for something to happen.
31	It is difficult for me to stay interested in what I'm doing.
34	When I am doing one thing I often wish that I were doing something else.

Part 1: Study 3 (Final Version)

10	I often feel bored.
13b	I often do not know what I want to do.
17b	I often feel like there is nothing fun to do.
22	I often feel like I am wasting time that would be better spent on something else.
28	I often feel like I'm sitting around waiting for something to happen.
31	It is difficult for me to stay interested in what I'm doing.
34	When I am doing one thing I often wish that I were doing something else.