# UNDERSTANDING THE RELATION BETWEEN BOREDOM AND ACHIEVEMENT IN POST-SECONDARY STUDENTS

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Abstract

Pekrun's (2006) control-value theory offers a comprehensive theoretical framework for understanding the causes and consequences of boredom in a learning context. One important aspect of this model is the relationship between boredom and academic achievement: Boredom and academic achievement are theorized to affect each other causally, with increased boredom leading to poorer academic achievement and poor academic achievement leading to increased boredom. Prior work on this model has conflated trait boredom, state boredom, and judgments of task boringness and has not examined the relationship between boredom and academic achievement using experimental designs. The present dissertation sought to better understand the relationship between boredom and achievement by, for the first time: distinguishing between trait boredom, state boredom, and judgments of task boringness; conducting experiments in the laboratory where extraneous variables could be better controlled; and using experimental manipulation for causal conclusions. Study 1 examined the naturally occurring relationship between state boredom and achievement (performance on a word list recall task) in the laboratory. Study 2 tested whether manipulating state boredom resulted in changes in word list recall, and Study 3 tested whether manipulating perceived word list recall resulted in changes in state boredom. State boredom and performance had a reciprocal relationship only for participants who memorized 'interesting' word lists and only after repeated trials (Study 1); trait boredom predicted performance but state boredom did not (Study 2); and manipulating perceptions of performance had no effect on state boredom but did affect participants' judgments of how boring the learning task was (Study 3). Thus, support for control-value theory is strongest when *boredom* is conceptualized as the boringness of a task or trait boredom rather than state boredom. Interventions to address boredom in the classroom can help target state boredom before it crystallizes into the more damaging forms of course-related and trait boredom. Guidelines for educators are offered. Future research work is proposed, most pressingly the need to replicate the current findings with more complex learning tasks.

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Understanding the Relation Between Boredom and Achievement in Post-Secondary Students

In the popular comic *Calvin and Hobbes*, entire story arcs revolve around Calvin's boredom in the classroom, and the anti-social or escapist lengths to which he will go to avoid this excruciating emotion. Calvin interrupts the teacher, spends hours watching the clock, and frequently slips into a longstanding daydream fantasy world in which he is courageous space explorer Spaceman Spiff. Research substantiates that boredom in school is not just a problem dreamed up by Bill Watterson, the creator of *Calvin and Hobbes*: 56% of post-secondary students report that half or most of their lectures are boring (Mann & Robinson, 2009), and post-secondary students asked to report their emotions immediately after being in class or studying report boredom 42% of the time (Pekrun, Goetz, Daniels, Stupinsky, & Perry, 2010).

**What Is 'Boredom'?**

Like Calvin, we all have a phenomenological understanding of boredom. The first known individuals to extensively discuss this experience were the 'Desert Fathers': Christian monks who went out into the desert to seek closeness with God (Healy, 1984). In their writings, they chronicled the phenomenon of *acedia*, which they defined as a spiritual dryness or aridity "culminating in a disgust" with the spiritual task at hand (Kuhn, 1976, p. 40). Many of these ancient descriptions of acedia read as if they could be happening today – perhaps even in the modern classroom. Take for instance this description of acedia written in the 4th Century by Cassian of Marseilles that would be an equally fitting description of Calvin at his desk:

> When this besieges the unhappy mind, it begets aversion from the place, boredom with one's cell and towards any work that may be done within the enclosure of our own lair, we become listless and inert. It will not suffer us to stay in our cell, or to attend to our reading...Finally one gazes anxiously here and there, and sighs that no brother of any

> description is to be seen approaching: one is for ever in and out of one's cell, gazing at the sun as though it were tarrying in its setting: one's mind is in an irrational confusion... (as cited in Healy, 1984, p. 16)

Drawing on decades of empirical research and theory, present day boredom scholars define the state of boredom as "the aversive experience of wanting, but being unable, to engage in satisfying activity" (Eastwood, Frischen, Fenske, & Smilek, 2012, p. 483). Although boredom is often seen as a minor irritation in popular culture, the existing research suggests that the state of boredom can have serious, negative consequences. Experimental research has shown that inducing participants into a state of boredom leads to increased hostility or aggression (van Tilburg & Igou, 2011) and increased eating after a full meal (Abramson & Stinson, 1977) relative to controls. Further probing the relationship between boredom and eating, Moynihan and colleagues (2015) conducted a diary study and two experiments. They found that reports of state boredom in the diary study predicted increased consumption of daily calories, specifically increased consumption of fats, carbohydrates, and proteins. In their experiments, they found that participants induced into a state of boredom reported an increased desire to snack and consumed more unhealthy snacks and 'exciting' healthy snacks (but not unexciting healthy snacks) compared to controls. Using a within-subjects experimental design, Havermans, Vancleef, Kalamatianos, and Nederkoorn (2015) found that participants were more likely to eat and also to administer electric shocks to themselves when bored. Finally, a study of clinically depressed hospital inpatients found that state boredom at time $t$-1 (controlling for suicidal ideation at time $t$-1) was the best predictor of suicidal ideation at time $t$ in these individuals, even when other state variables such as tension and sadness were held constant (Ben-Zeev, Young, & Depp, 2012).

Researchers have also examined the impact of the characteristic tendency to be bored (*trait boredom*). Trait boredom has been linked to a variety of emotional difficulties such as alexithymia (Eastwood, Cavaliere, Fahlman, & Eastwood, 2007), an absence of life meaning (Fahlman, Mercer, Gaskovski, Eastwood, & Eastwood, 2009), and depression (Goldberg, Eastwood, Laguardia, & Danckert, 2011; Mercer-Lynn, Hunter, & Eastwood, 2013). Trait boredom has also been associated with behavioural difficulties such as procrastination (Vodanovich & Rupp, 1999), poor job performance (Watt & Hargis, 2009), alcohol abuse (Carlson, Johnson, & Jacobs, 2010; Flory, Pytte, Hurd, Ferrell, & Manuck, 2011), substance abuse (Vodanovich & Watt, 2016), problem gambling (Mercer & Eastwood, 2010), and risky or poor driving behaviour (Furnham & Saipe, 1992; Witte & Donahue, 2000). In one hair-raising study, individuals who reported engaging in risky driving behaviour around trains such as trying to 'beat' the train across the tracks had significantly higher trait boredom scores than their more cautious counterparts (Witte & Donahue, 2000).

**The Control-Value Theory of Achievement Emotions**

Pekrun (2006)'s control-value theory of achievement emotions offers a comprehensive theoretical framework for understanding the causes and consequences of boredom in the classroom (Figure 1).

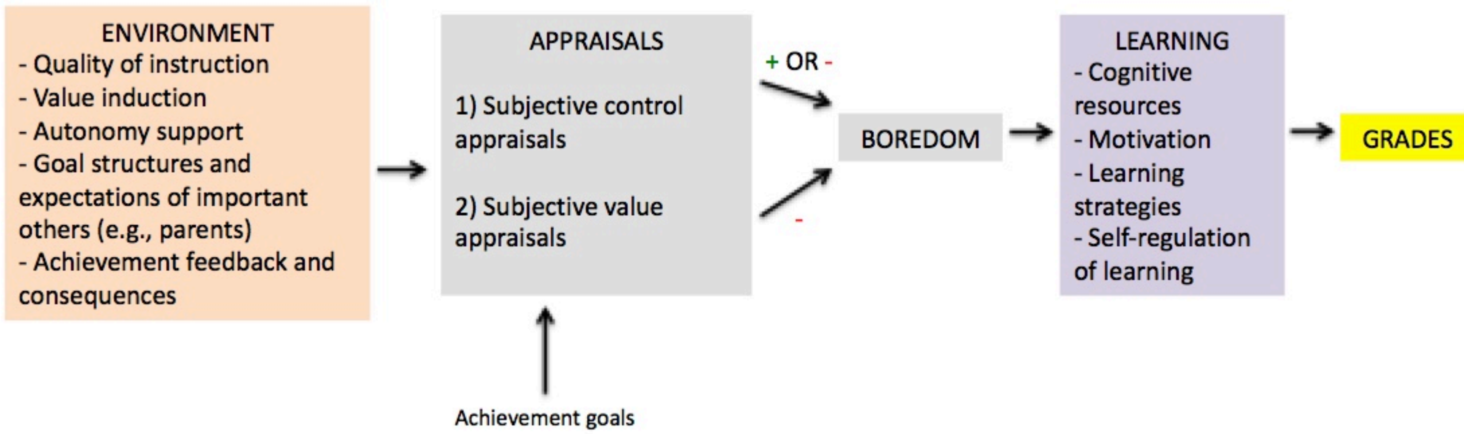


*Figure 1*. Pekrun's (2006) control-value theory for boredom

Appraisals are the linchpin of Pekrun's (2006) theory, and are theorized to give rise to achievement emotions such as boredom. The theory outlines two types of appraisals: subjective control appraisals and subjective value appraisals. *Subjective control appraisals* primarily concern action-control expectancies, which reflect the degree to which one feels one has control over what one needs to do (e.g., if I want to, I can study), and action-outcome expectancies, which reflect the degree to which one feels that one's actions will result in the desired outcome (e.g., if I study, I will do well on the test). *Subjective value appraisals* concern how valuable one perceives the achievement activity (e.g., studying) or achievement outcome (e.g., test grade) to be. Boredom is presumed to occur when the task's value is deemed low *and* one's control over the situation is perceived as low (demands outstrip individual capabilities) or when one's control over the situation is perceived as high (the situation is not sufficiently challenging). In post-secondary settings, this "high control" option is not usually examined because it is presumed that the university situation is sufficiently challenging for almost all students (e.g., Pekrun, Hall, Goetz, & Perry, 2014).

Environmental factors that are theorized to influence subjective control and value appraisals include elements of the classroom (e.g., how enthusiastic the instructor is, how well the instructor supports students' independence) as well as non-classroom elements, including the demands of important others such as parents (Pekrun, 2006). As well, although not strictly part of the environment, achievement goals (i.e., mastery and performance goals) are viewed as focusing students' attention on learning outcomes (mastery goals) or outcomes (performance goals) as they form these subjective appraisals (Pekrun, Elliot, & Maier, 2009). Since the environment influences appraisals, and appraisals result in achievement emotions, appraisals are viewed as mediating the effect of the environment on achievement emotions (Pekrun, 2006).

Pekrun's (2006) control-value theory also specifies the consequences of these achievement emotions. Boredom is viewed as leading to impaired learning due to reduced cognitive resources (when bored, the student is attending to the boringness of the learning task and has fewer cognitive resources available for the learning task itself), decreased motivation to learn, the use of shallow learning strategies, and reliance on external pressure rather than self-regulation of learning. Consequently, boredom is theorized to result in poor academic achievement.

As a final note, although the model's causal relationships are largely described as unidirectional, Pekrun (2006) acknowledges that these causal relationships are reciprocal. For instance, frequent experiences of poor achievement are likely to enhance negative achievement emotions: thus, boredom is theorized to lead to poor academic achievement, and also poor academic achievement is theorized to lead to increased boredom (Pekrun, 2006; Pekrun et al., 2014). In fact, a close examination of Pekrun's model reveals that the reciprocal relationship between emotions and achievement is implicitly built into the model: Academic emotions are seen as influencing achievement, and the feedback and consequences of achievement are listed as a feature of the academic environment which in turn influences achievement emotions.

**Empirical evidence for the Control-Value Theory of Achievement Emotions.** Since Pekrun's (2006) articulation of his theory, empirical work has tested various aspects of the model pertaining to boredom. A small body of literature has examined the impact of the environment on students' boredom (Daschmann, Goetz, & Stupnisky, 2011 and 2014; Frenzel, Pekrun, & Goetz, 2007; Goetz, Pekrun, Hall & Haag, 2006; Goetz, Lüdtke, Nett, Keller, & Lipnevich, 2013; Tze, Klassen, & Daniels, 2014), including recent work examining how appraisals mediate this effect (Luo, Ng, & Aye, 2016). Factors such as monotonous, poor or punitive teaching (Daschmann et al., 2011 and 2014; Frenzel et al., 2007), and a lack of positive reinforcement of achievement from the family (Goetz et al., 2006) have been identified as predictors of boredom. Luo et al. (2016) demonstrated that parental expectancy and involvement positively predicted math control and value appraisals, leading in turn to decreased boredom in relation to math.

A larger body of work has examined the relationships among achievement goals, appraisals, boredom, learning strategies, and achievement. Pekrun, Elliot, and Maier (2006) assessed achievement goals early in the semester and boredom at the end of the semester. They found that mastery-approach goals, which focus attention on gaining expertise in performing an activity, were a negative predictor of boredom. Extending this finding, Pekrun et al. (2009) and Daniels et al. (2009) found that boredom mediated the link between mastery-approach goals and academic performance: Mastery goals resulted in reduced boredom, and reduced boredom resulted in higher course grades. Research has also addressed the appraisal-boredom link. Across studies, control and value appraisals have been negatively related to boredom (Goetz, Cronjaeger, Frenzel, Lüdtke, & Hall, 2010; Goetz et al., 2006; Kim, Park, & Cozart, 2014; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011). A recent study addressing the rarely explored 'under-challenged' dimension (high control appraisal) has substantiated that boredom can result from either feeling under-challenged or over-challenged (Preckel, Goetz, and Frenzel, 2010). As well, the sequence of appraisals leading to boredom leading to achievement has been validated (Pekrun et al., 2010). In this article, a longitudinal study showed that appraisals of control and value negatively predicted boredom, which in turn negatively predicted final course grade.

Researchers have outlined the negative effects of boredom on learning (Ahmed, van der Werf, Kuyper, & Minnaert, 2013; Kim et al., 2014; Pekrun et al., 2010; Pekrun et al., 2011; Pekrun, Goetz, Titz, & Perry, 2002; Perry, Hladkyj, Pekrun, & Pelletier, 2001). Perry et al. (2001) found that boredom was negatively related to the use of elaboration to remember material, although they found that boredom was positively related to intrinsic motivation to learn. Pekrun et al. (2002, 2010, & 2011) found that boredom was negatively related to intrinsic motivation, the use of elaboration to remember material, and self-regulation of learning. Ahmed et al. (2013) found that boredom predicted less use of learning strategies in general, as boredom negatively predicted the initial use of both shallow and meta-cognitive strategies. Kim et al. (2014) found that boredom was negatively correlated with the use of learning strategies and self-regulation of learning. Although not explicitly conducted within the control-value theory framework, Baker, D'Mello, Rodrigo and Graesser (2010)'s study on interactive learning environments highlighted the devastating impact of boredom on learning outcomes. The authors found that boredom was the most persistent state experienced by participants, and was observed on average 4 to 6% of the time while individuals were engaged with the interactive learning environments. Furthermore, state boredom was associated with gaming the learning environment.

Finally, the negative effects of boredom on academic performance have been documented (Ahmed et al., 2013; Pekrun et al., 2010; Pekrun et al., 2011; Ruthig, Perry, Hladkyj, Hall, &

Chipperfield, 2008). Perry et al. (2001) found that boredom was negatively correlated with university students' course grades. Ruthig et al. (2008) found that boredom in university students who felt they had high control over their academics negatively predicted final course grade and the number of courses students retained during the academic year. Pekrun et al. (2010) found that boredom was negatively correlated with university students' grades. Examining the trajectory of emotions and self-regulatory strategies in Grade 7 students in a mathematics class over the course of a year, Ahmed et al. (2013) found that initial boredom predicted lower course grades, and an increase in boredom predicted a decline in achievement. In a study testing Pekrun's (2006) claim of reciprocal causation, Pekrun et al. (2014) showed that boredom at time point $t$-1 negatively affected university students' grades at time $t$, and that grades at time $t$ had a negative effect on boredom at time $t + 1$.

**Research gaps and opportunities.** As this review highlights, various aspects of Pekrun's (2006) model have been empirically supported. Nevertheless, some gaps in this area of research remain. First, the aforementioned studies were all field studies conducted in the classroom, with the exception of the Baker et al. study (2010), which observed students as they completed a learning task. The field study design has excellent ecological validity; however, unlike an experimental design that manipulates variables, field studies do not permit definitive causal conclusions.

Second, aside from Pekrun et al.'s (2014) investigation of the reciprocal relationship between boredom and achievement, there has been a lack of testing of reciprocal causation. Testing only one direction of causation may obscure important feedback loops and result in a misrepresentative picture.

Third, the research has not attended to the differences between trait boredom (the characteristic tendency to be bored), state boredom (boredom in the moment), and judgments of task boringness. This omission is worrying, as these three types of boredom are theoretically distinct. Empirical research has also demonstrated that trait and state boredom are empirically distinct (Fahlman, Mercer-Lynn, Flora, & Eastwood, 2011; Vodanovich, 2003). However, these three ‘types’ of boredom are often conflated in academic boredom research. Frequently, when studying the variability of boredom over time (i.e., state boredom), researchers assess ‘course-related boredom’ (boredom in relation to an academic course; e.g., Pekrun et al., 2014). As Pekrun and colleagues (2002) have noted, course-related emotions are not strictly state emotions but rather lie somewhere in between state and trait. In many other cases, what is deemed “state boredom” is not a true assessment of boredom in the moment. For example, researchers using an experience-sampling methodology asked participants to report their state boredom using the item “how much boredom are you experiencing during this class?” (Bieg, Goetz, & Hubbard, 2013, p. 104). This question has students average across moments to report their general judgment of how bored they were during the class, rather than assessing how bored students are at the time at which the question is posed.

Lastly, Pekrun’s (2006) program of research has not thoroughly investigated personality antecedents of boredom, achievement, or the boredom-achievement relationship, likely due to the confounding of trait, state and retrospective judgments discussed above. Pekrun’s model (2006) makes a brief mention of personality antecedents, but does not specifically outline important personality variables to consider. One intriguing possibility is the personality variable conscientiousness, which assesses one’s organization, cautiousness, drive for perfection, and persistence (Lee & Ashton, 2004). Conscientiousness is reliably associated with post-secondary academic performance in large-scale meta-analysis studies (O'Connor & Paunonen, 2007; Richardson, Abraham, & Bond, 2012). O'Connor and Paunonen note that the relationship between conscientiousness and academic outcome is quite variable across studies, suggesting that other variables may be intervening. Taken another way, this suggests that conscientiousness may moderate the association between another variable (say, state boredom) and academic achievement.

**The Present Program of Study**

To address these research gaps, the following program of study consisting of three studies was carried out. Study 1 examined the naturally occurring relationship between state boredom and achievement (operationalized as recall of a word list) in the laboratory during a series of learning tasks; Study 2 tested whether manipulating state boredom resulted in changes in performance; and Study 3 tested whether manipulating perceived performance resulted in changes in state boredom. All studies investigated whether key personality variables (particularly trait boredom and conscientiousness) influenced the observed relationships between state boredom and achievement, or had an effect on the outcome variable in question. Studies 2 and 3 also measured participants' retrospective judgments of the objective boringness of the learning task. Thus, unlike the previous research reviewed, the present program of study 1) was conducted in the laboratory, allowing for extraneous variables to be better controlled and, when an experimental manipulation was employed, for causal conclusions to be drawn; 2) examined the causal relationship between state boredom and achievement, and in particular whether this relationship was reciprocal; and 3) distinguished between and simultaneously assessed trait boredom, state boredom, and retrospective judgments of the objective boringness of the learning task.

The following hypotheses were tested:

*H1*: The naturally occurring relationship between state boredom and achievement will consist of a positive feedback loop, wherein an increase in state boredom predicts a decrease in achievement, and a decrease in achievement predicts an increase in state boredom (Study 1).

*H2*: Experimentally manipulating state boredom will cause changes in achievement, such that individuals who are induced into a state of boredom will perform more poorly than individuals who are induced into a state of non-boredom (Study 2).

*H3*: Experimentally manipulating perceived achievement on a learning task will cause changes in state boredom (Study 3), such that:

*H3a*: Individuals who receive false negative feedback will report higher levels of state boredom after the feedback than individuals who receive no feedback or false positive feedback.

*H3b*: Individuals who receive false positive feedback will report lower levels of state boredom after the feedback than individuals who receive no feedback or false negative feedback.

*H4*: Trait variables will affect participants' state boredom and achievement (Studies 1-3), such that:

*H4a*: There will be a main effect of trait boredom: Participants who score highly on trait boredom measures will report more state boredom and will exhibit worse performance than participants who do not score highly on trait boredom measures.

*H4b*: Conscientiousness will moderate the relationship between state boredom and achievement: The relationship between state boredom and achievement will be stronger for individuals with lower levels of conscientiousness compared to individuals with higher levels of conscientiousness.

*H5*: Trait boredom, state boredom, and objective judgments about the boringness of the learning task will not have the same impact on the dependent variable in question.

## Study 1

### Method

**Participants.** All participants were York University students and received course credit for participation. Participants (*N* = 498) had an average age of 19.64 years (*SD* = 3.04, five number summary (minimum, 25th percentile, 50th percentile, 75th percentile, maximum): 17, 18, 19, 20, 38). The total sample contained 103 individuals who identified their gender as male (20.68%); 391 individuals who identified their gender as female (78.51%); 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 (0.80%). Participants identified with the following ethnicities: 23.90% South Asian, 21.89% White/Caucasian, 12.05% Arab/West Asian, 11.65% Black, 7.43% multiracial, 6.02% Filipino, 5.02% Chinese, 4.02% South East Asian, 3.21% Latin American, 3.61% Other, and 0.40% Korean. Four individuals (0.80%) indicated that they preferred not to report their ethnicity.

**Procedure.** See Appendix A for a diagram outlining this procedure. After providing informed consent, participants reported demographic information. Then, they were presented with a word list of 16 nouns and were asked to memorize the words. Participants had 60 seconds to memorize the list. After a 30-second delay, they were asked to write down all of the words that they remembered. This process was repeated four additional times (i.e., participants memorized and recalled five different word lists in sequence). Participants were randomly assigned to memorize and recall either a fixed sequence of five ‘interesting’ word lists (comprised of nouns high in imagery, concreteness, and meaningfulness; see Appendix B) or a fixed sequence of five ‘uninteresting’ word lists (comprised of nouns low in imagery, concreteness, and meaningfulness). Before and after each administration of the word list, participants were asked to rate their boredom and physiological arousal (i.e., participants rated their state boredom and arousal six times). Participants ended by completing the following trait questionnaires: 1) the Trait Boredom Scale, 2) the Boredom Proneness Scale (Farmer & Sundberg, 1986), 3) the Boredom Susceptibility Scale (Zuckerman, 2007), 4) the Achievement Emotions Questionnaire - class-related and learning-related boredom scales (Pekrun et al., 2011), 5) the Achievement Goal Questionnaire – Revised (Elliot & Murayama, 2008), and 6) the HEXACO-60 personality inventory (Ashton & Lee, 2009).[1] After these trait questionnaires were completed, participants were provided with a debriefing statement outlining the purpose of the study and thanking them for their participation, and completed the debriefing consent form.

**Measures.**

***State boredom.*** Four items from the 28 item Multidimensional State Boredom Scale (Fahlman et al., 2011) were administered to quickly assess state boredom (the experience of boredom in the moment), specifically: “I feel bored, “I am wasting time that would be better spent on something else,” “I am easily distracted,” and “Time is passing by slower than usual.” These items were selected because they had been previously identified as discriminating well between bored and non-bored individuals and as a group they represented the three state boredom subscales (disengagement, attention problems, and time perception) that contained items discriminating well between bored and non-bored individuals (Hunter, Dyer, Cribbie, & Eastwood, 2015). Participants responded using a seven-point Likert-type scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). See Tables 1 and 3 for each measure’s mean, standard

[1] Only the trait measures analyzed in the present project are described here.

deviation, range of scores, and reliability estimate in the present sample. See Appendix C for all study measures administered, with the exception of the Achievement Emotions Questionnaire as this scale has not been made publicly available by the researchers.

***Physiological arousal.*** Two researcher-created items were administered to assess physiological arousal. Participants responded using a seven-point Likert-type scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*).

***Boredom Proneness Scale (BPS).*** The BPS (Farmer & Sundberg, 1986) is a 28-item scale that measures an individual's tendency to experience boredom. The present study used a seven-point Likert-type version of the scale (Vodanovich & Kass, 1990) ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*) that has been reported to have an internal consistency coefficient ranging from .79 to .91 (Vodanovich, 2003; Vodanovich & Watt, 2016).

***Trait Boredom Scale (TBS).*** The TBS is a researcher-created (Dr. John Eastwood) 18-item scale that measures an individual's tendency to frequently experience state boredom. It is based primarily on the extensively validated Multidimensional State Boredom Scale (Fahlman et al., 2011). Participants responded using a seven-point Likert-type scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*).

***Boredom Susceptibility Scale (ZBS).*** The ZBS (Zuckerman, 2007) is a ten-item scale designed to measure how easily an individual experiences boredom. The scale has a forced-choice response format: For each item, two response options are provided with one indicative of boredom susceptibility. In a review of 21 studies reporting reliability coefficients for the ZBS, Deditius-Island and Caruso (2002) found that the scale had a mean coefficient alpha of .62 and a median coefficient alpha of .61.

***Achievement Emotions Questionnaire (AEQ).*** The AEQ (Pekrun et al., 2011) is a 24-scale measure that measures nine different achievement emotions in some or all of the three settings of studying, during class, and writing a test. In the current study, the two boredom scales were used; these assess boredom while studying (e.g., "The material bores me to death") and in class (e.g., "I get bored"). Each subscale has 11 items and participants responded using a five-point Likert-type scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). The scale's authors report coefficient alphas of .93 for the class-related boredom scale and .92 for the learning-related boredom scale (Pekrun et al., 2011).

***Achievement Goal Questionnaire – Revised (AGQ-R).*** The AGQ-R (Elliot & Murayama, 2008) is a 12-item measure comprised of four subscales assessing the extent to which individuals want to understand the material (mastery approach goals) and avoid learning the material poorly (mastery avoidance goals), and the extent to which individuals want to achieve highly (performance approach goals) and avoid poor achievement (performance avoidance goals). Each subscale consists of three items. Participants responded on a Likert-type scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). The scale's authors report coefficient alphas of .84 (mastery approach), .88 (mastery avoidance), .92 (performance approach), and .94 (performance avoidance; Elliot & Murayama, 2008).

***HEXACO-60.*** The HEXACO-60 (Ashton & Lee, 2009) is a 60-item measure of six major dimensions of personality (Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness and Openness to Experience). Participants responded to items using a five-point Likert-type scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). Internal consistency statistics for the six subscales ranged from .77 to .80 in a college sample and .73 to .80 in a community sample in the article debuting the scale (Ashton & Lee, 2009).

**Materials.**

***Word lists.*** Friendly's (1996) word generator was used to create ten word lists of 16 nouns each. Friendly's generator selects from 925 nouns from the Paivio, Yuille, and Madigan (1968) word pool that have been rated for word frequency in printed text (Kucera-Francis word counts), imagery, concreteness, and meaningfulness. All words were selected to fall in the middle fifty percent (i.e., between the 25$^{th}$ and 75$^{th}$ percentile) on number of syllables and word frequency. Two sets of lists were created: one five-list set of 'uninteresting word lists' comprised of nouns in the bottom 50$^{th}$ percentile on imagery, concreteness, and meaningfulness, and one five-list set of 'interesting word lists' comprised of nouns in the top 50$^{th}$ percentile on imagery, concreteness, and meaningfulness. The words were selected on this basis given prior research findings that concreteness, imagery, and meaningfulness tend to evoke interest (Hidi, 2001; Sadoski, Goetz, & Rodriguez, 2000). More broadly, two different word lists were used to ensure a breadth of learning situations that varied on interest; there were no a priori hypotheses about the effect of the word list on boredom or achievement.

**Data analysis plan.** Using Pekrun et al.'s (2014) study as a template, structural equation modeling (SEM) was used to estimate an autoregressive cross-lagged path model (the 'reciprocal effects model'; see Figure 2). Boredom and word list performance were modeled in alternating, sequential order, and the autoregressive effects of boredom and word list performance were included. Thus, the model included five paths from boredom to subsequent performance, five paths from performance to subsequent boredom, five autoregressive boredom paths, and four autoregressive performance paths. The six boredom variables were modeled as latent variables whereas the five performance variables were modeled as manifest variables. The four state boredom scale items were used as indicators for each of the six latent state boredom variables.

Correlations between residuals for the boredom items across time points were included to ensure that systematic measurement error did not confound the results.

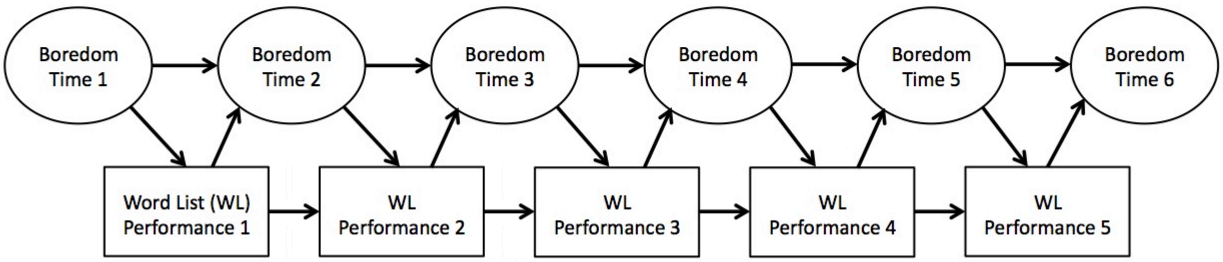


*Figure 2*. Diagram of reciprocal effects model.

Next, the model was expanded to include the personality variables of trait boredom and conscientiousness as predictors of state boredom and performance. Trait boredom was modeled as a latent variable with the trait boredom scales that were moderately to strongly correlated with another (i.e., the BPS, TBS, and the two AEQ scales) as indicators. Conscientiousness was also modeled as a latent variable with the ten HEXACO Conscientiousness subscale items as indicators.

Demographic characteristics (e.g., age, gender, ethnicity) were surveyed for the purposes of establishing the sample's generalizability. There was no a priori plan to analyze for any demographic differences. Demographic-based analyses can be illuminative, but require careful focus and exploration. Given the brief questions asked about demographics, the present study did not have the information necessary for this investigation. As well, this dissertation is designed to support the development of pedagogical strategies. Post-secondary educators teach students from a variety of social identities, and pedagogical strategies cannot be formulated with reference to specific groups (for a similar discussion in regards to the provision of psychotherapy, see Brown, 2008).

**Results**

**Descriptive statistics for trait variables.** Table 1 displays the descriptive statistics for all trait variables.

Table 1

*Descriptive Statistics for Trait Variables*

| | *N* | *M* | *SD* | Possible Range | Observed Range | Ω |
|---|---|---|---|---|---|---|
| BPS | 453 | 104.08 | 16.87 | 28 – 196 | 51 – 152 | .80 |
| TBS | 465 | 71.83 | 18.96 | 18 – 126 | 21 – 126 | .92 |
| ZBS | 494 | 2.36 | 1.82 | 0 – 10 | 0 – 9 | .59 |
| AEQ Class | 490 | 35.43 | 10.04 | 11 – 55 | 11 – 55 | .93 |
| AEQ Learn | 485 | 31.22 | 10.22 | 11 – 55 | 11 – 55 | .94 |
| AGQ MastApp | 496 | 12.79 | 2.16 | 3 – 15 | 3 – 15 | .81 |
| AGQ MastAvoid | 496 | 10.90 | 2.99 | 3 – 15 | 3 – 15 | .81 |
| AGQ PerfApp | 493 | 11.99 | 2.75 | 3 – 15 | 3 – 15 | .86 |
| AGQ PerfAvoid | 498 | 11.91 | 3.28 | 3 – 15 | 3 – 15 | .92 |
| Honesty | 488 | 33.46 | 5.73 | 10 – 50 | 15 – 50 | .70 |
| Emotionality | 485 | 35.29 | 5.58 | 10 – 50 | 20 – 50 | .72 |
| Extraversion | 485 | 31.72 | 6.30 | 10 – 50 | 10 – 48 | .80 |
| Agreeableness | 484 | 31.48 | 5.75 | 10 – 50 | 14 – 50 | .74 |
| Conscientiousness | 482 | 35.14 | 5.85 | 10 – 50 | 16 – 50 | .78 |
| Openness | 481 | 32.06 | 6.17 | 10 – 50 | 16 – 48 | .70 |

*Note*. Ω = McDonald's (1999) coefficient omega reliability estimate. BPS = Boredom Proneness Scale; TBS = Trait Boredom Scale, ZBS = Boredom Susceptibility Scale; AEQ Class = Academic Emotions Questionnaire Class-Related Boredom Subscale; AEQ Learn = Academic Emotions Questionnaire Learning-Related Boredom Subscale; AGQ MastApp = Achievement Goals Questionnaire Mastery Approach Subscale; AGQ MastAvoid = Achievement Goals Questionnaire Mastery Avoidance Subscale; AGQ PerfApp = Achievement Goals Questionnaire Performance Approach Subscale; AGQ PerfAvoid = Achievement Goals Questionnaire Performance Avoidance Subscale; Honesty = HEXACO Honesty-Humility Subscale; Emotionality = HEXACO Emotionality Subscale; Extraversion = HEXACO Extraversion Subscale; Agreeableness = HEXACO Agreeableness Subscale; Conscientiousness = HEXACO Conscientiousness Subscale; Openness = HEXACO Openness to Experience Subscale.

**Correlations among trait variables.** Scatterplots between all variable pairs indicated no evidence of curvilinearity. Kernel density plots of each variable showed that all variables were approximately normally distributed, with the exception of the ZBS and the four Achievement Goal Questionnaire scales. The ZBS was positively skewed, with most respondents reporting lower levels of boredom susceptibility. The Mastery Approach, Mastery Avoidance, Performance Approach, and Performance Avoidance scales from the AGQ were all negatively skewed, with most participants reporting higher levels of these goals.

Table 2

*Correlations Among Trait Variables*

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. |
|---|---|---|---|---|---|---|---|---|
| 1. BPS | 1 | | | | | | | |
| 2. TBS | .78* | 1 | | | | | | |
| 3. ZBS | .33* | .32* | 1 | | | | | |
| 4. AEQ Class | .46* | .53* | .29* | 1 | | | | |
| 5. AEQ Learn | .61* | .63* | .25* | .62* | 1 | | | |
| 6. AGQ MastApp | -.20* | -.09 | -.10* | -.14* | -.15* | 1 | | |
| 7. AGQ MastAvoid | -.09 | -.04 | -.01 | -.11* | -.06 | .40* | 1 | |
| 8. AGQ PerfApp | .00 | .04 | .07 | .04 | -.02 | .32* | .23* | 1 |
| 9. AGQ PerfAvoid | .08 | .15* | .10* | .12* | .10* | .21* | .25* | .47* |
| 10. Honesty | -.28* | -.18* | -.24* | -.19* | -.18* | .10* | .02 | -.18* |
| 11. Emotionality | .08 | .19* | -.21* | .15* | .17* | .16* | .05 | .09 |
| 12. Extraversion | -.42* | -.38* | -.01 | -.20* | -.25* | .12* | .05 | .19* |
| 13. Agreeableness | -.28* | -.23* | -.25* | -.20* | -.17* | .07 | .05 | -.03 |
| 14. Conscientiousness | -.53* | -.38* | -.20* | -.24* | -.38* | .32* | .11* | .18* |
| 15. Openness | -.22* | -.10* | -.01 | -.13* | -.16* | .11* | .04 | -.05 |

| | 9. | 10. | 11. | 12. | 13. | 14. | 15. |
|---|---|---|---|---|---|---|---|
| 9. AGQ PerfAvoid | 1 | | | | | | |
| 10. Honesty | -.15* | 1 | | | | | |
| 11. Emotionality | .15* | -.02 | 1 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12. Extraversion | -.02 | -.06 | -.10* | 1 | | | |
| 13. Agreeableness | -.06 | .25* | -.08* | .15* | 1 | | |
| 14. Conscientiousness | .03 | .26* | .11* | .14* | .09 | 1 | |
| 15. Openness | .05 | .13* | -.03 | .09* | .02 | .13* | 1 |

*Note*. *N* ranged from 425 to 498.

* $p < .05$.

The trait boredom scales were moderately to strongly positively correlated ($r = .32$ to .78). Consistent with prior research (Mercer-Lynn et al., 2011), the BPS and ZBS, both of which purport to assess a general tendency to be bored, were not highly correlated ($r = .33$). The BPS was more highly correlated with the two scales assessing academic boredom (AEQ Class and AEQ Learn; $r = .46$ and .61). These two academic boredom scales were only moderately correlated ($r = .62$), substantiating that they assess different constructs.

The trait boredom scales showed similar relationships with the other trait variables. In general, trait boredom was negatively correlated with mastery approach goals, being humble and honest, extraversion, agreeableness, conscientiousness, and openness to experience and was positively correlated with performance avoidance goals.

**Descriptive statistics for state variables.** Table 3 displays the descriptive statistics for all state variables.

Table 3

*Descriptive Statistics for State Variables*

| | *N* | *M* | *SD* | Possible Range | Observed Range | Ω |
|---|---|---|---|---|---|---|
| State Boredom | | | | | | |
| Time 1 | 488 | 14.46 | 3.54 | 4 – 28 | 4 – 25 | .47 |
| Time 2 | 487 | 14.39 | 4.13 | 4 – 28 | 4 – 26 | .71 |
| Time 3 | 486 | 15.17 | 4.57 | 4 – 28 | 4 – 28 | .77 |
| Time 4 | 487 | 16.15 | 5.02 | 4 – 28 | 4 – 28 | .81 |
| Time 5 | 487 | 16.64 | 5.31 | 4 – 28 | 4 – 28 | .81 |
| Time 6 | 483 | 17.51 | 5.60 | 4 – 28 | 4 – 28 | .84 |
| State Arousal | | | | | | |
| Time 1 | 491 | 9.27 | 2.35 | 2 – 14 | 2 – 14 | .70 |
| Time 2 | 493 | 9.22 | 2.48 | 2 – 14 | 2 – 14 | .78 |
| Time 3 | 489 | 9.11 | 2.50 | 2 – 14 | 2 – 14 | .81 |
| Time 4 | 493 | 8.70 | 2.66 | 2 – 14 | 2 – 14 | .82 |
| Time 5 | 493 | 8.53 | 2.82 | 2 – 14 | 2 – 14 | .83 |
| Time 6 | 495 | 8.18 | 2.95 | 2 – 14 | 2 – 14 | .85 |
| Performance | | | | | | |
| Word List 1 | 498 | 7.66 | 2.51 | 0 – 16 | 0 – 16 | n/a |
| Word List 2 | 497 | 7.66 | 2.58 | 0 – 16 | 2 – 16 | n/a |
| Word List 3 | 498 | 7.08 | 2.91 | 0 – 16 | 0 – 16 | n/a |
| Word List 4 | 497 | 7.70 | 3.27 | 0 – 16 | 0 – 16 | n/a |
| Word List 5 | 494 | 7.05 | 2.82 | 0 – 16 | 1 – 16 | n/a |

**Correlations among state variables.** Scatterplots for each variable pair indicated no evidence of curvilinearity. Kernel density plots of each variable showed that all variables were approximately normally distributed. Table 4 displays the correlations among the state variables.

Table 4

*Correlations Among State Variables*

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. |
|---|---|---|---|---|---|---|---|---|
| 1. Boredom Time 1 | 1 | | | | | | | |
| 2. Boredom Time 2 | .75* | 1 | | | | | | |
| 3. Boredom Time 3 | .66* | .87* | 1 | | | | | |
| 4. Boredom Time 4 | .61* | .79* | .89* | 1 | | | | |
| 5. Boredom Time 5 | .57* | .73* | .82* | .87* | 1 | | | |
| 6. Boredom Time 6 | .55* | .70* | .78* | .85* | .92* | 1 | | |
| 7. Arousal Time 1 | -.22* | -.22* | -.21* | -.19* | -.19* | -.18* | 1 | |
| 8. Arousal Time 2 | -.18* | -.33* | -.33* | -.33* | -.28* | -.26* | .80* | 1 |
| 9. Arousal Time 3 | -.22* | -.36* | -.41* | -.41* | -.36* | -.33* | .68* | .84* |
| 10. Arousal Time 4 | -.25* | -.43* | -.47* | -.49* | -.45* | -.44* | .57* | .71* |
| 11. Arousal Time 5 | -.23* | -.38* | -.42* | -.47* | -.50* | -.47* | .55* | .66* |
| 12. Arousal Time 6 | -.26* | -.41* | -.47* | -.49* | -.54* | -.54* | .49* | .60* |
| 13. WL 1 Performance | -.07 | -.19* | -.19* | -.18* | -.15* | -.13* | .00 | .11* |
| 14. WL 2 Performance | -.05 | -.11* | -.23* | -.22* | -.18* | -.18* | -.06 | -.01 |
| 15. WL 3 Performance | -.11* | -.18* | -.23* | -.34* | -.29* | -.27* | .02 | .04 |
| 16. WL 4 Performance | -.12* | -.17* | -.21* | -.24* | -.30* | -.25* | .02 | .03 |
| 17. WL 5 Performance | -.15* | -.24* | -.29* | -.34* | -.35* | -.39* | .00 | .05 |

| | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. |
|---|---|---|---|---|---|---|---|---|---|
| 9. Arousal Time 3 | 1 | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 10. Arousal Time 4 | .81* | 1 | | | | | | | |
| 11. Arousal Time 5 | .75* | .88* | 1 | | | | | | |
| 12. Arousal Time 6 | .69* | .81* | .88* | 1 | | | | | |
| 13. WL 1 Performance | .09* | .10* | .05 | .05 | 1 | | | | |
| 14. WL 2 Performance | .11* | .10* | .05 | .06 | .51* | 1 | | | |
| 15. WL 3 Performance | .07 | .18* | .12* | .13* | .42* | .54* | 1 | | |
| 16. WL 4 Performance | .07 | .15* | .18* | .15* | .44* | .47* | .60* | 1 | |
| 17. WL 5 Performance | .13* | .19* | .17* | .24* | .42* | .51* | .56* | .63* | 1 |

*Note*. *N* ranged from 471 to 498. WL 1 Performance = number of words recalled from Word List 1; WL 2 Performance = number of words recalled from Word List 2; WL 3 Performance = number of words recalled from Word List 3; WL 4 Performance = number of words recalled from Word List 4; WL 5 Performance = number of words recalled from Word List 5.

* $p < .05$.

State boredom was highly positively correlated across all time points ($r$ = .55 to .92), with the strongest correlations between adjacent time points ($r$ = .75 to .92). The same was true for arousal ($r$ across all time points = .49 to .88, $r$ between adjacent time points = .81 to .88). A similar pattern was observed for word list performance, with word list performance moderately correlated across all time points ($r$ = .42 to .63) and the strongest correlations observed between adjacent time points ($r$ = .51 to .63). At each time point, state boredom was negatively associated with physiological arousal. State boredom was consistently negatively associated with subsequent word list performance whereas state arousal was not.

**State boredom and performance over time.** To visually explore the data, the means of state boredom and word list performance for each word list group were plotted over time. Tables

5 and 6 display the means and standard deviations of state boredom and word recall for each word list group over time, and Figures 3 and 4 display this information visually. Boredom increased over time for both word list groups. Performance remained steady for individuals who memorized interesting word lists, whereas individuals who memorized uninteresting word lists showed performance decrements over the learning trials. There was larger variation within groups than between groups.

Table 5

*State Boredom Means and Standard Deviations by Word List Group Over Time*

| Time Point | Word List Group | |
|---|---|---|
| | Uninteresting Word List Group *M (SD)* | Interesting Word List Group *M (SD)* |
| 1 | 14.66 (3.68) | 14.27 (3.39) |
| 2 | 14.49 (4.34) | 14.30 (3.90) |
| 3 | 15.45 (4.77) | 14.89 (4.35) |
| 4 | 16.59 (5.13) | 15.73 (4.88) |
| 5 | 17.34 (5.21) | 15.95 (5.32) |
| 6 | 17.95 (5.54) | 17.06 (5.63) |

*Note*. *N* ranged from 241 to 244 for the uninteresting word list group, and from 239 to 246 for the interesting word list group.

Table 6

*Word List Recall by Word List Group Over Time*

| Time Point | Word List Group | |
|---|---|---|
| | Uninteresting Word List Group *M (SD)* | Interesting Word List Group *M (SD)* |
| 1 | 7.29 (2.32) | 8.04 (2.64) |
| 2 | 7.16 (2.43) | 8.17 (2.63) |
| 3 | 6.18 (2.76) | 7.97 (2.79) |
| 4 | 6.13 (2.67) | 9.28 (3.05) |
| 5 | 6.38 (2.59) | 7.71 (2.89) |

*Note*. *N* ranged from 246 to 249 for the uninteresting word list group, and from 248 to 249 for the interesting word list group.

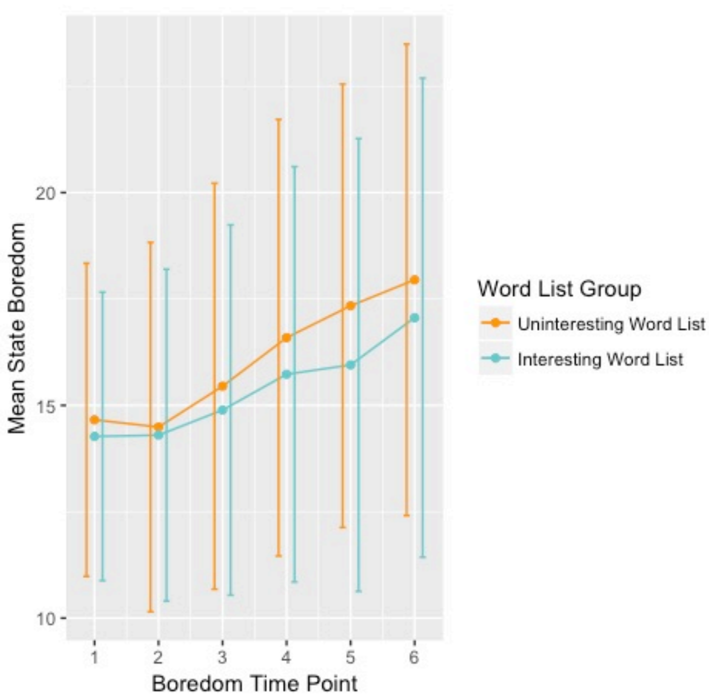


*Figure 3*. Mean state boredom over time by word list group.

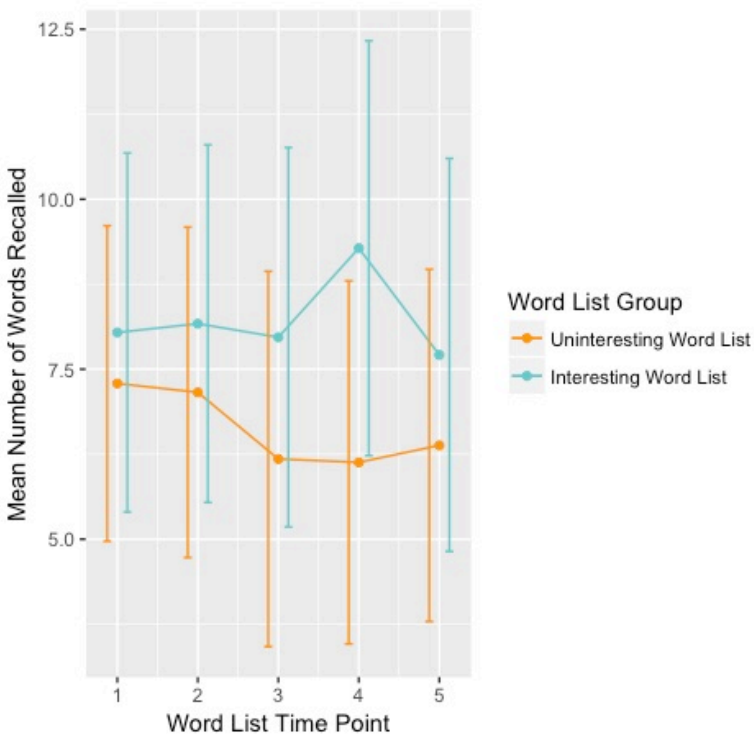


*Figure 4*. Mean word recall over time by word list group.

**Reciprocal effects SEM.** The previously described reciprocal effects model was estimated using the lavaan package (Rosseel, 2012) in the statistical software *R*. As outlined previously, half of the respondents memorized five uninteresting word lists whereas the other half memorized five interesting word lists. Thus, to model the potential impact of word list condition on the relationship between state boredom and achievement, a multiple-groups model was specified. The factor loadings relating the state boredom items to the state boredom latent variables were constrained to be equal across groups to ensure that group differences were attributable to true differences in state boredom rather than measurement differences. All latent variable variances were fixed to 1.0 to set their scales. To estimate the model parameters, full information maximum likelihood (FIML) in conjunction with robust model fit statistics and standard errors was used.

The model fit the data well, CFI = .978, TLI = .971, RMSEA = .044 (90% CI [.038, .050]), SRMR = .06. See Table 7 for the factor loadings, standardized path coefficients, and $R^2$ statistics for each group. Autoregressive effects were observed for both groups: State boredom at time point $t - 1$ was a significant, positive predictor of state boredom at time $t$ and word-list performance at time $t - 1$ was a significant, positive predictor of word-list performance at time $t$. The cross-lagged path coefficients revealed that the relationship between boredom and performance was not consistent across the two word-list conditions. Among participants who memorized uninteresting word lists, word list performance at time $t - 1$ was a significant, negative predictor of boredom at time $t$ for the fourth and sixth boredom time points while boredom was a significant, negative predictor of subsequent word list performance for the second, third, and fifth word lists. In contrast, for participants who memorized the interesting word lists, state boredom and performance were more consistently predictive of one another: Word-list performance at time $t - 1$ was a significant, negative predictor of boredom at time $t$ for all time points and boredom was a significant, negative predictor of subsequent word-list performance for only the last three word lists. For both word-list groups, the model explained a large proportion of variance of participants' state boredom ($R^2$ = .815 to .918), but explained only a small to moderate proportion of variance of participants' word list performance ($R^2$ = .003 to .456).

Table 7

*Factor Loadings, Standardized Path Coefficients, and $R^2$ Statistics for Reciprocal Effects Model – Interesting Word List Group*

| | Boredom | | | | | | Word List | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 |
| Coefficient | | | | | | | | | | | |
| Factor loadings | | | | | | | | | | | |
| Item 1 | .261* | .417* | .471* | .547* | .579* | .443* | | | | | |
| Item 2 | .754* | .352* | .384* | .423* | .481* | .375* | | | | | |
| Item 3 | .630* | .269* | .232* | .288* | .318* | .249* | | | | | |
| Item 4 | .578* | .331* | .371* | .393* | .456* | .362* | | | | | |
| Path coefficients | | | | | | | | | | | |
| Boredom Time $t-1$[a] | | .882* | .905* | .892* | .867* | .921* | -.053 | .029 | -.164* | -.142* | -.162* |
| Word List $t-1$[b] | | -.151* | -.124* | -.098* | -.134* | -.083* | | .529* | .557* | .525* | .592* |
| $R^2$ | | .815 | .852 | .852 | .845 | .917 | .003 | .275 | .372 | .347 | .456 |

*Factor Loadings, Standardized Path Coefficients, and $R^2$ Statistics for Reciprocal Effects Model – Uninteresting Word List Group*

| | Boredom | | | | | | Word List | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Coefficient | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 |
| Factor loadings | | | | | | | | | | | |
| Item 1 | .261* | .417* | .471* | .547* | .579* | .443* | | | | | |
| Item 2 | .754* | .352* | .384* | .423* | .481* | .375* | | | | | |
| Item 3 | .630* | .269* | .232* | .288* | .318* | .249* | | | | | |
| Item 4 | .578* | .331* | .371* | .393* | .456* | .362* | | | | | |
| Path coefficients | | | | | | | | | | | |
| Boredom Time $t-1$[a] | | .911* | .920* | .886* | .922* | .937* | -.148 | -.148* | -.156* | .019 | -.239* |
| Word List $t-1$[b] | | -.070 | -.055 | -.141* | .005 | -.061* | | .422* | .397* | .514* | .515* |
| $R^2$ | | .854 | .873 | .871 | .848 | .918 | .022 | .226 | .215 | .257 | .360 |

*Note.* $N = 249$ observations per word list group.

[a] Effects of Boredom Times 1, 2, 3, 4, and 5 on Boredom Times 2, 3, 4, 5, and 6, respectively; and on Word Lists 1, 2, 3, 4, and 5, respectively. [b] Effects of Word Lists 1, 2, 3, 4, and 5 on: Boredom Times 2, 3, 4, 5, and 6, respectively; and effects of Word Lists 1, 2, 3, and 4 on Word Lists 2, 3, 4, and 5, respectively.

* $p < .05$.

**Reciprocal effects SEM model with trait variables.** Next, trait boredom and conscientiousness were added to the model. As before, a multiple-group model was estimated, with type of word list as the grouping variable. The factor loadings of the state boredom items on the state boredom latent variables, of the trait boredom scales on the trait boredom latent variable, and of the conscientiousness items on the conscientiousness latent variable were constrained to be equal across groups. All latent variable variances were fixed to 1.0 to set their scales. To estimate the model parameters, full information maximum likelihood (FIML) in conjunction with robust model fit statistics and standard errors was used.

The model fit the data well, CFI = .941, TLI = .932, RMSEA = .050 (90% CI [.046, .053]), SRMR = .077. See Table 8 for the factor loadings, standardized path coefficients, and $R^2$ statistics for each group. Autoregressive effects were observed for both groups: State boredom at time point $t$ – 1 was a significant, positive predictor of state boredom at time $t$ and word-list performance at time $t$ – 1 was a significant, positive predictor of word-list performance at time $t$. Cross-lagged path estimates indicated that the relationship between boredom and performance was not consistent across the two word list conditions. For participants who memorized uninteresting word lists, word-list performance at time $t$ – 1 was a significant, negative predictor of boredom at time $t$ for the fourth and sixth boredom time points and boredom was a significant, negative predictor of subsequent word-list performance for the second and fifth word lists. In contrast, for participants who memorized the interesting word lists, state boredom and performance were more consistently predictive of one another. Word-list performance at time $t$ – 1 was a significant, negative predictor of boredom at all subsequent time points and boredom was a significant, negative predictor of subsequent word-list performance for only the last three word lists. These findings were consistent with the findings from the previous model where trait variables were not included. In both word-list groups, neither trait boredom nor conscientiousness consistently predicted state boredom or word list performance. For both word-lists groups, the model explained a large proportion of variance in participants' state boredom ($R^2$ = .839 to .922), but explained only a small to moderate proportion of variance in participants' word-list performance ($R^2$ = .026 to .464).

Table 8

*Factor Loadings, Standardized Path Coefficients, and $R^2$ Statistics for Reciprocal Effects Model with Trait Variables – Interesting Word-List Group*

| | Boredom | | | | | | Word List | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 |
| Coefficient | | | | | | | | | | | |
| Factor loadings | | | | | | | | | | | |
| Item 1 | .207* | .374* | .454* | .526* | .575* | .426* | | | | | |
| Item 2 | .670* | .313* | .368* | .403* | .472* | .361* | | | | | |
| Item 3 | .727* | .281* | .252* | .298* | .335* | .257* | | | | | |
| Item 4 | .630* | .321* | .374* | .389* | .464* | .358* | | | | | |
| Path coefficients | | | | | | | | | | | |
| Boredom Time $t-1$[a] | | .949* | .914* | .862* | .856* | .879* | -.024 | .001 | -.122* | -.182* | -.138* |
| Word List $t-1$[b] | | -.161* | -.138* | -.099* | -.143* | -.086* | | .531* | .571* | .517* | .591* |
| Trait boredom | | -.093 | .059 | .111* | .042 | .106* | .075 | .074 | -.095 | .120 | -.032 |
| Conscientiousness | | .030 | .123* | .044 | .049 | .003 | .183 | -.030 | .039 | .071 | .081 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $R^2$ | | .839 | .858 | .862 | .847 | .922 | .026 | .283 | .384 | .356 | .464 |

*Factor Loadings, Standardized Path Coefficients, and $R^2$ Statistics for Reciprocal Effects Model with Trait Variables – Uninteresting Word-List Group*

| | Boredom | | | | | | Word List | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 |
| Coefficient | | | | | | | | | | | |
| Factor loadings | | | | | | | | | | | |
| Item 1 | .207* | .374* | .454* | .526* | .575* | .426* | | | | | |
| Item 2 | .670* | .313* | .368* | .403* | .472* | .361* | | | | | |
| Item 3 | .727* | .281* | .252* | .298* | .335* | .257* | | | | | |
| Item 4 | .630* | .321* | .374* | .389* | .464* | .358* | | | | | |
| Path coefficients | | | | | | | | | | | |
| Boredom Time $t – 1$[a] | | 1.052* | .898* | .838* | .889* | .925* | -.330 | -.243* | -.217 | -.002 | -.300* |
| Word List $t – 1$[b] | | -.056 | -.080 | -.153* | -.004 | -.063* | | .379* | .361* | .501* | .482* |
| Trait boredom | | -.129 | .071 | .083 | .079 | .026 | .325 | .329* | .138 | .038 | .191 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Conscientiousness | .115 | .080 | -.003 | .049 | .007 | .129 | .273* | .110 | .052 | .225 |
| $R^2$ | .871 | .874 | .875 | .843 | .920 | .064 | .275 | .227 | .259 | .395 |

*Note*. $N$ = 249 observations per word list group. Trait boredom latent variable factor loadings: BPS = 14.322*, TBS = 16.362*, AEQ Class = 6.269*, AEQ Learn = 7.696*. Conscientiousness latent variable factor loadings: Item 2 = .484*, Item 8 = .412*, Item 14 = .506*, Item 20 = .555*, Item 26 = .632*, Item 32 = .663*, Item 38 = .297*, Item 44 = .536*, Item 50 = .458*, Item 56 = .516*

[a] Effects of Boredom Times 1, 2, 3, 4, and 5 on Boredom Times 2, 3, 4, 5, and 6, respectively; and on Word Lists 1, 2, 3, 4, and 5, respectively. [b] Effects of Word Lists 1, 2, 3, 4, and 5 on: Boredom Times 2, 3, 4, 5, and 6, respectively; and effects of Word Lists 1, 2, 3, and 4 on Word Lists 2, 3, 4, and 5, respectively.

* $p < .05$.

**Correlations among trait variables, average state boredom, and average word-list performance.** To better understand the global relation between trait variables, state boredom and word-list performance, the correlations between traits and averaged state variables were examined for each word list group (see Tables 9 and 10). Scatterplots for each variable pair indicated no evidence of curvilinearity. Kernel density plots of each variable showed that all variables were approximately normally distributed.

Table 9

*Correlations Among Select Trait Variables, Average State Boredom, and Average Performance: Interesting Word-List Group*

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. |
|---|---|---|---|---|---|---|---|
| 1. BPS | 1 | | | | | | |
| 2. TBS | .77* | 1 | | | | | |
| 3. AEQ Class | .47* | .52* | 1 | | | | |
| 4. AEQ Learn | .61* | .63* | .63* | 1 | | | |
| 5. Conscientiousness | -.53* | -.37* | -.19* | -.33* | 1 | | |
| 6. Average SB | .37* | .36* | .44* | .38* | -.19* | 1 | |
| 7. Average WL | -.15* | -.09 | .03 | .02 | .12 | -.32* | 1 |

*Note*. *N* ranged from 200 to 247. Average SB = Average state boredom across the six state boredom time points. Average WL = Average word list performance across the five learning trials.

* $p < .05$.

Table 10

*Correlations Among Select Trait Variables, Average State Boredom, and Average Performance: Uninteresting Word-List Group*

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. |
|---|---|---|---|---|---|---|---|
| 1. BPS | 1 | | | | | | |
| 2. TBS | .80* | 1 | | | | | |
| 3. AEQ Class | .46* | .55* | 1 | | | | |
| 4. AEQ Learn | .60* | .63* | .62* | 1 | | | |
| 5. Conscientiousness | -.54* | -.39* | -.30* | -.44* | 1 | | |
| 6. Average SB | .45* | .48* | .44* | .42* | -.25* | 1 | |
| 7. Average WL | -.03 | -.01 | -.07 | -.10 | .12 | -.28* | 1 |

*Note*. *N* ranged from 202 to 249.

* $p < .05$.

The observed correlations were very similar across groups. One exception was that boredom proneness and average word list performance were not significantly correlated for individuals who memorized uninteresting word lists, but these two variables were significantly negatively related for those who memorized interesting word lists.

**Testing moderation effects for boredom proneness and conscientiousness.** Hypothesis 4 postulated that trait boredom would not moderate the relationship between state boredom and achievement, but conscientiousness would. Thus, two sets of regression models were planned: one regressing average state boredom upon word list performance, the trait variable in question, and their interaction; and another regressing average word list performance upon average state boredom, the trait variable in question, and their interaction. In all models, the effect of the set of word lists participants memorized (interesting vs. uninteresting) was controlled. This variable was dummy-coded with the uninteresting list condition as the reference group. The BPS scale was used as the measure of trait boredom. All continuous predictor variables were centered to facilitate interpretation. Any non-significant interactions were dropped and the model re-estimated. Assumptions were examined and met for all regression models below.

Tables 11 through 18 display the results of the moderation analyses. Table 11 shows the regression of average state boredom upon boredom proneness, average word list recall, their interaction, and word list set. Multiple $R^2$ (.242) was significant ($p < .001$), indicating that, as a set, the independent predictors significantly predicted participants' average state boredom during the learning tasks. The model explained 23.4% of the variance in average state boredom.

Table 11

*Boredom Proneness, Average Word-List Recall, Their Interaction, and Word List as Predictors of Average State Boredom*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 15.41 | 56.93 | < .001* |
| BPS | 0.09 | 8.51 | < .001* |
| Average WL | -0.55 | -6.04 | < .001* |
| BPS*Average WL | -0.00 | -0.72 | .474 |
| Word List Set | 0.24 | 0.60 | .548 |

Note. $N = 399$. $R^2 = .242$, $F(4, 394) = 31.43$, $p < .001$, $Adj.\ R^2 = .234$.

* $p < .05$.

Given that the interaction above was non-significant, it was dropped and the model was re-estimated (see Table 12). Multiple $R^2$ (.241) was significant ($p < .001$), indicating that, as a set, boredom proneness, average word list recall and word list set significantly predicted participants' average state boredom. The model explained 23.4% of the variance in average state boredom. Boredom proneness and average word list performance were both significant, unique predictors of participants' average state boredom. Holding average word list performance and word list set constant, an increase of one unit in boredom proneness was associated with a .09 increase in participants' average state boredom, $t$ (395) = 8.50, $p < .001$. Holding boredom proneness and word list set constant, an increase of one word recalled was associated with a .56 decrease in participants' average state boredom, $t$ (395) = -6.07, $p < .001$.

Table 12

*Boredom Proneness, Average Word-List Recall, and Word List as Predictors of Average State Boredom*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 15.41 | 56.96 | < .001* |
| BPS | 0.09 | 8.50 | < .001* |
| Average WL | -0.56 | -6.07 | < .001* |
| Word List Set | 0.27 | 0.68 | .498 |

Note. $N = 399$. $R^2 = .241$, $F(3, 395) = 41.79$, $p < .001$, *Adj.* $R^2 = .235$.

* $p < .05$.

Table 13 shows the regression of average state boredom upon conscientiousness, average word list recall, their interaction, and word list set. Multiple $R^2$ (.139) was significant ($p < .001$), indicating that, as a set, the independent predictors significantly predicted participants' average state boredom during the learning task. The model explained 13% of the variance in average state boredom.

Table 13

*Conscientiousness, Average Word-List Recall, Their Interaction, and Word List as Predictors of Average State Boredom*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 15.51 | 54.88 | < .001* |
| Conscientiousness | -0.14 | -4.10 | < .001* |
| Average WL | -0.60 | -6.31 | < .001* |
| Conscientiousness*Average WL | 0.01 | 0.38 | .702 |
| Word List Set | 0.21 | 0.51 | .613 |

Note. $N = 422$. $R^2 = .139$, $F(4, 417) = 16.79$, $p < .001$, *Adj.* $R^2 = .130$.

* $p < .05$.

Given that the interaction above was non-significant, it was dropped and the model was re-estimated (see Table 14). Multiple $R^2$ (.138) was significant ($p < .001$), indicating that, as a set, conscientiousness, average word list recall and word list set significantly predicted participants' average state boredom. The model explained 13.2% of the variance in average state boredom. Conscientiousness and average word list performance were both significant, unique predictors of participants' average state boredom. Holding average word list performance and word list set constant, an increase of one unit in conscientiousness was associated with a .13 decrease in participants' average state boredom, $t$ (418) = -4.09, $p < .001$. Holding conscientiousness and word list set constant, an increase of one word recalled was associated with a .61 decrease in participants' average state boredom, $t$ (418) = -6.38, $p < .001$.

Table 14

*Conscientiousness, Average Word-List Recall, and Word List as Predictors of Average State Boredom*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 15.50 | 54.94 | < .001* |
| Conscientiousness | -0.13 | -4.09 | < .001* |
| Average WL | -0.61 | -6.38 | < .001* |
| Word List Set | 0.22 | 0.54 | .590 |

Note. $N = 422$. $R^2 = .138$, $F(3, 418) = 41.79$, $p < .001$, *Adj.* $R^2 = .132$.

* $p < .05$.

Table 15 shows the regression of average word-list recall upon boredom proneness, average state boredom, their interaction, and word list set. Multiple $R^2$ (.218) was significant ($p < .001$), indicating that, as a set, the independent predictors significantly predicted participants' average word-list recall during the learning task. The model explained 21% of the variance in average word-list recall.

Table 15

*Boredom Proneness, Average State Boredom, Their Interaction, and Word List as Predictors of Average Word-List Recall*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 6.68 | 46.48 | < .001* |
| BPS | 0.00 | 0.53 | .598 |
| Average SB | -0.15 | -5.86 | < .001* |
| BPS*Average SB | -0.00 | -0.35 | .725 |
| Word List Set | 1.53 | 7.84 | < .001* |

Note. $N = 396$. $R^2 = .218$, $F(4, 391) = 27.22$, $p < .001$, *Adj.* $R^2 = .210$.

* $p < .05$.

Given that the interaction above was non-significant, it was dropped and the model was re-estimated (see Table 16). Multiple $R^2$ (.218) was significant ($p < .001$), indicating that, as a set, boredom proneness, average state boredom and word list set significantly predicted participants' average word list recall. The model explained 21.2% of the variance in average word list recall. Average state boredom and word list set were both significant, unique predictors of participants' average word list recall. Holding boredom proneness and word list set constant, an increase of one unit in average state boredom was associated with a .15 decrease in participants' average word list recall, $t$ (392) = -5.86, $p < .001$. Holding boredom proneness and average state boredom constant, participants who memorized interesting word lists recalled 1.53 more words on average on each learning trial than participants who memorized uninteresting word lists, $t$ (392) = 7.86, $p < .001$.

Table 16

*Boredom Proneness, Average State Boredom, and Word List as Predictors of Average Word-List Recall*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 6.66 | 48.48 | < .001* |
| BPS | 0.00 | 0.53 | .592 |
| Average SB | -0.15 | -5.86 | < .001* |
| Word List Set | 1.53 | 7.86 | < .001* |

Note. $N = 396$. $R^2 = .218$, $F(3, 392) = 36.33$, $p < .001$, *Adj.* $R^2 = .212$.

* $p < .05$.

Table 17 shows the regression of average word-list recall upon conscientiousness, average state boredom, their interaction, and word list set. Multiple $R^2$ (.229) was significant ($p <$ .001), indicating that, as a set, the independent predictors significantly predicted participants' average word-list recall during the learning task. The model explained 22.1% of the variance in average word-list recall.

Table 17

*Conscientiousness, Average State Boredom, Their Interaction, and Word List as Predictors of Average Word-List Recall*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 6.68 | 49.03 | < .001* |
| Conscientiousness | 0.01 | 0.67 | .502 |
| Average SB | -0.15 | -6.20 | < .001* |
| Conscientiousness*Average SB | 0.00 | 1.06 | .289 |
| Word List Set | 1.60 | 8.36 | < .001* |

Note. $N = 419$. $R^2 = .229$, $F(4, 414) = 30.68$, $p < .001$, *Adj.* $R^2 = .221$.

* $p < .05$.

Given that the interaction above was non-significant, it was dropped and the model was re-estimated (see Table 18). Multiple $R^2$ (.227) was significant ($p < .001$), indicating that, as a set, conscientiousness, average state boredom and word list set significantly predicted participants' average word list recall. The model explained 22.1% of the variance in average word list recall. Average state boredom and word list set were both significant, unique predictors of participants' average word list recall. Holding conscientiousness and word list set constant, an increase of one unit in average state boredom was associated with a .14 decrease in participants' average word list recall, $t$ (415) = -6.14, $p < .001$. Holding conscientiousness and average state boredom constant, participants who memorized interesting word lists recalled 1.60 more words on average on each learning trial than participants who memorized uninteresting word lists, $t$ (415) = 8.39, $p < .001$.

Table 18

*Conscientiousness, Average State Boredom, and Word List as Predictors of Average Word-List Recall*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 6.65 | 49.54 | < .001* |
| Conscientiousness | 0.01 | 0.69 | .489 |
| Average SB | -0.14 | -6.14 | < .001* |
| Word List Set | 1.60 | 8.39 | < .001* |

Note. $N = 419$. $R^2 = .227$, $F(3, 415) = 40.52$, $p < .001$, *Adj.* $R^2 = .221$.

* $p < .05$.

**Study 1 Discussion**

Study 1's main purpose was to test the first hypothesis generated from control-value theory: that the naturally occurring relationship between state boredom and achievement would consist of a positive feedback loop, wherein an increase in state boredom would predict a decrease in achievement, and a decrease in achievement would predict an increase in state boredom. The results provided partial support for Hypothesis 1 and thus the control-value theory of boredom. Word list performance consistently predicted subsequent state boredom, but only for participants who memorized interesting word lists. State boredom predicted subsequent performance more consistently for those who memorized interesting word lists compared to those who memorized uninteresting word lists, but this effect was only observed in later learning trials. That is, boredom and word list performance had a reciprocal relationship only for those who memorized interesting word lists, and only after repeated trials (see Figure 5, which displays the SEM model with significant paths only for each word list group). The models were better at explaining variance in state boredom than at explaining variance in performance: the variance in state boredom was almost entirely explained, whereas more than half of the variance in performance was unaccounted for.

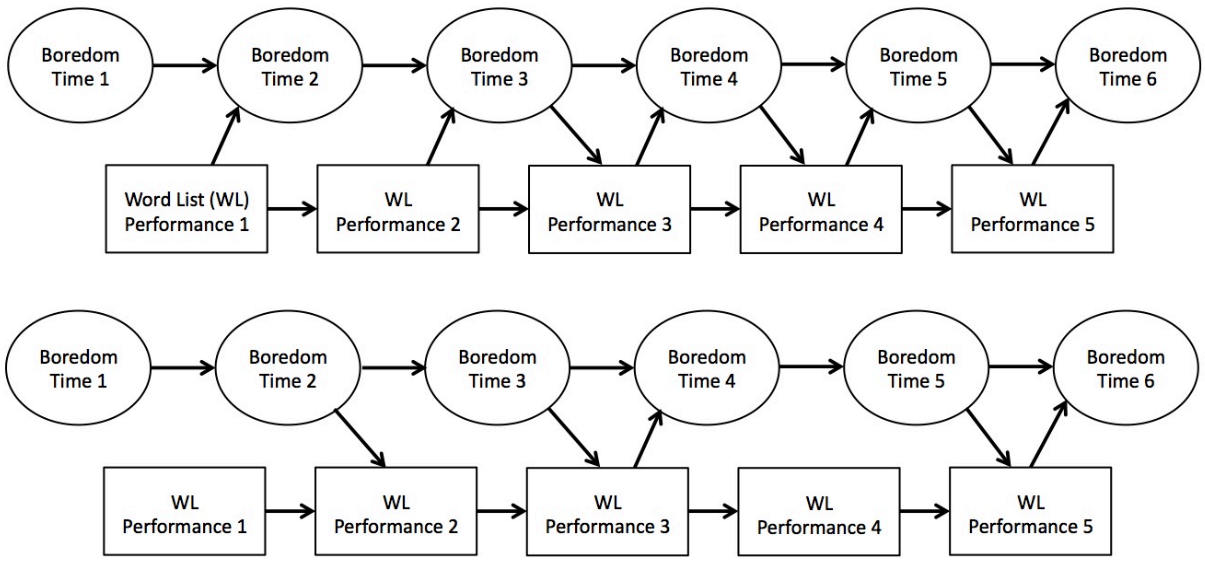


*Figure 5.* Reciprocal effects model with significant pathways only. Top: interesting word list group; bottom: uninteresting word list group.

Future work should further investigate this relationship: For instance, why were boredom and word list performance only related for participants who memorized interesting word lists? Were the uninteresting word lists so dull that the relationship between boredom and performance was obscured? Were the interesting word lists less effortful to memorize and thus achievement was more readily impacted by fluctuations in mood? It is my hypothesis that the relationship between boredom and performance requires an interesting backdrop (e.g., stimulus) to flourish in the moment: that is, that the uninteresting word lists obscured the relationship between performance and boredom. Put another way, we may only identify ourselves as feeling bored when we have a specific reference point to something such as a word list that is not boring.

Future work could disentangle these variables by explicitly assessing participants' level of interest in the word lists and perceived effort to memorize the lists.

Additionally, Study 1's finding that the relationship between state boredom and performance was task-contingent emphasizes the importance of the situational context for state boredom. State boredom is a complex emotion, determined by a delicate interplay of the situation, one's interpretation of the situation, and one's characteristic tendencies (traits). In particular, Study 1 suggests that state boredom may impact performance when one expects that one should not be bored, given an engaging stimulus. Showcasing the reverse finding, Orne (1962) reported a series of studies where no matter how meaningless he attempted to make the task (most strikingly – participants completed simple addition problems and then tore each sheet immediately after it was completed into "a minimum of thirty-two pieces"), participants persisted in following instructions without appearing disgruntled (p. 777). When he asked participants to explain their behaviour, he observed that participants assigned meaning to their participation such as "viewing it as an endurance test" (Orne, 1962, p. 777). One's interpretations of the task ("this is meaningful," "this task should not make me bored") clearly have powerful effects upon emotions.

Our findings partially aligned with those of Pekrun et al. (2014), who found that boredom and performance were mutually predictive of each other. However, Pekrun et al. (2014) examined different, less momentary types of boredom and performance: how bored students felt while studying for the course, and their achievement on term tests. It may be that boredom and performance are less mutually predictive in the moment (Study 1) than when observed at the level of retrospective, cumulative judgments of boredom or performance (Pekrun et al., 2014).

Study 1 also examined the impact of trait variables, specifically trait boredom and conscientiousness, upon word list performance and state boredom. It was hypothesized that trait boredom would exhibit a main effect such that participants who scored highly on trait boredom measures would report more state boredom and would exhibit worse performance than participants who did not score highly on trait boredom measures (H4a). It was hypothesized that conscientiousness would moderate the relationship between state boredom and achievement, such the relationship between state boredom and achievement would be stronger for individuals with lower levels of conscientiousness compared to individuals with higher levels of conscientiousness (H4b). Study 1's results provided partial support for the main effect of trait boredom (H4a) upon state boredom and performance, and no support for the moderating effect of conscientiousness on the relationship between state boredom and performance.

In contrast to the previous work reviewed that found trait boredom and conscientiousness to be associated with academic and employment outcomes (e.g., Watt & Hargis, 2009), Study 1's SEM model found that the personality variables of trait boredom and conscientiousness did not predict word list performance. Furthermore, neither boredom proneness nor conscientiousness predicted average word list recall, controlling for the effects of average state boredom and word list set. Since the previous research did not account for the impact of state boredom, my findings could be attributed to the inclusion of state boredom in the model. However, none of the trait boredom measures or conscientiousness were correlated with average word list performance (i.e., without controlling for state boredom or other variables), with the exception of boredom proneness's negative association with average word list performance for those who memorized the interesting word lists.

The SEM model also revealed the surprising finding that trait boredom did not predict the experience of *state* boredom. One the one hand, this casts worrying doubt about the construct validity of these trait boredom scales, as trait boredom scales purport to assess the frequent experience of state boredom. However, in Study 1 the effect of trait boredom on state boredom controlled for previous state boredom. Given the strong autoregressive relationships between boredom time points observed, it may be that there was not much variation remaining for trait boredom to explain. Supporting this idea, when the correlations between trait variables and average state boredom over all time points were examined (i.e., without other variables included), all trait boredom measures were positively associated with average state boredom. As well, boredom proneness was a positive predictor of average state boredom, controlling for average word list recall and word list set. Conscientiousness predicted average state boredom, controlling for average word list recall and word list set, but did not moderate the relationship between average word list recall and average state boredom.

Finally, Study 1 highlighted the importance of distinguishing between state boredom and trait boredom. As expected, state and trait boredom did not have the same effect upon performance (H5), with state boredom being a more consistent predictor of performance than trait boredom.

***Limitations.*** Study 1 allowed for the course of boredom and achievement to be observed without manipulation over a series of learning trials. As previously reviewed, the academic boredom literature has almost exclusively tested its hypotheses in the classroom, resulting in study designs with excellent ecological validity but relatively poor internal validity. Our study sought to investigate the relationship between boredom and achievement in a controlled laboratory setting where extraneous variables could be better controlled, improving internal validity. We also sought to investigate the relationship between boredom and achievement as it occurred, which previous studies have not done. At first glance, our use of memorization of a word list to stand for "achievement" is less ecologically valid than field studies' use of students' academic course grades or test scores (e.g., as in Pekrun et al., 2014). However, the present study sought to assess the relationship between boredom and achievement *in the moment*: Thus, it was necessary to use a learning task which was discreet and easily understandable, objectively graded, situation-specific (i.e., not influenced by students' prior knowledge), and swiftly administered to allow for repeated learning trials. As well, given that post-secondary education demands a high degree of rote learning, memorization of a word list was also considered a fundamental building block for the broader achievement (academic course grade or test score) typically assessed during field studies. In the present series of studies, therefore, we assert that use of the word list task to represent academic achievement is appropriate for our interest in the relationship between momentary boredom and performance, but that it is narrower than the achievement typically assessed during field studies examining the relationship between boredom and achievement at the level of traits or solidified judgments. Future research could build on our findings with more complex, brief learning tasks.

Another limitation of Study 1 is that it did not involve any manipulation of variables and consequently causal conclusions could not be drawn. Thus, Studies 2 and 3 were planned to investigate the two causal directions of the boredom-achievement relationship. Study 2 was planned to explore whether manipulating state boredom resulted in changes in achievement, and Study 3 was planned to explore whether manipulating perceptions of achievement resulted in changes in state boredom.

## Study 2

### Method

**Participants.** All participants were York University students and received course credit or financial compensation ($10) for participation. Participants ($N$ = 182) had an average age of 20.42 years ($SD$ = 4.00; five number summary: 17, 18, 19, 21, 52). The total sample contained 61 individuals who identified their gender as male (33.52%), 120 individuals who identified their gender as female (65.93%), and one participant who preferred not to respond (0.55%). Participants identified with the following ethnicities: 20.33% South Asian, 17.58% Black, 17.03% Arab/West Asian, 17.03% Caucasian, 6.04% Chinese, 6.04% Filipino, 5.49% multiracial, 4.95% South East Asian, 2.20% Latin-American, 2.20% Other, 0.55% Korean, and one individual (0.55%) who preferred not to respond.

**Procedure.** See Appendix A for a diagram outlining this procedure. After providing informed consent, participants disclosed demographic information. They reported their baseline level of state boredom, emotional valence (positive vs. negative), and physiological arousal. Next, participants were randomly assigned to one of two conditions in a boredom manipulation (Fahlman et al., 2011). In this manipulation, participants watch a 25-minute video clip that is either dull (*Easy English Using Numbers and Money* (1995) – an English language lesson for children; boredom condition) or entertaining (a clip from the Hollywood action movie *Speed* (1994); non-boredom condition). To enhance participants' feelings of boredom or interest, perception of choice and time were manipulated. Participants in the boredom condition were told that due to technical difficulties they could not choose between two different video clips as planned and would have to watch the only video available. Participants in the non-boredom condition heard descriptions of two different movies and selected one to watch; however in reality there was no choice as both descriptions pertained to the same video. As well, participants in the boredom condition were told that the clip was 20 minutes in length, and participants in the non-boredom condition were told that the clip was 30 minutes in length. To ensure participants paid attention to the video, they were told that they would be asked question about its content. After the video, participants reported their state boredom, emotional valence, and physiological arousal.

Participants then had 60 seconds to memorize and, after a 30-second delay, recall a word list comprised of 16 nouns (see Appendix B). After, participants completed the following trait questionnaires: 1) the BPS, 2) the AEQ class-related and learning-related boredom scales, and 3) the HEXACO-60 Conscientiousness subscale. Then they reported the word learning task's boringness, and answered three memory questions about the video. To ensure the highest quality data, participants answered a final question asking if they were able to follow the study instructions. Finally, participants watched a brief comedy clip to dispel any lingering effects of the mood induction. They were provided with a debriefing statement outlining the purpose of the study and thanking them for their participation, and completed the debriefing consent form.

**Measures.**

***State boredom.*** State boredom was assessed using the validated short-form of the Multidimensional State Boredom Scale, the 'MSBS-8' (Hunter et al., 2015). The MSBS-8 contains the items from the full MSBS scale that best discriminate between bored and non-bored individuals. See Table 11 for each measure's range, mean, standard deviation, and reliability estimate in the present sample.

***Emotional valence.*** Two researcher-created items were administered to assess emotional valence. Participants responded using a seven-point Likert-type scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*).

***Physiological arousal.*** The same two researcher-created items employed in Study 1 were used.

***Boredom Proneness Scale (BPS).*** The BPS was described in Study 1.

***Achievement Emotions Questionnaire (AEQ).*** The two AEQ boredom scales were described in Study 1.

***HEXACO – Conscientiousness subscale.*** The Conscientiousness subscale of the HEXACO consists of ten items assessing the personality trait of conscientiousness; that is, the extent to which one is careful, persistent, cautious, and strives for excellence. Participants responded to items using a five-point Likert-type scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). In the article debuting the HEXACO-60, the scale's internal consistency was .78 in a college sample, and .76 in a community sample.

***Objective boringness of the learning task.*** One researcher-created item was administered to assess participants' retrospective judgment of the objective boringness of the learning task. Participants responded using a seven-point Likert-type scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*).

**Materials.**

***Word list.*** Given Study 1's finding that the relationship between boredom and achievement was observed only for participants who memorized interesting word lists, the first interesting word list from Study 1 was used.

**Data analysis plan.** Two *t*-tests were used to ensure that the boredom manipulation was successful. The first *t*-test was used to compare the state boredom means of the two groups at baseline to ensure that any post-manipulation effects were not a function of pre-existing group differences. A second *t*-test compared the state boredom scores of the two groups after the induction to confirm that the individuals in the boredom condition were more bored than the individuals in the non-boredom condition.

For the main analyses, a *t*-test was used to test whether individuals in the boredom condition exhibited poorer word recall than individuals in the non-boredom condition. Next, the effects of boredom proneness, class-related and learning-related boredom, and conscientiousness on word recall were estimated. For each of these trait variables, a multiple regression model was estimated with word recall as the dependent variable and the trait variable in question, experimental condition (bored/not-bored), and their interaction as the independent variables.

**Results**

Table 19 displays the descriptive statistics for the study variables, and Table 20 displays the correlations among the study variables. Kernel density plots of each variable showed that all variables were approximately normally distributed, with the exception of the baseline valence, post-induction arousal, and task boringness variables. Baseline valence and post-induction arousal were negatively skewed, with most participants reporting higher levels of these state experiences. Ratings of task boringness were positively skewed, with most participants rating the task at lower levels of boringness. Scatterplots between all variable pairs indicated no evidence of curvilinearity.

Table 19

*Descriptive Statistics for Study Variables*

| | *N* | *M* | *SD* | Possible Range | Observed Range | Ω |
|---|---|---|---|---|---|---|
| Baseline state boredom | 177 | 30.94 | 8.33 | 8 – 56 | 11 – 54 | .82 |
| Baseline arousal | 182 | 9.68 | 2.39 | 2 – 14 | 2 – 14 | .75[a] |
| Baseline valence | 181 | 10.30 | 2.23 | 2 – 14 | 3 – 14 | .71[a] |
| Post-induction state boredom | 179 | 32.70 | 10.09 | 8 – 56 | 10 – 56 | .87 |
| Post-induction arousal | 180 | 9.16 | 3.04 | 2 – 14 | 2 – 14 | .89[a] |
| Post-induction valence | 181 | 9.54 | 2.64 | 2 – 14 | 2 – 14 | .77[a] |
| Word list performance | 182 | 9.07 | 2.59 | 0 – 16 | 3 – 16 | n/a |
| BPS | 171 | 101.74 | 16.68 | 28 – 196 | 62 – 154 | .81 |
| AEQ Class | 181 | 35.67 | 9.94 | 11 – 55 | 12 – 55 | .93 |
| AEQ Learn | 179 | 31.20 | 9.54 | 11 – 55 | 11 – 55 | .93 |
| Conscientiousness | 176 | 35.06 | 6.44 | 10 – 50 | 13 – 50 | .81 |
| Task boringness | 182 | 3.48 | 1.66 | 1 – 7 | 1 – 7 | n/a |

*Note.* Ω = McDonald's (1999) coefficient omega reliability estimate.

[a] For these variables the alpha coefficient is reported, as the standard errors in the CFA model used to extract the omega coefficient could not be computed.

Table 20

*Correlations Among Study Variables*

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Baseline SB | 1 | | | | | | | | | | | |
| 2. Baseline A | -.30* | 1 | | | | | | | | | | |
| 3. Baseline V | -.43* | .53* | 1 | | | | | | | | | |
| 4. Post SB | .35* | -.20* | -.23* | 1 | | | | | | | | |
| 5. Post A | -.01 | .41* | .27* | -.58* | 1 | | | | | | | |
| 6. Post V | -.20* | .31* | .50* | -.54* | .55* | 1 | | | | | | |
| 7. Performance | -.24* | .05 | .06 | -.20* | .05 | .14 | 1 | | | | | |
| 8. BPS | .50* | -.32* | -.47* | .39* | -.27* | -.37* | -.21* | 1 | | | | |
| 9. AEQ Class | .34* | -.20* | -.20* | .26* | -.18* | -.20* | -.18* | .46* | 1 | | | |
| 10. AEQ Learn | .29* | -.05 | -.13 | .22* | -.05 | -.08 | -.13 | .42* | .65* | 1 | | |
| 11. Con | -.33* | .10 | .24* | -.13 | .19* | .20* | .20* | -.52* | -.34* | -.37* | 1 | |
| 12. Task Bore | .14 | -.21* | -.13 | .17* | -.18* | -.17* | -.18* | .26* | .22* | .21* | -.05 | 1 |

*Note*. *N* ranged from 166 to 182. Baseline SB = baseline state boredom; Baseline A = baseline arousal; Baseline V = baseline valence; Post SB = post-induction state boredom; Post A = post-induction arousal; Post V = post-induction valence; Performance = recall of word list; Con = HEXACO Conscientiousness Subscale; Task Bore = rating of objective boringness of word list learning task.

* $p < .05$.

The trait boredom variables were moderately related to one another ($r$ = .42 to .65). All trait boredom measures were moderately to strongly negatively associated with conscientiousness (*r* = -.34 to -.52). All trait boredom measures were positively associated with state boredom at both time points. Among the state variables, boredom at each time point was moderately negatively associated with arousal and valence (*r* = -.30 to -.58). At both baseline and post-induction time points state boredom was negatively related to word list performance, and the state experiences of emotional valence and physiological arousal were unrelated to word list performance. The personality variables of conscientiousness, boredom proneness and class-related boredom were significantly correlated with word list performance: conscientiousness was positively related to performance, and boredom proneness and class-related boredom were negatively related. Participants' retrospective judgment of the objective boringness of the learning task was negatively correlated with performance, and positively correlated with post-induction state boredom and all trait boredom measures.

**Boredom manipulation check.** A *t*-test was used to examine the difference between the baseline state boredom of the experimental groups prior to the boredom induction. All *t*-test assumptions were met: within each experimental group, state boredom scores were distributed approximately normally. As expected, state boredom did not significantly differ between the two groups before the boredom induction, $t$ (175) = 1.80, $p$ = .074. Participants who were to undergo the boredom induction had a mean state boredom score of 29.79 (*SD* = 8.46) and participants who were to undergo the non-boredom induction had a mean state boredom score of 32.03 (*SD* = 8.11). Thus, any potential differences in state boredom after the boredom manipulation cannot be attributed to pre-existing group differences.

A second *t*-test was used to examine the difference between the state boredom means of the experimental groups after the boredom induction. All *t*-test assumptions were met: within each experimental group, state boredom scores were distributed approximately normally. The mean state boredom scores significantly differed between the induction groups, $t$ (177) = -8.44, $p$ < .001. The experimental manipulation was successful: Participants who underwent the boredom induction had a mean state boredom score of 38.18 ($SD$ = 8.77) after the induction whereas participants who underwent the non-boredom induction had a lower state boredom score of 27.41 ($SD$ = 8.31). Figure 6 displays the distribution of post-induction state boredom scores across the two experimental groups using overlapping density curves.

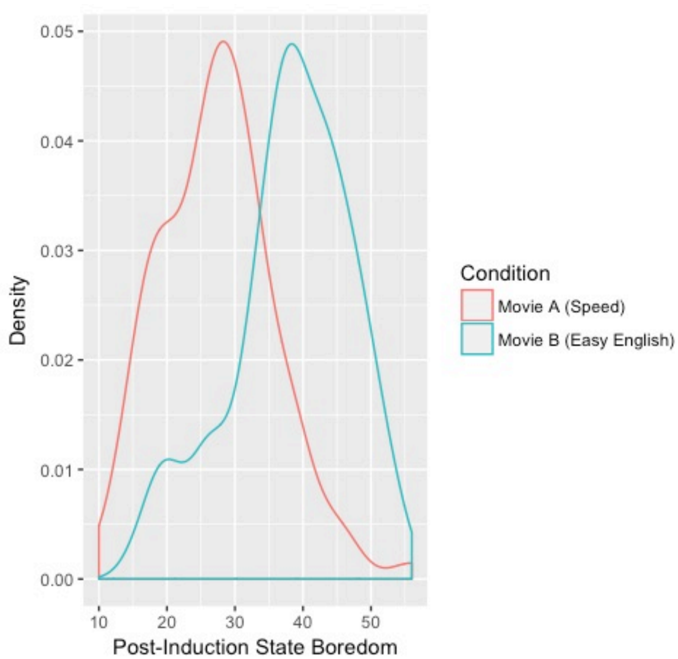


*Figure 6.* Distribution of post-induction state boredom scores across experimental groups.

**Effect of boredom manipulation on performance.** A $t$-test was used to test whether individuals in the boredom condition performed worse on the word memorization task than individuals in the non-boredom condition. All $t$-test assumptions were met: Within each experimental group, state boredom scores were distributed approximately normally. The mean number of words recalled did not significantly differ between the induction groups, $t$ (180) = -.32, $p$ = .751. Participants who underwent the boredom induction recalled a mean of 9.13 words

(*SD* = 2.56) whereas participants who underwent the non-boredom induction recalled a mean of 9.01 words (*SD* = 2.63).

In an exploratory follow-up, the correlations between post-intervention state boredom and performance in each experimental group were investigated. Within each experimental group, state boredom scores and word list recall scores were approximately normally distributed and scatterplots for each pair of variables indicated no evidence of curvilinearity. For participants who underwent the non-boredom induction, boredom after the induction was not significantly related to performance, $r = -.13$, $p = .213$, $n = 91$. For participants who underwent the boredom induction, boredom after the induction was significantly negatively associated with performance, $r = -.35$, $p < .001$, $n = 88$.

**Moderating effect of trait variables.** Next, the potential effects of boredom proneness, class-related and learning-related boredom, and conscientiousness on word recall were estimated. In the multiple regression models, experimental condition was dummy-coded with non-boredom as the reference group. All trait variables were centered to facilitate interpretation. Any non-significant interactions were dropped and the model re-estimated. Assumptions were examined and met for all regression models below.

The first model regressed word-list recall on boredom proneness, experimental condition, and their interaction (see Table 21).

Table 21

*Boredom Proneness, Experimental Condition, and Their Interaction as Predictors of Word-List Recall*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 9.05 | 32.91 | < .001* |
| BPS | -0.02 | -1.43 | .155 |
| Condition | 0.12 | 0.30 | .762 |
| BPS*Condition | -0.02 | -0.82 | .413 |

Note. $N = 171$. $R^2 = .049$, $F(3, 167) = 2.88$, $p = .037$, *Adj.* $R^2 = .032$.

* $p < .05$.

Multiple $R^2$ (.049) was significant ($p < .05$), indicating that, as a set, boredom proneness, experimental condition, and their interaction significantly predicted the number of words recalled. Because the interaction was not significant, it was dropped and the model was re-estimated with main effects only (see Table 22).

Table 22

*Boredom Proneness and Experimental Condition as Predictors of Word-List Recall*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 9.04 | 32.93 | < .001* |
| BPS | -0.03 | -2.82 | .005* |
| Condition | 0.12 | 0.30 | .763 |

Note. $N = 171$. $R^2 = .045$, $F(2, 168) = 4.00$, $p = .020$, *Adj.* $R^2 = .034$.

* $p < .05$.

Multiple $R^2$ (.045) was significant ($p$ = .020), indicating that, as a set, boredom proneness and experimental condition significantly predicted the number of words recalled. The model explained 3.4% of the variance in word recall. Boredom proneness was the only significant unique predictor. Holding experimental condition constant, an increase of one unit in boredom proneness was associated with a .03 decrease in the number of words recalled, $t$ (168) = -2.82, $p$ = .005.

The second model regressed word-list recall on class-related boredom, experimental condition, and their interaction (see Table 23).

Table 23

*Class-Related Boredom, Experimental Condition, and Their Interaction as Predictors of Word-List Recall*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 9.01 | 33.68 | < .001* |
| AEQ Class | -0.01 | -0.40 | .691 |
| Condition | 0.11 | 0.28 | .778 |
| AEQ Class*Condition | -0.07 | -1.85 | .066 |

Note. $N$ = 181. $R^2$ = .050, $F$(3, 177) = 3.12, $p$ = .028, Adj. $R^2$ = .034.

* $p$ < .05.

Multiple $R^2$ (.050) was significant ($p$ = .03), indicating that, as a set, class-related boredom, experimental condition, and their interaction significantly predicted the number of words recalled. The model explained 3.4% of the variance in word recall. None of the independent variables were significant, unique predictors.

Given that the interaction above was non-significant, it was dropped and the model was re-estimated (see Table 24). Multiple $R^2$ (.032) was not significant ($p$ = .06), indicating that, as a set, class-related boredom and experimental condition did not significantly predict the number of words recalled. Nonetheless, the unique effect of class-related boredom was significant. Holding experimental condition constant, an increase of one unit in class-related boredom was associated with a .05 decrease in the number of words recalled, $t$ (178) = -2.40, $p$ = .018.

Table 24

*Class-Related Boredom and Experimental Condition as Predictors of Word-List Recall*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 9.02 | 33.48 | < .001* |
| AEQ Class | -0.05 | -2.40 | .018* |
| Condition | 0.11 | 0.38 | .779 |

Note. $N$ = 181. $R^2$ = .032, $F$(2, 178) = 2.92, $p$ = .056, *Adj.* $R^2$ = .021.

* $p$ < .05.

The third model regressed word-list recall on learning-related boredom, experimental condition, and their interaction (see Table 25).

Table 25

*Learning-Related Boredom, Experimental Condition, and Their Interaction as Predictors of Word-List Recall*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 9.01 | 32.98 | < .001* |
| AEQ Learn | -0.01 | -0.38 | .707 |
| Condition | 0.10 | 0.25 | .801 |
| AEQ Learn*Condition | -0.05 | -1.23 | .221 |

Note. $N = 179$. $R^2 = .026$, $F(3, 175) = 1.55$, $p = .204$, *Adj.* $R^2 = .009$.

* $p < .05$.

Multiple $R^2$ (.026) was not significant ($p = .204$), indicating that, as a set, learning-related boredom, experimental condition and their interaction did not significantly predict the number of words recalled. Furthermore, none of the predictors had a significant unique effect.

Given that the interaction above was non-significant, it was dropped and the model was re-estimated (see Table 26). Multiple $R^2$ (.017) was not significant ($p = .212$), indicating that, as a set, learning-related boredom and experimental condition did not significantly predict the number of words recalled. Neither of the predictors had a significant unique effect.

Table 26

*Learning-Related Boredom and Experimental Condition as Predictors of Word-List Recall*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 9.02 | 33.03 | < .001* |
| AEQ Learn | -.04 | -1.73 | .086 |
| Condition | .10 | .25 | .800 |

Note. $N = 179$. $R^2 = .017$, $F(2, 176) = 1.57$, $p = .212$, *Adj.* $R^2 = .006$.

* $p < .05$.

The fourth model regressed word-list recall on conscientiousness, experimental condition, and their interaction (see Table 27).

Table 27

*Conscientiousness, Experimental Condition, and Their Interaction as Predictors of Word-List Recall*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 8.99 | 32.88 | < .001* |
| Conscientiousness | .06 | 1.58 | .115 |
| Condition | .15 | .39 | .699 |
| Conscientiousness*Condition | .04 | .71 | .479 |

Note. $N = 176$. $R^2 = .045$, $F(3, 172) = 2.73$, $p = .046$, *Adj.* $R^2 = .029$.

* $p < .05$.

Multiple $R^2$ (.045) was significant ($p = .046$), indicating that, as a set, conscientiousness, experimental condition, and their interaction significantly predicted the number of words recalled. The model explained 2.9% of the variance in number of words recalled. Because the interaction was not significant, it was dropped and the model was re-estimated with main effects only (see Table 28).

Table 28

*Conscientiousness and Experimental Condition as Predictors of Word-List Recall*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 8.99 | 32.94 | < .001* |
| Conscientiousness | 0.08 | 2.74 | .007* |
| Condition | 0.15 | 0.39 | .698 |

Note. $N = 176$. $R^2 = .043$, $F(2, 173) = 3.85$, $p = .023$, *Adj.* $R^2 = .032$.

* $p < .05$.

Multiple $R^2$ (.043) was significant ($p = .023$), indicating that, as a set, conscientiousness and experimental condition significantly predicted the number of words recalled. The model explained 3.2% of the variance in word recall. Conscientiousness was the only significant unique predictor. Holding experimental condition constant, an increase of one unit in conscientiousness was associated with a .08 increase in the number of words recalled, $t$ (173) = 2.74, $p = .001$.

**The impact of state boredom on experience of the learning task.** An exploratory *t*-test was used to test whether participants who were induced into a state of boredom rated the learning task as objectively more boring than participants who were not induced into a state of boredom. Because this outcome was assessed via a single Likert-type item, the data was not normally distributed and thus the non-parametric Mann-Whitney *U*-test was used. There was no significant difference between the two experimental groups on the assessed boringness of the learning task, $U$ (180) = 3804.5, $p = .34$. Participants in the boredom condition had a mean rank of 95.23 and participants in the non-boredom condition had a mean rank of 87.85.

**Study 2 Discussion**

Study 2 investigated Pekrun et al.'s (2006, 2014) model using experimental methods to address the issue of causality. As previously reviewed, Pekrun's theoretical model and the field studies investigating the relationships between boredom and achievement had previously found boredom to be predictive of poor performance. Consequently, I expected that experimentally manipulating state boredom would cause changes in performance, such that individuals who were induced into a state of boredom would perform more poorly than individuals induced into a state of non-boredom (H2); and that participants who scored highly on trait boredom measures would recall fewer words than participants who did not score highly on trait boredom measures (H4a). However, Study 2 found that inducing participants into a state of boredom did not have the hypothesized effect predicted by control-value theory. Participants who were induced into a state of boredom did not perform significantly more poorly in recalling a word list than participants who were not induced into a state of boredom. Post-induction state boredom was correlated with performance only for individuals induced into a state of boredom. Boredom did have an effect on performance when the 'boredom' in question was assessed by retrospective judgments of task boringness or general personality traits: rating the learning task as objectively boring was negatively correlated with performance; and boredom proneness and class-related boredom were both significant negative predictors of performance, controlling for experimental condition. Conscientiousness predicted better word recall, but contrary to Hypothesis 4b did not moderate the effect of experimental condition upon performance.

Why was state boredom not causal of performance? One potential explanation is that the difference in state boredom between the two experiment groups may have been statistically significant, but not 'clinically' significant: that is, not sufficient to lead to changes in performance. As depicted in Figure 6, there was quite a bit of overlap in the state boredom reported by members of the two groups. Another potential explanation is that boredom might only affect performance after repeated trials, as was observed for the interesting word list set in Study 1.

Most compellingly, our study manipulated state boredom whereas the previous studies that found a relation between boredom and performance assessed the naturalistic relationship between trait academic boredom (Pekrun et al., 2010; Ahmed et al., 2013) or course-related boredom (Perry et al., 2001, Ruthig et al., 2008, Pekrun et al., 2014) and performance. Thus, it is my contention that state boredom is correlated with performance under certain conditions (e.g., a boring environment) but not causal of performance. Supporting this, Goldberg and Todman (2018) also found that participants induced into a state of boredom did not exhibit poor word-list recall relative to a control group. Therefore, in considering Study 2's findings in relation to control-value theory, it is most accurate to revise the theory to say that boredom leads to decreased performance when the type of boredom assessed is trait boredom or retrospective judgments of the boringness of a task. These results underscore the importance of distinguishing between state boredom, trait boredom, and the perceived boringness of a task or learning environment: as hypothesized (H5), these different types of boredom did not have the same impact on word list recall.

## Study 3

The purpose of Study 3 was to experimentally test the relationship between achievement and state boredom hypothesized in Pekrun's control-value theory. Given that our study sought to establish causality and achievement cannot be experimentally manipulated, it was necessary to use a proxy variable. We used the proxy of performance feedback. As outlined below, participants were randomly assigned to receive: no feedback, false positive feedback, or false negative feedback.

**Method**

**Participants.** All participants were recruited by the data management, collection, and consultation company Qualtrics, and received financial compensation for participation. Participants were randomly selected from the population of Qualtrics participants, which is currently in excess of 90,000,000 participants (Qualtrics, 2018). In order to participate in the study, participants had to be 18 years of age or older, living in Canada, attending post-secondary education part-time or full-time, and completing the survey on a computer. Qualtrics also ensured that the sample consisted of no more than 60% of a given gender.

Participants ($N = 297$) had an average age of 24.47 years ($SD = 7.52$; five number summary: 18, 20, 22, 26, 64). The total sample contained 170 individuals who identified their gender as male (57.24%); 120 who identified as female (40.40%); one who identified their gender as both, five who identified their gender as other, and one individual who preferred not to answer (2.36%). Participants identified with the following ethnicities: 48.48% Caucasian, 14.48% South Asian, 12.12% Chinese, 6.06% multiracial, 3.37% Arab/West Asian, 2.69% South East Asian, 2.36% Black, 1.68% Filipino, 1.68% Korean, 1.35% Latin American, 1.01% Aboriginal, 1.01% Other. Eight individuals preferred not to respond to the ethnicity question, and three individuals did not respond (3.70%).

**Procedure.** See Appendix A for a diagram outlining this procedure. After providing informed consent, participants reported demographic information and their baseline level of state boredom, emotional valence, and physiological arousal. Then, participants had 60 seconds to memorize and, after a 30-second delay, recall a word list comprised of 16 nouns. Participants were randomly assigned to one of three performance feedback conditions: 1) no feedback, 2) false positive feedback, or 3) false negative feedback. Participants in the ‘no feedback’ condition did not receive any feedback on their word-list recall performance. Participants in the ‘false positive feedback’ condition were told that their performance placed them in the top 15% of people who had completed the study so far. Participants in the ‘false negative feedback’ condition were told that their performance placed them in the bottom 15% of people who had completed the study so far. Then, participants reported their state boredom, emotional valence, and physiological arousal. Next, they completed the following trait questionnaires: 1) the BPS, 2) the AEQ - class-related and learning-related boredom scales, and 3) HEXACO-60 Conscientiousness subscale. Finally, they reported how objectively boring they felt the word learning task was. To ensure the highest quality data, participants answered a final question asking if they were able to follow the study instructions. Participants were provided with a debriefing statement outlining the purpose of the study and thanking them for their participation, and completed the debriefing consent form.

**Measures.**

***State variables.*** The measures of state boredom, emotional valence, and physiological arousal used in Study 2 were used.

***Personality variables.*** The properties of the personality measures used (BPS, AEQ, and HEXACO – Conscientiousness subscale) have been previously reported in Studies 1 and 2.

**Materials.**

***Word list.*** The same word list employed in Study 2 was used (i.e., the first interesting word list from Study 1).

**Data analysis plan.** An ANOVA was used to compare the baseline state boredom of the three experimental feedback conditions to ensure that there were no pre-existing differences between the groups. For the main analysis, an ANOVA was used to compare the mean state boredom level of the three experimental feedback conditions after the feedback was delivered. Planned contrasts were used to test pairwise mean differences among the experimental groups. Next, the effects of boredom proneness, class-related and learning-related boredom, and conscientiousness on state boredom were estimated. For each of these trait variables, a multiple regression model was estimated with post-feedback state boredom as the dependent variable and the trait variable in question, experimental condition (no feedback/positive feedback/negative feedback), and their interaction as the independent variables.

## Results

Table 29 displays the descriptive statistics for the study variables and Table 30 displays the correlations among the study variables. Scatterplots for each variable pair indicated no evidence of curvilinearity. Kernel density plots showed that all variables were approximately normally distributed, with the exception of ratings of task boringness. This variable was negatively skewed, with most participants reporting the task as moderately to highly boring.

Table 29

*Descriptive Statistics for Study Variables*

| | *N* | *M* | *SD* | Possible Range | Observed Range | Ω |
|---|---|---|---|---|---|---|
| Baseline state boredom | 292 | 34.66 | 9.57 | 8 – 56 | 8 – 56 | .88 |
| Baseline arousal | 297 | 9.29 | 2.31 | 2 – 14 | 2 – 14 | .65[a] |
| Baseline valence | 296 | 9.32 | 2.45 | 2 – 14 | 2 – 14 | .58[a] |
| Word list performance | 282 | 8.52 | 3.93 | 0 – 16 | 0 – 16 | n/a |
| Post-intervention state boredom | 292 | 33.86 | 10.01 | 8 – 56 | 8 – 56 | .91 |
| Post-intervention arousal | 297 | 9.29 | 2.50 | 2 – 14 | 2 – 14 | .74[a] |
| Post-intervention valence | 294 | 9.18 | 2.57 | 2 – 14 | 2 – 14 | .58[a] |
| BPS | 284 | 108.16 | 18.71 | 28 – 196 | 47 – 189 | .84 |
| AEQ Class | 292 | 35.49 | 10.85 | 11 – 55 | 11 – 55 | .94 |
| AEQ Learn | 295 | 33.05 | 10.86 | 11 – 55 | 11 – 55 | .95 |
| Conscientiousness | 295 | 34.20 | 6.69 | 10 – 50 | 10 – 50 | .81 |
| Task boringness | 297 | 4.42 | 1.75 | 1 – 7 | 1 – 7 | n/a |

*Note*. Ω = McDonald's (1999) coefficient omega reliability estimate.

[a] For these variables the alpha coefficient is reported, as the standard errors in the CFA model used to extract the omega coefficient could not be computed.

Table 30

*Correlations Among Study Variables*

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Baseline SB | 1 | | | | | | | | | | | |
| 2. Baseline A | -.26* | 1 | | | | | | | | | | |
| 3. Baseline V | -.62* | .42* | 1 | | | | | | | | | |
| 4. Post SB | .90* | -.31* | -.60* | 1 | | | | | | | | |
| 5. Post A | -.24* | .76* | .45* | -.34* | 1 | | | | | | | |
| 6. Post V | -.48* | .40* | .79* | -.56* | .52* | 1 | | | | | | |
| 7. BPS | .72* | -.25* | -.59* | .71* | -.28* | -.51* | 1 | | | | | |
| 8. AEQ Class | .60* | -.21* | -.34* | .60* | -.22* | -.29* | .52* | 1 | | | | |
| 9. AEQ Learn | .60* | -.21* | -.39* | .58* | -.17* | -.32* | .61* | .74* | 1 | | | |
| 10. Con | -.44* | .13* | .28* | -.41* | .10 | .16* | -.57* | -.39* | -.49* | 1 | | |
| 11. Perf | -.12* | .06 | .06 | -.11 | .07 | .03 | -.08 | -.08 | -.08 | .11 | 1 | |
| 12. Task Bore | .33* | -.08 | -.22* | .38* | -.18* | -.18* | .28* | .37* | .38* | -.18* | -.12* | 1 |

*Note*. N ranged from 269 to 297. Post SB = Post-intervention state boredom; Post A = Post-intervention arousal; Post V = Post-intervention valence; Perf = performance on word list learning task.

* $p < .05$.

The trait boredom variables were moderately related to one another ($r$ = .52 to .74). All trait boredom measures were moderately negatively associated with conscientiousness ($r$ = -.39 to -.57). Among the state variables, boredom at each time point was negatively associated with arousal and valence. Baseline boredom, arousal and valence were all strongly predictive of post-induction boredom, arousal and valence, respectively ($r$ = .76 to .90). Examining the relationships among the state and trait variables, baseline state boredom and post-induction state boredom were moderately to strongly negatively related to all of the trait boredom variables ($r$ = .58 to .72), and moderately negatively related to conscientiousness ($r$ = -.41 and -.44). Word-list performance was only significantly related to baseline boredom and the rated boringness of the task: The more bored participants were before completing the word list, and the more highly they rated the task as boring, the fewer words they recalled.

**Differences among the experimental groups on baseline state boredom.** A one-way ANOVA was used to examine differences among the experimental groups on baseline state boredom before the feedback variable was manipulated. All one-way ANOVA assumptions were met: Within each experimental group, state boredom scores were distributed approximately normally and their standard deviations were similar. As expected, the baseline state boredom means did not significantly differ among the three experimental feedback groups before any feedback was provided, $F(2, 289) = 0.208$, $p = .81$. Participants who were to receive negative feedback reported mean state boredom scores of 34.37 ($SD$ = 8.89), participants who were to receive positive feedback reported mean state boredom scores of 34.43 ($SD$ = 10.69), and participants who were to receive no feedback reported state boredom scores of 35.16 ($SD$ = 8.98). Thus, any potential differences in state boredom after the experimental manipulation cannot be attributed to pre-existing group differences.

**Effect of performance feedback on state boredom.** A one-way ANOVA was used to examine differences among the performance feedback groups on post-feedback state boredom. Within each experimental group, state boredom scores were distributed approximately normally. Since the within-group standard deviations varied, Welch's approximation, which does not assume equal variances among groups, was used. Post-feedback state boredom did not significantly differ among the experimental groups, Welch's $F$ (2, 190.39) = 0.54, $p$ = .59. Participants who received negative feedback on their word list performance reported state boredom scores of 34.05 (*SD* = 9.57), participants who received positive feedback reported state boredom scores of 33.05 (*SD* = 11.31), and participants who received no feedback reported state boredom scores of 34.49 (*SD* = 9.03). Thus, the experimental manipulation did not significantly affect participants' state boredom.

**Moderating effect of trait variables on the effect of performance feedback on state boredom.** Four multiple regression models were estimated to obtain the effects of boredom proneness, class-related and learning-related boredom, and conscientiousness on post-feedback state boredom; results are displayed in Tables 31 to 37. In each model, the trait variable was centered for easier interpretation. Experimental condition was dummy-coded using the "No Feedback" group as the reference category. Finally, assumptions were examined and met for all four models below.

Table 31

*Boredom Proneness, Experimental Condition, and Their Interactions as Predictors of Post-Feedback State Boredom*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 34.00 | 47.75 | < .001* |
| BPS | 0.37 | 8.05 | < .001* |
| Negative Feedback vs. No Feedback | -0.40 | -0.39 | .699 |
| Positive Feedback vs. No Feedback | 0.10 | 0.10 | .918 |
| BPS*Negative Feedback vs. No Feedback | -0.02 | -0.29 | .775 |
| BPS*Positive Feedback vs. No Feedback | 0.04 | 0.73 | .465 |

*Note*. $N = 280$. $R^2 = .513$, $F(5, 274) = 57.64$, $p < .001$, Adj. $R^2 = .504$.

* $p < .05$.

Table 31 displays the regression of post-intervention state boredom on boredom proneness, condition, and their interactions. Multiple $R^2$ (.513) was significant, $p < .001$. To probe the effects of BPS, condition (Negative Feedback vs. No Feedback, Positive Feedback vs. No Feedback), and their interaction (BPS*Negative Feedback vs. No Feedback, BPS*Positive Feedback vs. No Feedback), three different regression models were estimated. Specifically, Model 1 regressed post-intervention state boredom on the BPS; Model 2 regressed post-intervention state boredom on condition (Negative Feedback vs. No Feedback, Positive Feedback vs. No Feedback); and Model 3 regressed post-intervention state boredom on the interactions between BPS and condition (BPS*Negative Feedback vs. No Feedback, BPS*Positive Feedback vs. No Feedback). This allowed the main effects of boredom proneness and experimental condition, as well as their interaction, to be tested for significance. The interaction between boredom proneness and experimental condition was not significant, $F$ (2, 274) = 0.70, $p$ = .499. Thus, it was dropped and the model was re-estimated with main effects only (see Table 32).

Table 32 displays the regression of post-intervention state boredom on the BPS and experimental condition.

Table 32

*Boredom Proneness and Experimental Condition as Predictors of Post-Feedback State Boredom*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 34.00 | 47.84 | < .001* |
| BPS | 0.38 | 16.90 | < .001* |
| Negative Feedback vs. No Feedback | -0.42 | -0.41 | .680 |
| Positive Feedback vs. No Feedback | 0.04 | 0.04 | .972 |

*Note.* $N$ = 280. $R^2$ = .510, $F$(3, 276) = 95.82, $p$ < .001, Adj. $R^2$ = .505.

* $p$ < .05.

Multiple $R^2$ (.510) was significant, $p$ < .001. There was a significant effect of boredom proneness on post-feedback state boredom, $t$ = 16.90, $p$ < .001. Boredom proneness was a positive predictor of state boredom, and accounted for an increase in 50.70% in unique variance over and above experimental condition. The effect of experimental condition was not significant, $F$(2, 276) = 0.12, $p$ = .885.

Table 33 displays the regression of post-intervention state boredom on class-related boredom, condition, and their interactions.

Table 33

*Class-Related Boredom, Experimental Condition, and Their Interactions as Predictors of Post-Feedback State Boredom*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 34.67 | 43.22 | < .001* |
| AEQ Class | 0.48 | 6.30 | < .001* |
| Negative Feedback vs. No Feedback | -1.17 | -1.01 | .313 |
| Positive Feedback vs. No Feedback | -1.30 | -1.14 | .257 |
| AEQ Class*Negative Feedback vs. No Feedback | -0.04 | -0.38 | .707 |
| AEQ Class*Positive Feedback vs. No Feedback | 0.25 | 2.38 | .018* |

*Note*. $N = 288$. $R^2 = .384$, $F(5, 282) = 35.09$, $p < .001$, $R^2 = .384$, *Adj*. $R^2 = .373$.

* $p < .05$.

Multiple $R^2$ (.384) was significant, $p < .001$. Notably, the interaction between class-related boredom and experimental condition was significant, $F\ (2, 282) = 4.55$, $p = .011$. The interaction accounted for an increase of 1.98% in unique variance over and above class-related boredom and experimental condition.

Figure 7 displays the interaction graphically. Individuals who were high on class-related boredom did not display marked differences in state boredom across the three feedback conditions. In contrast, individuals who were low on class-related boredom and received false positive feedback showed markedly less state boredom compared to individuals low on class-related boredom who received no feedback or false negative feedback.

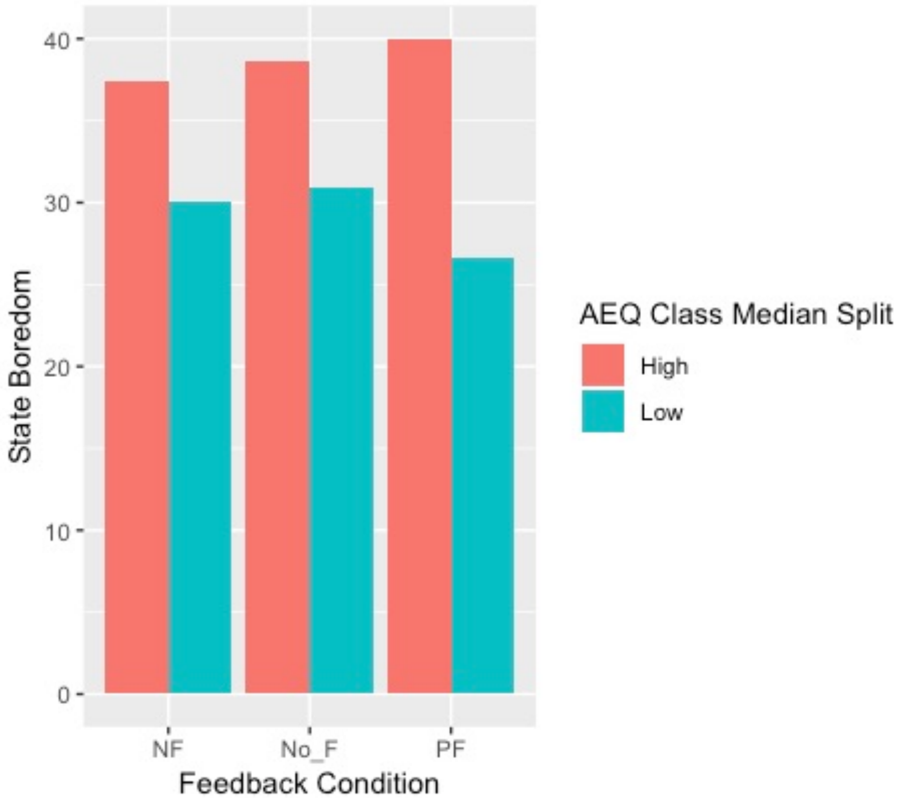


*Figure 7.* Effect of experimental condition on state boredom at different levels of class-related boredom. NF = false negative feedback, No_F = no feedback, PF = false positive feedback.

Table 34 displays the regression of post-intervention state boredom on learning-related boredom, condition, and their interactions.

Table 34

*Learning-Related Boredom, Experimental Condition, and Their Interactions as Predictors of Post-Feedback State Boredom*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 34.16 | 42.08 | <.001* |
| AEQ Learn | 0.49 | 6.13 | <.001* |
| Negative Feedback vs. No Feedback | -0.07 | -0.06 | .949 |
| Positive Feedback vs. No Feedback | -0.55 | -0.47 | .638 |
| AEQ Learn*Negative Feedback vs. No Feedback | -0.06 | -0.56 | .573 |
| AEQ Learn*Positive Feedback vs. No Feedback | 0.19 | 1.71 | .089 |

*Note*. $N = 290$. $R^2 = .350$, $F(5, 284) = 30.61$, $p < .001$, Adj. $R^2 = .339$.

* $p < .05$.

Multiple $R^2$ (.350) was significant, $p < .001$. The interaction between learning-related boredom and experimental condition was not significant, $F(2, 284) = 2.96$, $p = .054$. Because the interaction was not significant, it was dropped and the model was re-estimated with main effects only (see Table 35).

Table 35

*Learning-Related Boredom and Experimental Condition as Predictors of Post-Feedback State Boredom*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 34.14 | 41.82 | <.001* |
| AEQ Learn | 0.54 | 12.00 | <.001* |
| Negative Feedback vs. No Feedback | -0.04 | -0.03 | .975 |
| Positive Feedback vs. No Feedback | -0.60 | -0.52 | .605 |

*Note.* $N = 290$. $R^2 = .337$, $F(3, 286) = 48.38$, $p < .001$, Adj. $R^2 = .330$.

* $p < .05$.

Multiple $R^2$ (.337) was significant, $p < .001$. There was a significant positive effect of learning-related boredom on post-feedback state boredom, $t = 12.00$, $p < .001$, accounting for an increase of 33.37% unique variance over and above experimental condition. The effect of experimental condition was not significant, $F\ (2, 286) = 0.17$, $p = .848$.

Table 36 displays the regression of post-intervention state boredom on conscientiousness, condition, and their interaction.

Table 36

*Conscientiousness, Experimental Condition, and Their Interactions as Predictors of Post-Feedback State Boredom*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 34.27 | 37.45 | <.001* |
| Conscientiousness | -0.60 | -4.48 | <.001* |
| Negative Feedback vs. No Feedback | -0.34 | -0.26 | .796 |
| Positive Feedback vs. No Feedback | -0.56 | -0.43 | .668 |
| Conscientiousness*Negative Feedback vs. No Feedback | 0.06 | 0.27 | .785 |
| Conscientiousness*Positive Feedback vs. No Feedback | -0.05 | -0.28 | .780 |

*Note.* $N = 290$. $R^2 = .169$, $F(5, 284) = 11.54$, $p < .001$, *Adj.* $R^2 = .154$.

* $p < .05$.

Multiple $R^2$ (.350) was significant, $p < .001$. The interaction between conscientiousness and experimental condition was not significant, $F(2, 284) = 0.14$, $p = .866$. Because the interaction was not significant, it was dropped and the model was re-estimated with main effects only (see Table 37).

Table 37

*Conscientiousness and Experimental Condition as Predictors of Post-Feedback State Boredom*

| | *B* | *t* | *p* |
|---|---|---|---|
| Intercept | 34.27 | 37.60 | <.001* |
| Conscientiousness | -0.61 | -7.53 | <.001* |
| Negative Feedback vs. No Feedback | -0.36 | -0.27 | .786 |
| Positive Feedback vs. No Feedback | -0.60 | -0.46 | .647 |

*Note.* $N = 290$. $R^2 = .168$, $F(3, 286) = 19.25$, $p < .001$, *Adj.* $R^2 = .159$.

* $p < .05$.

Multiple $R^2$ (.168) was significant, $p < .001$. There was a significant negative effect of conscientiousness on post-feedback state boredom, $t = 7.53$, $p < .001$, accounting for an increase of 16.52% in unique variance over and above experimental condition. The effect of experimental condition was not significant, $F(2, 286) = 0.11$, $p = .899$.

**The impact of performance feedback upon experience of the learning task.** An exploratory one-way ANOVA was planned to test whether participants in the different experimental performance feedback conditions had different experiences of the boringness of the learning task. Because the learning task's boringness was assessed using a single Likert-type item, the data were not normally distributed and thus the non-parametric Kruskal-Wallis test was used. There were significant differences among the experimental groups on the assessed boringness of the learning task, $H$ (2) = 8.48, $p = .014$. Post-hoc comparisons (with a correction to the alpha level for the number of comparisons) found that the negative feedback group retrospectively reported the learning task as significantly more boring than the positive feedback group (negative feedback group rank $M = 164.06$, positive feedback group rank $M = 129.76$; $p <$

.05). The differences between the no feedback group (*M* = 153.93) and the false feedback groups were not significant, *p*s > .05.

**Study 3 Discussion**

Based on control-value theory, I expected that experimentally manipulating perceived achievement would causes changes in state boredom, such that individuals who received false negative feedback would report higher levels of state boredom after the feedback compared to the other two feedback groups (H3a), and individuals who received false positive feedback would report lower levels of state boredom after the feedback compared to the other two feedback groups (H3b). I also expected that participants who scored highly on trait boredom measures would report more state boredom than participants who did not score highly on trait boredom measures (H4a). Although not part of control-value theory, I further hypothesized that conscientiousness would moderate the relationship between feedback and state boredom (H4b).

Study 3 found that manipulating perceptions of performance did not significantly affect participants' state boredom (H3a and H3b), but did significantly affect participants' ratings of the boringness of the learning task. Performance itself, which participants were blind to, was uncorrelated with post-feedback state boredom. Next, the effects of trait variables on post-feedback state boredom were examined. All trait variables had a significant effect on state boredom: boredom proneness, class-related boredom, and learning-related boredom were positively related to state boredom (H4a) while conscientiousness was negatively related to state boredom. Conscientiousness did not moderate the relationship between performance and state boredom (H4b). Unexpectedly, class-related boredom moderated the relationship between performance and boredom: individuals who were high on class-related boredom did not display marked differences in state boredom across the three feedback conditions, whereas individuals who were low on class-related boredom and received false positive feedback showed markedly less state boredom compared to individuals low on class-related boredom who received no feedback or false negative feedback.

As noted, contrary to what was hypothesized based on Pekrun's model, manipulating performance feedback did not result in changes in state boredom. It might be that performance and performance feedback are not measuring exactly the same construct – this issue is discussed in more detail in the General Discussion. However, in Study 3 actual performance was uncorrelated with post-feedback state boredom, again contrary to Pekrun's model and to our findings in Study 1. This may be an issue of power to detect a slight effect: the magnitude of performance's significant effect on boredom in Study 1 in the interesting word list group (-.083 to -.151; $n$ = 294) and performance's effect on boredom in Pekrun et al.'s (2014) study (significant paths -.11 to -.16, $n$ = 424) are not vastly larger than performance's correlation with boredom in Study 3 ($r$ = -.11, $n$ = 272).

Crucially, Study 3 highlights the importance of distinguishing between 'types' of boredom (H5). In Pekrun et al.'s (2014) study, students reported their boredom when studying. This variable was assessed in relation to the course: For example, "When studying for this course, I feel bored." Thus, it may be that performance or feedback changes one's subjective judgment about the boringness of the task (e.g., the boringness of studying for Psychology Course A), but not one's actual boredom in the moment. Further supporting this notion, we found significant differences among our three feedback groups on rated boringness of the learning task but not on state boredom.

## General Discussion

The present program of study sought to better understand the relationship between boredom and achievement by: experimentally manipulating variables to assess whether changes in state boredom caused changes in performance, and whether changes in (perceived) performance caused changes in state boredom; distinguishing between trait boredom, state boredom, and judgments of the boringness of a task; and testing the contribution of conscientiousness to boredom, achievement, and the boredom-achievement relationship. Hypotheses were generated based on an extensive review of the academic boredom literature and in particular, on Pekrun's (2006) control-value theory of achievement emotions. Below, we briefly review our hypotheses and subsequent findings before a broader discussion of the difference between performance and performance feedback, the importance of precision when discussing and measuring boredom, and the role educators can play in preventing boredom in the post-secondary classroom.

### Degree of Support For Our Hypotheses Generated From Control-Value Theory

**Hypothesis 1: The naturally occurring relationship between state boredom and achievement will consist of a positive feedback loop (Study 1).** Study 1 found that the relationship between state boredom and achievement (with achievement measured by recall of a word list) was not as robust as prior work (Pekrun et al., 2014) would suggest. As noted earlier, Pekrun et al.'s study assessed boredom by measuring students' learning-related boredom in relation to their psychology course (e.g., "When studying for this course, I feel bored"; p. 700). This boredom represents not an in the moment affective feeling but rather a solidified judgment: It may be that this type of boredom is more robustly affected by, and predictive of, achievement. In contrast, the type of boredom we assessed in relation to Hypothesis 1 – state boredom – had an effect only as the learning trials wore on. Furthermore, the relationship between state boredom and achievement was more robust for those who memorized interesting word lists. This finding speaks to the importance of the educational context and material and provides an additional avenue for intervention.

**Hypothesis 2: State boredom causes lower achievement (Study 2).** Study 1 found that state boredom predicted performance on some learning trials. However, Study 1's design assessed state boredom and performance as they occurred. Study 2 directly tested the causal relationship between state boredom and achievement by experimentally manipulating state boredom and observing any effects upon performance (memorization of an interesting word list). Study 2 found no support for Hypothesis 2: Participants who were induced into a state of boredom did not perform significantly worse on the learning task than participants who were not induced into a state of boredom. State boredom and performance were negatively associated with each other among participants in the boredom induction group only. It may be that state boredom and achievement are linked, but only for those in a sufficiently intense state of boredom. Although participants in our boredom condition reported being significantly more bored than participants in the non-boredom condition, there was still substantial overlap between these two distributions. Alternatively, it may be that state boredom is correlated with achievement but does not cause changes in achievement. For instance, perhaps some other variable such as mental engagement explains achievement and state boredom is acting as a proxy variable.

**Hypothesis 3: Achievement causally affects state boredom (Study 3).** Study 1 found that performance predicted state boredom, but this relationship was only observed consistently for participants who memorized interesting word lists. However, Study 1's design assessed state boredom and performance as they occurred. Study 3 directly tested the causal relationship between state boredom and achievement by experimentally manipulating perceived performance on an interesting word list and observing any effects upon state boredom. Study 3 found no support for the hypothesis that manipulating perceived performance would result in differences among the feedback groups on state boredom: The feedback groups did not report significantly different state boredom levels after the manipulation. Significant effects were observed, however, regarding boringness of the learning task. Participants in the false negative feedback condition rated the learning task as more boring than participants in the false positive feedback condition.

**Hypothesis 4: Trait variables will affect state boredom and achievement (Studies 1-3).**

***Hypothesis 4a: Overall effect of trait boredom.*** Hypothesis 4a was partially supported. Individuals who reported higher levels of trait boredom also reported higher levels of state boredom and performed worse on the learning tasks in Studies 2 and 3. In Study 1, all trait boredom measures were correlated with average state boredom, and the Boredom Proneness Scale was correlated with average word list performance for those who memorized the interesting word list. However, when trait boredom was entered into the SEM model it had almost no effect on participants' state boredom levels or performance. However, it is also true that in Study 1 the variance in state boredom was almost entirely explained by participants' state boredom at the prior time point, so there was not much variance left to explain. Regression analyses showed that the Boredom Proneness Scale predicted average state boredom, controlling for average word list recall and word list set; but was not a unique predictor of average word list recall, controlling for average state boredom and word list set.

***Hypothesis 4b: Moderating effect of conscientiousness.*** Hypothesis 4b was not supported. Conscientiousness did not moderate the relationship between state boredom and performance in Studies 1 and 2 or the relationship between performance and state boredom in Studies 1 and 3. Conscientiousness did have a main effect on achievement in Study 2 and state boredom in Studies 1 and 3. However, control-value theory does not include conscientiousness in its model, so a lack of support for Hypothesis 4b does not imply a lack of support for control-value theory.

**Hypothesis 5: Trait boredom, state boredom, and retrospective judgments about the boringness of the learning task will not have the same impact on the dependent variable in question (Studies 1-3).** As reviewed, control-value theory and research has conflated state boredom, trait boredom, and retrospective judgments about the boringness of the learning task. Contrary to the working assumption in the literature that these three types of boredom are largely interchangeable, my program of study found that they are not. In all three studies, the correlations between these three constructs were moderate: in Study 1, the correlation between trait boredom scales and average state boredom ranged from .36 to .48; in Study 2 the correlations between state boredom and the trait boredom scales ranged from .22 to .50, the correlations between state boredom and the retrospective judgment about the boringness of the task were .14 and .17, and the correlations between the trait boredom scales and the retrospective judgment about the boringness of the task ranged from .21 to .26; and in Study 3 the correlations between state boredom and the trait boredom scales ranged from .58 to .72, the correlations between state boredom and the retrospective judgment about the boringness of the task were .33 and .38, and the correlations between the trait boredom scales and the retrospective judgment about the boringness of the task ranged from .28 to .38.

More critically, these three types of boredom did not have the same effect upon the dependent variables in question. In Study 1, state boredom was a more consistent predictor of performance than trait boredom. In Study 2, state boredom did not cause changes in performance, but trait boredom was a robust predictor of performance; and in Study 3, manipulating perceptions of performance did not significantly affect participants' state boredom, but did significantly affect participants' perceived boringness of the learning task. However, control-value theory does not explicitly state that these three types of boredom are interchangeable, so support for Hypothesis 5 does not imply a lack of support for control-value theory.

**Overall degree of support for control-value theory.** Table 38 summarizes the degree of support for our main hypotheses generated from control-value theory.

Table 38

*Degree of Support for Control-Value Theory*

| | Degree of Support for Main Hypotheses Generated From Control-Value Theory |
|---|---|
| Hypothesis 1 | Moderate support |
| Hypothesis 2 | No support |
| Hypothesis 3 | No support |
| Hypothesis 4a | Moderate to strong support |

As discussed earlier, control-value theory does not distinguish between different types of boredom such as state boredom, course-related boredom or boringness of a task, and trait boredom. My program of study represents the first attempt to disentangle these variables, and is also the first to assess state boredom. Based on my data, support for control-value theory is strongest when the 'boredom' in question is conceptualized as the boringness of the learning task or trait boredom. Figure 8 below shows a revised diagram of control-value theory congruent with my findings. Although not tested in my studies (and thus not included in our diagram), I predict that control and value appraisals lead to the 'boredom' of judgments of task boringness, and that trait boredom influences students' control and value appraisals.

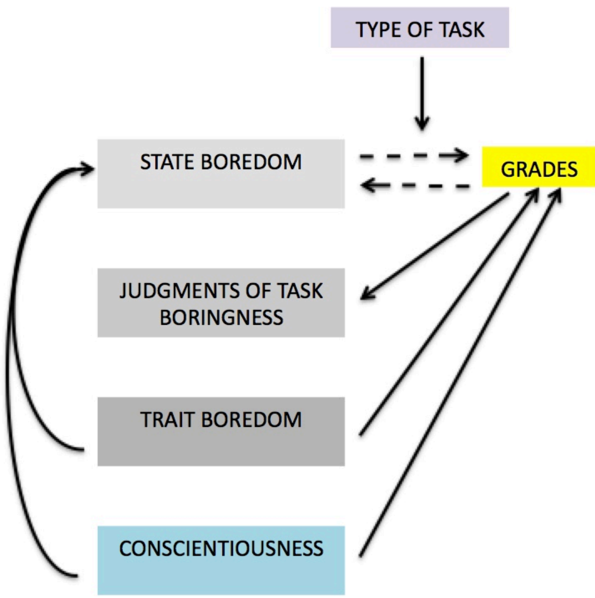


*Figure 8.* Pekrun's control-value theory, revised.

As Figure 8 shows, students seem to be able to weather changes in achievement or boredom in the moment without one affecting the other. It is when the situation persists, or state boredom crystallizes into the form of a judgment (course-related boredom) or way of being (trait boredom) that problems emerge. We contend that this is a hopeful finding that speaks to students' resilience. This finding suggests opportunities for intervention for both educators and students, which we discuss below.

**The Many Boredoms**

In his psychoanalytic treatise on boredom, Phillips (1993) wrote that "we should speak not of boredom, but of the boredoms, because the notion itself includes a multiplicity of moods and feelings" (p. 78). Supporting that idea, the present program of study substantiated important distinctions among different types of trait boredom and, more broadly, among the concepts of trait boredom, state boredom, and the perceived boringness of a task.

**Trait boredom.** To our knowledge, the present program of study is the first to explore the relationship between academic trait boredom (as assessed by the AEQ) and the broad construct of trait boredom (as assessed by the ZBS and, more commonly, by the BPS). Previously, these different approaches to trait boredom have been largely siloed, with educational researchers using the AEQ and cognitive and clinical researchers using the ZBS and BPS. The present program of study suggests that trait academic boredom and trait boredom are related but distinct concepts: In all three studies, the BPS and the two AEQ subscales were moderately positively correlated with each other. Substantiating the construct validity of the trait boredom scales, all trait boredom scales were moderately positively correlated with state boredom across the three studies, with the BPS tending to show slightly stronger correlations with state boredom than the AEQ scales. This is an interesting finding given that participants were in a learning situation. Future work could examine whether the BPS is more predictive of state boredom than trait academic boredom scales when measuring student boredom in the classroom.

**A taxonomy of boredom: Trait boredom, state boredom, and rated objective boringness of a task.** As reviewed earlier, the literature on boredom in school has been plagued by imprecision regarding use of the word 'boredom.' As discussed, researchers have used 'boredom' to refer to trait boredom and the rated boringness of a task or learning environment (sometimes referred to as 'course-related boredom'). As well, when researchers have tried to study the experience of boredom in the moment, they have often done so using trait or course-related boredom measures.

The present study underscored the importance of keeping these terms conceptually and psychometrically distinct. On the whole, state boredom was moderately to strongly related to trait boredom and weakly to moderately correlated with ratings of the boringness of the learning task, whereas ratings of the boringness of the learning task were weakly to moderately correlated with trait boredom measures. Furthermore, as shown in Figure 8, our studies found different relationships between trait boredom, state boredom, perceived boringness of a task and performance. Future researchers should be mindful of the conceptual distinctions between these concepts and refrain from using them interchangeably. Doing so will allow future work to disentangle which findings in the academic boredom literature are attributable to which 'type' of boredom.

In creating a 'taxonomy' of boredom in post-secondary education for educators and researchers, the present study suggests the importance of distinguishing between 'green light', 'yellow light', and 'red light' boredom. 'Green light' boredom is state boredom, which as I found does not have a reliable relationship with performance. Green light boredom is more likely to occur against the backdrop of an interesting task where students may be more sensitive to the contrast between an ostensibly interesting task and their feeling of in the moment disengagement. As the name suggests, and as discussed in more detail below, green light boredom is a 'go ahead' signal for students and educators to understand why students are bored and to change the learning environment or the students' framing of the task. 'Yellow light' boredom is judgments of the learning task as boring. My Study 3 found that this type of boredom is impacted by performance feedback: students may react to negative feedback by blaming the task, and perhaps especially so if the feedback does not resonate with their expectations. This aligns broadly with cognitive dissonance theory, which documents the truly impressive lengths students and indeed most people will go to in order to resolve discrepant cognitions. Clearly, this spells trouble for the educator, as the true point of intervention may not be the task itself but perhaps how the material was taught or how students approached the task. Finally, 'red light' boredom is trait boredom, when students have become characteristically prone to being bored in learning settings (class-related and learning-related boredom) or in general (boredom proneness). Red light boredom is exemplified in the student that sits down for the first lecture with their headphones on. Although this attitude may seem defeatist, researchers have also framed this stance as students' attempt at asserting agency when trapped in an educational system that is not meeting their needs (Fallis & Opotow, 2003). When students adopt this position, it is extremely difficult for students or educators to intervene.

**The Difference Between Performance and Performance Feedback**

Study 1 investigated the naturalistic relationship between performance and state boredom, whereas Study 3 investigated whether manipulating performance feedback resulted in changes in state boredom. In partial support of control-value theory, Study 1 found that performance consistently negatively predicted state boredom for participants who memorized an interesting word list. Not supporting control-value theory, Study 3 found that manipulating performance feedback did not affect state boredom. 'Performance' and 'performance feedback' are likely two distinct variables with possibly different relationships to boredom.

In line with our finding in Study 3, the scant literature on the relationship between performance feedback and boredom suggests that the effect of performance feedback on students' boredom is not robust. Fong et al. (2016) investigated students' affective reactions to imagining receiving constructive criticism, positive feedback, and negative feedback. Boredom was an integral piece of students' imagined affective reaction to *each* feedback situation: that is, boredom was not specific to one type of feedback. Viciana, Cervelló, and Ramírez-Lechuga (2007) studied the effect of providing high school gym class students with only positive feedback, only negative feedback, or an even mix of positive and negative feedback. They found that students receiving only positive or only negative feedback reported significantly higher levels of boredom than students who received a mix of feedback, but found no significant difference between students who received only positive or only negative feedback.

The studies that have found an effect of performance feedback upon boredom have found it to be highly dependent on individual variables such as type of boredom assessed, overall intellectual ability, and task performance. Studying the effect of the 'feedback' of being placed in an academically gifted classroom, Preckel et al. (2010) found that students who were placed into a gifted secondary classroom reported an increase in boredom in mathematics class due to being over-challenged and a decrease in boredom in mathematics class due to being under-challenged over the school year, but that students who stayed in non-gifted classrooms did not report changes in these types of boredom over the year. Further, they did not find that either of the groups' reported frequency of boredom in mathematics class changed over the course of the school year. In a study of kindergartners, Muis, Ranellucci, and Duffy (2015) found that the provision of feedback on a literacy game early in the school year did not change how boring participants felt the game was compared to when these same participants played the game without feedback (Study 1). When they repeated the experiment with another kindergarten class (Study 2), they found that participants rated the game as more boring in the feedback condition compared to the no feedback condition early in the year, but that this effect disappeared when these participants were re-tested later in the year. The authors noted that the Study 1 participants were high-achieving, such that they had equivalent scores as the Study 2 participants at Time 2. In contrast, the Study 2 participants had much lower achievement at Time 1 than the Study 1 participants had at this time in the school year. That is, finding the game more boring when feedback was provided was only the case when individuals were not performing well. Our own work in Study 3 suggests that academic boredom may be an important moderator of the relationship between feedback and state boredom.

Future work should disentangle performance and performance feedback to better understand their relationship to boredom.

## Heeding Warning Signs

What would help Calvin and others like him find school as exciting as the adventures of Spaceman Spiff? Boredom in the classroom is a problem that, I contend, is amenable to intervention. Below, I discuss how educators and students can help prevent, reduce and respond adaptively to boredom in the classroom.

### Potential interventions for educators.

***Research findings.*** Research has found that students attribute their boredom primarily to characteristics of teaching instruction, and at much higher rates than teachers attribute boredom in the classroom to this cause (Daschmann et al., 2014). Students report experiencing certain teaching activities and styles as more boring than other activities and styles. In terms of teaching activities, Mann and Robinson's (2009) university student sample reported laboratory work, computer sessions, copying overheads in lectures, and the use of Powerpoint (audio-visual slides) with handouts as highly boring and group discussions in lectures as interesting. Note that some of these activities reported as boring involve active participation (e.g., laboratory work).

Thus, merely requiring students to participate is not enough; in other words, boredom is not just a function of low arousal, and therefore cannot be solved merely by having students be active. Similarly, Struyven, Dochy, and Janssens (2012) found that students preferred a traditional lecture to “student activating instruction,” which required students to engage in learning through self-discovery by completing practical assignments with the teacher functioning as a coach (p. 393). Sharp, Hemmings, Kay, Murphy, and Elliott’s (2017) sample of university students reported traditional whole-year lectures as the least interesting method of course delivery and individual or small-group tutorials, specialized practical input, and seminars as interesting methods of course delivery. Considering the findings of these studies, it seems that students do not enjoy being passive recipients of learning, nor do they enjoy classroom settings when the demands are too high. Supporting this pattern, Goetz, Lüdtke, Nett, Keller, and Lipnevich (2013)’s experience sampling study found that lessons that were too challenging for students predicted boredom and Vogel-Walcutt, Fiorella, Carper, and Schatz’s (2012) review of the literature on state boredom in educational settings concluded that boredom is likely to result when students receive insufficient guidance. The context of learning was also highlighted as crucial: Vogel-Walcutt et al. (2012) also concluded that state boredom is likely to result when tasks are overly abstract or are not clearly linked to the course aims. In terms of teacher styles, supportive, autonomy-granting instruction has been found to result in lower levels of boredom (Goetz et al., 2013; Tze et al., 2014; Vogel-Walcutt et al., 2012).

***Guidelines for educators.*** The literature on which teaching activities are boring is somewhat murky, likely because it is difficult to assess the boringness of teaching activities without reference to the teacher’s overall style, and the lesson and course objectives. Based on the extant research, we suggest that the sorts of activities that are unlikely to result in student boredom are those that emphasize active learning (e.g., discussion, completing an activity), are clearly linked to the lesson and course objectives, allow for student feedback and direction, and are carried out in a supportive environment. In my own teaching at the post-secondary level, I try to intersperse didactic instruction with activities, typically lecturing for about 10 to 15 minutes and then breaking for a 10 to 15 minute activity. The lecture is an efficient way to transmit information and provides structure and guidance for students; then, the activity allows students to either apply their learning or engage in self-discovery that will be addressed in the subsequent lecture portion of the class.

In my series of studies, as reviewed previously (see Figure 8), the evidence supported distinguishing between three types of boredom: 'green light' boredom (state boredom), 'yellow light' boredom (judgments of a task as boring), and 'red light boredom (trait boredom). I found that 'green light' boredom did not have a consistent relationship with performance, but that 'yellow light' and 'red light' boredom did. Consequently, I recommend that educators monitor their classroom for signs of boredom. If the classroom experiences a noticeable shift from engagement to boredom, this shift is a valuable signal for the educator that something about the lesson is not working. This can be a good time to check with the class: Is the content too challenging for students' current abilities? Has the lecture been going on too long and an experiential learning activity would help re-engage the class? Not only does talking directly with students solicit invaluable feedback, the act of engaging with learners in this way signals respect for students' experience and reframes learning as a mutual act of collaboration between the teacher and the student. In a parallel, researchers have begun exploring the use of "affect-aware" technology that monitors users' emotions (particularly boredom) during online learning and provides tailored responses based on the emotion (D'Mello & Graesser, 2012). One example of this technology is Affective AutoTutor and its two variants, Supportive AutoTutor (where student emotions are conceptualized as a reaction to the material or tutor) and Shakeup AutoTutor (where student emotions are located as emanating from the student, and the tutor has a sassy interpersonal style). Results suggest that students prefer Supportive AutoTutor to Shakeup AutoTutor and that Supportive AutoTutor appears to work best when students start with low domain knowledge and are past the introductory content (D'Mello & Graesser, 2012).

Similarly, educators can also intervene when students display 'yellow light' boredom. In this case, students have begun to form judgments about the boringness of the task or learning environment. This can be a good time to solicit student feedback about the learning environment, perhaps through the use of anonymous feedback surveys. Students can then provide the teacher with some ideas as to how to make the class more manageable or engaging. Lastly, interventions for 'red light' boredom are more difficult and may not be possible inside the classroom. If a student seems chronically disengaged, there might be a larger issue at play such as an ongoing stressor or learning difficulties. In this case, students may benefit from referral to other resources such as the university counselling center or writing center. In line with transition pedagogy (Kift, Nelson, & Clark, 2010), particular attention should be paid to students in the first year as they may be struggling with the new demands of post-secondary education.

Note that ensuring that students are not bored should not be the sole teaching objective. If that were the case, educators would be encouraged to play action movies or the like during the lesson rather than teaching. Learning is challenging and requires extended focus; given that no student has perfect patience or focus, some boredom in the moment during the lesson is inevitable. Furthermore, enjoyment does not necessarily result in motivation. Reviewing the neuroscience findings on motivation, Kim (2013) distinguished between *liking* (enjoyment of a learning task; not necessary for motivation) and *wanting* (extent to which the task is valued or has salience; more associated with motivation), and concluded that educators should not assume that making educational activities enjoyable will result in student motivation to learn. Below, we discuss how students can be encouraged to prevent and manage the inevitable boredom that occurs even with the very best of teachers.

**Potential interventions for students.** The existing research suggests that students are not very adept at coping with boredom when it strikes. That is, the most common methods students report using to cope with boredom are methods that hinder learning. In Mann and Robinson's (2009) study of university students, the most commonly reported boredom coping strategies were daydreaming (75%), doodling (66%), 'switching off' (62%), colouring in letters in their handout (60%), and talking to the person next to them (51%). Reporting almost identical results, Sharp et al. (2017)'s university student sample reported that, when bored, students engaged in daydreaming (46%), 'switching off' (44%), texting (37%), doodling or scribbling over handouts (36%), or talking to the person next to them (27%). Students seem to be aware of their struggle to manage boredom: In Daschmann et al.'s (2014) study, 41% identified their personality as an antecedent to boredom in the classroom.

Taking a more theoretical approach, Nett and colleagues (2010; 2011) have examined boredom coping through the lens of whether students approach or avoid the material and whether they do so using behavioural or cognitive strategies. In this framework, Nett, Goetz, and Daniels (2010) proposed four potential ways that students could cope with boredom: *cognitive approach*, in which students attempt to change their perception of the situation, particularly in ways that highlight the value of the situation (e.g., reminding one's self that learning how to conduct a *t*-test will allow one to explore exciting research questions in the future); *cognitive avoidance*, in which students try to distract or entertain themselves with thoughts that are not associated with their current situation (e.g., plan a holiday party in one's head); *behavioural approach*, in which students take action to modify the learning situation (e.g., ask the instructor to provide a case example); and *behavioural avoidance*, in which students take action to avoid the boring situation (e.g., talk to classmate about their weekend). In the previous research by Mann and Robinson (2009) and Sharp et al. (2017), students' most commonly reported boredom coping strategies can be understood as cognitive avoidance or behavioural avoidance. Based on this typology, Nett and colleagues have consistently found three boredom coping profiles: *reappraisers* (who favour cognitive approach strategies), *criticizers* (most often use behavioural approach), and *evaders* (employ behavioural and cognitive avoidance; Nett et al., 2010; Nett, Goetz, & Hall, 2011; Daniels, Tze, & Goetz, 2015). Across these studies, reappraisers report less boredom than criticizers and evaders. Crucially, reappraisers use cognitive approach strategies both when bored and when not bored (Nett et al., 2011). The term *boredom coping* then might be a misnomer in that effective coping strategies in fact address the underlying cause of disengagement as well as manage the symptoms or outcomes of disengagement (i.e., boredom).

It is my contention that students can learn to cope more adaptively with boredom. This position stands in contrast to Vogel-Walcutt et al. (2012), who hold that state boredom should be addressed through "environmentally based mitigation strategies" (p. 90). Although, as reviewed prior, I believe that educators have a role to play in reducing student boredom, I advance students as active agents in their own learning. Indeed, as Nett and colleagues' (2010; 2011) work found, many students are already able to effectively manage their boredom in the classroom. One example of an intervention that teaches individuals to cope adaptively with boredom is described by Corvinelli (2005) in the context of alleviating boredom in men recovering from substance abuse disorder. Corvinelli (2005) suggests teaching these individuals how to reduce boredom by helping them select activities that are appropriately challenging, and then helping them understand why these activities are more engaging than the activities they usually select.

***Guidelines for educators.*** Building on the extant research, I recommend that educators support students to monitor their boredom and engage in cognitive approach strategies when boredom arises. Educators can help by providing psychoeducation about boredom's negative effects in the classroom and the efficacy of reframing the value of the task when boredom occurs. Educators can also help by building boredom coping into the lesson and course structure itself. For instance, educators could encourage students to check in with themselves periodically during the lecture and to reorient to the value of the lesson as needed. On a broader level, educators can begin the course by asking students to write down what they hope to achieve from the course and then can have students connect each lesson with their goals as the course proceeds. Linking back to our previous discussion, this strategy is easier for students when instructors clearly connect each lesson and the activities within each lesson to the course aims.

A related concern is the use of laptops or smartphones during class. On the one hand, these products allow students to take notes efficiently. Indeed, many student accommodation plans specify the use of such technologies in the classroom as a required accommodation for this reason. On the other hand, as reviewed, many students use these technologies as crutches during lectures to relieve their boredom, which negatively impacts their learning. Playing a game on one's phone stifles boredom in the moment but will make it difficult to retain the lesson. I recommend that educators do not ban technology. Not only is this banning legally inadvisable given the student accommodations discussed above, it removes the opportunity for students to learn how to manage their boredom inside and outside the classroom even when distractors are available. Instead, I recommend that educators explicitly discuss technology in the classroom with their students. Students are often aware of how distracting their laptops and phones can be and once the topic is raised, students are amenable to generating solutions. As an example of this strategy, one of my colleagues asks each of her classes at the start of the term to generate class norms around technology. Typically, the class decides something like phone and laptops cannot be used for off-task purposes if said use is distracting others in the classroom. Another common norm that students generate is that phones should be put away in one's backpack or purse before the lesson begins. Again, discussions such as these provide psychoeducation about effective learning and encourage student autonomy.

**Limitations and Future Directions**

The present program of study used a rote learning task (memorization of a word list) to mimic the learning environment. Although this design allowed for achievement to be easily and effectively assessed in the moment and for the experimental environment to be sufficiently controlled, as discussed earlier it is a narrow operationalization. Future work could explore the causal relationship between achievement and boredom using more complex learning tasks. As reviewed, boredom is related to the use of more superficial learning strategies; using a more complex learning task where a variety of learning strategies could be used would offer additional information as to how boredom and achievement interact, and would ensure that the findings observed in the present series of studies are not specific to rote learning tasks.

Similarly, the laboratory environment may have diminished the impact of our performance manipulation. Students completing a psychology study may not be particularly moved by what they perceive to be their performance, in contrast to how they might react to perceived performance in a post-secondary course. Future laboratory work could address this limitation by asking students to rate how important their performance was to them or perhaps by asking students to choose the most valuable learning task out of a series of learning tasks and then assessing them in regards to that task.

Finally, this program of study assessed student boredom from the student's perspective. The field of educational research almost overwhelmingly conducts research from this perspective; research on the educator's experience is not as common. It would be valuable to explore how educators think that boredom in the classroom can be mitigated and the potential barriers they foresee in implementing these solutions. For example, the impact of institutional barriers is almost never explored yet has a substantial impact on the lives of many educators. The types of learning activities suggested earlier (e.g., experiential learning) require a substantial time and cognitive investment from educators and are easier to carry out in a work environment that privileges preparation time and educator development.

## Conclusion

The present program of study sought to better understand the relationship between boredom and achievement by distinguishing between state boredom, trait boredom and judgments of task boringness; by conducting experiments in the laboratory where extraneous variables could be better controlled; and by using experimental manipulation for causal conclusions. Hypotheses were primarily generated based on Pekrun's (2006) control-value theory. My program of study found that state boredom and achievement had a reciprocal relationship only for those who memorized interesting word lists and only after repeated trials (Study 1), that trait boredom predicted performance on a learning task but state boredom did not (Study 2), and that manipulating perceptions of performance had no effect on state boredom but did affect participants' judgments of how boring the learning task was (Study 3). Thus, support for control-value theory is strongest when the ‘boredom’ in question is conceptualized as the boringness of a task or trait boredom rather than state boredom. These findings speak to students’ resilience and suggest that interventions to address boredom in the classroom can help target state boredom before it crystallizes into the more damaging forms of course-related and trait boredom. I call on educators to prevent boredom in the classroom to the extent that they can and also to help students manage boredom when it inevitably occurs. In particular, I recommend that educators emphasize experiential learning activities and teach students to monitor their boredom and reframe the lesson as valuable for their learning goals when boredom strikes. I urge students to use their boredom as a signal that they need to reorient to the task at hand and to consider the negative impact that distracting technologies such as laptops and smartphones can have on learning when they are used to pursue off-task activities.

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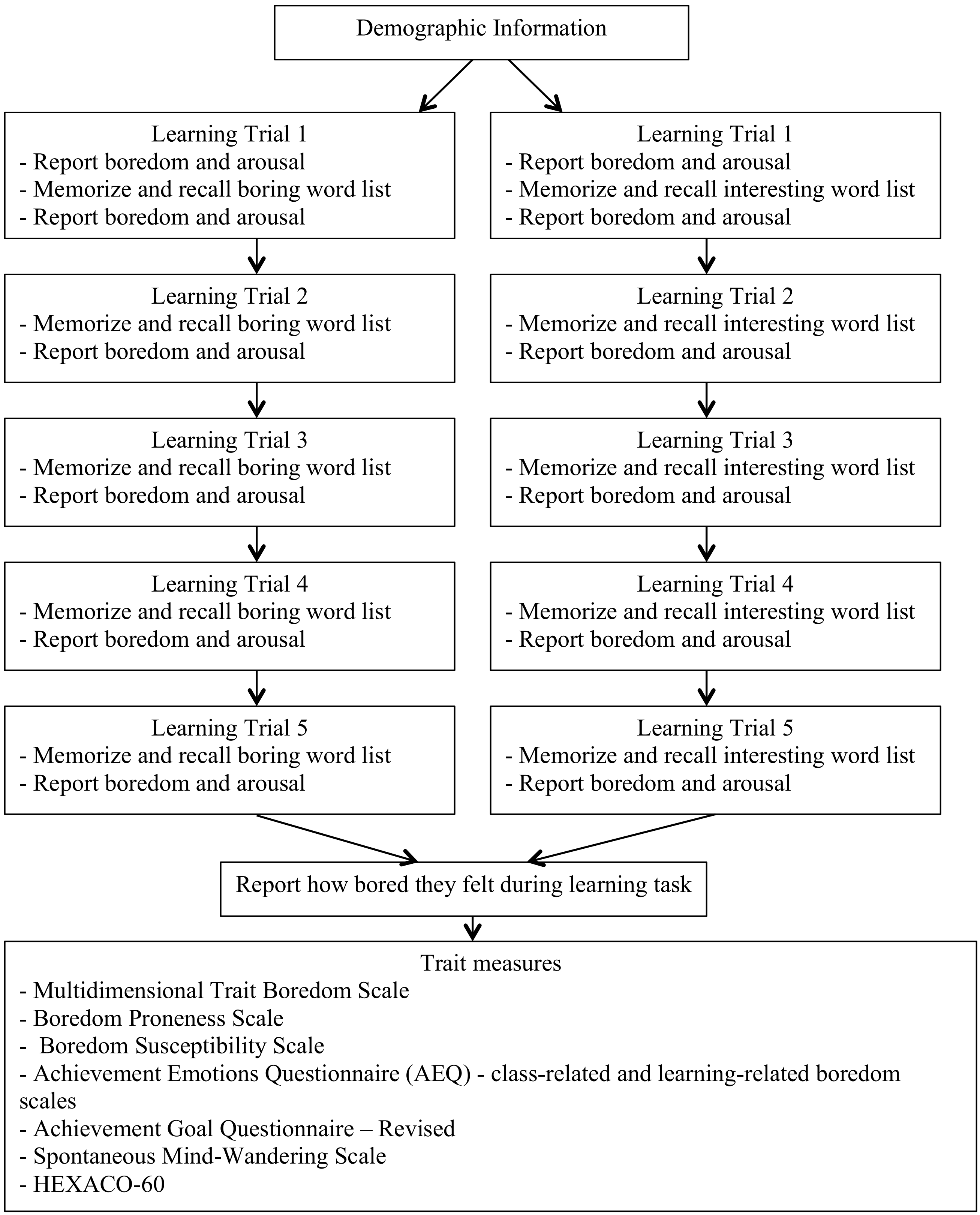
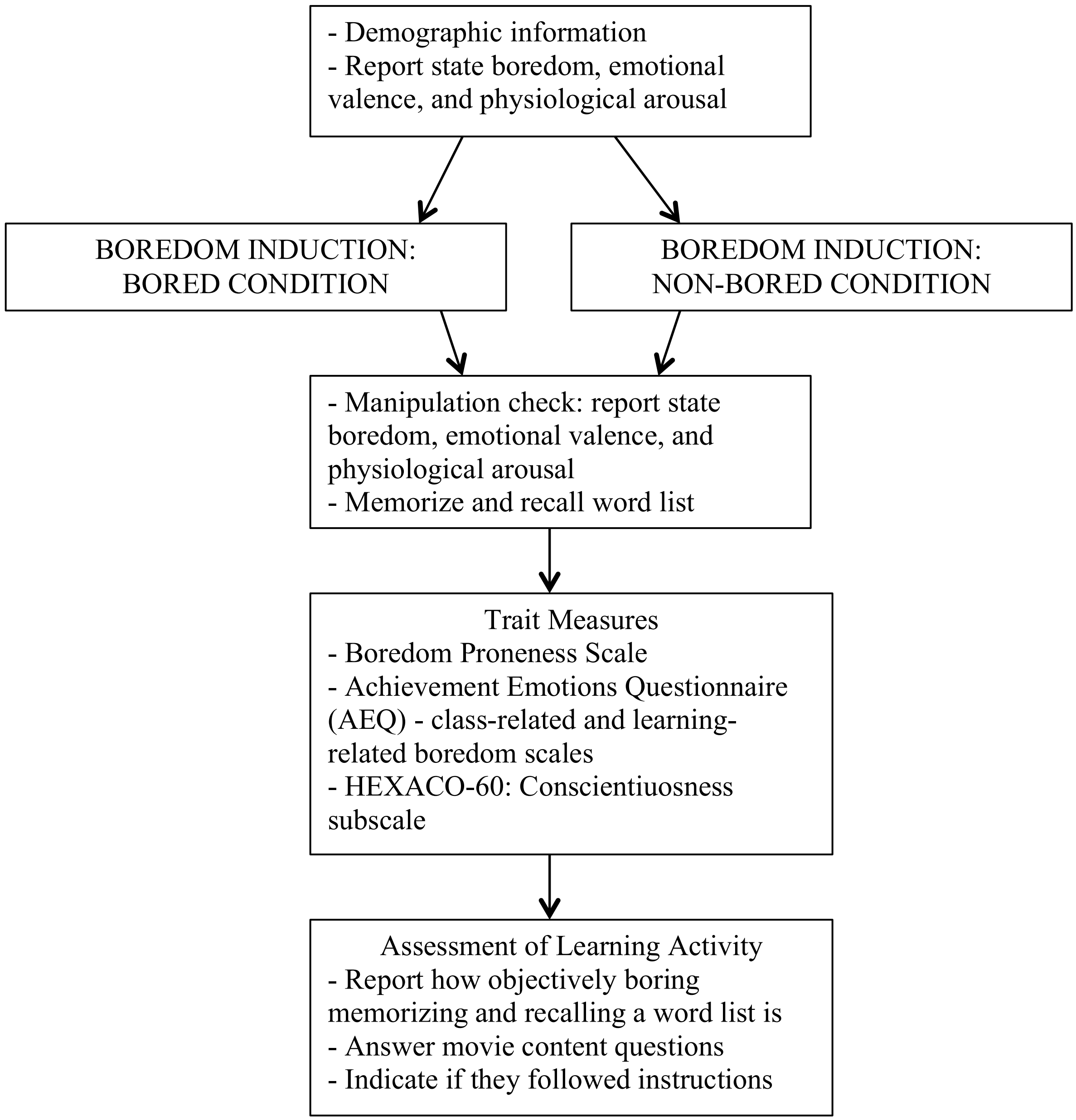
# Appendix A:

## Diagram of Study Procedures

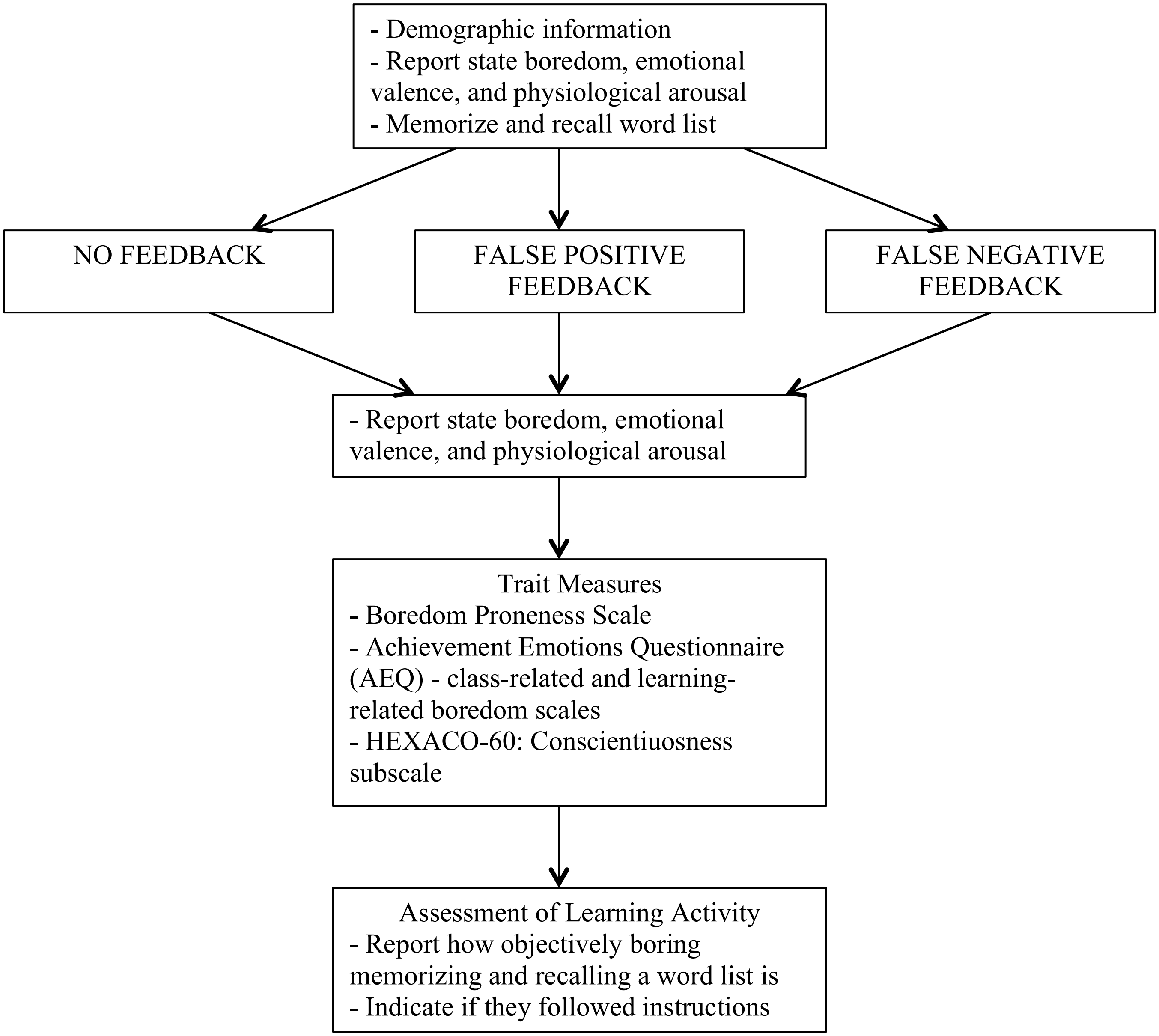
### Study 1



Study 2


- Demographic information
- Report state boredom, emotional valence, and physiological arousal
BOREDOM INDUCTION: BORED CONDITION
BOREDOM INDUCTION: NON-BORED CONDITION
- Manipulation check: report state boredom, emotional valence, and physiological arousal
- Memorize and recall word list
Trait Measures
- Boredom Proneness Scale
- Achievement Emotions Questionnaire (AEQ) - class-related and learning-related boredom scales
- HEXACO-60: Conscientiuosness subscale
Assessment of Learning Activity
- Report how objectively boring memorizing and recalling a word list is
- Answer movie content questions
- Indicate if they followed instructions

Study 3


- Demographic information
- Report state boredom, emotional valence, and physiological arousal
- Memorize and recall word list
NO FEEDBACK
FALSE POSITIVE FEEDBACK
FALSE NEGATIVE FEEDBACK
- Report state boredom, emotional valence, and physiological arousal
Trait Measures
- Boredom Proneness Scale
- Achievement Emotions Questionnaire (AEQ) - class-related and learning-related boredom scales
- HEXACO-60: Conscientiuosness subscale
Assessment of Learning Activity
- Report how objectively boring memorizing and recalling a word list is
- Indicate if they followed instructions

Appendix B:

Word Lists

Study 1

Boring Word Lists

| *List 1* | *List 2* | *List 3* | *List 4* | *List 5* |
|---|---|---|---|---|
| memory | franchise | illusion | deceit | prestige |
| kindness | management | safety | cleanness | essence |
| demon | array | mastery | custom | agreement |
| ownership | irony | interview | friction | promotion |
| satire | mischief | vigour | crisis | abyss |
| reminder | ignorance | gratitude | tragedy | socialist |
| virtue | hardship | underworld | recital | heroism |
| reaction | loyalty | facility | tendency | occasion |
| jealousy | advice | genius | attitude | poverty |
| formation | assault | humour | perception | malice |
| mercy | sadness | origin | anecdote | phantom |
| session | glory | ritual | salary | appearance |
| item | vanity | convention | misery | creator |
| northwest | hatred | outcome | miracle | maker |
| madness | episode | patent | series | victim |
| permission | exclusion | substitute | suppression | amazement |

Interesting Word Lists

| *List 1* | *List 2* | *List 3* | *List 4* | *List 5* |
|---|---|---|---|---|
| glacier | hillside | ticket | beaver | settler |
| revolver | cattle | physician | volcano | beverage |
| jury | musician | beggar | barrel | potato |
| sovereign | hotel | vehicle | avenue | prisoner |
| performer | butcher | prairie | blossom | umbrella |
| diamond | orchestra | reptile | pepper | kerosene |
| furniture | saloon | monarch | lemonade | landscape |
| candy | robber | fabric | lemon | pupil |
| magazine | alcohol | appliance | library | kettle |
| vessel | slipper | student | steamer | piano |
| photograph | hamlet | cottage | coffee | piston |
| banner | engine | bottle | garments | sultan |
| meadow | insect | moisture | banker | daybreak |
| lobster | sunset | jelly | fisherman | twilight |
| caravan | cabin | tobacco | hurricane | hammer |
| singer | apple | rattle | restaurant | salad |

Studies 2 and 3

glacier
revolver
jury
sovereign
performer
diamond
furniture
candy
magazine
vessel
photograph
banner
meadow
lobster
caravan
singer

Appendix C:

Measures

Study 1

**Demographics**

What is your age? ______

Gender (circle one): M F Both Other Prefer not to answer/question is not applicable

What is your ethnic/cultural background (check all that apply):
- ❑ Aboriginal (e.g., First Nations, Métis, Inuit)
- ❑ Arab/West Asian (e.g., Armenian, Egyptian, Iranian, Lebanese, Moroccan)
- ❑ Black (e.g., African, Haitian, Jamaican, Somali, Trinidadian)
- ❑ Chinese
- ❑ Filipino
- ❑ Japanese
- ❑ Korean
- ❑ Latin-American
- ❑ South Asian (e.g., East Indian, Pakistani, Punjabi, Sri Lankan)
- ❑ South East Asian (e.g., Cambodian, Indonesian, Laotian, Vietnamese)
- ❑ White (Caucasian)
- ❑ Other (please specify: ______________________ )
- ❑ Prefer not to answer/question is not applicable

**Assessment of State Boredom and Arousal Before and After Each Word List**

Instructions: Please respond to each question indicating how you feel right now, even if it is different from how you usually feel.

Participants respond on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

*Boredom (from the Multidimensional State Boredom Scale – Short Form; Hunter, Dyer, Eastwood & Cribbie, 2015)*
1. I feel bored.
2. I am wasting time that would be better spent on something else.
3. I am easily distracted.
4. Time is passing by slower than usual.

*Arousal (Researcher created)*
1. I am alert.
2. I am energized.

**Trait Boredom Scale (Created by Dr. John Eastwood)**

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 |

**Boredom Proneness Scale (Farmer & Sundberg, 1986)**

Participants respond on a scale ranging from 1 (strongly disagree) to 7 (strongly 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.

**Boredom Susceptibility Scale (Zuckerman, Eysenck, & Eysenck, 1978; Zuckerman, 1979)**

Instructions: Each of the items below contains two choices A and B. Please indicate which of the choices most describes your likes or the way you feel. In some cases you may find items in which both choices describe your likes or feelings. Please choose the one which better describes your likes or feelings. In some cases you may find items in which you do not like either choice. In these cases mark the choice you dislike least. Do not leave any items blank. It is important you respond to all items with only ONE CHOICE, A or B. We are interested only in YOUR likes or feelings, not how others feel about these things or how one is supposed to feel.

1. A. There are some movies I enjoy seeing a second or even 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 comfortable familiarity of everyday friends.

3. A. I dislike people who do or say things just to shock or upset others.
   B. When you can predict almost everything a person will do and say he or she must be a bore.

4. A. I usually don't enjoy a movie or a 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 to.

**The 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:

5 = strongly agree
4 = agree
3 = neutral (neither agree nor disagree)
2 = disagree
1 = strongly disagree

Please answer every statement, even if you are not completely sure of your response.

Scale items:

1. I would be quite bored by a visit to an art gallery.
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.
10. I rarely express my opinions in group meetings.
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.
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.
15. People sometimes tell me that I'm too stubborn.
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.
20. I make decisions based on the feeling of the moment rather than on careful thought.
21. People think of me as someone who has a quick temper.
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.
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.
27. My attitude toward people who have treated me badly is "forgive and forget."
28. I feel that I am an unpopular person.
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.
31. I've never really enjoyed looking through an encyclopedia.
32. I do only the minimum amount of work needed to get by.
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.
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.
42. I would get a lot of pleasure from owning expensive luxury goods.
43. I like people who have unconventional views.
44. I make a lot of mistakes because I don't think before I act.
45. Most people tend to get angry more quickly than I do.
46. Most people are more upbeat and dynamic than I generally am.
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.
49. I don't think of myself as the artistic or creative type.
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.
53. Even in an emergency I wouldn't feel like panicking.
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.
56. I prefer to do whatever comes to mind, rather than stick to a plan.
57. When people tell me that I'm wrong, my first reaction is to argue with them.
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.
60. I'd be tempted to use counterfeit money, if I were sure I could get away with it.

Studies 2 and 3

**Assessment of State Boredom, Emotional Valence, and Physiological Arousal**

Instructions: Please respond to each question indicating how you feel right now, even if it is different from how you usually feel.

Participants respond on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

*Boredom (Multidimensional State Boredom Scale – Short Form; Hunter, Dyer, Eastwood, & Cribbie, 2015)*

5. I seem to be forced to do things that have no value to me.
6. I feel bored.
7. I am wasting time that would be better spent on something else.
8. I want something to happen but I'm not sure what.
9. I feel like I'm sitting around waiting for something to happen.
10. I am easily distracted.
11. My mind is wandering.
12. Time is passing by slower than usual.

*Arousal*

3. I am alert.
4. I am energized.

*Valence*

1. I am feeling positive.
2. I am feeling unpleasant. (R)

**The HEXACO-60: Conscientiousness Subscale (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:

5 = strongly agree
4 = agree
3 = neutral (neither agree nor disagree)
2 = disagree
1 = strongly disagree

Please answer every statement, even if you are not completely sure of your response. R = reverse scored.

Scale items:

1. I plan ahead and organize things, to avoid scrambling at the last minute.
2. I often push myself very hard when trying to achieve a goal.

3. When working on something, I don’t pay much attention to small details. (R)
4. I make decisions based on the feeling of the moment rather than on careful thought. (R)
5. When working, I sometimes have difficulties due to being disorganized. (R)
6. I do only the minimum amount of work needed to get by. (R)
7. I always try to be accurate in my work, even at the expense of time.
8. I make a lot of mistakes because I don’t think before I act. (R)
9. People often call me a perfectionist.
10. I prefer to do whatever comes to mind, rather than stick to a plan. (R)

**Assessment of Objective Boringness of Word Learning Task (Researcher Created)**

As you recall, we had you memorize a list of words and then recall them. We are interested in how objectively boring you feel this task is, and have asked a question about this below. Please note that how objectively boring a task is, is different than how bored you felt while completing the task. (For instance, sometimes you are in a bored mood and even usually exciting tasks seem dull.) Keeping this in mind, please respond to the below question.

Memorizing the list of words and then recalling them is an objectively boring task.

Participants responded on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

**Movie Content Questions (Study 2 Only; Researcher Created)**

* = correct answer

*Boredom Movie (Easy English Using Numbers and Money)*

1. The mimes wore shirts that were:
a) Striped*
b) Had polka dots
c) A solid colour

2. In the first section of the movie, the mimes are in a:
a) Veterinary office
b) Shopping mall
c) Classroom*

3. The narrator who teaches about numbers wears a suit that is:
a) Orange
b) Gray*
c) Black

*Non-boredom Movie (Speed)*

1. The movie opens with the female character (played by Sandra Bullock) yelling at the bus driver to wait for her. What is the name of the bus driver?

a) Sam*
b) Reginald
c) Fernando

2. In the movie, the male character (Keanu Reeves) is a member of the:
a) New York Fire Service (NYFS)
b) Central Intelligence Agency (CIA)
c) Los Angeles Police Department (LAPD)*

3. What speed does the bus have to stay above in order not to detonate the bomb?
a) 25
b) 50*
c) 100

**Final Question Assessing Whether Study Instructions Were Followed**

Thank you very much for your participation in our research study!

To ensure that we can use our data to help future students, we are asking that you please check the box below if you found that you could not follow our study's instructions (e.g., you randomly answered questions about how you were feeling; or you didn't understand the instructions). Please note that you will receive credit for this study even if you check the box indicating that you were not able to follow instructions today, so please answer honestly.

- ❑ I was not able to follow instructions today.