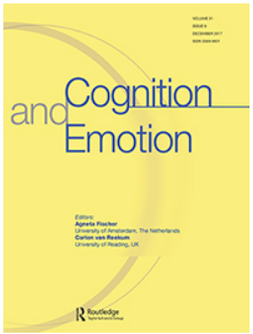

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BRIEF ARTICLE

Cognitive and affective predictors of boredom proneness

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ABSTRACT

Boredom proneness has been linked to various forms of cognitive and affective dysregulation including poor self-control and mind-wandering (MW), as well as depression and aggression. As such, understanding boredom and the associated cognitive and affective components of the experience, represents an important first step in combatting the consequences of boredom for psychological well-being. We surveyed 1928 undergraduate students on measures of boredom proneness, self-control, MW, depression and aggression to investigate how these constructs were related. Hierarchical regression analysis indicated that self-control operated as a strong negative predictor of boredom proneness. Finally, when controlling for age and self-control, we observed large decreases in the magnitudes of the relationships between boredom proneness and our other measures of interest. Together, these results imply a strong relationship between boredom proneness and cognitive and affective dysregulation, and show that individual levels of self-control can account for the lion's share of variance in the relationships between boredom, cognition, and affect.

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Boredom; mind-wandering; self-control; depression; aggression

Boredom is a ubiquitous human experience characterised by a failure to engage with one's environment – a failure that is negatively valenced (Eastwood, Frischen, Fenske, & Smilek, 2012). Higher levels of boredom proneness can negatively impact attentional capacities, emotional well-being, and have been associated with problematic behavioural consequences. For instance, high boredom-prone individuals are more likely to engage in addictive behaviours such as substance abuse and problem gambling (e.g. Mercer & Eastwood, 2010), impulsive and higher risk-taking behaviours (Joireman, Anderson, & Strathman, 2003; Kass & Vodanovich, 1990), and tend to have poorer outcomes associated with achievement settings (Pekrun, Hall, Goetz, & Perry, 2014).

The propensity to experience boredom regularly – that is, trait boredom proneness – has been associated with poor sustained attention, increased attentional lapses, attention-related cognitive errors, and mind-wandering (MW) (Carriere, Cheyne, & Smilek, 2008; Cheyne, Carriere, & Smilek, 2006). Similarly, we showed that high-boredom proneness was associated with poor performance on measures of sustained attention, with individuals who scored high on boredom proneness also demonstrating increased adult symptoms of attention deficit-hyperactivity disorder (ADHD; Malkovsky, Merrifield, Goldberg, & Danckert, 2012). Similarly, Gerritsen and colleagues (2014) found that boredom was associated with inattention, hyperactivity, and executive dysfunction. Taken together, this suggests that boredom proneness is associated with dysregulation of attentional control (Eastwood et al., 2012).

While research has demonstrated a clear link between boredom proneness and cognitive difficulties, it has also been associated with negative affective consequences. High-boredom proneness is associated with feelings of dissatisfaction, frustration, and anger (Dahlen, Martin, Regan, & Kuhlman, 2004; Goldberg, Eastwood, LaGuardia, & Danckert, 2011; Fahlman, Mercer-Lynn, Flora, & Eastwood, 2013). Perhaps the most commonly demonstrated

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relationship between boredom proneness and affect is with depression (Farmer & Sundberg, 1986; Goldberg et al., 2011). It may be the case that the persistent disengagement from one's environment – characteristic of boredom – in turn leads to feelings of sadness, helplessness, and in more extreme cases, depressive episodes (Smallwood, Fitzgerald, Miles, & Phillips, 2009). At least one study provides tentative support for this contention. Using structural equation modelling, these authors suggested that lapses in attention (i.e. disengagement from one's task or environment) do indeed lead to elevated levels of *both* boredom *and* depression (Carriere et al., 2008; Cheyne et al., 2006). That is, being disengaged from one's environment may be a precursor to both boredom and depression.

Boredom proneness has also been related to inappropriate expression of anger, and deficits in controlling aggressive feelings (Dahlen et al., 2004). When controlling for sensation seeking and impulsivity, research has demonstrated a strong association between boredom proneness and various measures of aggression including physical and verbal aggression, anger, and hostility (Fahlman et al., 2013; Rupp & Vodanovich, 1997). Collectively, these studies suggest that boredom proneness is associated with a difficulty in self-regulating negative affect.

Research has shown that individuals with high-self-control (i.e. the capacity to self-regulate one's cognitions, affect, and behaviours; Tangney, Baumeister, & Boone, 2004) show a marked reduction in measures of impulsivity, engage in fewer risky behaviours such as substance abuse and gambling, and experience reduced negative affective states, such as depression and aggression (Denson, Pedersen, Friese, Hahm, & Roberts, 2011; Rehm, 1977). Recently, we showed that those low in general measures of self-control tended to exhibit higher levels of boredom proneness (Struk, Scholer, & Danckert, 2015). In other words, those with *high* self-control represent a kind of mirror-symmetric presentation to what is commonly observed in high boredom-prone individuals (Dahlen et al., 2004; Farmer & Sundberg, 1986). Research on the development of self-control has shown that as we age, our levels of self-control increase (Anderson, Anderson, Northam, Jacobs, & Catroppa, 2001). With an increase in self-control over time, one would expect to see a decline in boredom proneness; indeed studies have reported such a decrease in boredom proneness for older adults, relative to their younger counterparts (Vodanovich & Kass, 1990).

The current study aimed to replicate findings pertaining to boredom proneness and self-control, and to extend our understanding of boredom proneness by further exploring the relation between boredom proneness and measures of cognitive and affective dysregulation. With respect to cognitive dysregulation, we chose to examine MW as this represents a kind of "lapse" in attention. MW can be divided into deliberate (i.e. intentionally letting your thoughts shift from a current task to something else) and spontaneous MW (i.e. unintentional "off-task" processing; Seli, Carriere, & Smilek, 2015). The distinction is not trivial. If boredom proneness is more strongly associated with spontaneous MW, it would lend support to the notion that this trait is more strongly linked to a failure to self-regulate cognition; however, if boredom proneness is related to both spontaneous *and* deliberate MW equally, a self-regulatory explanation for boredom proneness may not be appropriate. To our knowledge, no study has examined the relationship between boredom proneness and deliberate or spontaneous MW. Regarding affect, we chose to assess depression and aggression (broken down into subcomponents of physical and verbal aggression, anger, and hostility) to better understand which of these constructs best explain boredom proneness.

We surveyed a large undergraduate sample on measures of boredom proneness, self-control, MW, depression, and aggression to better understand how boredom proneness is related to these constructs; to assess the degree to which cognitive and affective measures can predict boredom proneness; and to assess the role self-control plays in these relationships. We thought it was first important to account for any potential influence of age, even in an undergraduate sample with a relatively restricted range. Thus, our first prediction was that boredom proneness would decrease as individuals age (Prediction 1; Vodanovich & Kass, 1990). Next, we expected to replicate our previous findings that boredom proneness is negatively related to self-control (Struk, Scholer, et al., 2015). Given that spontaneous MW is indicative of poor cognitive control, we predict that boredom proneness will relate most strongly to this subtype of MW and will show little, if any, relationship to deliberate MW (Prediction 2). With respect to affective correlates, we expected to find positive

associations between boredom proneness and our measures of depression and aggression (Prediction 3). We chose these two affective states as depression is possibly the strongest and most reliable affective correlate of boredom in the literature and together, depression and aggression represent internalised vs. externalised affective dysregulation, respectively (Dahlen et al., 2004; Fahlman et al., 2013; Rupp & Vodanovich, 1997). With respect to the aggression subscales, any directional hypothesis concerning specific subscales would be speculative. We expected that levels of self-control would operate as a negative predictor of boredom proneness (Prediction 4), whereas the cognitive and affective indicators of dysregulation would positively predict boredom proneness (Prediction 5). Finally, regarding the role of self-control, we expected that self-control would account for a significant portion of covariance in these relationships (Prediction 6).

Method

Participants

The current sample was recruited in the Fall semester of 2013 to participate online using the University of Waterloo's Research Experiences Group in which undergraduate students participate for course credit. The initial sample was comprised of 3555 individuals; we included only participants who reported no prior history of head injury (with or without a loss of consciousness), or neurological or psychiatric illness. This left us with a final sample of 1928 participants (1400 females; *M* age = 19.64 years; *SD* = 1.88; range 15–30 years). Participants gave informed consent prior to completing the questionnaires. The study was approved by the University of Waterloo's Office of Research Ethics. We report how we determined our sample size and data exclusions (Appendix A: Participant Recruitment), as well as all manipulations and measures used in the study.

Self-report measures

Shortened Boredom Proneness Scale (SBPS; Struk, Carriere, Cheyne, & Danckert, 2015). The SBPS is an 8-item questionnaire designed to assess trait propensity for experiencing boredom. The SBPS includes items such as "I find it hard to entertain myself" measured on a 7-point Likert scale from 1 "Strongly disagree" to 7 "Strongly agree".

Brief Self-Control Scale (bSCS; Tangney et al., 2004). The bSCS is a 13-item scale that measures the level of self-control one has over one's cognitions, emotions, and behaviours. It includes items such as "I am good at resisting temptation" measured on a 5-point Likert scale from 1 "Not at all" to 5 "Very much".

Mind-Wandering (Carriere, Seli, & Smilek, 2013). The MW scale is an 8-item measure of the propensity with which an individual allows his/her mind to wander from topic to topic. The scale is split into deliberate (MW-D) and spontaneous (MW-S) subscales, each with 4 items measured on a 7-point Likert scale from 1 "Extremely inaccurate" to 7 "Extremely accurate". The MW-D scale includes items such as "I allow my thoughts to wander on purpose," whereas the MW-S scale includes items such as "It feels like I don't have control over when my mind wanders."

Depression, Anxiety and Stress Scale (DASS; Lovibond & Lovibond, 1995). The DASS is a 42-item questionnaire designed to measure an individual's general level of depression, anxiety, and stress. The current study only made use of the Depression sub-scale which includes 14 items such as "I felt that life was meaningless" measured on a 4-point Likert scale from 0 "Did not apply to me at all" to 3 "Applied to me very much, or most of the time".

Buss-Perry Aggression Questionnaire (BPAQ; Buss & Perry, 1992). The BPAQ is a 27-item measure of an individual's level of aggression. The scale subdivides aggression into four domains: (1) physical aggression; (2) verbal aggression; (3) anger; and (4) hostility. This scale includes items such as "Once in a while I can't control the urge to strike another person;" "I have threatened people I know;" "When frustrated, I let my irritation show;" and "When people are especially nice, I wonder what they want," respectively. It is measured on a 7-point Likert scale from 1 "Extremely uncharacteristic of me" to 7 "Extremely characteristic of me."

Data analyses

Statistical analyses were conducted using SPSS Statistics 20 (Armonk, NY). First, we tested for gender differences and age effects on boredom proneness scores. Second, while controlling for age, we performed partial correlational analyses to examine the direction and strength of any relations between boredom proneness and self-control, MW, depression, and aggression. Third, to assess the degree to which our cognitive and affective measures predicted

levels of boredom proneness, a hierarchical regression analysis was conducted. Fourth, to assess the degree to which self-control accounts for the relationships between boredom proneness and our measures of cognition and affect, we performed partial correlational analyses again, controlling for age *and* self-control.

Results

Descriptive and difference statistics are presented in Supplementary Table 1. Women were significantly younger than men in this sample, and reported significantly lower levels of boredom proneness relative to men. Women also reported significantly higher levels of self-control relative to men. Overall levels of aggression were higher in men, as were reports of physical and verbal aggression**,** relative to women. There were no significant gender differences in reports of deliberate or spontaneous MW, depression, anger, or hostility (Supplementary Table 1).

A linear regression analysis was employed to determine whether boredom proneness changed as a function of age, while controlling for the effect of gender.[1] Results indicated that age was a significant *negative* predictor of boredom proneness ($F(2, 1922) = 16.75$, $p < .001$; $\beta = -.06$, $t = -2.67$, $p = .008$). This age effect continued to be significant even when we further restricted the range of our sample from 17 to 22 years.

Controlling for age, boredom proneness was negatively correlated with self-control (see Supplementary Table 2). Boredom was positively correlated with both deliberate and spontaneous MW, indicating that MW of both kinds was more prevalent in those high in boredom proneness. Directly contrasting these two correlations using *z*-scores for dependent correlations (DeCoster, 2007) demonstrated that the correlation between spontaneous MW and boredom was significantly larger than the same relationship seen for deliberate MW($z = 9.98$, $p < .001$), in line with Prediction 2.

Regarding affect, we observed significant positive correlations between boredom proneness and all measures, in line with Prediction 3 (*r* values ranging from .26 to .57; Supplementary Table 2). Directly contrasting aggression sub-scores and boredom proneness using the DeCoster method indicated that the relationship between boredom proneness and hostility was significantly stronger than the correlations observed for boredom proneness and physical aggression ($z = -9.51$, $p < .001$), verbal aggression ($z = -10.32$, $p < .001$), and anger ($z = -7.76$, $p < .001$). The next largest correlation between boredom and subscales of aggression was observed with anger, which was significantly larger relative to the correlations observed with physical ($z = 3.47$, $p < .001$) and verbal aggression ($z = 4.26$, $p < .001$). The correlations between boredom and physical and verbal aggression did not differ significantly from one another.

To assess the degree to which boredom proneness is predicted by our cognitive and affective measures, a hierarchical regression analysis was conducted (Table 1).

The first step of the regression was used to control for gender and age effects, which accounted for ~2% of the total variance in the model ($R^2 = .02$, $SE = 8.81$, $p < .001$); the second step included our cognitive and affective measures of interest, which accounted for an additional 46% of variance ($\Delta R = .46$, $SE = 6.42$, $p < .001$). Results showed that self-control was the only significant *negative* predictor of boredom proneness, in line with our 4th prediction. Spontaneous MW was a significant *positive* predictor of boredom

Table 1. Hierarchical regression analysis statistics for boredom proneness, controlling for gender and age.

						CI (95%) for B			
	B	SE	*β*	*t*	*P*	LB	UB	*sr*	sr^2(%)
[1] Gender	1.173	.232	.118	5.062	.000	.719	1.628	.117	.014 (1.37)
Age	−.303	.109	−.065	−2.774	.006	−.517	−.089	−.064	.004 (0.41)
[2] Self-control	−.279	.022	−.272	-12.971	.000	−.321	−.237	−.219	.048 (4.80)
Deliberate mind-wandering	.017	.029	.011	.593	.553	−.040	.074	.010	.000 (0.01)
Spontaneous mind-wandering	.208	.033	.132	6.272	.000	.143	.273	.106	.011 (1.12)
Depression	.677	.041	.344	16.563	.000	.597	.757	.280	.078 (7.84)
Physical aggression	.031	.023	.029	1.371	.171	−.014	.076	.023	.001 (0.05)
Verbal aggression	−.039	.028	−.034	−1.396	.163	−.094	.016	−.024	.001 (0.06)
Anger	.026	.029	.024	.894	.371	−.031	.084	.015	.000 (0.02)
Hostility	.100	.019	.126	5.152	.000	.062	.138	.087	.008 (0.76)

Notes: DV, boredom proneness; B, unstandardised beta coefficient; SE, standard error of unstandardised beta coefficient; ß, standardised beta coefficient; *t*, *t*-score; *p*, significance value; *CI*, confidence interval; *LB/UB*, lower/upper bounds; *sr*, semi-partial correlation; sr^2(%), squared semi-partial correlation (unique variance).

Table 2. Partial correlations between boredom proneness and all measures controlling for age, and age and self-control.

	Boredom proneness		
	C: Age	C: Age + Self-control	% Change
Deliberate mind-wandering	.200	.071	64.5
Spontaneous mind-wandering	.426	.232	45.5
Depression	.574	.461	19.7
Total aggression	.429	.261	39.2
Physical aggression	.263	.133	49.4
Verbal aggression	.262	.131	50.0
Anger	.336	.185	44.9
Hostility	.475	.325	31.6

Note: C, control variable. All coefficients are significant ($p < .001$).

proneness (Prediction 5), whereas deliberate MWdid not reach significance, and failed to improve the fit of the model. Regarding affect, depression and hostility were significant *positive* predictors of boredom proneness (also evidence for Prediction 5), whereas physical aggression, verbal aggression and anger did not significantly predict boredom proneness and failed to improve the fit of the model. The overall model fit was significant ($F(10, 1827) = 167.92$, $p < .001$), with a total of 47.7% of the variance explained (adjusted $R^2 = 0.477$).

Finally, to assess the degree to which self-control accounts for the relationships between boredom and our measures of MW, depression, and aggression, we conducted partial correlations, controlling for age and self-control. All relationships remained significant (Supplementary Table 3); but decreased in magnitude across the board (Prediction 6; Table 2). To illustrate this decrease when taking self-control into account, coefficient difference scores were computed for each *r*-value and are presented as *percentage decreases* in Table 2. These decreases provide a rough indication of the proportion of the relationship between boredom proneness and each variable that can be accounted for by age and levels of self-control.

When taking into account both age and self-control, we see dramatic reductions in the magnitude of initial coefficients. Regarding MW, the strength of both relationships is reduced; boredom proneness and deliberate MW is reduced by 64.5% and boredom proneness and spontaneous MW is reduced by 45.5%. Similarly, for our measures of affect, we see boredom and depression's relationship reduced by ~20%, and we observed decreases ranging from 31% (hostility) to 49% (physical aggression) in the relation between boredom and each aspect of aggression. When controlling for age alone, the relationships between boredom proneness and our measures of cognition and affect are moderate in strength; however, when parsing out the influence of self-control, we see a large shift in how these variables relate to one another. These results suggest that the relations observed between cognition, affect, and boredom proneness can largely be accounted for by differing levels of self-control.

Discussion

We sought to better understand boredom proneness by exploring the role played by self-control in the cognitive and affective contributors to this trait. In line with previous findings, we found gender and age differences, with women reporting lower levels of boredom proneness relative to men, and younger people reporting higher boredom proneness relative to older adults (Vodanovich & Kass, 1990). Age was found to be a significant negative predictor of boredom proneness despite the restricted range of the sample (15 years), and remained significant when we further restricted the age range to just 5 years (17–22 y.o.a.). The tantalising, although admittedly speculative, hypothesis is that levels of boredom proneness follow to some extent the degree of frontal cortical maturation (Hamilton, 1983). This would be consistent with the role of self-control as a negative predictor of boredom proneness (Table 1); as frontal cortex matures in the late teens and early 20s, one expects concomitant improvements in executive functions that in part may result in higher levels of self-control (Anderson et al., 2001; Poletti, 2009). Similarly, frontal maturation will be related to increased levels of attentional control perhaps making it easier for people to engage with their environment, leading to lower levels of boredom proneness (Keating, 2012). Future research using structural and functional neuroimaging techniques may help address these hypotheses by examining changes in brain structure (e.g. cortical thickness, grey/white matter ratios; white matter connectivity) and activity (e.g. functional connectivity) as a function of age and self-reported levels of boredom proneness.

Regarding our self-report measures of cognition, our correlation analyses indicated that boredom proneness was most strongly related to spontaneous MW (Supplementary Table 2). This is consistent with previous accounts relating boredom proneness to increased difficulties with sustained or directed attention (Eastwood

et al., 2012; Malkovsky et al., 2012). Furthermore, hierarchical regression indicated that only spontaneous MW acted as a significant, positive predictor of boredom proneness. These findings lend support to the notion that a failure to self-regulate attention is strongly related to experiencing boredom proneness. It would be worthwhile for future research to pursue the possibility that *deliberate* MW, by virtue of successful engagement with one's own thoughts, may act to *prevent* boredom proneness.

With respect to affective measures, correlational analyses (Supplemental Table 2) indicated that depression and all subscales of aggression were positively correlated with boredom proneness, replicating previous findings (Dahlen et al., 2004; Rupp & Vodanovich, 1997). Our regression analysis similarly replicated previous findings that showed levels of depression to be a significant positive predictor of boredom proneness (Goldberg et al., 2011). Interestingly, when examining the subscales of aggression, we found that only hostility significantly predicted boredom proneness. Both affective states, depression and hostility, would make it difficult to engage with the environment, albeit for potentially different reasons. For the depressed individual, the failure to satisfy the need for external stimulation may result in feelings of helplessness that in turn impede their ability to engage with their environment. On the other hand, increased levels of hostility may be related to a higher tendency to discount, or devalue, potential options for engagement – options that may otherwise alleviate boredom (Stein & Madden, 2013; note: such "discounting" behavior may also be evident in depressed individuals; see Dennhardt & Murphy, 2011). Indeed, research on boredom and discounting has shown that high boredom-prone individuals will readily discount rewards that are not immediate (Smits, Stein, Johnson, Odum, & Madden, 2013). To discount an option before considering it entirely is in essence antagonistic, and may explain why hostility is a strong positive predictor of boredom proneness. Clearly, further research is needed to fully explore these hypotheses.

Interestingly, self-control was the only construct negatively correlated with boredom proneness (Supplementary Table 2); our regression analysis indicated that it was also the only negative predictor of boredom proneness (Table 1), replicating our previous work (Struk, Scholer, & Danckert, 2015). Furthermore, we found that individual levels of self-control can partially explain the observed relationships between boredom proneness and our measures of cognition and affect. This provides evidence to support the notion that both the cognitive and affective components associated with trait boredom can be explained by failures of self-regulatory control. The results here reflect the relationships between self-control and *trait* propensity to experience boredom. It may also be the case that the intensity and duration of *states* of boredom are also related to levels of self-control and self-regulatory capacity. Further research on state boredom is needed to address this possibility.

This work is not without limitations. First, correlational analyses do not allow us to infer causation. An experimental manipulation using tasks known to require self-control (e.g. Stroop or Go/No-go tasks) would go some way to addressing whether or not low levels of self-control and high levels of boredom proneness have explicit behavioural consequences. Mood inductions may also help address questions concerning the consequences of state boredom for cognitive and behavioural control. Second, the cognitive and affective constructs measured here are unlikely to function in a unidirectional manner. Instead, boredom, depression and aggression likely interact in dynamic ways. It is entirely plausible that the propensity to experience boredom may lead to feelings of depression and vice versa. Finally, the use of a general measure of self-control is associated with inherent limitations; we are not able to separately parse out the cognitive, affective, and behavioural aspects of self-control. Future research could utilise more directed measures of self-control that specifically address distinct regulatory modes or foci.

Our findings underline the dynamic interplay between cognitive and affective components of boredom proneness. We make no claims that our chosen measures are the only factors that can contribute to boredom proneness; for instance, research has demonstrated that motivation and sensation seeking can play an important role in engaging with one's environment (Dahlen et al., 2004). While we did not address motivation or sensation seeking directly here, the SBPS assesses an individual's need for external stimulation (Struk, Carriere, Cheyne, & Danckert, 2015); presumably, individuals high in boredom proneness *are* motivated to engage with their environments, but when they attempt to do so, they fail. With respect to sensation seeking, research has shown that peak sensation seeking behaviour occurs in mid-adolescence, tapering off after the age of 15, and is strongly related to immature capacities for self-control. As such, our sample, with a mean age of 20, is beyond that peak age for sensation seeking (Steinberg et al.,

2008). Taken together, our findings suggest that boredom proneness is strongly related to both cognitive and affective dysregulation, and illustrate that differing levels of self-control can explain a substantial proportion of variance in the relationships between boredom proneness, cognition, and affect.

Note

1. To control for gender, the variable was dummy coded and an unweighted effects code was computed as a ratio between females and males, and then collapsed to assess the effect of age.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix A: Participant Recruitment

Time and Place:

Fall of 2013; University of Waterloo

Procedure:

Using the University of Waterloo's Research Experiences Group (REG), undergraduate students participate for course credit by completing surveys online.

Inclusion Criteria:

Completed all Questionnaires.

Exclusion Criteria:

History of head injury, with or without loss of consciousness (LOC).

Diagnosis of neurological/psychiatric condition(s), with or without medication(s).

Initial participants: 3555

Did not complete all questionnaires: 1079

History of head injury injury, with or without LOC: 355

Diagnosis of neurological/psychiatric condition(s), with or without medication(s): 193

Final sample: 1928