Boredom and the Sense of Agency

by

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Author's Declaration

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Statement of Contributions

This research was conducted at the University of Waterloo by V. Baaba Dadzie under the supervision of Dr. James Danckert. Experiments 1 and 2 of this dissertation have been published in two separate articles at the journal *Personality and Individual Differences* (Dadzie et al., 2024; Dadzie & Danckert, 2025). The study from chapter 5 has been submitted as an article to the *Journal of Personality*. This article was co-authored by myself, Xinyu Zhang (Tianjin Normal University), Yeyang Zhang (University of Michigan), Dr. Haibo Yang (Tianjin Normal University), Dr. Abdalla Hamid (United Arab Emirates University and Dr. James Dankert. Portions of this dissertation have been derived from or taken verbatim from these manuscripts.

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Abstract

Previous research has established boredom as an uncomfortable affective experience with a number of cognitive, physiological and behavioural correlates that are more prevalent for those who experience the state more frequently and intensely—the so-called boredom prone. The conundrum of boredom is that the individual fails to engage meaningfully with their environment despite the strong desire to do so. A proposed contributor to the experience of boredom that has had relatively little focus to date, is the sense of agency, the feeling of being an active contributor to one's outcomes. This thesis explores the notion that agency is critical to the experience of boredom and boredom proneness. In Chapter 2 of this thesis, where boredom is conceptualized within a self-regulatory framework, the sense of agency negatively predicted boredom proneness in two separate samples (N= 283; N=1,358) over and above other known correlates of boredom proneness. In Chapter 3, the possibility that this relation was due to an impoverished capacity to perceive agency external to the self was explored. Results indicated that trait boredom showed no association with the perception of agency external to the self. In contrast, state boredom was negatively associated with perceptual judgements of agency, a relationship that was partially mediated by attentional engagement. Chapter 4 investigated the possibility that the highly boredom prone report a diminished sense of agency because they are less tolerant of disruptions to agency. Both state and trait boredom were significantly associated with metrics in this study indicative of an intolerance to agency disruption. Those high in boredom proneness tended to reset game play more frequently when faced with disruptions to agency and did so earlier than did those low in boredom proneness. This is taken to reflect a lower level of tolerance for disruptions to agency. Finally, Chapter 5 assessed possible cross-cultural influences of the association between boredom and agency given differences in the adherence to individualist and

collectivist ideals. Culture showed only a minimal influence on the relation between boredom and agency, indicating that this relation is robust across multiple cultures. These results give meaningful insights into the individual differences that drive boredom proneness and emphasize that a strong sense of agency is imperative in responding to boredom's signal to re-orient and engage more meaningfully.

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Chapter 1: Introduction

In-the-moment feelings of boredom are transient, negatively valenced and represent a kind of a conundrum—the state of wanting to engage in some purposeful or meaningful activity but failing to effectively do so (Eastwood et al., 2012; Danckert, 2019; Danckert & Eastwood, 2020). It is a pervasive affective state that has been shown to be increasing among specific populations in recent years (Weybright et al., 2020; Gu et al., 2023). For example, in a longitudinal study from Weybright and colleagues (2020), data showed an increase in self-reported levels of boredom among adolescents over the decade from 2007—2017, with the rise in boredom being more prevalent among females. While research has elaborated on the antecedents, characteristics and behaviours associated with boredom, one aspect of the experience that has received relatively little attention is its association with the sense of agency, the notion that the individual is self-determined and as such makes active and intentional decisions that contribute to the desired outcomes in their life (Tapal et. al., 2017; Bandura 2006; Chambon et al, 2014). The purpose of this dissertation was to investigate how a perceived lack of agency perpetuates and perhaps amplifies the experience of boredom, particularly for those high in trait boredom proneness. To achieve this, the dissertation assesses associations between self-reported ratings of agency and ratings of both state and trait boredom. It explores the directionality of the relationship between boredom and agency, and finally, examines possible underlying cultural influences that may drive the association between the two constructs.

Early accounts of boredom conceptualized it as an experience that evoked intermittent fidgeting (Galton, 1885) and cast it as a derivative of other affective states, prominent among them disgust (Plutchik, 1989). More recent work has shown that boredom presents with distinct physiological and behavioural manifestations when contrasted with other proximate affective

states such as apathy, anhedonia, depression, and frustration (Goldberg et al., 2011; Van Tilburg & Igou, 2011; Wallbott, 1998). Boredom occurs across situations and in varied settings, with some situational contexts—studying, work environments and environments with high/competing attentional demands—being more likely predictors of the state than others (Chin et al., 2016).

The propensity to experience boredom more frequently and intensely, so-called boredom proneness (Farmer & Sundberg, 1986; Tam et al., 2021a), is associated with a raft of negative outcomes including increased sensation seeking, problematic smart phone usage, risk taking behaviours such as pathological gambling and substance abuse (Kass & Vodanovich 1990; Dahlen et al., 2004; Lee et. al., 2007; Oxtoby et al., 2019; Elhai et al., 2018; Mercer & Eastwood 2010). Furthermore, boredom proneness is associated with a pervasive sense that life lacks meaning or purpose (Bargdill, 2000; Fahlman et al. 2009; Tam et al. 2021a).

Boredom, both state and trait, have been cast in a number of theoretical frameworks, from difficulties with attention and meaning making, to challenges with self-regulation. Cognitive accounts of boredom characterize it as a deficit in attentional control by drawing parallels between boredom, everyday lapses in attention and suboptimal performance on laboratory-based measures of attention (Tam et al., 2021b; Drory 1982; Cheyne, Carriere, & Smilek, 2006; Gerritsen et al., 2014; Malkovsky et al., 2012). Evidence from these studies indicate that those high in boredom proneness generally struggle to focus their attention on tasks during the experience of boredom (Malkovsky et al, 2012; Gerritsen et al., 2014; Hunter et al., 2018).

Frameworks that emphasize a meaning component of boredom (Barbalet, 1999; Bargdill, 2000; Van Tilburg & Igou 2012) posit that humans ordinarily want to feel purposeful. Thus, the state of boredom arises when the current avenue(s) for engagement lacks meaning. It is

noteworthy that the experience of situational meaninglessness may be more frequent for individuals who are not actively pursuing personal goals, lack emotional clarity and generally report a loss of life meaning (Bargdill, 2000; Fahlman et al. 2009).

Finally, boredom proneness has been associated with failures of self-regulation (Isacescu et al., 2017; Struk et al., 2016; Mugon et al., 2018). That is, those more susceptible to being bored fail to adequately marshal cognitive, behavioural and emotional resources towards the effective pursuit of goals (Wolff et al., 2020b; Isacescu et al., 2018; Boylan et al., 2020; Struk et al., 2016). In the context of regulatory mode theory (Kruglanski et al., 2000), the highly boredom prone tend to prefer to adopt an Assessment focus—ruminating over options for action to ensure they 'do the right thing'—as opposed to adopting a Locomotion focus wherein individuals move rapidly and effectively from one action state to another (Mugon et al., 2018). This accords well with the notion that boredom proneness represents a conundrum—the recognition of the desire to effectively engage with the world, coupled with a failure to launch into action (see Chapter 2 for a more expansive discussion of boredom proneness and its association with regulatory modes).

Each of these accounts of boredom can be subsumed under a functional definition of the experience—the notion that the state of boredom serves an adaptive purpose, prompting the search for more purposeful alternatives to the current situation. Beyond merely feeling uncomfortable, boredom propels the individual to seek alternative, more purposeful avenues for engagement to optimize deployment of cognitive resources (Bench & Lench 2013, 2019; Kurzban et al., 2013; Trudel et al., 2025). In other words, individuals will likely seek stimulation or more challenging situations in the wake of boredom (e.g., Dahlen et al. 2004). However, given the challenges with self-regulation outlined above, those high in trait boredom fail to engage in exploratory behaviours in response to this call to action. Furthermore, this adaptive role of

boredom only signals the importance of changing activities but does not necessarily guide the individual in choosing *which* alternative activity might best satisfy the need to be engaged. For the highly boredom prone, this may account for the array of detrimental behaviours and the negative emotional states associated with the trait.

In a more recent conceptualization, boredom has been considered a threat to one's sense of agency (Danckert & Eastwood 2020). That is, the highly boredom prone may feel that they are not the author of their own lives such that outcomes in their environment are a function of their own intentions, decisions and actions (Chambon et al., 2014; Haggard 2017). An effective agent is not merely subject to environmental influences. To be an effective agent is to actively contribute to one's circumstances. This requires identifying a course of action that is intended to influence one's life in some meaningful way and committing to all processes required to achieve this goal.

Boredom has been shown to arise in situations which present some level of constraint on an individual's capacity to act. That is, when the individual feels obliged to do what they would rather not do or is prevented in some way from engaging in what feels meaningful or enjoyable to them (Eastwood et al., 2012; O'Hanlon, 1981; Fenichel, 1953; Geiwitz, 1966). Thus, an individual in the throes of boredom is likely to report feeling a diminished sense of agency over the situation with which they are engaged (or are struggling to engage with). This diminished sense of agency may then manifest in two ways: in attempts to re-establish agency or in failures to act at all. Put another way, the self-regulatory challenges of the boredom prone outlined above may lead to either maladaptive attempts to re-establish agency (e.g., increased risk-taking, aggression; Isacescu et al., 2017; Pfattheicher et al., 2021), or as a failure to launch into action

(Mugon et al., 2018). Both kinds of outcomes highlight a role for the sense of agency in both in-the-moment feelings of boredom and the propensity to experience the state more chronically.

This thesis represents a comprehensive examination of the relation between agency and both state and trait boredom. Personal agency has been assessed in a number of ways, using both direct and indirect measurements. This thesis deploys direct measurements that evaluate the individual's self-reported perceptions of personal agency, as well as the perception of agency for external events. The measure of personal agency used in the first study examines the individual's assessment of how much agency they believe they have, as well as the extent to which they feel a lack of agency as reported on two separate sub-scales, which when combined, generate a value for the individual's general sense of agency. Chapter 2 evaluates the relation between trait boredom proneness and the general sense of agency while highlighting the independent associations of each sub-scale of the sense of agency with boredom proneness. Results ultimately show that those high in boredom proneness express lower levels of agency.

Chapter 3 investigated the hypothesis that the lack of agency reported by those high in boredom proneness could be attributed to challenges in perceiving agency. That is, do the highly boredom prone report a diminished level of agency because they fail to *perceive* agency in themselves and in others? Is the state of boredom associated with perceptual judgements of agency more broadly? This was explored in two studies, the first of which investigated whether perceptions of agency were impaired among the highly boredom prone. The second study investigated the mediating effect of attention on the association between state boredom and the perceptual judgement of agency, given results from the first study. To do this, Chapter 3 employed the classic task developed by Heider and Simmel (1944), an animation of geometric shapes moving around a screen in seemingly purposeful ways. Here, participants were required

to watch the animation and provide ratings of how much agency they thought the shapes had. While trait boredom proneness showed no association with the perceptual judgement of agency, state boredom negatively predicted perceptual judgements of agency. Furthermore, attentional engagement mediated the association between the state of boredom and perceptual judgements of agency, such that poor attentional performance was associated with lower judgements of agency.

Chapter 4 explored the possibility that those high in boredom proneness would be less tolerant to disruptions to their sense of agency. That is, the depleted levels of agency reported in Chapters 2 and 3 was potentially due to the highly boredom prone feeling a lack of agency acutely as they are less tolerant of *disruptions* to agency. In this study, agency was disrupted during video game play. Boredom proneness was shown to be related to choices to reset game play in the face of disruptions to agency for those who chose to reset the game at least twice. In regression analyses for those who reset the game at least twice, boredom proneness predicted the number of resets participants made during the game, such that those high in boredom proneness reset the game more frequently.

In the final study (Chapter 5), this thesis examined possible cross-cultural influences in the associations between boredom proneness and agency. The goal was to determine whether culturally transmitted ideals, perceptions and preferences would contribute to the association between the two constructs. This is based on existing characterizations of individualist cultures as independent, autonomous and "egocentric", while collectivist cultures are considered primarily interdependent and sociocentric (Triandis, 1989; Markus & Kitayama, 1991). The notion was that a loss of agency in cultures that prioritized autonomy, and the independent self would be felt more strongly thereby translating into a stronger relationship between boredom proneness and the sense of agency. Results ultimately showed only a minimal influence of

culture on the association between boredom and agency, with highly boredom prone individuals reporting a diminished sense of agency across multiple cultures (samples were drawn from Canada, the United Arab Emirates and China). This suggests that the relation between boredom proneness and agency explored in this thesis is robust to cultural differences.

The data from this thesis clarifies that agency—the ability to set intentions and execute them effectively—is an important component of boredom felt in the moment and plays a key role in the experience of those predisposed to experience the state more frequently and intensely (i.e, the trait boredom prone).

1.1 General methods

Participants in each study completed the shortened Boredom Proneness Scale (SBPS; Struk et al., 2017) as part of the institutional on-line testing that students take at the beginning of each term. The SBPS is an 8-item questionnaire designed to assess one's proneness to experience boredom. Sample items include "I find it hard to entertain myself" measured on a Likert scale ranging from 1 "strongly disagree" to 7 "strongly agree" with high scores reflecting a high propensity to be bored. Struk and colleagues (2017) report an internal consistency of 0.88.

Participants also completed the Sense of Agency Scale (Tapal et. Al., 2017) as part of the institutional on-line testing administered each term. The SAS consists of 13 questions (e.g., "Nothing I do is actually voluntary.") rated on a Likert scale (1=totally disagree to 7=fully agree) with higher scores indicating a high sense of agency. Two subscales assess the distinct factors of a positive or negative sense of agency (e.g., for positive agency; "I am the author of my actions" and for negative agency: "My actions happen without my intention"). Tapal and colleagues

(2017) report a reliability of 0.78 for positive sense of agency and 0.76 for negative sense of agency.

1.2 Data Availability

Data for all studies are available at the following OSF sites:

Study 1: https://osf.io/26mxh/

Study 2a: https://osf.io/h9uya/

Study 2b: https://osf.io/y7s4v (preregistration)

Study 3: https://osf.io/xejgp/

Study 4: https://osf.io/pfw3j/

Chapter 2: Boredom and the Sense of Agency[1]

2.1. Introduction

Feelings of boredom are a reminder that our current activity is unsatisfying, and functions to push us to explore some alternative, more meaningful activity (Danckert & Elpidorou, 2023). While the state is transient and has been associated with both positive (e.g., prosocial intentions; Van Tilburg & Igou 2017) and negative outcomes (e.g., sadistic behaviour; Pfattheicher et al., 2021), research shows that trait boredom proneness—the tendency to experience the state more frequently and intensely (Tam et al., 2021a)—is broadly associated with negative outcomes (Danckert et al., 2018).

One little studied aspect of boredom proneness is the concept of agency—the perception that we are in control of our thoughts and actions. That is, when bored we are failing to interact effectively with our environs which is felt as a threat to our sense of agency (when referring to the 'sense of agency' what is intended is a general belief that one is agentic). Gorelik and Eastwood (2023) conceptualized agency as the core factor impacting trait boredom and showed a negative relation between boredom proneness and agency (i.e., high boredom proneness associated with lower agency; Gorelik & Eastwood, 2023). The scale they used, however, makes a distinction between a positive and negative sense of agency. When considering the full-scale, high scores reflect a general belief that one has some core sense of agency. When split, high scores on the negative sense of agency scale imply feelings of a *loss of control*, whereas high scores on the positive sense of agency imply the opposite. Gorelik and Eastwood (2023) did not examine these scales independently.

[1] A version of this chapter has been published in the journal *Personality and Individual Differences* (Dadzie et al., 2024).

The study presented here does not address the claim that agency *undergirds the experience of boredom proneness* (Gorelik & Eastwood, 2023). Rather, this chapter explored the possibility that diminished agency explains individual differences in boredom proneness within a self-regulatory framework. That is, does a diminished sense of agency contribute to boredom proneness beyond other known correlates of the trait including low self-control (Isacescu et al., 2017) and differences in regulatory modes (Mugon et al., 2018). This question is important given that many maladaptive responses associated with boredom proneness, from breaking social distancing rules to increased sadism and aggression, could be cast in terms of a need to re-establish agency when bored (Boylan et al., 2020; Isacescu et al., 2017; Pfattheicher, et al., 2021).

The relation between boredom proneness and the sense of agency was investigated within a self-regulatory framework for several reasons. First, the conundrum of boredom proneness is characterized by a desire to engage with the world coupled with a failure to launch into action (Gorelik & Eastwood, 2019; Mugon et al., 2018). Second, past research has outlined consistent relations between boredom proneness and a range of self-regulatory variables. Third, effective self-regulation is likely a requisite skill for successful goal pursuit, such that poor self-regulation may reflect not only failed goal pursuit, but also diminished agency. Finally, the aim was to determine the extent to which one's sense of agency would explain variance in boredom proneness, over and above these known relations.

Past research has shown that the highly boredom prone tend to be lower in self-control (Isacescu et al., 2017), which presents as a difficulty in regulating thoughts, emotions and behaviour in the pursuit of goals (Tangney et al., 2004). Successful self-control is likely necessary to attain and maintain a sufficient level of perceived agency. Furthermore, the

boredom prone individual's failure to launch (Mugon et al., 2018) is suggestive of a struggle to engage actions to re-establish agency. Regulatory mode theory (Kruglanski et al., 2000), distinguishes between two goal pursuit approaches that are also likely related to perceived agency. The locomotion mode in which individuals rapidly move from one action to another, is associated with action initiation and is considered an effective approach to goal pursuit. Conversely, the assessment approach to goal pursuit is characterized by evaluation of options for action to ensure the right choice is made. The highly boredom prone tend not to adopt the locomotion focus, struggling to initiate actions—what has been referred to as a failure to launch (Mugon et al., 2018). Instead, they adopt an assessment mode ruminating over available options for action (Mugon et al., 2018). Recent work showed that the highly boredom prone also tend to engage in rumination more generally (Wang et al., 2020). Coupled with the tendency towards adoption of the assessment mode, this highlights the conundrum of boredom proneness—the desire to be engaged coupled with a failure to satisfy that desire. This failure to launch into effective goal pursuit may be felt by the highly boredom prone as a lack of, or diminished sense of, agency (i.e., any struggle to move towards a goal will highlight to the individual that they are not being effective agents). Given that the capacity to self-regulate is an important characteristic of agency (Bandura, 2006), the current study tested whether the need for agency would explain variance in boredom proneness over and above known relations with self-control and regulatory mode.

To do this, two independent samples completed surveys of boredom proneness, self-control and self-regulation. Agency was measured using the self-efficacy scale and the sense of agency scale (Schwarzer & Jerusalem, 1995; Tapal et. al., 2017). The self-efficacy scale is a measure assessing an individual's belief in their own capacity to effectively pursue goals which

is negatively related to boredom proneness (Mugon et al., 2020). A more direct measure was obtained using the Sense of Agency Scale (Tapal et. al., 2017), which measures an individual's self-reported feelings of control over their thoughts, actions and immediate environs with a two-factor model distinguishing between reported feelings of control (i.e., positive agency) and *lack of control* (i.e., negative agency).

This chapter represents an attempt to replicate and extend the findings of Gorelik and Eastwood (2023) such that boredom proneness would be negatively correlated with the broad sense of agency (i.e., the core belief that one does or does not have agency). This was then extended in two ways; first by exploring the two factors of this scale separately, and second, by using regressions to determine the extent to which the sense of agency explains variance in boredom proneness beyond known relations with self-regulatory control. More explicitly, this chapter explored the hypothesis that the sense of agency would be negatively associated with boredom proneness, with the subscales representing the positive and negative sense of agency showing *opposing relations*. The chapter also hypothesizes that the overall sense of agency would explain additional variance in boredom proneness, after accounting for the role of self-control, self-efficacy, and regulatory modes.

There were no a priori expectations about which aspect of agency—positive or negative—would explain more variance in boredom proneness.

In addition, it was expected that past relations between boredom proneness and self-regulatory variables (e.g., self-control and regulatory modes) would replicate, such that those high in boredom proneness would show lower levels of self-control and self-efficacy, and opposing relations with the locomotion and assessment regulatory modes.

2.2 Method

Participants

For Sample one, 299 participants were recruited from the University of Waterloo undergraduate students who participated in exchange for course credit. Data was collected in Spring 2022. Participants with missing responses were excluded. The final sample consisted of 283 participants (males=88; mean age (years)=20.98; SD=3.83). Sample two (1,399 participants) was collected in Fall 2022. After excluding participants who did not report their age, or who had missing responses, the final sample consisted of 1,358 participants (males=280; mean age (years)=20.31; SD=2.93). Informed consent was obtained prior to completing any surveys and the study was approved by the University of Waterloo's Office of Research Ethics (see Appendix A for a breakdown of ethnicities within each sample).

Surveys

Five questionnaires assessing boredom proneness, agency, self-regulation and self-efficacy were completed by both samples. The Short Boredom Proneness scale (SBPS—Struk et. Al., 2017) was used to assess the trait of boredom while the Sense of Agency Scale (SAS—Tapal et. Al., 2017) was used to assess subjective ratings of agency (see Chapter 1, page 7 for details of the SBPS and SAS).

Self-control was assessed using the Brief Self-Control Scale (Tangney et al., 2004), while regulatory modes were assessed using the Regulatory Mode Questionnaire (Kruglanski et. al., 2000). Participants rated their agreement with 13 items on the Brief Self-Control Scale for questions such as "I have a hard time breaking bad habits". Responses were measured on a 5-point Likert scale (1="not at all like me" to 5="very much like me"). Higher scores indicate

higher levels of self-control. The scale has internal consistencies of 0.83 and 0.85 (Tangney et el., 2004).

The Regulatory Mode Questionnaire has a total of 24 items, 12 assessing the tendency towards adopting the assessment mode (e.g. “I am a critical person”), while the other 12 assess the tendency to adopt the locomotion mode (e.g. “I am a go-getter”). Responses were rated on a 6-point Likert scale (1=“Strongly disagree” to 6=“Strongly agree”), with higher scores indicating a greater tendency to adopt the specific regulatory mode. Kruglanski and colleagues (2000) report internal consistencies of 0.78 for assessment and 0.82 for locomotion.

Self-efficacy was assessed using the General Self-Efficacy Scale (Schwarzer & Jerusalem 1995). Participants responded to 10 questions (e.g., “I can usually handle whatever comes my way”), rated on a 4-point Likert scale (1=“not at all true” to 4=“exactly true”). Higher scores indicate stronger beliefs in personal efficacy. Schwarzer and Jerusalem (1995) report internal consistencies between .76 and .90.

Scales were administered to participants in the same order.

Data Analysis

Data analysis was conducted using R (R Core team, 2015). Zero order correlations between all constructs were examined first, followed by a hierarchical linear regression to determine whether the sense of agency predicted variance in boredom proneness. Age, gender and self-control have been shown to explain a proportion of variance in boredom proneness (Isacescu et al., 2017). As such, these variables were included in the first three steps of the regression. Agency was included at the last step to determine whether this variable would explain additional variance over and above these known relationships. It was expected that self-

control, locomotion, and self-efficacy would all negatively predict boredom proneness, whereas assessment would positively predict boredom proneness. Finally, a negative association was expected between boredom proneness and the sense of agency, such that participants who reported high levels of boredom proneness would also report diminished levels of the sense of agency (Gorelik & Eastwood, 2023).

2.3 Results

Trait boredom was negatively associated with the sense of agency in both samples. There was also a negative association between trait boredom and self-efficacy (Tables 2.1 & 2.2). In both samples, the magnitude of the negative relation between boredom proneness and agency was significantly larger than the same relation between boredom proneness and self-efficacy (DeCoster, 2007; $Z=-2.06$, $p<0.05$ for both samples). The commonly shown negative association between boredom proneness and self-control was replicated, as were the distinct associations between boredom proneness, locomotion (a negative relation) and assessment (a positive relation), in both samples (Tables 2.1 & 2.2). When correlated with the two factors of agency independently, boredom proneness was negatively associated with the sense of positive agency and positively associated with the sense of negative agency in both samples (Tables 2.1 & 2.2; Figure 2.1).

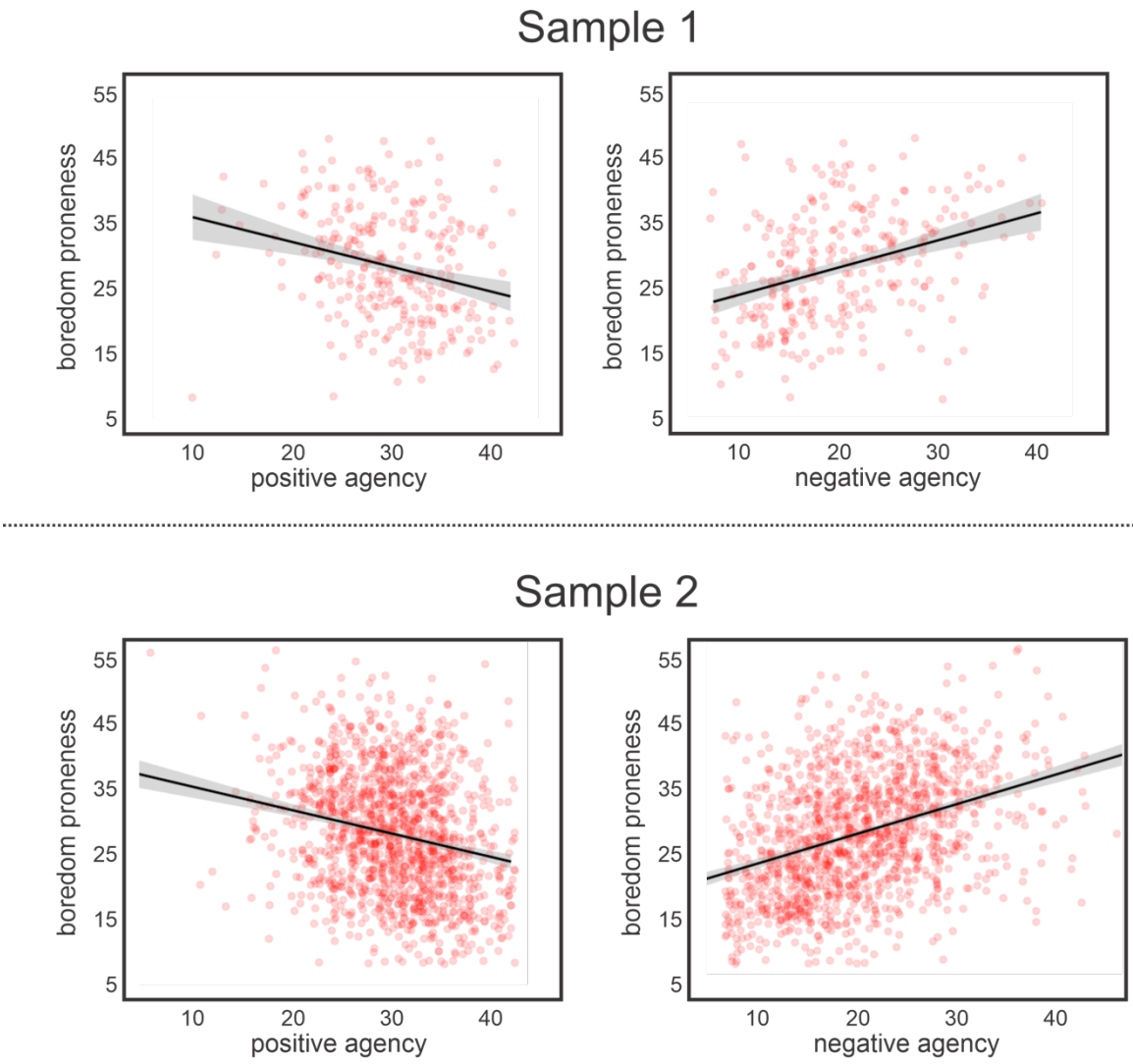


Figure 2.1. Scatter plots showing the relation between boredom proneness and positive agency (left) and negative agency (right) for sample 1 (upper rows) and sample 2 (lower rows).

To examine whether the magnitude of the relation between boredom proneness and the negative or positive sense of agency measures differed, correlations were converted to z-scores ignoring sign (DeCoster, 2007). For Sample 1, while numerically larger, the association between boredom proneness and negative agency was not significantly different from the association with positive

agency (Z=-1.72, p=.085). This difference was significant for Sample 2 (Z=-4.37, p<.001), indicating that boredom and the sense of negative agency was more strongly correlated than

Table 2.1. Bivariate correlations among study variables–Sample 1

	1	2	3	4	5	6	7	8
1. BPS	-	-0.42***	-0.24***	-0.26***	0.24***	-0.37***	-0.26***	0.35***
2. BSCS		-	0.28***	0.43***	-0.11*	0.34***	0.27***	-0.29***
3. GSES			-	0.45***	0.11	0.36***	0.38***	-0.25***
4. Loco				-	0.24***	0.28***	0.40***	-0.10
5. Ax					-	0.02	0.09	0.04
6. SAS						-	0.79***	-0.87***
7. SoPA							-	-0.38**
8. SoNA								-

BPS=Boredom Proneness Scale; BSCS=Brief Self-control Scale; GSES=General Self-efficacy Scale; Loco=Locomotion; Ax=Assessment; SAS=Sense of Agency Scale; SoPA=Sense of Positive Agency; SoNA=Sense of Negative Agency. * $p<.05$, ** $p<0.01$, *** $p<0.001$.

Table 2.2. Bivariate correlations among study variables–Sample 2

	1	2	3	4	5	6	7	8
1. BPS	-	- 0.44***	- 0.28***	- 0.29***	0.26***	- 0.34***	- 0.23***	0.38***
2. BSCS		-	0.25***	0.37***	- 0.17***	0.34***	0.25***	- 0.28***
3. GSES			-	0.38***	0.04	0.34***	0.35***	- 0.19***
4. Loco				-	0.20***	0.20***	0.25***	- 0.11***
5. Ax					-	0.03	0.05	0.02
6. SAS						-	0.82***	-0.74***
7. SOPA							-	- 0.34***
8. SONA								-

BPS=Boredom Proneness Scale; BSCS=Brief Self-control Scale; GSES=General Self-efficacy Scale; Loco=Locomotion; Ax=Assessment; SAS=Sense of Agency Scale; SOPA=Sense of Positive Agency; SONA=Sense of Negative Agency. * p<.05, ** p<0.01, *** p<0.001.

boredom proneness and the sense of positive agency.

Hierarchical Regression

Given that the correlation with boredom proneness and the sense of negative agency was stronger than that for positive agency, these variables were entered in separate steps of the regression (see Appendix A for a model in which the full scale of the Sense of Agency was submitted in the final step in each sample). That is, a hierarchical multiple regression was conducted for each sample to determine the extent to which either the positive or negative sense of agency predicted boredom when controlling for theoretically important variables in the model (i.e. self-control, self-efficacy and regulatory modes). Age and gender were included at the first two steps of the model. For sample one, age was a significant negative predictor of boredom proneness, accounting for 2.51% of variance. Gender positively predicted boredom proneness but did not contribute additional variance to the model. At step 3, the assessment regulatory mode was entered which significantly *positively* predicted boredom proneness, accounting for an additional 4.59% of variance. Locomotion, included at step 4, significantly *negatively* predicted boredom proneness, accounting for an additional 11.24% variance. At step 5, self-control significantly *negatively* predicted boredom proneness, accounting for an additional 7.09% of variance. Self-efficacy, included at step 6, significantly *negatively* predicted boredom proneness, although this variable only accounted for a small amount of additional variance (0.86%). At step 7, the sense of positive agency was included and significantly *negatively* predicted boredom proneness, accounting for an additional 1.38% of variance. When the sense of negative agency was included at the final step, it *positively* predicted boredom proneness, explaining an additional 3.57% of variance. The final model accounted for 31.48% $F(8, 274 = 15.74, p < .001)$

of variance in boredom proneness.

Results were essentially identical for Sample two (Table 4). When the sense of positive agency was added to the model at step 7, it accounted for 0.62% of variance in boredom proneness, while the sense of negative agency accounted for an additional 5.68% of variance when added at the final step of the model. The final model accounted for 35.52% $F(8, 1349 = 92.89, p < .001)$ of variance in boredom proneness.

To directly test whether the addition of agency as outlined above provided a better fit to the data than a model in which *only* self-regulatory variables were included, a direct comparison of the two models was conducted. Results indicated that the second model (i.e., with the inclusion of both positive and negative sense of agency), provided a significantly better model fit for both samples (for Sample 1 $F(5, 274) = 12.22\ p < .001$; for Sample 2 $F(2, 1349) = 65.88, p < .001$).

To test whether a model in which *only* the sense of agency was used to predict variance in boredom proneness would fit the data better than the models presented above, another regression was conducted in which the sense of agency (i.e., the full scale) was added at the third step after first controlling for age and gender. Results showed that this model explained only 15.85% of variance in boredom proneness for Sample 1 ($F(3, 279 = 17.52, p < .001$), and only 12.20% for Sample 2 ($F(3, 1354 = 62.73, p < .001$; note, the initial models explained approximately 31 and 35% of variance in the two samples). Clearly, agency alone does not explain as much variance in boredom proneness as do the models which include self-regulatory variables.

Table 2.3. Hierarchical regression predicting Boredom Proneness (Sample 1)

	B	*SE*	*t*	***P***	***p*Δ**	***R2*Δ**
Step 1						
Age	-0.35	0.13	-2.69	.008		
					.008	.02
Step 2						
Age	-0.36	0.13	-2.75	.006		
Gender	0.89	1.08	0.83	.410		
					.410	.002
Step 3						
Age	-0.27	0.13	-2.05	.041		
Gender	0.43	1.07	0.40	.690		
Ax	2.68	0.72	3.72	<.001		
					<.001	.05
Step 4						
Age	-0.27	0.12	-2.23	.027		
Gender	1.02	1.01	1.01	.313		
Ax	3.64	0.69	5.25	<.001		
Loc	-3.94	0.64	-6.19	<.001		
					<.001	.11
Step 5						
Age	-0.24	0.12	-2.01	.045		
Gender	1.33	0.97	1.38	.170		
Ax	2.80	0.68	4.10	<.001		
Loc	-2.27	0.69	-3.29	.001		
BSCS	-0.32	0.06	-5.14	<.001		
					<.001	.07
Step 6						
Age	-0.23	0.12	-1.92	.056		
Gender	1.17	0.97	1.21	.228		
Ax	2.86	0.68	4.20	< .001		
Loc	-1.79	0.74	-2.44	.016		
BSCS	-0.31	0.06	-4.92	< .001		
GSES	-0.21	0.11	-1.80	.073	.073	.01
Step 7						
Age	-0.24	0.12	-2.03	.044		
Gender	1.28	0.96	1.33	.184		
Ax	2.87	0.68	4.24	<.001		
Loc	-1.42	0.75	-1.90	.059		
BSCS	-0.29	0.06	-4.74	<.001		
GSES	-0.14	0.12	-1.21	.226		
SOPA	-0.20	0.09	-2.29	.023		

					.023	.01
Step 8						
Age	-0.18	0.11	-1.59	.112		
Gender	1.10	0.94	1.17	.244		
Ax	2.91	0.66	4.41	<.001		
Loc	-1.92	0.74	-2.59	.010		
BSCS	-0.24	0.06	-3.83	<.001		
GSES	-0.09	0.12	-0.76	.445		
SOPA	-0.08.	0.09	-0.93	.355		
SONA	0.26	0.07	3.78	<.001		
					<.001	.04

BPS=Boredom Proneness Scale; BSCS=Brief Self-control Scale; GSES=General Self-efficacy Scale; Loco=Locomotion; Ax=Assessment; SAS=Sense of Agency Scale; SOPA=Sense of Positive Agency; SONA=Sense of Negative Agency. * p<.05, ** p<0.01, *** p<0.001.

Table 2.4. Hierarchical regression predicting Boredom Proneness (Sample 2)

	B	***SE***	***t***	***p***	***p*Δ**	***R2*Δ**
Step 1						
Age	-0.29	0.08	-3.42	<.001		
					<.001	0.01
Step 2						
Age	-0.29	0.08	-3.40	<.001		
Gender	0.37	0.61	0.60	.546		
					.546	0.00
Step 3						
Age	-0.23	0.08	-2.80	.005		
Gender	0.18	0.59	0.30	.765		
Ax	3.51	0.36	9.78	<.001		
					<.001	0.07
Step 4						
Age	-0.15	0.08	-1.89	.060		
Gender	0.60	0.55	1.09	.275		
Ax	4.53	0.34	13.24	<.001		
Loc	-4.87	0.34	-14.32	<.001		
					<.001	0.12
Step 5						
Age	-0.13	0.07	-1.84	.066		
Gender	0.93	0.53	1.76	.078		
Ax	3.43	0.34	10.17	<.001		
Loc	-3.09	0.36	-8.71	<.001		
BSCS	-0.33	0.03	-12.05	<.001		
					<.001	0.08
Step 6						
Age	-0.11	0.07	-1.49	.135		
Gender	0.62	0.52	1.19	.233		
Ax	3.45	0.33	10.33	<.001		
Loc	-2.43	0.37	-6.59	<.001		
BSCS	-0.31	0.03	-11.33	<.001		
GSES	-0.29	0.05	-5.88	<.001		
					<.001	0.02
Step 7						
Age	-0.11	0.07	-1.58	.114		
Gender	0.62	0.52	1.19	.236		
Ax	3.51	0.33	10.54	<.001		
Loc	-2.35	0.37	-6.38	<.001		
BSCS	-0.30	0.03	-10.68	<.001		
GSES	-0.25	0.05	-4.75	<.001		
SOPA	-0.13	0.04	-3.46	<.001		

					<.001	0.01
Step 8						
Age	-0.05	0.07	-0.67	.500		
Gender	0.63	0.50	1.27	.206		
Ax	3.59	0.32	11.26	<.001		
Loc	-2.60	0.35	-7.35	<.001		
BSCS	-0.23	0.03	-8.59	<.001		
GSES	-0.22	0.05	-4.44	<.001		
SOPA	-0.02	0.04	-0.51	.613.		
SONA	0.32	0.03	10.90	<.001		
					<.001	0.06

BPS=Boredom Proneness Scale; BSCS=Brief Self-control Scale; GSES=General Self-efficacy Scale; Loco=Locomotion; Ax=Assessment; SAS=Sense of Agency Scale; SOPA=Sense of Positive Agency; SONA=Sense of Negative Agency. * p<.05, ** p<0.01, *** p<0.001.

2.4 Discussion

This chapter assessed the sense of personal agency as it relates to boredom proneness and other known correlates of the trait (i.e., self-control, regulatory mode; Isacescu et al., 2017; Mugon et al., 2018). Results replicated findings showing those high in boredom proneness to be lower in self-control (Isacescu et al., 2017). Similarly, the known relations with regulatory mode and boredom proneness were replicated. Adoption of the locomotion focus, characterized by the tendency to move rapidly from one goal to another (demonstrating effective agency), was negatively associated with boredom proneness, whereas, the assessment focus, best characterized by rumination over potential action options, was positively associated with boredom proneness (Mugon et al., 2018). These associations fit with the notion that boredom proneness represents failed goal pursuit. The tendency to adopt an assessment focus mires the highly boredom prone in indecision, as opposed to launching into action (something they tend not to do, evidenced by the negative association with locomotion; Tables 2.1 & 2.2). Results from both samples supported the hypothesized negative relationship between boredom proneness and the sense of

agency, such that the highly boredom prone reported diminished levels of a general sense of agency (Tables A1 & A2; Appendix), replicating recent work (Gorelik & Eastwood, 2023). While it is not feasible from this data to claim that agency is *the* critical determinant of boredom, results do show that both the positive and negative sense of agency explain variance in boredom proneness over and above other known relations (Tables 2.3 & 2.4).

While the measure of self-efficacy used here significantly improved model fit (Tables 2.3 & 2.4), it accounted only for a small amount of variance (~1 – 2%). Furthermore, while both self-efficacy and agency were negatively correlated with boredom proneness, the relation was stronger for the sense of agency. This suggests that one's sense of being in control and its relation to boredom proneness is not tied to outcomes. That is, self-efficacy by its nature depends on seeing the results of one's actions. In contrast, one could have a sense of agency *before* any outcome is achieved (i.e., prospective agency; Bandura, 2006), or despite goal success. Future work should examine whether prospective or retrospective judgements of agency and efficacy play differential roles in explaining boredom proneness.

Boredom proneness was differentially associated with positive and negative agency (Tapal et al., 2017; Figure 1). Furthermore, it was the relation with negative agency—the feeling that one *lacks* control—that was more strongly associated with boredom proneness, at least in the larger of the two samples. This suggests that the negative sense of agency accounts for the fundamental conundrum of boredom, the inability to engage in actions despite the desire to do so. If an individual does not *believe* they have control over their own goal pursuit, they may also feel that there is little point in launching into action.

Exploring the distinct facets of agency has important implications for mental health for which agency is a key factor. Castiello and colleagues (2020) suggest that depression may in part

be characterized by an absence of agency. Furthermore, the tendency to engage in repetitive compensatory behaviours in OCD may represent attempts to re-establish agency (Tapal et al., 2017; Gentsch et al., 2012). These relations are more prominently related to the *negative* sense of agency (Tapal et al., 2017), shown here to be strongly related to boredom proneness. Given the mental health challenges associated with boredom proneness (e.g., depression, anxiety, drug use; Danckert et al., 2018), it may be the case that a diminished sense of agency plays a transdiagnostic role in these relations. Clearly, more work is needed to evaluate this hypothesis.

The current findings suggest a role for the sense of agency even when taking into account known associations with trait boredom proneness. This supports the idea that feelings of state boredom are in part felt as a threat to our sense of agency (Gorelik & Eastwood, 2023). For the highly boredom prone, experiencing these feelings more frequently and intensely may indicate a persistent lack of a sense of agency, amplifying the negative experience of boredom (Gorelik & Eastwood, 2023). More work is needed to explore this hypothesis, focusing on the possibility that the need to *re-establish* agency may underlie negative outcomes related to boredom (e.g., Pfattheicher et al., 2021).

The variables included do not necessarily represent a complete compendium of factors relevant to trait boredom proneness. Notably, measures of motivation (Gorelik & Eastwood, 2023), individual differences in attentional control (Tam et al., 2021b), or metrics of meaning-making (Van Tilburg & Igou, 2012), may all play important roles in the experience of boredom proneness. These variables are important contributors to trait boredom and future research could profitably examine their relation with agency.

The relation between boredom proneness and agency shown here reflects a kind of vicious cycle for the highly boredom prone. In having a low sense of control over goal pursuit

they may initially fail to launch into action (Mugon et al., 2018). Having failed to launch, any reflection on their immediate past *confirms* their sense of a lack of agency. This may in turn make them less likely to launch into action if they feel there is little point, given the anticipation of a failure to exercise agency. This aligns with the assertion that agency may not only be generated as an after-effect of deliberate action, but can be deployed prospectively, in anticipation of specific outcomes (Wenke et al., 2010). In that case, it will be important to determine whether anticipated outcomes (i.e., prospective agency) or eventualities of goal pursuit (i.e., retrospective agency) differentially contribute to boredom proneness.

While the highly boredom prone individual reports diminished levels of agency, it may be the case that they failed to perceive it accurately in themselves. Furthermore, it is possible that the highly boredom prone struggle to accurately perceive agency, not only in themselves but in other actors as well. The following chapter addresses this question.

Chapter 3: Boredom and the Judgement of Agency[2]

3.1 Introduction

Results from the previous chapter showed that even after controlling for known associations between boredom proneness and various self-regulatory factors, the sense of agency explained additional variance in trait boredom proneness. Furthermore, it was the negative sense of agency—in other words, the strong feeling that one *lacks* agency—that explained more variance in boredom proneness (Dadzie et al., 2024).

While the sense of agency is described as a subjective and somewhat unconscious feeling of being in control of one's actions (Haggard, 2017), a second more external focus of agency—the perceptual judgment of agency—is distinguishable from the sense of one's own agency in that it involves ascribing control to actors *external to the self* (Moore, 2016). Given the association between boredom proneness and a diminished sense of agency established in Chapter 2, the current chapter considered the possibility that the highly boredom prone may feel that they themselves lack agency *because they fail to perceive agency accurately*. That is, this chapter examined whether those who experience boredom more frequently and intensely, do so because they struggle to accurately perceive agency external to themselves. This was done using a classic task of the perception of agency developed by Heider and Simmel (1944). In this task people watch a short animation of geometric shapes moving in a variety of ways that can be interpreted as agentic (e.g., the large triangle "attacking" the small circle; the small triangle and circle

[2] A version of this chapter was published in the journal *Personality and Individual Differences* (Dadzie & Danckert, 2025).

"trying to escape" the big triangle; Figure 3.1; For a video of the animation used in this study see this YouTube link).

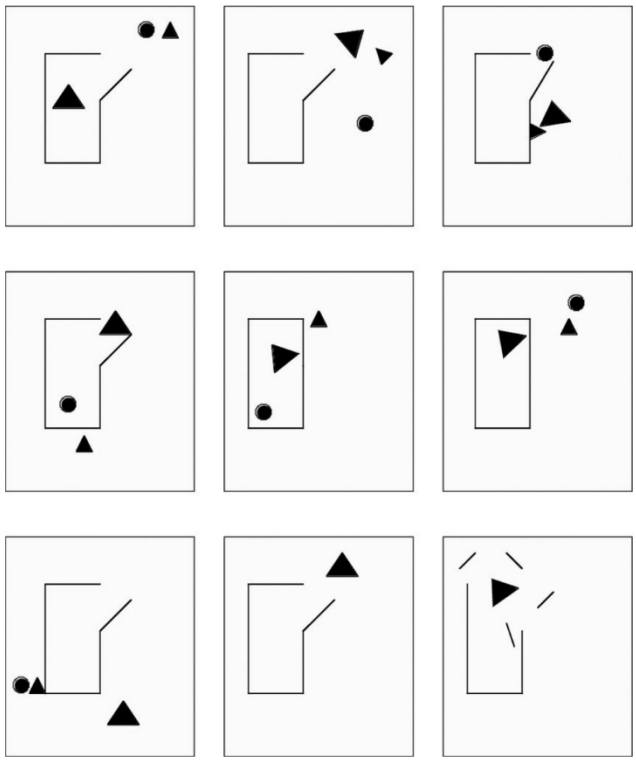


Figure 3.1. Schematic of screen shots from the Heider & Simmel (1944) animation in which shapes move in what is perceived to be agentic ways. The sequence runs from top left to bottom right.

Participants are then asked to answer a range of questions regarding their perception of agency in the video, by reporting on how intentional or human–like they believed the shapes to be.

Hypotheses regarding this experiment were necessarily exploratory. It is plausible that state feelings of boredom would have little influence on judgements of agency *external to the self*. That is, boredom is an inherently self-focused experience (Bambrah et al., 2023). As such, it may have little to no influence in how we judge the agency of others. However, it seemed equally plausible that feelings of boredom themselves are laced with feelings of a lack of agency

(Gorelik & Eastwood, 2023) which may then permeate those judgements of agency external to the self. This could, of course go in one of two directions; that feelings of boredom *reduce* our perceptions of agency ubiquitously, or that when feeling bored, we experience a heightened sense of agency, 'seeing' it acutely in others, where we do not feel it in ourselves (e.g., leading to exaggerated perceptions of agency in others). With respect to trait boredom proneness, if the diminished sense of agency reported in the previous chapter was driven by a failure to perceive agency accurately, this would be expected to lead to a diminished perception of agency external to the self when evaluated with the Heider & Simmel animation. That is, highly boredom prone individuals may have a broad, generalized deficit in representing agency, whether in the self or others.

3.2 Method

Participants

Two samples were drawn from a University of Waterloo undergraduate participant pool. Participants completed the same Shortened Boredom Proneness Scale and Sense of Agency Scale as used in Chapter 2. They also completed an anthropomorphism scale (Waytz et al., 2010), which was included in order to determine how likely the boredom prone individual would be to ascribe human like characteristics to real world objects (beyond the task used to assess the perception of agency). No a priori power analysis was conducted, but a stopping rule of collecting as much data as possible until the end of the academic term was employed. The study was approved by the University of Waterloo's Office of Research Ethics and participants gave written informed consent prior to participating. Sample 1 was collected in the Fall of 2022 and originally consisted of 220 participants. Participants who did not provide demographic data or

failed to complete responses to all measures of interest were excluded, leading to a final sample of 180 (males = 40; females = 140; mean age in years = 20.15; SD = 2.72). The study was replicated in a second sample collected in the Spring term of 2023 (original n = 296). After excluding participants with missing demographic data or missing responses to any of the measures of interest, the final sample consisted of 220 participants (males = 39 females = 181; mean age in years = 20.48; SD = 3.14.). We provide details of ethnicities for both samples in Appendix B.

Questionnaires

Both samples completed questionnaires assessing boredom proneness, the sense of agency, and the tendency to anthropomorphize (see below for justification of inclusion of this scale); see Chapter 1, page 7 for a description of the SBPS and SAS scales).

A participants' tendency to anthropomorphize was assessed via the Individual Differences in Anthropomorphism Questionnaire (IDAQ; Waytz et al., 2010). The notion here was that the tendency to anthropomorphize may in turn be associated with a stronger tendency to ascribe agency in the Heider and Simmel (1944) animation (see below for description). The IDAQ assesses variations in the extent to which participants ascribe intentionality and responsibility to non-human elements. Participants responded to a total of fifteen items such as "To what extent does the average mountain have free will?" rated on a 10-point Likert scale ranging from 1 (not at all) to 10 (very much). The scale has an internal consistency of 0.85 (Waytz et al., 2020).

Scales were administered to participants in the same order (i.e., SBPS, SAS, IDAQ).

Judgement of Agency Task

The original version of this task had participants watch a short animation of two triangles and a circle making movements around a larger stationary rectangle (Figure 3.1). Participants, when asked to describe their perception of the video, make causal attributions based on the movement of the shapes, and describe the sequence of events by attributing human-like characteristics/qualities to the shapes. The version of the task adopted here was first used by Douglas and colleagues (2016), which assessed participants' perception of the animation using a 10-item questionnaire with items such as "Did you think the behaviour of the shapes was intentional?", measured on a Likert scale ranging from 1 (not at all) to 5 (very much). This questionnaire was administered after participants had viewed the 84-second-long animation to explore their perceptual judgements of agency based on the level of intentionality assigned to the shapes. The questionnaire has a reported internal consistency of 0.94.

Measuring State Boredom

To measure state boredom in the first sample, participants responded to the question "How boring did you find the video to be?" which was asked immediately after viewing the Heider and Simmel (1944) animation and was rated on a 10-point visual analogue scale where 0 indicated the lowest boredom rating and 10 indicated the highest state boredom rating. In addition to asking them to rate how boring they found the video to be, for the second sample, people also rate their general level of state boredom before and after viewing the animation by responding to the question "How bored are you now?" rated on the 10-point visual analogue scale.

Data Analysis

Data was analyzed using R (R Core team, 2015). The goal was to investigate possible relationships between both state and trait boredom and the perceptual judgement of agency. Zero order correlations between all measures were examined first. To explore how much variance both trait and state boredom explained in the perceptual judgements of agency, a stepwise hierarchical regressions was run for each sample with gender dummy coded as 0 (male) and 1 (female). Participants who did not identify as either male or female (n=2 in Sample 1); n=1 in Sample 2) were excluded from the data.

3.3 Results

The full suite of correlations between all measures of interest for both samples are reported in Tables 3.1 and 3.2. In both samples, the finding from Chapter 2 that trait boredom proneness was negatively correlated with the sense of agency was replicated, such that those higher in boredom proneness tended to report feeling lower levels of agency. Boredom proneness had no association with the perceptual judgement of agency, nor was it correlated with the measure of individual differences in anthropomorphism in either sample. State and trait boredom proneness showed no relation in Sample 1, however it is worth pointing out that the boredom rating in Sample 1 was explicitly directed towards evaluations of the animation itself. In-the-moment measures of state boredom (i.e., "How bored are you right now?") were positively correlated with trait boredom proneness in Sample 2. The perception of agency was significantly negatively associated with judgements of how boring participants found the animation to be (Figure 3.2). That is, participants who reported finding the animation to be very boring also reported perceiving minimal agency in the behaviour of the shapes within the animation. This

was the case in both samples. Broader judgements of state boredom (i.e., "How bored are you now?") post watching the animation (but not pre) were also negatively correlated with judgements of agency in Sample 2 (note, this measure was not taken in Sample 1). This was true despite the fact that pre- and post-animation ratings of boredom were not significantly different from one another (t=1.41, p=.159). Notably, when the post-animation reports of general state boredom were contrasted with how boring *the movie itself* was rated to be (DeCoster, 2007), the latter correlation was significantly stronger (Z=2.16, p=0.031).

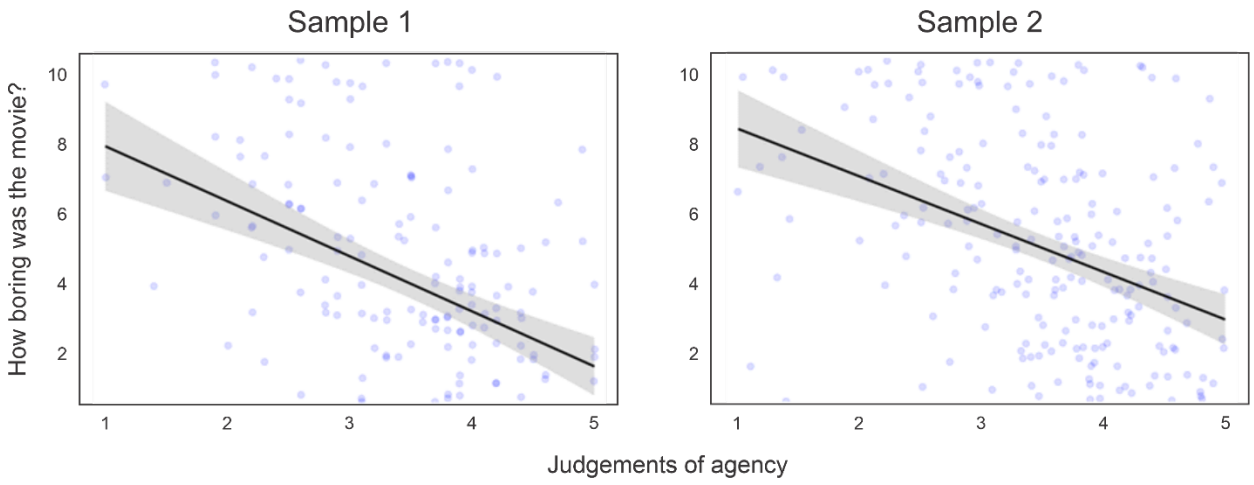


Figure 3.2. Correlations between ratings of how boring the animation was (y-axis) and perceptual judgements of agency (x-axis) for the two samples tested in Study 1.

Table 3.1 Bivariate correlations among study variables–Sample 1

	M	*SD*	1	2	3	4	5
1. Animation rating (boredom)	3.99	3.17	-	0.03	-0.07	-0.44***	0.09
2. Boredom Proneness	29.04	9.54		-	-0.37***	-0.06	-0.04
3. Sense of Agency	65.46	10.88			-	0.14	-0.06
4. Judgements of Agency	3.50	0.88				-	0.05
5. Anthropomorphism	66.7	22.66					-

* $p<0.001$

Table 3.2 Bivariate correlations among study variables–Sample 2

	M	*SD*	1	2	3	5	6	7	8
1. State Boredom (pre animation)	5.3	2.47	-	0.74***	0.36***	0.29***	-0.15*	-0.07	0.09
2. State Boredom (post animation)	4.95	2.72		-	0.67***	0.20**	-0.20**	-0.29***	0.05
3. Animation rating (boredom)	5.0	3.05			-	0.08	-0.17**	-0.40***	0.03
5. Boredom Proneness	28.96	9.50				-	-0.35***	0.05	0.02
6. Sense of Agency	65.07	11.25					-	0.04	-0.14*
7. Judgement of Agency	3.50	0.90						-	0.13
8. Anthropomorphism	64.31	21.66							-

* $p<.05$, ** $p<0.01$, *** $p<0.001$.

Hierarchical Regressions

Given the observed association between ratings of boredom related to the animation in both samples, regressions were run in which age and gender were first entered as predictors of judgements of agency (Tables 3.3 and 3.4). This was done as both variables have been consistent (though small) predictors of boredom proneness (Giambra et al., 1992; Isacescu et al., 2017). Age did not emerge as a significant predictor of judgements of agency in sample one, but significantly negatively predicted the judgement of agency in Sample 2, such that these judgements slightly diminished with age (explaining 3% of variance in the model). Gender, when included at the second step in both samples, only emerged as a significant negative predictor of the judgement of agency in the first sample, indicating that females generally had lower judgements of agency (mean judgements of agency for females=3.43; for males=3.76; t=2.058; p=0.044). Gender explained an additional 2% of variance in the perceptual judgements of agency in Sample 1. While boredom proneness was not significantly correlated with the perceptual judgement of agency, for the sake of thoroughness it was included in the third step of the model. Unsurprisingly, results showed that it did not significantly predict the perceptual judgements of agency in either sample. Finally, in Sample 1, ratings of how boring the movie was perceived to be were included at the fourth step of the model. These ratings significantly improved the model, accounting for 18.95% of variance in judgements of agency.

In Sample 2, pre-movie boredom did not significantly predict perceptual judgements of agency when included at step 4. Post-movie boredom (i.e., general ratings of how bored you are right now) did significantly negatively predict perceptual judgements of agency and accounted for 10.30% of additional variance in the model. Finally, the measure of state boredom

which more directly measured how boring participants found the animation to be, significantly negatively predicted the perception of agency and explained an additional 4.45% of variance in the model. The full model accounted for 20.79% of variance in the perceptual judgement of agency.

Table 3.3 Hierarchical regression predicting Judgements of Agency–Sample 1

	B	***SE***	***t***	***P***	***p*Δ**	***R2*Δ**
Step 1						
Age	0.01	0.02	0.41	.682	.682	0.001
Step 2						
Age	0.01	0.02	0.39	.695		
Gender	-0.33	0.16	-2.08	.039	.039	0.02
Step 3						
Age	0.01	0.02	0.32	.748		
Gender	-0.32	0.16	-2.06	.041		
Boredom Proneness	-0.004	0.01	-0.70	.483	.483	0.003
Step 4						
Age	0.001	0.02	0.03	.978		
Gender	-0.34	0.14	-2.39	.018		
Boredom Proneness	-0.003	0.01	-0.62	.534		
Animation Rating (Boredom)	-0.12	0.02	-6.51	<.001	<.001	0.19

Table 3.4 Hierarchical regression predicting Judgements of Agency–Sample 2

	B	***SE***	***t***	***P***	***p*Δ**	***R2*Δ**
Step 1						
Age	-0.05	0.02	-2.65	.009	.009	0.03
Step 2						
Age	-0.05	0.02	-2.73	.007		
Gender	-0.12	0.16	-0.75	.457	.457	0.00
Step 3						
Age	-0.05	0.02	-2.75	.006		
Gender	-0.11	0.16	-0.67	.504		
Boredom Proneness	0.01	0.01	0.81	.421	.421	0.00
Step 4						
Age	-0.05	0.02	-2.74	.007		
Gender	-0.12	0.16	-0.73	.464		
Boredom Proneness	0.01	0.01	1.14	.257		

Pre-Animation State Boredom	-0.03	0.03	-1.27	.205	.205	0.01
Step 5						
Age	-0.05	0.02	-2.47	.014		
Gender	-0.15	0.15	-1.00	.320		
Boredom Proneness	0.01	0.01	1.05	.294		
Pre-movie State Boredom	0.11	0.03	3.06	.002		
Post-Animation State Boredom	-0.17	0.03	-5.52	<.001	<.001	0.12
Step 6						
Age	-0.04	0.02	-2.31	.022		
Gender	-0.07	0.15	-0.47	.639		
Boredom Proneness	-0.01	0.01	1.07	.288		
Pre-Animation State Boredom	0.07	0.03	2.11	.036		
Post Animation State Boredom	-0.08	0.04	2.06	.041		
Animation Rating (Boredom)	-0.09	0.03	-3.48	<.001	<.001	0.05

3.4 Discussion

In this study, the possibility that trait and state boredom were associated with diminished perceptual judgements of agency was examined using the Heider and Simmel animation. In both samples, the relation between high boredom proneness and the tendency to report lower levels of the sense of agency, found in Chapter 2 was replicated. Trait boredom proneness had no association with the perceptual judgement of agency in either sample. It also showed no relation to the measure of individual differences in anthropomorphism. Interestingly, state boredom—as measured by how boring participants found the animation to be—correlated negatively with the perceptual judgement of agency in both samples (Figure 3.2).

Given that both state and trait boredom are associated with difficulties in sustaining attention, one possibility for the current results was that the animation itself failed to fully capture participants' attention (Eastwood et al., 2012; Hunter & Eastwood, 2018; Isacescu et al., 2017; Malkovsky et al., 2012). Participants who were not fully engaged while watching the

animation would likely find little reason to ascribe agency to the observed action of the shapes. While the Heider and Simmel animation was only 84 seconds long and hardly represents a demanding attentional task, past work has shown an association between boredom and sustained attention that is independent of task demands (Scerbo, 1998). If attentional disengagement was indeed a factor in judgements of agency over such a short duration, it would provide strong evidence for the already well-established link between boredom and attention (Tam et al., 2021b). This possibility motivated the next experiment which examined differences in participants' perceptual judgements of agency when an element of attentional demand was incorporated into the animation.

3.5. Study 3.2 Introduction

The purpose of Study 3.2 was to investigate the possibility that perceptual judgements of agency and state boredom were negatively associated as a function of attentional disengagement. To test this, an attentional component was introduced to the Heider and Simmel animation. While participants watched the animation the shapes would briefly change colour. Participants were not given any information about these colour changes prior to watching the animation, but were asked afterwards to estimate how many times the shapes had changed colour (see below for details). The idea was that this incidental attentional task would provide a metric for how well participants had attended to the animation with the hypothesis that lower judgements of agency would be associated with poor attention to the colour changes. In addition, this experiment aimed to replicate findings from the first study of this Chapter.

3.6 Study 3.2 Methods

Preregistration

Prior to data collection, the hypothesis, desired sample size, variables of interest and planned analyses were preregistered on Open Science Framework (see page 8 for link).

Participants

Prior to data collection, it was determined that a sample size comparable to Samples 1 and 2 of Study 3.1 would be ideal. Thus, the goal was to collect data from approximately 200 participants. 244 participants from the University of Waterloo undergraduate participant pool were recruited in Spring of 2024, in exchange for course credit. Participants provided their written informed consent prior to participating in this study. Participant data was removed from this initial sample if they provided inaccurate (non-numeric) responses on the attention component of the task (see below), had missing responses on any of our measures of interest or failed to provide demographic data. As with Study 3.1, participants in this sample provided responses to a range of questionnaires—including the Boredom Proneness Scale and the Sense of Agency scale—as part of a larger study, prior to completing the Heider animation task. Given that the measure of individual differences in anthropomorphism provided no significant results in Study 3.1 for either sample, it was excluded from this follow up study. Fifty-six participants who did not have responses to the Sense of Agency Scale and the Boredom Proneness Scale recorded as part of the institutional testing, were excluded from this sample. Next, participants who did not provided definite numeric responses to the attention component of the task (n = 26) and those with missing responses to our measures of interest or demographic data (n=7), were excluded from the sample. The final sample for this study consisted of 155 participants (males = 27

females = 128; mean age in years = 22.13; SD = 4.86.). Details of participant ethnicities are reported in Appendix B.

Materials and Procedure

The scales used here were administered to participants in the same order as in Study 3.1. The only change to the animation were periodic colour changes to all three shapes and some minor changes to the post movie questions (details below).

Judgement of Agency Task

Participants watched the three geometric shapes in motion on the screen as they had in Study 3.1. The sequence of movements, as well as the duration of the animation, was identical to that of the animation used in Study 3.1. During the animation each shape would change colour at pseudo-random time points. Each shape was assigned a specific colour (red for the bigger triangle, blue for the smaller triangle and green for the circle). Colour changes lasted for 1200 msec with each shape changing colour a total of five times (for a total of 15 colour changes within the 84 seconds). There were a few criteria applied to the colour changes. No changes occurred within the first or last 10 seconds of the animation to avoid this being distracting during those specific time epochs. In addition, a minimum of 2 seconds and an upper limit of 5 seconds were applied between successive colour changes. Within those constraints the colour changes occurred randomly. While we did not give participants prior information about the colour changes, it was emphasized to participants in the instructions to watch the animation carefully from beginning to end. At the end of the animation, participants' perceptual judgements of agency were assessed using the same questions adopted for Study 3.1 (Douglas et al., 2016). In

addition to this, participants were asked two questions related to the colour changes. First, participants were asked to report how frequently they saw one of the small shapes (triangle or circle, randomized across participants) change colour. Second, participants were asked to report the total number of colour changes observed throughout the animation across all shapes. For the sake of clarity, we specified that responses should be numerical—a number from 0-10 for question 1 and from 0-20 for question 2.

Data Analysis

All data were analyzed using R (R Core team, 2015). In addition to running zero order correlations and a hierarchical linear regression as was done in Study 3.1, a mediation analysis was run to determine whether the observed relationship between state boredom and the perceptual judgement of agency was mediated by levels of attentional disengagement (as measured by accuracy on the colour change questions). Responses to the colour change questions were calculated as both absolute and relative errors by subtracting the actual number of colour changes from participant responses (note that for absolute error sign was ignored, while for relative errors underestimates would be represented as negative numbers and overestimates as positive numbers). It was predicted that the relationship between state boredom and judgements of agency would be mediated by attentional disengagement. That is, lower ratings of agency as a function of higher boredom would depend on the extent to which people attended to the colour changes. To test this, a bootstrapping approach was used which evaluated the significance of indirect effects of the mediator. The state boredom rating for the animation was used as the predictor variable in this model. Absolute error—the proxy for attentional disengagement—was the mediator variable, while the perceptual judgement of agency was set as the outcome variable.

A bootstrapping approach with bias-corrected 95% confidence intervals was used to test the significance of the indirect effect, with the absence of zero within the confidence intervals indicating significance.

3.7 Study 3.2 Results

Zero-order correlations between all measures of interest were examined first (Table 3.6). As with the two samples in Study 3.1, the negative correlation between boredom proneness and the sense of agency was replicated, indicating that the highly boredom prone tend to report low levels of agency. State and trait boredom proneness were positively correlated in Study 3.2. This was the case for both the broader judgements of state boredom and the evaluations of state boredom specific to the animation (Table 3.5). Consistent with the two samples tested in Study 3.1, there was no relation between trait boredom proneness and the perceptual judgement of agency. Participant reports of how boring they found the video to be were negatively correlated with the perceptual judgement of agency, as was the second more general measure of state boredom, taken after the animation had been viewed, replicating the data from Study 3.1 (Figure 3.3). As was the case with Sample 2 in Study 3.1, the pre- and post-animation boredom ratings were not significantly different from one another ($t=0.58$; $p=0.56$). When the boredom ratings relevant to the animation itself were contrasted with the more general post-animation state boredom ratings, results showed they were not different from one another ($Z=1.30$, $p=0.193$). The measure of absolute error for specific colour changes (i.e., judgements of colour change for just one shape) had no relation with any of our three measures of state boredom, nor was it related to the perceptual judgement of agency. However, absolute error for total colour changes

across the whole animation was negatively correlated with perceptual judgements of agency and positively correlated with animation rating of (state) boredom (Figure 3.3).

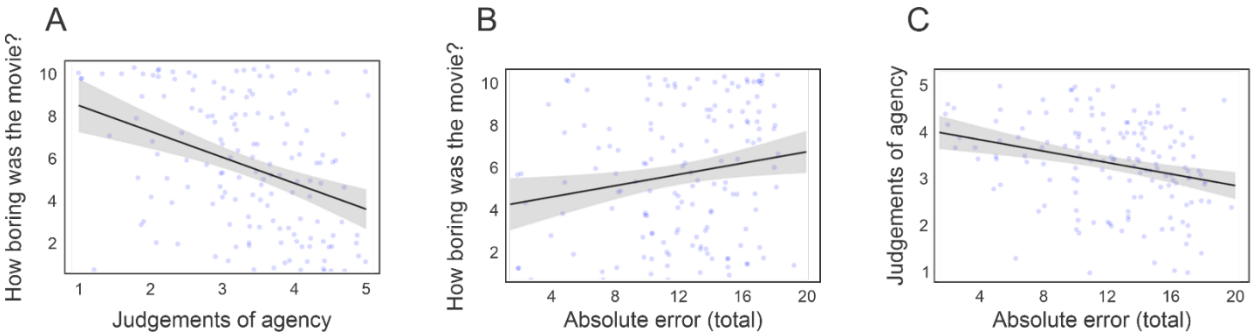


Figure 3.3. Panel A. Correlations between ratings of how boring the animation was (y-axis) and perceptual judgements of agency (x-axis). Panel B. Correlations between boredom ratings for the animation and absolute error for total shape colour changes. Panel C. Correlations between judgements of agency and absolute error for total shape colour changes.

Table 3.5. Bivariate correlations among study variables–Sample 3

	mean	SD	1	2	3	4	5	6	7	8	9	10
1. BPS	30.72	10.44	-	-0.39***	0.05	0.34***	0.21**	0.15*	-0.01	0.12	-0.06	-0.11
2. SAS	63.11	11.10		-	0.12	-0.15	-0.13	-0.05	0.13	-0.07	-0.09	0.09
3. JA	3.35	0.94			-	-0.07	-0.29***	-0.37***	-0.08	-0.30***	0.08	0.31***
4. SB1	5.57	2.86				-	0.75***	0.34***	-0.04	0.02	0.08	0.00
5. SB2	5.39	2.79					-	0.67***	0.00	0.13	0.01	-0.10
6. SB3	5.62	3.15						-	0.01	0.19*	-0.05	-0.17*
7. ICC_a	1.85	1.19							-	0.41***	-0.75***	-0.41***
8. TCC_a	11.91	4.59								-	-0.62***	-0.99***
9. ICC_r	-1.53	1.59									-	0.62***
10. TCC_r	-11.85	4.76										-

BPS=Boredom Proneness Scale; SAS=Sense of Agency Scale; JA=Judgement of Agency; SB1=Pre-Animation State Boredom; SB2=Post-Animation State Boredom; SB3=Animation Rating Boredom; ICC_a=Absolute error for individual colour changes of shapes; TCC_a=Absolute error for total colour changes of shapes; ICC_r=Relative error for individual colour changes of shapes; TCC_r=Relative error for total colour changes.

Note. * p<.05, ** p<0.01, *** p<0.001.

Hierarchical Regressions

A hierarchical multiple regression with variables included in the same order as in Study 3.1 (for Sample 2) was run with the measure of attentional disengagement (which evaluated how attentive participants were to the animation as measured by their absolute error made when reporting total colour changes) added in an additional/final step (Table 3.6). Age, gender, trait boredom proneness and the pre-animation measure of boredom did not emerge as significant predictors of the perceptual judgement of agency when included at steps one, two, three and four respectively. At step 5, the post animation measure of boredom significantly negatively predicted the perceptual judgement of agency explaining 12.87% of variance. At step 6, the third measure of state boredom, which specifically evaluated participant perceptions of how boring the animation was, significantly negatively predicted the perceptual judgement of agency and explained 2.63% of additional variance in the perceptual judgement of agency. Attentional disengagement when added at the final step negatively predicted the perception of agency and explained an additional 5.45% of variance in judgements of agency. The full model accounted for 22.44% of variance in the perceptual judgement of agency.

Table 3.6. Hierarchical regression predicting Judgements of Agency–Sample 3

	B	***SE***	***T***	***p***	***P*** Δ	***R2***Δ
Step 1						
Age	-0.01	0.02	-0.60	.55	.550	0.00
Step 2						
Age	-0.01	0.02	-0.57	.568		
Gender	-0.12	0.20	-0.59	.556	.556	0.00
Step 3						
Age	-0.01	0.02	-0.47	.642		
Gender	-0.12	0.20	-0.58	.563		
Boredom Proneness	0.004	0.01	0.57	.572	.572	0.00

Step 4						
Age	-0.01	0.02	-0.50	.620		
Gender	-0.08	0.20	-0.42	.677		
Boredom Proneness	0.01	0.01	0.91	.362		
Pre-animation State Boredom	-0.03	0.03	-1.12	.263	.263	0.01
Step 5						
Age	-0.01	0.01	-0.81	.418		
Gender	-0.07	0.19	-0.35	.730		
Boredom Proneness	0.004	0.01	0.60	.550		
Pre-animation State Boredom	0.10	0.04	2.63	.009		
Post-animation State Boredom	-0.18	0.04	-4.73	<.001	<.001	0.13
Step 6						
Age	-0.01	0.02	-0.35	.725		
Gender	0.004	0.19	0.02	.983		
Boredom Proneness	0.01	0.01	0.96	.338		
Pre-animation State Boredom	0.07	0.04	1.69	.092		
Post-animation State Boredom	-0.10	0.05	-2.01	.046		
Animation Rating (Boredom)	-0.07	0.03	-2.16	.032	.032	0.03
Step 7						
Age	-0.00	0.01	-0.21	.831		
Gender	0.05	0.18	0.30	.768		
Boredom Proneness	0.01	0.01	1.43	.155		
Pre-animation State Boredom	0.05	0.04	1.33	.186		
Post-animation State Boredom	-0.09	0.05	-1.79	.075		
Animation Rating (Boredom)	-0.06	0.03	-1.98	.050		
Attentional Disengagement	-0.05	0.02	-3.21	.002	.002	0.05

Mediation

A regression of the perceptual judgements of agency on state boredom was significant when the hypothesized mediation model was tested (Figure 3.4). The direct effect between state boredom and the perception of agency was significant (β= -0.10, SE = 0.03, $p<.001$), indicating that higher levels of boredom were associated with lower judgements of agency. The indirect effect from boredom to attentional disengagement was also significant (β = 0.28, SE = 0.12, $p=.017$), indicating that higher levels of state boredom were associated with greater attentional disengagement (i.e., larger absolute errors on estimations of total shape colour changes). Finally, the indirect effect from attentional disengagement to judgements of agency was also significant

(β = -0.05, SE = 0.02, p<.001), indicating that poor attentional performance was associated with lower judgements of agency. No zero values were observed within the lower and upper limits of the confidence interval for the product of coefficients, indicating a significant mediating effect of attentional disengagement on the relationship between state boredom and the perceptual judgements of agency (β = -0.01, SE = 0.01, p = .037).

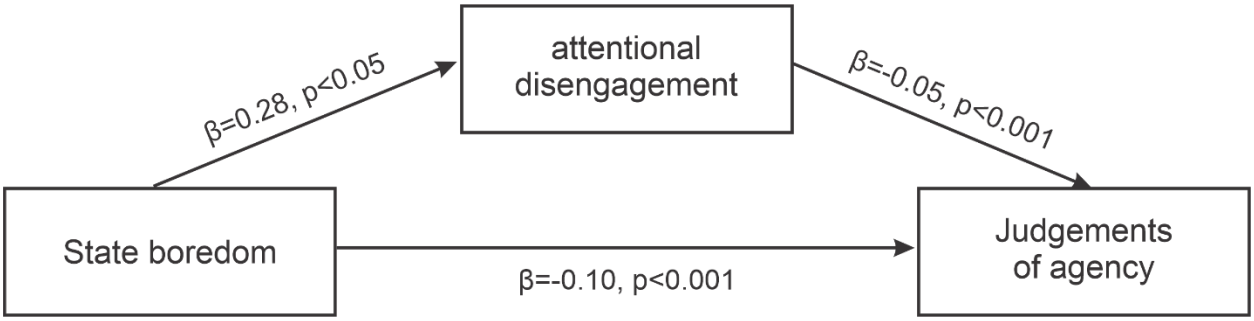


Figure 3.4**.** Mediation model showing partial mediation of the relation between state boredom and judgements of agency via attentional disengagement (as operationalized as absolute error for total colour changes).

3.8. Study 3.2 General Discussion

The goal of the current research was to investigate possible relations between both state and trait boredom and the perceptual judgement of agency *external to the self*. The possibility that trait boredom proneness would impact the tendency to perceive or ascribe agency externally was explored across two studies. Results found no such relationship between trait boredom and the judgement of agency across three independent samples, suggesting that while the highly boredom prone experience diminished levels of agency *for the self*, their capacity to judge agency externally is not impaired. Consistent with this finding was the lack of any correlation between the sense of one's own agency and the perceptual judgments of agency in the shapes moving about in the Heider and Simmel (1944) animation (Tables 3.1, 3.2, and 3.5). In short, the

two things measure something quite different. While the sense of agency is directed towards the self, perceptual judgements of agency of the kind tested here are directed towards external events. Interestingly, the trait of boredom proneness shows a consistent correlation with the sense of agency highlighting that both things are self-focused. While in-the-moment feelings of boredom would also, typically be self-focused, as measured here they may have been more obviously directed towards the external events of the animation.

Similarly, there was no association observed between boredom proneness and individual differences in anthropomorphism. This measure reflected participants' attributions of agency to real-world, non-human elements. Not only was there no relation between anthropomorphism and either state or trait boredom, it was also unrelated to the measures explicitly asking about the perception or judgement of agency. This suggests that while people are capable of ascribing agency to the animation of typically inanimate objects (i.e., the shapes in the Heider and Simmel (1944) animation), this does not extend to other, anthropomorphic judgements. It may simply be the case that participants were comfortable ascribing agency to objects in motion (Morewedge et al., 2007). The questions asked in the anthropomorphism scale involved ascribing intentionality to static scenarios (e.g., "To what extent does a mountain have free will?"). Such scenarios lack animacy and motion and may feel decidedly more unusual to participants. Epley and colleagues (2008) also suggest that the tendency to anthropomorphize increases *when there is a motivation* to establish predictability, particularly with social relationships. Here too, animacy and motion likely play a role. The movements of the shapes in the Heider and Simmel animation are to some extent predictable and evoke social relations (e.g., the large triangle "bullying" the small circle). Without such predictable motion and the capacity to infer social relations, judgements of agency may be greatly muted.

Importantly, while boredom proneness and the perception of agency were not associated, results did demonstrate a highly consistent negative relationship between the perception of agency and ratings of how boring participants found the animation to be (Samples 3.1, 3.2 and 3.3) and more generally how bored they felt after having watched the animation (Samples 3.2 and 3.3). That is, the more bored participants found the animation to be, or the more bored they reported being after having watched it, the less agency they perceived in the shapes. Given that the highly boredom prone tend to experience the state of boredom more frequently and intensely (Tam et al., 2021a), it may be the case that continual or chronic experiences of state boredom reinforce the notion that the individual lacks agency. So, while boredom proneness showed little relation with judgements of agency in the specific scenario outlined here, *persistent* experiences of state boredom may themselves contribute to the trait disposition to believe that one lacks agency. Further research would be needed to test this notion.

Why reported feelings of boredom (i.e., state boredom) should influence judgements of agency also warrants further research. It may be that boredom first leads to a perceived lack of meaning while watching the animation (van Tilburg and Igou 2012). While it was not the intention here to *induce* either boredom or a diminished sense of meaning (but rather to simply evaluate how much agency participants ascribed to the film), it is plausible that the 84-second animation, which is admittedly short, influenced both in ways not measured here. While it seems somewhat unlikely that the movie induced boredom, given that the average ratings of boredom prior to watching the animation were not significantly different from ratings of boredom given after the animation had been viewed, it is possible that the movie induced feelings of meaninglessness. What seems clear from our three samples is that feelings of boredom per se are indeed related to lower levels of perceived of agency. Future work could more explicitly induce

the state of boredom (or manipulate the sense of meaning; Fahlman et al., 2009) to determine more directly the causal role, if any, played by feelings of boredom in the perception of external agency.

As mentioned above, the experiential content of boredom includes feeling under-challenged and perceiving a situation to be lacking in meaning. Therefore, it would seem plausible that participants ascribed little or no agency to the shapes if they did not consider the animation to be particularly meaningful. Furthermore, there seems to be little doubt that feelings of agency are related more broadly to perceptions of meaning in life (Bandura, 2006). This highlights the need for further research to determine whether perceptions of meaning mediated the effects observed here.

Further, findings from the third sample indicate that the relation between boredom and agency was indeed mediated by attention to the animation. That is, the relation between in the moment feelings of boredom and judgements of agency was partially mediated by attention to the animation itself. Higher boredom levels were associated with poor attention to the animation that in turn was related to lower judgements of agency. This is remarkable given how short the animation was, suggesting that ratings of agency diminished as a function of participants *rapidly disengaging* from the animation. It is worth noting that the addition of colour changes to the Heider and Simmel animation essentially turns the animation into a dual task. While it is plausible that the dual task nature of this version of the animation influenced judgements of agency in some way, this seems unlikely for several reasons. First, participants were not aware prior to watching the movie that they would be asked to report on how many colour changes they had seen. Second, there were no differences observed in the mean judgements of agency for Sample 3.3 (with colour changes) when compared with the mean judgements of agency for either

Sample 3.1 or Sample 3.2 (where no colour changes were included; Sample 3 vs. Sample 2; $t=1.6$, $p=0.11$; Sample 3 vs. Sample 1; $t=1.53$, $p=0.13$). This suggests that the colour changes themselves had no influence on judgements of agency. Finally, one could imagine that the colour changes may have induced some re-evaluation of the 'identity' of the shapes. On this front it is worth noting that each shape consistently changed to a specific colour (e.g., the small circle always changed to green), such that colour changes would potentially be integrated into any form of 'identity' judgement regarding each shape. In addition, the means by which agency is generally thought to be ascribed to shapes in this animation is via their contiguous motion which would be unlikely to be affected by the colour changes.

What is clear from the current work is that those high in boredom proneness do not struggle in any meaningful way with assigning agency to external events (at least in the context of the stimuli used here). Nor are they more likely to ascribe agency to inanimate objects (i.e., anthropomorphizing) which may have suggested a tendency to over-attribute agency to events of others external to themselves (and by extension see themselves as lacking in agency). Instead, the tendency for highly boredom prone individuals to perceive a lack of agency in the self may authentically reflect the reality of their experiences. Therefore, it would be worth probing in more detail the antecedents and outcomes associated with a diminished sense of agency in those highly prone to boredom.

Chapter 4: Boredom and the Disruption of Agency

4.1 Introduction

The experimental work in Chapter 2 clearly demonstrated that the sense of agency plays a prominent role in the propensity to experience boredom. Those who experience boredom frequently may adopt a conservative approach to goal pursuit, and in doing so fail to launch into action as efficiently as the boredom signal demands (Mugon et al., 2018). This failure to launch may undergird the feeling that agency is depleted. Importantly, this diminished sense of agency was not due to any deficit in the ability to *perceive* agency itself (Chapter 3). While situational boredom did lead to lower judgements of agency for external events, trait boredom proneness itself showed no relation to the capacity to perceive external agency. Further, perceptual judgements of agency were reduced as a function of attentional disengagement. In this third study, the goal was to identify a possible causal relationship between boredom proneness and the sense of agency with the hypothesis that disruptions to agency would lead to elevated self-reports of state boredom and that those high in trait boredom proneness would evince behaviours indicative of low tolerance for such disruptions.

The human need for agency deserves attention given that it guides human action, influences emotions and impacts the pursuit of goals (Thompson, 1999; Deci & Ryan, 1985; Fiske, 2009). During the Covid 19 pandemic, highly boredom prone individuals struggled to adhere to regulations regarding social distancing (Boylan et al., 2020; Wolff et al., 2020; Drody et al., 2022). These regulations by their nature removed individual autonomy and control. Clearly, this loss of agency was more challenging for those high in boredom proneness. This reiterates the proposition that the highly boredom prone may engage in detrimental behaviours in an attempt to re-establish some sense of agency (Pfattheicher et al., 2021).

The sense of agency can be regained when action intentions and outcomes are continually linked, with the predictability of action outcomes being particularly important for establishing this causal relationship (Blakemore et al., 2002; Blakemore et al., 1998; Moore and Haggard, 2008; Aarts et al., 2005). When intended actions do not lead to the expected action outcomes, disruptions in the sense of agency occur. Closely linked to this idea is the role of temporal contiguity in establishing agency. That is, the causal relationship between intended actions and outcomes is established when they are closely linked in time. As such, delays introduced between an action and its outcome will lead to a decrease in the sense of agency, which may in turn precipitate boredom. Kahn (2018) gives preliminary evidence that outlines these associations. In a task that required participants to move a square on a screen a predetermined number of times, delays were introduced between participants' action onset and the movement of the square. Participants reported diminished levels of agency that were correlated with elevated self-reports of state boredom. While results from this study outlined the association between state boredom and the need for agency, the association between trait boredom proneness and agency was not measured.

The intent of the current chapter was first to conceptually replicate these preliminary findings, such that disruptions in agency would be associated with elevated self-reports of state boredom. A second prediction of the current study was that participants higher in boredom proneness would be expected to demonstrate a lower tolerance for disruptions to agency, given that they experience boredom more acutely (Tam et al., 2021a). Finally, those higher in boredom proneness would also be expected to report lower ratings in agency more broadly.

To test these predictions, participants played the video game Pong, with delays introduced in titrated amounts between action onset and expected outcomes. An important

element in this set up was the option for participants to reset the game at any point during game play. This was incorporated with the expectation that participants would generally choose to reset the game as an approach to re-establishing agency and escaping the experience of boredom, with this need being more salient for the highly boredom prone. Thus, the highly boredom prone were expected to reset at lower levels of disruption to agency if they were indeed intolerant of the disruption. They were also expected to reset the game more frequently over time.

4.2 Method

Participants

The goal was to collect as many participants for this study as for the samples in Chapter 2, (Study 2.1, Sample 1) and Chapter 3 (Experiments 3.1 and 3.2) where the variables of interest showed consistent relations and a significant medium effect size. Data collection began in Winter 2024 and continued until the stopping rule which was the beginning of the Winter term of 2025. A total of 204 University of Waterloo students participated in this study in exchange for course credit. From this initial sample, participants who did not provide a complete set of responses on the measures used (n=20) and those who had missing demographic information (n=1), were excluded from further analysis. In addition, one participant who reset only once during game play at a delay of 0 msec (i.e., no actual delay between action onset and movement of the paddle) was excluded from the sample. All other participants who made resets before delays were introduced (n=23), generally also reset the game more than once, such that other resets were made *after* delays had been introduced. These participants were therefore kept in the sample (with only resets made after the introduction of delays included in the analyses). This led to a final sample of 183 (males=38; mean age (years)= 21.03; SD=1.98).

4.3 Materials

Questionnaires

The Shortened Boredom Proneness Scale (SBPS) and the Sense of Agency Scale (SAS) used in previous chapters were included in this study.

Pong Task

A single player version of the video game Pong in which participants played against a computer opponent for a standard duration of 20 minutes was used in this study. The game required participants to move a vertical paddle to intercept a 'ball' in a tennis-like game (Figure 4.1). Participants moved their paddle using the up and down arrow keys on a standard keyboard. The goal was for participants to beat the computer opponent by scoring more points by the end of the game. Participants were given the option to reset the game as often as they wanted (and for any reason) during the 20-minute duration of play. In the first 120 seconds of the game, there was no disruption to game play, thus paddle movements were initiated at the onset of the participant's key presses and moved at an expected pace. After the first two minutes of uninterrupted play, delays were introduced between the participant's button press and the paddle's movement, with increments of 15 milliseconds at 5-second intervals (i.e., for every 5 seconds of game play an additional 15 msec delay between key press and paddle movement was introduced). After the first reset of the game participants would experience 90 seconds of uninterrupted game play, followed by the same incremental introduction of delays. Game play was uninterrupted for 60 seconds after the second reset prior to the onset of delays. After the third reset (and for all subsequent resets), delays in paddle movement were introduced after 30 seconds of game play. At the end of the game participants responded to questions about their

gaming habits (if they played video games, the types of video games they played and how may hours they played in a week).

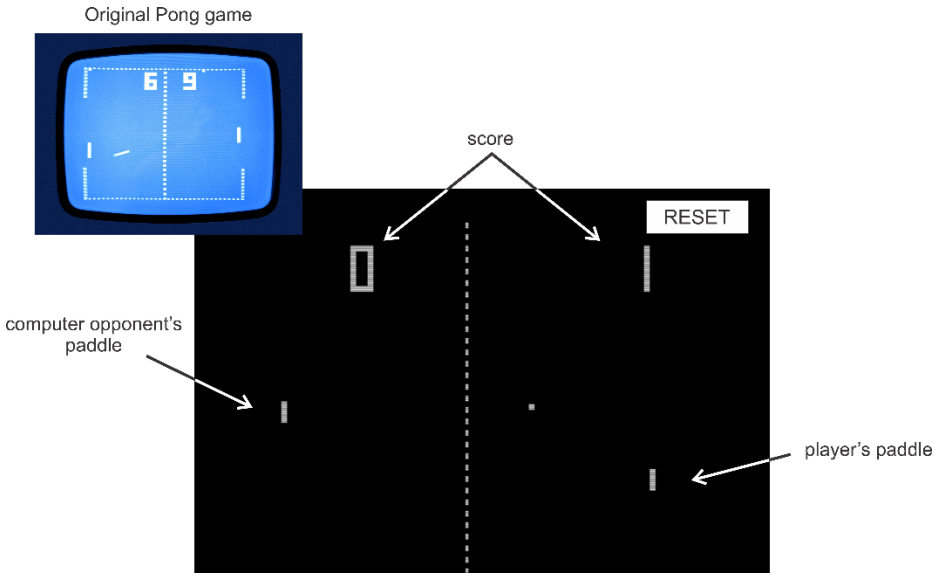


Figure 4.1. Schematic of the pong game (upper left inset shows what the original game looked like).

Measuring State Boredom, Agency and Frustration

Participants reported their in-the-moment feelings of boredom by responding to the question "How bored are you now?" before beginning game play, after every time they reset the game, and at the end of the 20-minute period of play. Participants also provided self-reported levels of agency and frustration by responding to two other prompts "How much control do you feel you have over the gameplay?" and "How frustrated are you?" after each game reset. Responses to each of these questions were provided on a 10-point slider scale, where zero indicated no boredom/control/frustration, whereas high scores represented high levels of these variables.

Data Analysis

Data was analyzed using R (R Core team, 2020). A series of one-way ANOVAS were conducted to determine whether the disruptions introduced led to increased self-reports of state boredom, lower reports of control (a proxy for agency) and higher reports of frustration at each reset. Between-item associations were established by calculating Pearson correlation coefficients between all variables. Stepwise multiple regressions were then conducted to investigate whether individual differences in state boredom or boredom proneness would predict first, how frequently participants reset the game and second, the delay at which participants reset during game play.

4.4 Results

Some participants did not reset the game at all during the full twenty minutes of game play (n=31). For those participants, this meant that there was a 3.24 second delay between movement initiation and the actual movement of the paddle by game's end. The vast majority of participants did reset the game at least once, with a little over half of the group resetting the game at least four times (Figure 4.2).

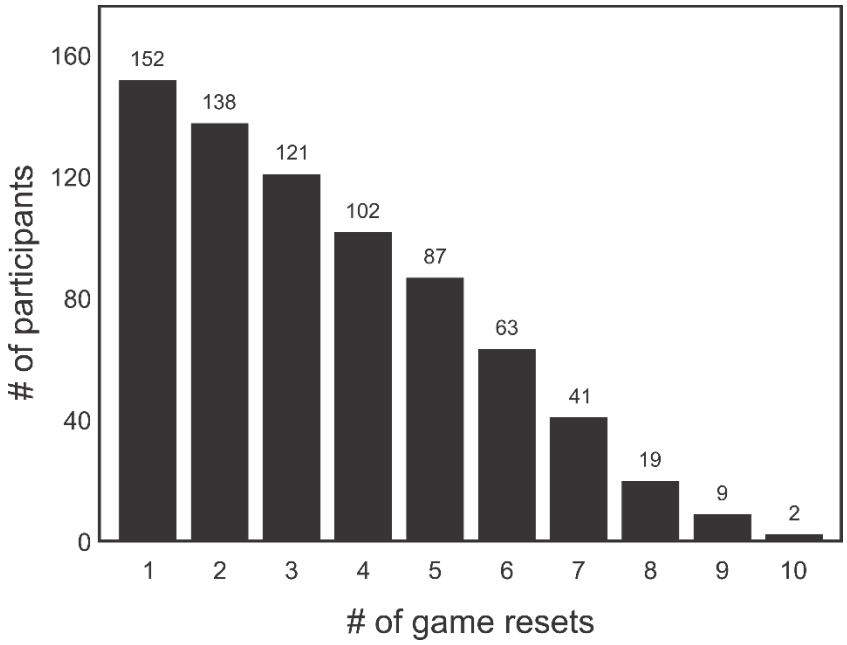


Figure 4.2. Number of participants who reset the game between 1 and 10 times.

For participants who reset the game more than four times, data was averaged across values recorded at and after the fourth reset. That is, for all measures (e.g., delay at reset, self-report metrics of boredom, control and frustration) an average value was recorded at the fourth reset and all resets above that (e.g., a participant making seven resets would have the delay at their first, second and third resets recorded, as well as a value averaged over their fourth, fifth, sixth and seventh resets as a final data point, thereby providing four data points in total).

For delay at reset, participants in general reset the game at shorter and shorter delays as game play progressed (Figure 4.3), with delays being significantly different from each other in a one-way ANOVA ($F(3, 570) = [16.06]$, $p < .001$). Mean values were significantly different between the first and second delay ($p<.001$), between the first and third delay($p<.001$) and between the first and fourth (or more) delay at reset ($p<.001$) on Tukey's HSD Test.

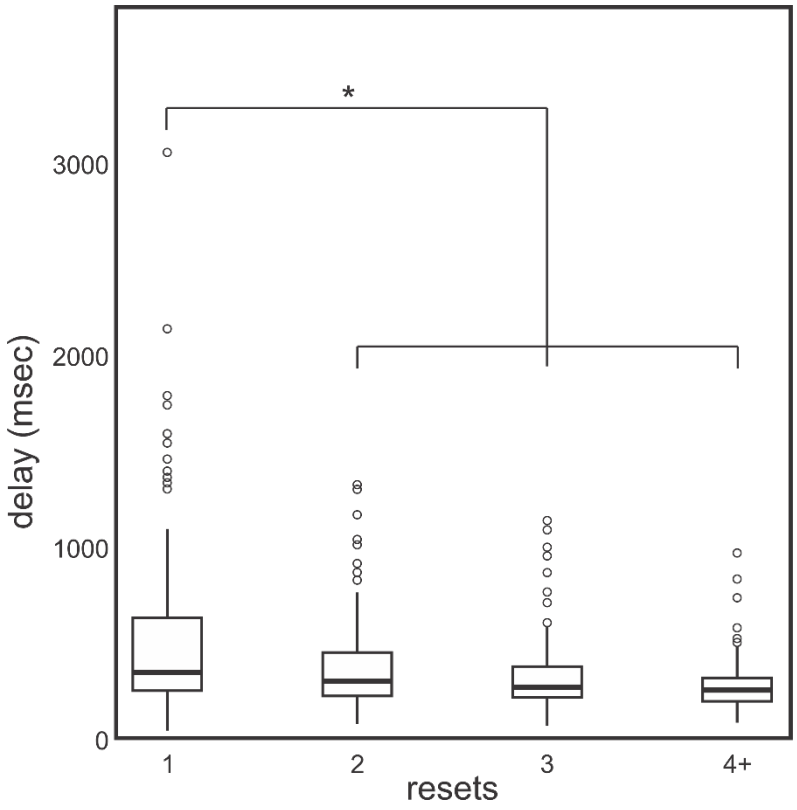


Figure 4.3. Box plots showing average delay magnitude at reset (d1-mean delay at first reset, d2-mean delay at 2nd reset; d3-mean delay at third reset; d4_plus-mean value of all delays ta and after the fourth reset).

A one-way ANOVA exploring state boredom ratings as a function of resets (with 4 levels) indicated a statistically significant difference in mean ratings ($F(3, 570) = [10.04]$, $p < .001$). In general, state boredom ratings rose as a function of resets. Tukey's HSD Test indicated that the mean value of subjective ratings of boredom at reset was significantly different between the first and third reset, between the first and fourth (or more) reset(s), as well as between the second and fourth (or more) resets. A second one-way ANOVA examining control ratings across resets (4 levels) was also significant ($F(3, 570) = [6.94]$, $p < .001$). In this instance, control ratings diminished with increased resets. Tukey's HSD test indicated that control ratings at reset were significantly different between the first and third reset and between the first and fourth (or more) resets. Finally, a one-way ANOVA exploring frustration ratings as a function of resets

showed no statistically significant difference between mean frustration ratings across different levels of resets (Figure 4.4).

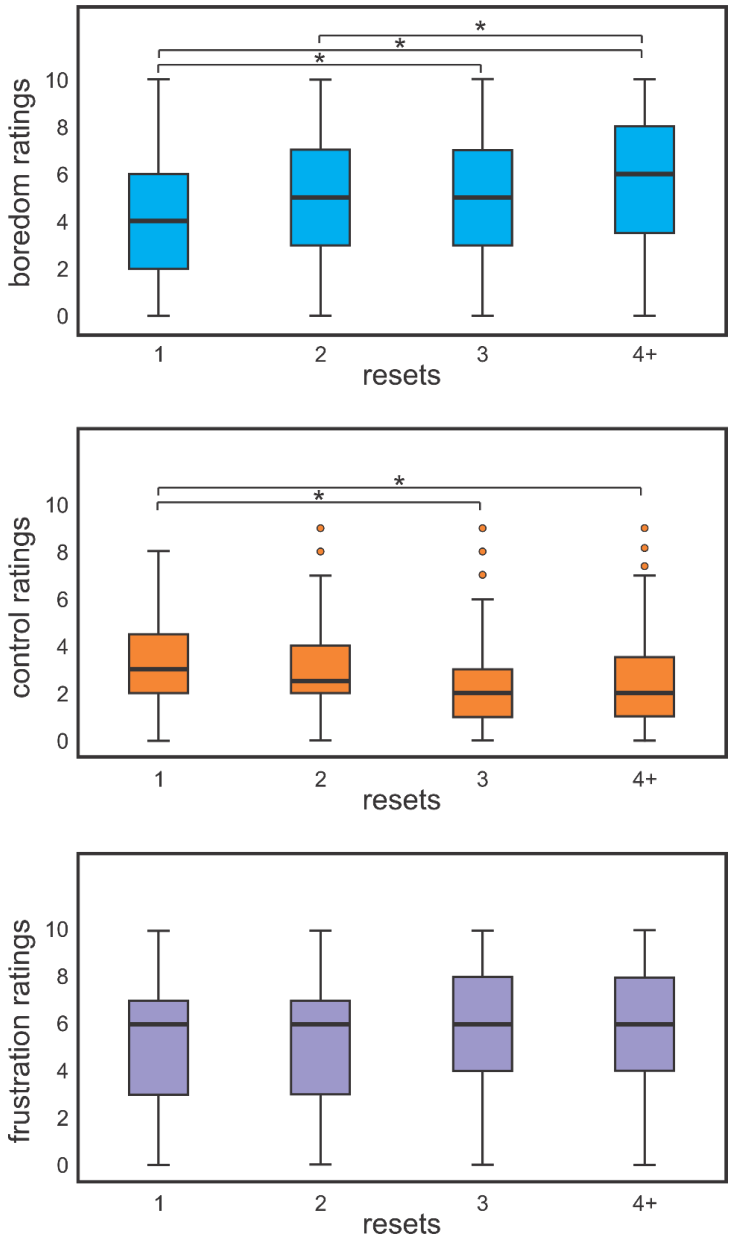


Figure 4.4. Subjective ratings of boredom (blue), control (orange) and frustration (purple) after each reset.

In the initial sample of 183 participants, frequency of resets showed no correlation with boredom proneness, nor did the delay magnitude at which resets were chosen relate to either boredom proneness or state boredom. As already mentioned, thirty-one participants did not reset the game at all over the course of the full 20-minutes of game play. As such there were no ratings of state boredom, frustration or control from these participants, with the exception of boredom ratings pre and post total game play. Those ratings showed that while participants did not reset the game, they did report higher levels of boredom by the end of the game ($t=-3.97$; $p<.001$). Nevertheless, these participants were eliminated from further analysis. When exploring correlations for the remaining sample ($n=152$), the number of resets and the average magnitude of delay at reset showed no relation to either boredom proneness or state boredom. Average self-reported ratings of state boredom (calculated across all resets) were significantly negatively correlated with self-reported ratings of control at reset ($r = -.22$, $p = .006$) and were positively correlated with ratings of frustration ($r = .41$, $p<.001$; Table 4.1).

Given the hypothesis that boredom (both state and trait) should relate to an increased rate of resetting the game, exploratory analyses were conducted including only those participants who reset the game at least twice ($n = 138$). This seemed valid given that a single reset within 20 minutes of play would seem to indicate a great deal of tolerance for the introduced disruptions. Within this subset of participants, state boredom ratings were negatively associated with self-reported ratings of control at reset ($r = -.23$; $p = .006$). Mean state boredom ratings were also positively correlated with ratings of frustration ($r = .39$, $p<.001$). In this sample, boredom proneness was significantly positively correlated with the frequency of resets ($r = .19$, $p = .026$). That is, those higher in boredom proneness reset the game more often than those lower in boredom proneness, at least when considering those who reset the game at least twice (Table

4.2). For all participants who reset the game at least once (n=152), the more boredom prone a participant was, the smaller the magnitude of delay at which they reset the game once delays had been introduced (Figure 4.5).

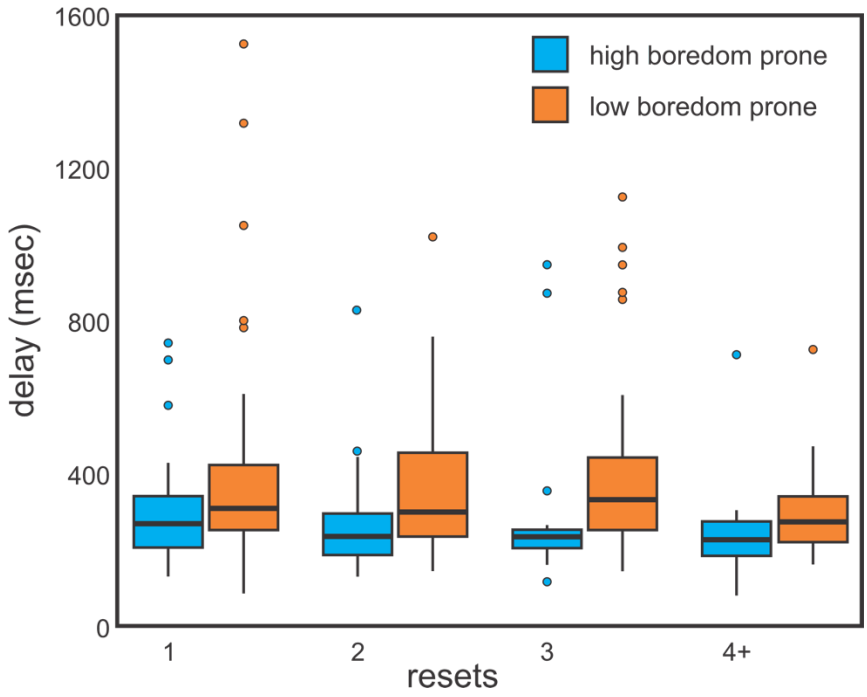


Figure 4.5. Delay at reset as a function of boredom proneness. For visualization purposes the sample was split into tertiles with the upper and lower tertiles of boredom proneness shown here.

The correlations between boredom proneness and number of resets increased in size when examining only those who reset three or more times, asymptoting at a sample resetting four or more times (Figure 4.6).

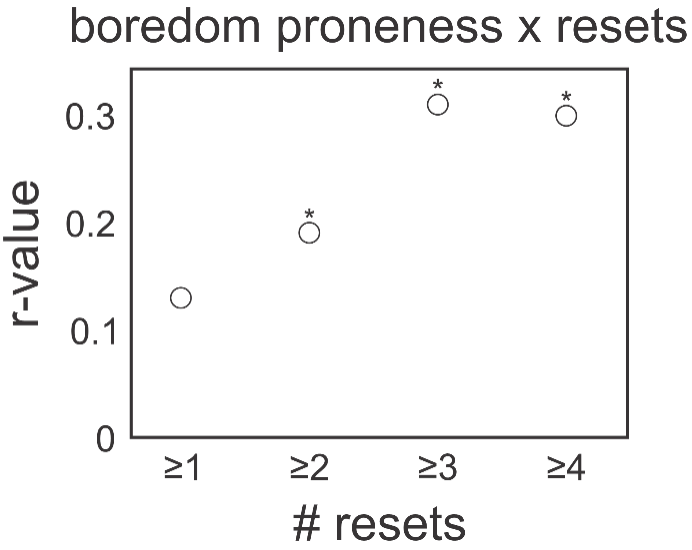


Figure 4.6. Correlations between boredom proneness and the number of resets as a function of minimum number of resets[3]

Scores achieved during game play were not associated with any of the variables of interest (i.e., number of resets, trait and state boredom, and all ratings of boredom, control, and frustration at reset). When only those who reset at least once were considered (n=152), there was no relation between overall game scores and boredom proneness. However, boredom proneness did show a weak negative correlation with mean game scores at reset, when examined in the sample of participants who reset at least twice (n=138). Mean game scores at reset was also correlated with the number of resets in both samples (Tables 4.1; 4.2).

While the hours spent playing video games was weakly positively correlated with boredom proneness (r=.16; p=.050), it was not correlated with any of the other variables of interest.

[3] See Appendix C for a figure showing the relationship between Boredom Proneness and the Number of Resets up to 7 or more resets (correlations between the two variables were not included beyond this given the small sample size: n=19)

Hierarchical Regressions

A series of hierarchical multiple regressions were run to determine whether boredom proneness predicted both frequency of resets and the temporal delay at resets. Separate regressions were run for the full sample (n=183), for the sample of participants who reset at least once (n=152) and for the sample of participants who reset at least twice during game play (n=138). These were conducted for the number of resets in one series of regressions and the temporal delay at reset for a second set of regressions. Initially, all models included age and gender, as these variables have small but reliable effects on boredom proneness (Giambra et al., 1992; Isacescu et al., 2017). Neither variable showed any influence on the number of resets or the temporal delay at reset. As such, the regressions shown here only include both state (pre and post task measures separately) and trait boredom as predictors of either reset frequency or delay at reset.

Boredom proneness did not predict the number of resets in the full sample or in the sample of participants who reset at least once. In the sample of those who reset at least twice (n=138), pre and post ratings of state boredom did not predict any variance in the number of resets. Boredom proneness, however, did emerge as a significant positive predictor of the number of resets, explaining 3.34% of variance in the frequency of resets.

Neither pre nor post ratings of state boredom emerged as significant predictors of the delay at reset in any of the three samples tested. Similarly, boredom proneness did not significantly predict the delay at reset in any of the samples tested (i.e., full sample, those who reset at least once, or those who reset at least twice). Results of both regressions (n=138) are reported in Tables 4.3 & 4.4

Table 4.1. Pearson Correlations Between Study Variables with Participants with a Minimum of 1 Resets (n=152)

	BPS	SAS	SOPA	SONA	SB1	SB2	SBC	R1	BM	CM	FM
BPS	-	-0.43***	-0.30***	0.37***	0.16*	-0.01	-0.14	-0.07	0.07	-0.02	0.14
SAS		-	0.70***	-0.85***	-0.10	0.09	0.17*	-0.02	-0.02	0.02	-0.15
SOPA			-	-0.22**	0..03	0.03	0.01	0.02	0.03	-0.06	-0.06
SONA				-	0.15	-0.10	-0.23**	0.05	0.04	-0.07	0.17*
SB1					-	0.42***	-0.38***	-0.05	0.54***	-0.05	0.47***
SB2						-	0.68***	-0.11	0.83***	-0.25**	0.35***
SBC							-	-0.07	0.41***	-0.21**	-0.03
R1								-	-0.06	0.00	0.09
BM									-	-0.22**	0.41***
CM										-	-0.35***
FM											-

Table 4.1 continued. Pearson Correlations Between Study Variables with Participants with a Minimum of 1 Resets (n=152)

	#Resets	Mean R. Int	Mean Delay	MPS	OPS	Game hrs/wk
BPS	0.13	-0.11	-0.10	-0.14	-0.11	0.16*
SAS	-0.01	0.03	0.01	0.03	0.05	-0.12
SOPA	0.01	0.01	0.01	0.00	0.09	-0.11
SONA	0.03	-0.03	-0.01	-0.03	0.00	0.09
SB1	0.01	-0.02	-0.03	-0.04	0.08	-0.05
SB2	0.03	-0.06	-0.07	-0.03	0.03	-0.10
SBC	0.03	-0.04	-0.05	0.00	-0.04	-0.06
R1	-0.54***	0.84***	0.85***	0.70***	-0.02	0.01
BM	0.09	-0.10	-0.11	-0.08	0.07	-0.01
CM	0.03	-0.01	0.00	0.09	0.15	0.02
FM	0.08	0.05	0.06	-0.04	-0.10	0.03
#Resets	-	-0.75***	-0.69***	-0.67***	0.05	0.01
Mean R. Int		-	0.99***	0.87***	-0.04	0.00
Mean Delay			-	0.86***	-0.04	0.00
MPS				-	0.34***	-0.07
OPS					-	-0.03
Game hours/wk						-

Table 4.2. Pearson Correlations Between Study Variables with Participants with a Minimum of 2 Resets (n=138)

	BPS	SAS	SOPA	SONA	SB1	SB2	SBC	R1	Int:R1/R2	BM	CM
BPS	-	-0.44***	-0.30***	0.38***	0.17*	-0.02	-0.16*	-0.05	-0.16*	0.11	0.05
SAS		-	0.70***	-0.85***	-0.05	0.09	0.13	-0.04	0.11	0.01	0.02
SOPA			-	-0.21**	0.05	0.03	-0.01	0.01	-0.04	0.03	-0.04
SONA				-	0.10	-0.10	-0.18*	0.06	-0.17*	0.02	-0.05
SB1					-	0.44***	-0.36***	-0.07	-0.08	0.52***	-0.03
SB2						-	0.68***	-0.11	-0.03	0.85***	-0.26**
SBC							-	-0.05	0.03	0.46***	-0.25**
R1								-	0.26**	-0.02	-0.06
Int:R1/R2									-	-0.13	-0.02
BM										-	-0.23**
CM											-

Table 4.2 continued. Pearson Correlations Between Study Variables with Participants with a Minimum of 2 Resets (n=138)

	FM	#Resets	Mean R Int	Mean Delay	MPS	OPS	Game hrs/wk
BPS	0.19*	0.19*	-0.14	-0.12	-0.17*	-0.08	0.18*
SAS	-0.18*	-0.04	0.05	0.02	0.03	0.02	-0.12
SOPA	-0.10	-0.03	0.00	-0.01	0.01	0.07	-0.12
SONA	0.17*	0.04	-0.06	-0.04	-0.03	0.03	0.08
SB1	0.47***	0.00	-0.02	-0.04	-0.02	0.10	-0.05
SB2	0.33***	0.00	-0.02	-0.05	0.00	0.02	-0.10
SBC	-0.03	0.00	0.00	-0.02	0.02	-0.06	-0.06
R1	0.09	-0.44***	0.62***	0.62***	0.39***	0.04	0.12
Int:R1/R2	-0.07	-0.66***	0.81***	0.81***	0.66***	0.04	0.05
BM	0.39***	0.04	-0.06	-0.09	-0.03	0.07	-0.02
CM	-0.36***	0.06	-0.09	-0.09	0.02	0.16	0.02
FM	-	0.05	0.03	0.05	-0.08	-0.11	0.04
#Resets		-	-0.83***	-0.78***	-0.66***	-0.01	-0.04
Mean R Int			-	0.99***	0.76***	0.04	0.14
Mean Delay				-	0.74***	0.02	0.16
MPS					-	0.57***	0.01
OPS						-	-0.04
Game hrs/wk							-

BPS=Boredom Proneness Scale; SAS=Sense of Agency Scale; SoPA=Sense of Positive Agency; SoNA=Sense of Negative Agency; SB1= Pre Boredom; SB2= Post Boredom, SBC= State Boredom Change; R1=Time at first reset; Int:R1/R2=Interval Between the first and second resets; BM=Mean boredom ratings (at reset); CM=Mean control ratings (at reset); FM=Mean frustration ratings (at reset); #Resets=Number of Resets; Mean R. Int=Mean Interval Between Reset; Mean Delay=Mean of delay magnitude at reset; MPS = Means participant scores (at reset); OPS = Overall player scores; Game hours/wk = Number of hours spent playing video games weekly. * $p<.05$, ** $p<0.01$, *** $p<0.001$.

Table 4.3. Hierarchical Regressions Predicting Number of Resets (n=138)

	B	***β***	***SE***	***t***	***p***	***p*Δ**	***R2*Δ**
Step 1							
Pre-Boredom	-0.00	-0.00	0.09	-0.06	.956	.956	0.00
Step 2							
Pre-Boredom	-0.01	-0.01	0.10	-0.06	.955		
Post-Boredom	0.00	0.00	0.07	0.02	.986	.986	0.00
Step 3							
Pre-Boredom	-0.05	-0.05	0.10	-0.52	.602		
Post-Boredom	0.02	0.03	0.07	0.27	.785		
Boredom Proneness	0.05	0.20	0.02	2.30	.023	.023	0.04

Table 4.4. Hierarchical Regressions Predicting Delay at Reset (n=138)

	B	***β***	***SE***	***t***	***p***	***p*Δ**	***R2*Δ**
Step 1							
Pre-Boredom	-4.00	-0.04	8.03	-0.50	.62	.62	0.00
Step 2							
Pre-Boredom	-2.36	-0.03	8.94	-0.26	.793		
Post-Boredom	-2.94	-0.04	6.99	-0.42	.675	.675	0.00
Step 3							
Pre-Boredom	0.17	0.00	9.11	0.02	.985		
Post-Boredom	-4.00	-0.05	7.01	-0.57	.569		
Boredom Proneness	-2.64	0.12	1.93	-1.37	.174	.174	0.01

4.5 Discussion

There were two primary goals for Experiment 4.3. The first was to determine whether disruptions to agency would lead to higher self-reported ratings of state boredom. Second, the study aimed to explore whether boredom proneness would predict the frequency of resets during game play as well as the delay at reset. This latter measure is an indication of tolerance (or lack thereof) of disruptions to agency. In general, participants reset the game play at shorter and shorter intervals as play wore on ($F(3, 570) = [16.06]$, $p < .001$) (Figure 4.3). This suggests that participants were generally aware of the delays and chose to reset game play at shorter and shorter delays as game play progressed. These data can be taken in part, to indicate that the manipulation of agency used here had the intended effect. More evidence for this comes from self-reported ratings of state boredom which increased over successive resets (Figure 4.4). Similarly, ratings of control, the proxy used here for the sense of agency, diminished after the first reset (Figure 4.4). These two ratings—state boredom and control—were negatively associated, such that the more bored participants reported feeling in the moment the less control they felt they had over game play (Table 4.1). These data highlight that the key manipulation in this experiment worked and that disruptions to agency did indeed lead to elevated feelings of boredom. Interestingly, ratings of frustration in response to delays did not show any significant changes across resets, which emphasizes that participant resets during game play as a result of their loss of agency and the corresponding increase in boredom, was independent of feelings of frustration. Overall scores during game play showed no association with the number of resets, trait boredom, state boredom and control ratings at reset. In the sample where participants reset at least twice, high boredom prone individuals were more likely to reset at lower scores. Participants may have believed that resetting the game would not only give them more agency

but improve their chances at winning the game. While one may interpret this as an indicator that participants reset the game to avoid losing, the opponent's score (i.e., the pc opponent) was not recorded, making it impossible to determine whether participants were indeed losing (or by how much) when they reset the game. Furthermore, when explicitly asked whether they had reset the game because they were losing, only around half of those who were high in boredom proneness (i.e., scoring in the upper tertile on the BPS) indicated this as a reason for resetting. In contrast, almost two thirds of those low in boredom proneness indicated that they reset due to losing. Therefore, highly boredom prone individuals may have reset with the hope of improving their score but not necessarily because they were losing.

Results also indicated that for participants who reset the game at least twice, the overall frequency of resets was positively correlated with boredom proneness, such that high boredom prone individuals reset the game more frequently (Figure 4.4). This supports the notion that circumstances that present some level of constraint or appear to remove individual autonomy tend to induce boredom, with the effect being stronger as the number of resets increased. The highly boredom prone would be expected to experience and respond to the feeling of constraint more strongly given that they experience boredom more intensely. Boredom proneness, however, did not predict the amount of delay at which a reset was made in this sample.[4]

The fact that highly boredom prone individuals tended to reset more frequently may be indicative of two possibilities. On the one hand, this could reflect attempts to re-establish agency. That is, upon experiencing a disruption to agency the highly boredom prone may be more motivated to redress the circumstance. On the other hand, this may reflect a low level of

[4] For participants who reset the game a minimum of three times, boredom proneness did predict the amount of delay at which a reset was made ($r = -.21$, $p<.024$).

tolerance of disruptions to agency. In some sense this would reflect low frustration tolerance (Leyro, Zvolensky, & Bernstein, 2010; Jonassen & Grabowski, 2012). This possibility seems unlikely given that reports of frustration from one reset to the next did not change. It is more plausible that participant resets in response to delays represent a lack of persistence, thereby emphasizing the self-regulatory failures (Duckworth & Kern, 2011) that are characteristic of boredom proneness and its associated behavioural outcomes. More research would be needed to more directly examine these distinct possibilities.

Accurately perceiving the passage of time provides insights into one's progress on a task (Michon 1972), which in turn will influence motivation during task completion (Conti, 2001), and finally, is considered an important aspect of the subjective experience of boredom (Danckert & Allman, 2005). Existing work shows that for those higher in boredom proneness, time passed more slowly during task completion (Danckert and Allaman, 2005; Watt 1991). Similarly, studies investigating the sense of agency in intentional binding paradigms show that a subjective shortening of time between an action and its effect leads to high feelings of agency, with lower feelings of agency being linked to longer durations between an action and its effect (Wenke and Haggard, 2009; Wen, Yamashita, & Asama, 2015a). As such the motivation to reset and stay engaged with the Pong game may have been influenced by the subjective perception of time experienced as function of the disruptions to agency. More research would be needed to determine the role played by the perception of time on agency.

One final factor worth considering is the extent to which player scores influenced the tendency to reset as a function of boredom and agency. That is, it is plausible that resets were driven by the fact that introduced delays led to participants being beaten by the computer opponent. Neither state boredom at reset nor boredom proneness were associated with

participants' overall scores (mean score=18.05, SD=4.88), suggesting that participants' resets were primarily a function of a loss of agency and the attendant experience of boredom, and were less related to losing the game.

The tendency for the highly boredom prone to reset the game more frequently has been cast throughout this chapter as an *intolerance* of disruptions to their sense of agency and while that might accurately describe their experience, an alternate explanation is plausible. It may be the case that the behaviour of the boredom prone is better conceptualized as a *sensitivity* to disruptions in agency, a sensitivity that precipitates the adaptive response to reset earlier and more often. Clearly, further research would be needed to disambiguate these possibilities.

Results from this chapter, as well as chapters 2 and 3 tell a consistent story—that a diminished sense of agency is associated with boredom, particularly for the highly boredom prone individual who experiences boredom more frequently. Since boredom has been cast as a ubiquitous experience, confirming the consistency of this association across cultures is important, bearing in mind that differences in cultural ideals that may influence emotional expression could also lead to differences in how these variables are associated. This is addressed in the following chapter.

Chapter 5: Boredom and the Moderating Role of Culture

5.1 Introduction

Boredom is the uncomfortable feeling of wanting but failing to engage in activities that are deemed meaningful or purposeful by the individual (Eastwood et al., 2012). Those in-the-moment feelings of boredom, although transient, present a conundrum for those high in trait boredom proneness. The highly boredom prone individual recognizes the need or desire to engage meaningfully with the world but fails to launch into any action that would satisfy that desire (Mugon et al., 2018). The tendency to feel boredom more frequently and intensely—the hallmark of boredom proneness—(Tam et al 2021a) has clear ramifications for mental health and well-being (Farmer & Sundberg, 1986; LePera, 2011; Danckert, et al., 2018; Lee et. al., 2019; Mercer & Eastwood 2010; Stickney & Miltenberger, 1999; Rupp & Vodanovich, 1997). Both boredom and boredom proneness have been conceptualized as a deficit in attentional control (Tam et al., 2021b), a self-regulatory failure (Struk et al., 2016; Isacescu et al., 2017; Wolff and Martarelli, 2020), a failure in the effective pursuit of goals (Mugon et al., 2018), as well as a consequence of a diminished sense of life meaning (Bargdill, 2000; Fahlman et al. 2009; Van Tilburg & Igou 2012; O'Dea et al., 2024). Importantly, boredom is seen as a motivational experience, prompting the need to discontinue one's current activity in the pursuit of something more meaningful (Wolff and Martarelli, 2020; Bench and Lench 2013; Elpidorou 2014).

More recently, boredom has been framed within the context of agency—the belief that we are in control of our own actions and that events in the world can be attributed to our own intentions (Chambon et al., 2014). The relationship between boredom and agency suggests that when in the throes of an episode of boredom, we feel a loss of agency and as a result, fail to interact effectively with the environment (Danckert & Eastwood, 2020). The work outlined in

the previous chapters of this thesis shows that those high in trait boredom report diminished levels of the sense of agency. These studies outline the centrality of the sense of agency to the experience of boredom and reiterate the functional account of boredom as a call to action (Danckert & Elpidorou, 2023).

The current chapter explored the relationship between boredom and agency across three distinct cultures. Given the functional account of boredom outlined above as a call to action, it is presumed to be a universal human experience. Certainly, boredom proneness and its associated consequences have been studied in a wide variety of cultures with much the same outcomes highlighted (e.g., elevated rates of depression and anxiety associated with boredom proneness; Yang et al., 2023; Schwartze et al., 2020; Oxtoby et al., 2019; Chin et al., 2017; Leung & Zhang, 2016; Tze et al., 2013). Nevertheless, given that culture presents a portrait that encapsulates the norms, beliefs, social institutions and identity of a group of people (Lytle et al., 1995), it is plausible that any differences in the individual propensity to be bored may be influenced by cultural norms. That is, while the tendency to be bored is universal, and its function is singular (Elpidorou, 2021), it would be reasonable to expect that its manifestations may vary in line with cultural norms. This may be particularly so when examining the relation between boredom and agency as a function of individualist and collectivist ideals. That is, individualist cultures are often characterized as prioritizing autonomy, strong self-construction and a sense of personal achievement. As such, individualist cultures adhering to or advancing those norms may be more likely to forefront their sense of agency, in which case, the previously established relationship between boredom proneness and agency would be stronger (i.e., as compared with collectivist cultures).

While there is relatively little work examining the experience of boredom as a function of culture there are some hints that an influence does exist. In one study, participants from a collectivist orientation (a Chinese sample) reported experiencing less state boredom than participants from an individualist culture (European Canadians; Ng et al., 2015). Findings for the impact of culture on trait boredom have been varied, perhaps owing to differences in measures used across studies. However, existing work outlines cultural differences in affect valuation as a function of internalized cultural values (Tsai et al., 2006), identifying a preference for positive affective states that are high in arousal (e.g., excitement) among individualist cultures. It follows from this, that those in individualist cultures will feel the absence of externally stimulating environments or stimuli acutely, which in turn may translate to feelings of boredom. As such, it is plausible to expect that boredom, and associated features (e.g., a perceived lack of agency) may be more prevalent among groups that endorse individualist ideals (Ng et al., 2015).

The established relationship between boredom and agency discussed above was collected in North American samples and focused entirely on the individual's sense of agency, which emphasizes a dependence on the self. In contrast, a more collective sense of agency is considered to represent feelings of mutual dependence and shared effort, more characteristic of non-Western cultures (Bandura, 2000; Triandis, 1990, 1995). Here it was hypothesized that differences in endorsement of cultural norms of collectivism or individualism would influence the relationship between the sense of agency and boredom proneness such that the existing relationship would be stronger in individualist cultures where independence and autonomy are normative, than in collectivist cultures where group interests are prioritized above self-interest. Three independent samples completed measures of boredom proneness, self-control, self-efficacy, the sense of agency and the cultural orientation scale (Triandis & Gelfland, 1998), which measures an

individual's endorsement of individualist ideals, collectivist ideals and societal hierarchy. The samples were drawn from Canada (individualist), China and the United Arab Emirates (collectivist).

First, the study aimed to replicate known relations with boredom proneness in all three samples, such that those high in boredom proneness would report a lower sense of agency, as well as lower levels of both self-control and self-efficacy. Next, cultural ideals were expected to have a moderating effect on the relationship between boredom proneness and the sense of agency, such that those endorsing an individualist identity would demonstrate a stronger relationship when compared with those who endorsed collectivist ideals.

5.2. Method

2.2 Participants

It was decided prior to data collection that a minimum sample size of 300 participants would be ideal given the sample sizes used in previous studies (Dadzie et al., 2024; Gorelik & Eastwood 2023).

Canadian sample: The Canadian (presumably individualist) sample consisted of 2,786 participants from a University of Waterloo undergraduate research pool, recruited to participate in exchange for course credit. For the purposes of identifying clear patterns and differences between those who endorse individualist and collectivist cultural norms, the sample was divided based on self-reported ethnic background and differentiated between Europeans, Asians and other ethnic groups that were minimally represented in the dataset. For the final Canadian sample, data is presented for participants whose self-reported ethnic origins were European which was assumed a priori would more closely reflect an individualist cultural influence. After

excluding participants without a complete set of responses for the variables of interest, the final sample consisted of 794 participants (males=174; mean age (years)=21.60; SD=5.10). The study was approved by the University of Waterloo's Office of Research and informed consent was obtained from participants prior to their completion of any surveys.

The Chinese sample had 1,173 participants (males=818; mean age (years)=20.45; SD=3.88), primarily recruited from Tianjin Normal University, as well as other universities in China. Eight participants did not report their age, and the gender of 16 participants was unknown. All participants provided informed consent before completing the survey, and the study was approved by the Institution's Office of Research.

For the UAE sample, 356 participants were recruited from the United Arab Emirates University. After excluding those with missing responses on the variables of interest, the final sample consisted of 342 participants (males=65; mean age (years)=20.99; SD=3.69). Participants gave consent prior to survey completion and the study was approved by the Institution's Office of Research.

Data for all 3 samples was collected from Spring 2023 through to Spring 2024.

Surveys

Questionnaires for this study assessed boredom proneness, self-regulation (i.e., self-control and self-efficacy), the sense of agency and the extent to which participants endorsed individualist or collectivist cultural ideals. For the Canadian sample, participants completed these questionnaires as part of a larger study. The shortened version of the Boredom Proneness Scale and the Sense of Agency Scale used throughout this thesis were again, used here. A number of other scales were employed as outlined below.

The Brief Self-Control Scale (Tangney et al., 2004) was used to measure trait-level self-control. The 13-item questionnaire, with reported internal consistencies of 0.83 and 0.85, assesses the regulation of thoughts and emotions with questions such as "I am good at resisting temptation". Responses are given on a Likert scale ranging from 1= "not at all like me" to 5 = "very much like me", with higher scores indicative of elevated levels of self-control.

The General Self-Efficacy Scale (Schwarzer & Jerusalem 1995) consists of 10 items that evaluate an individual's self-efficacy beliefs. Questions such as "I can usually handle whatever comes my way" are rated on a 4-point Likert scale (1="not at all true" to 4="exactly true") where higher scores imply stronger self-efficacy beliefs. It has reported internal consistencies between .76 and .90.

Participants' adherence to cultural ideals was evaluated using the 16 item Individualism-Collectivism Scale (Triandis & Gelfland 1998), which is also referred to as the Cultural Orientation Scale. This scale measures the extent to which individuals choose personal goals over group interests, as well as the individual's endorsement of societal hierarchy. Thus, the scale assesses two domains of individualism (Vertical and Horizontal Individualism) and two domains of collectivism (Vertical and Horizontal Collectivism). That is, the scale categorizes the adherence to both individualist and collectivist ideals along two dimensions, labelled vertical and horizontal. The so-called "vertical" dimension assesses how accommodating the individual is of societal hierarchy, whereas the horizontal dimension assesses the preference for equality in society. Questions such as "Winning is everything" and "I often do my own thing", assess the vertical and horizontal domains of individualism respectively, whereas items such as "I feel good when I cooperate with others" and "It is important to me that I respect the decisions made by my groups" assess the horizontal and vertical domains of collectivism. Responses were rated on a 9-

point Likert scale (ranging from 1= never or definitely no to 9 = always or definitely yes). It has reported reliability scores of 0.65 for vertical individualism, 0.64 for horizontal individualism, 0.64 for vertical collectivism and 0.69 for horizontal collectivism.

Each scale was originally translated into Arabic by a collaborator at the UAE University and Chinese by collaborators from University of Michigan and Tianjin Normal University using a meaning-based approach ensuring linguistic and cultural validity. The scales were then back translated into English and inspected by James Danckert (supervisor) to ensure that translated versions of the scale were aligned with the original versions. Where items needed revising, the process was repeated for those specific items. Scales were administered in English for the Canadian sample, Simplified Chinese for the sample from China and in Arabic for the sample from the United Arab Emirates.

Data Analysis

Data was analyzed using R (R Core team, 2020). Measurement invariance was tested using a Multiple-group Confirmatory Factor Analysis (CFA) to enable between group comparisons of the measure of cultural adherence. To determine the extent to which each sample endorsed either collectivism or individualism, t-tests were used to compare each domain of cultural adherence across all three samples and within each sample. Zero order correlations were then calculated between all constructs, after which hierarchical multiple regressions were conducted for each sample to determine whether the sense of agency predicted boredom proneness over and above other known relations. Given the findings of Chapter 2, age, gender, self-control, self-efficacy and the sense of agency were entered at the first five steps of each regression. Each of the four domains of individualism-collectivism were then included in the

final step of separate regression models. More explicitly, there were four separate regressions in which one domain of individualism-collectivism was entered at the sixth step of each model. This was done for all three samples separately. It was expected that the results shown in Chapter 2 would be replicated such that the sense of agency and trait boredom would be negatively correlated in all three samples. In addition, it was expected that self-control, self-efficacy and the sense of agency would negatively predict boredom proneness. That is, those high in boredom proneness would report lower levels of self-control and self-efficacy, as well as a diminished sense of agency. Further, the negative association between trait boredom and the sense of agency was expected to be stronger in the sample representative of individualism, than in the two samples representative of collectivism. Finally, we ran a series of moderation analyses to determine whether culture moderated the relationship between boredom proneness and the sense of agency.

5.3. Results

Full configural and full metric invariance was established between all three samples across all scales measuring adherence to individualism and collectivism. Details of modification indices are provided in Appendix D. It was not possible to claim (partial) scalar invariance for the individualism and collectivism scales, which is a limitation in interpretating that scale. Prior to exploring the relation between boredom proneness and cultural orientation, general adherence or endorsement of the distinct factors of vertical/horizontal and individualism/collectivism was examined within and between each sample. All tests were corrected for multiple comparisons.

For the Canadian sample, results showed that Horizontal Collectivism (M = 27.03, SD = 4.92) was endorsed most strongly, followed by Horizontal Individualism (M = 26.47, SD = 5.14).

For the Chinese sample, Vertical Collectivism (M = 25.67, SD = 7.32) was endorsed most strongly, followed by endorsement of Horizontal Individualism (M = 25.36, SD = 7.81). In the UAE sample, Horizontal Individualism (M = 30.25, SD = 6.88) was most strongly endorsed followed by Vertical Collectivism (M = 29.48, SD = 7.73; Appendix D).

Next, endorsement of these domains was compared across samples. Results showed that the UAE sample endorsed each domain of cultural adherence more strongly than either the Canadian or Chinese samples. The Chinese sample endorsed Vertical Individualism (M = 23.11; SD = 7.47; t = 11.36) and Vertical Collectivism (M = 25.67; SD = 7.32; t = 10.51) at higher levels than the Canadian sample, whereas the Canadian participants endorsed Horizontal Individualism (M = 26.47; SD = 5.14; t = -3.78) and Horizontal Collectivism (M = 27.03; SD = 4.92; t = -12.09) at higher levels than did the Chinese sample (Table 5.1; Figure 5.1).

Table 5.1. T-test comparing cultural adherence (Between samples)

		Mean	*T*	*df*	*p*	95% CI (range for difference in means):
VI	UAE Canada	23.69 19.62	8.89	544.95	<.001	3.17 - 4.96
	UAE China	23.69 23.11	1.26	556.22	.207	-0.32 – 1.48
	China Canada	23.11 19.62	11.36	1900.2	<.001	2.88 – 4.09
VC	UAE Canada	29.48 22.59	14.86	505.96	<.001	5.98 – 7.80
	UAE China	29.48 25.67	8.11	532.16	<.001	2.88 – 4.73
	China Canada	25.67 22.59	10.51	1929.5	<.001	2.51 – 3.66
HI	UAE Canada	30.25 26.47	9.14	511.99	<.001	2.97 – 4.60

	UAE China	30.25 25.36	11.21	620.39	<.001	4.03 – 5.75
	China Canada	25.36 26.47	-3.78	1963.5	<.001	-1.68 – -0.53
HC	UAE Canada	27.72 27.03	1.62	483.45	.107	-0.15 – 1.53
	UAE China	27.72 23.76	8.98	546.99	<.001	3.09 – 4.82
	China Canada	23.76 27.03	-12.09	1963.5	<.001	-3.80 – -2.74

VI=vertical individualism; HI=horizontal individualism; VC=vertical collectivism; HC=horizontal collectivism

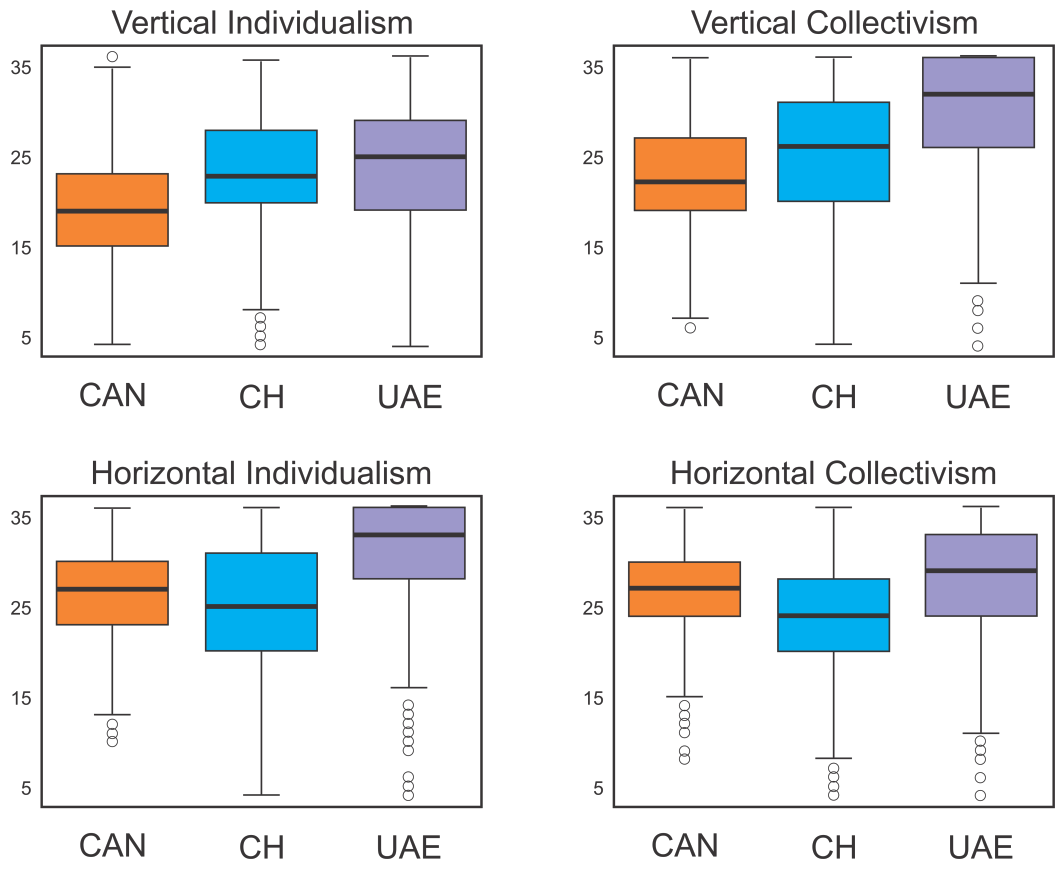


Figure 5.1. Box plots comparing the three samples on the endorsement of each domain of vertical/horizontal collectivism/individualism. CAN=Canada (left, orange), CH=China (middle, blue) and UAE=United Arab Emirates (right, purples).

The known relationship between trait boredom and the sense of agency was replicated across all three samples. That is, those high in trait boredom proneness reported a diminished sense of agency in all three samples. There were no significant differences in the magnitude of the correlations across samples. This was true for the full-scale sense of agency. When examining the two subscales, the sense of negative agency was consistently positively correlated with boredom proneness (in all three samples). That is, those high in boredom proneness reported a strong sense of negative agency (i.e., the feeling that they were *not* in control of their own actions). Conversely, the sense of positive agency was only significantly negatively correlated with boredom proneness in the Canadian sample. It had a non-significant negative association with boredom proneness in the UAE sample and, while significant in the Chinese sample, was mildly positive (Figure 5.2).

In addition, the known relationships between trait boredom and self-control was replicated (Figure 5.2). That is, high boredom proneness was associated with lower levels of self-control in all three samples. The known negative relation between boredom and self-efficacy was replicated in the Canadian sample. In contrast, the Chinese sample showed a small but significant positive relation between self-efficacy and boredom proneness, with a non-significant relation evident in the UAE sample.

Next, boredom proneness was significantly positively correlated with vertical individualism and significantly negatively correlated with horizontal collectivism in the Canadian sample. In the Chinese sample, trait boredom was significantly positively correlated with all four domains of individualism-collectivism, while in the sample from UAE, trait boredom was only positively correlated with vertical individualism (Tables 5.2, 5.3, and 5.4). It

is worth noting that all of these correlations were small in magnitude (contrasted against the moderate correlations between boredom proneness, agency and self-control).

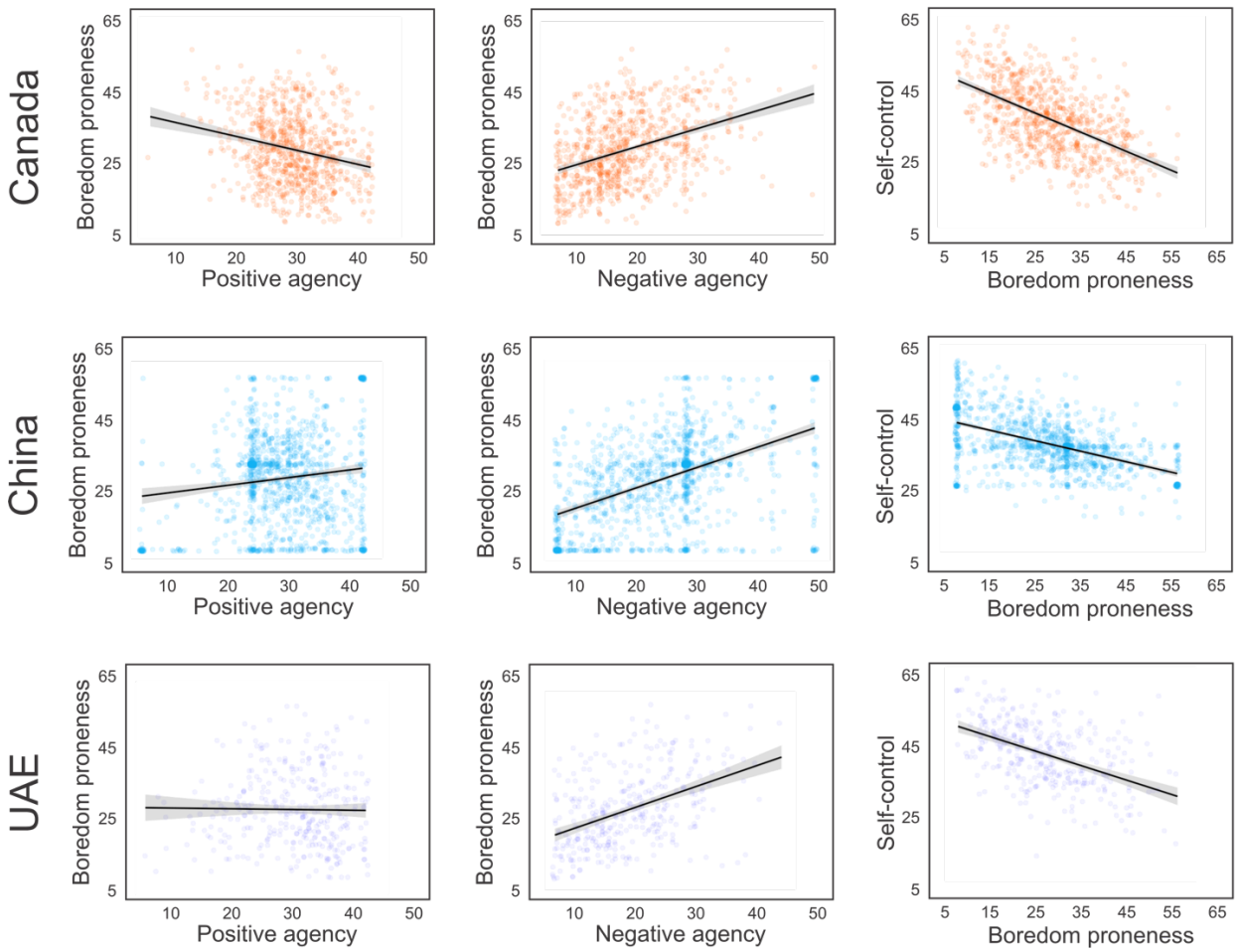


Figure 5.2. Scatter plots showing the relation between boredom proneness and positive sense of agency (left) the negative sense of agency (middle) and self-control (right). Canada=upper rows in orange; China=middle rows in blue; UAE=lower rows, in purple.

Table 5.2. Bivariate correlations among study variables – Canadian Sample

	M	*SD*	1	2	3	4	5	6	7	8	9	10
1. BPS	28.28	9.80	-	-0.54***	-0.34***	-0.39***	-0.23***	0.39***	0.16***	-0.02	0.05	-0.22***
2. BSCS	39.03	8.89		-	0.28***	0.32***	0.23***	-0.29***	-0.15***	0.08*	0.01	0.16***
3. GSES	29.46	4.67			-	0.31***	0.34***	-0.19***	0.11**	0.16***	0.27***	0.29***
4. SAS	67.02	10.97				-	0.77***	-0.87***	-0.12***	0.04	0.17***	0.29***
5. SOPA	29.38	5.83					-	-0.35***	0.08*	0.18***	0.24***	0.29***
6. SONA	18.36	7.49						-	0.24***	0.08*	-0.06	-0.20***
7. VI	19.62	6.08							-	0.23***	0.31***	-0.02
8. VC	22.59	5.67								-	0.19***	0.37***
9. HI	26.47	5.14									-	0.16***
10. HC	27.03	4.92										-

BPS=Boredom Proneness Scale; BSCS=Brief Self-control Scale; GSES=General Self-efficacy Scale; SAS=Sense of Agency Scale; SoPA=Sense of Positive Agency; SoNA=Sense of Negative Agency; VI=Vertical Individualism; VC=Vertical Collectivism; HI=Horizontal Individualism; HC=Horizontal Collectivism. * p<.05, ** p<0.01, *** p<0.001.

Table 5.3. Bivariate correlations among study variables – Chinese Sample

	M	*SD*	1	2	3	4	5	6	7	8	9	10
1. BPS	27.98	12.45	-	-0.51***	0.06*	-0.36***	0.13***	0.48***	0.24***	0.09**	0.15***	0.08**
2. BSCS	39.70	6.67		-	-0.06*	0.45***	-0.16***	-0.59***	-0.30***	-0.14***	-0.21***	-0.14***
3. GSES	27.57	6.95			-	0.13***	0.50***	0.23***	0.52***	0.50***	0.53***	0.54***
4. SAS	60.26	11.11				-	0.43***	-0.75***	0.02	0.28***	0.21***	0.16***
5. SOPA	28.61	7.67					-	0.28***	0.48***	0.61***	0.56***	0.55***
6. SONA	24.35	10.46						-	0.33***	0.15***	0.18***	0.23***
7. VI	23.11	7.47							-	0.64***	0.72***	0.63***
8. VC	25.67	7.32								-	0.65***	0.78***
9. HI	25.36	7.81									-	0.59***
10. HC	23.76	7.07										-

BPS=Boredom Proneness Scale; BSCS=Brief Self-control Scale; GSES=General Self-efficacy Scale; SAS=Sense of Agency Scale; SoPA=Sense of Positive Agency; SoNA=Sense of Negative Agency; VI=Vertical Individualism; VC=Vertical Collectivism; HI=Horizontal Individualism; HC=Horizontal Collectivism. * p<.05, ** p<0.01, *** p<0.001.

Table 5.4. Bivariate correlations among study variables – UAE Sample

	M	*SD*	1	2	3	4	5	6	7	8	9	10
1. BPS	27.03	10.50	-	-0.48***	-0.04	-0.31***	-0.02	0.44***	0.23***	0.00	0.01	0.09
2. BSCS	44.39	8.22		-	0.33***	0.51***	0.25***	-0.51***	-0.04	0.25***	0.17**	0.18***
3. GSES	31.34	5.86			-	0.42***	0.48***	-0.15**	0.36***	0.46***	0.57***	0.49***
4. SAS	66.93	11.77				-	0.75***	-0.76***	0.10	0.39***	0.45***	0.30***
5. SOPA	30.05	7.64					-	-0.15**	0.31***	0.42***	0.52***	0.39***
6. SONA	19.13	7.89						-	0.15**	-0.18***	-0.18***	-0.07
7. VI	23.69	7.46							-	0.42***	0.42***	0.34***
8. VC	29.48	7.73								-	0.53***	0.60***
9. HI	30.25	6.88									-	0.57***
10. HC	27.72	7.20										-

BPS=Boredom Proneness Scale; BSCS=Brief Self-control Scale; GSES=General Self-efficacy Scale; SAS=Sense of Agency Scale; SoPA=Sense of Positive Agency; SoNA=Sense of Negative Agency; VI=Vertical Individualism; VC=Vertical Collectivism; HI=Horizontal Individualism; HC=Horizontal Collectivism. * $p<.05$, ** $p<0.01$, *** $p<0.001$.

Next, to determine whether endorsing the various cultural identities predicted varying levels of boredom proneness when controlling for the sense of agency and other theoretically important variables (self-control and self-efficacy), a series of hierarchical multiple regressions were conducted (Tables 5.5, 5.6, 5.7). Given that only the negative sense of agency showed a consistent relation with boredom proneness in all three samples, this variable was used in step 4 of our regressions (results of regressions using the full Sense of Agency Scale are presented in the Appendix D). Age was only significant in the Canadian sample when included at the first step of the regression model (negatively predicting boredom proneness and explaining 2.2% of variance). Gender was not a significant predictor of boredom proneness in any of our three samples. Self-control significantly negatively predicted boredom proneness, accounting for 29.2%, 25.8% and 21.6% respectively in the Canadian, Chinese and UAE samples respectively. While self-efficacy negatively predicted boredom proneness in the Canadian sample, it was non-significant in the Chinese sample and positively predicted boredom proneness in the UAE sample. It is worth noting that self-efficacy explained only a small amount of additional variance

in the model, explaining 3.1% for the negative relation in the Canadian sample and 1.5% of additional variance for the positive relation in the UAE sample. At step 5, the sense of negative agency emerged as a significant positive predictor of boredom proneness across all three samples, explaining 4.2%, 5.0% and 5.7% of additional variance in the Canadian, Chinese and UAE samples respectively. At step 6, vertical individualism positively predicted boredom proneness across all three samples but did not explain any additional variance in boredom proneness in the Canadian sample. It did, however, explain 0.5% and 2.2% of additional variance in boredom proneness in the Chinese and UAE samples respectively. Vertical Collectivism was a non-significant predictor in the Canadian and Chinese samples, but positively predicted boredom proneness in the UAE sample, explaining 1% of additional variance in boredom proneness. Horizontal Individualism was a significant positive predictor of boredom proneness in the Canadian sample and accounted for 1.3% of additional variance. Finally, Horizontal Collectivism emerged as a significant negative predictor of boredom proneness in the Canadian sample and a significant positive predictor in the UAE sample, explaining 0.5% and 1.4% of additional variance in boredom proneness.

Table 5.5. Hierarchical regression predicting Boredom Proneness (Canadian Sample)

	B	***β***	***SE***	***t***	***p***	***p*Δ**	***R2*Δ**
Step 1							
Age	-0.29	0.15	0.07	-4.23	<.001	<.001	0.02
Step 2							
Age	-0.28	0.15	0.07	-4.21	<.001		
Gender	0.81	0.03	0.83	0.97	.332	.332	0.001
Step 3							
Age	-0.22	0.11	0.06	-3.86	<.001		
Gender	1.84	0.08	0.70	2.64	.009		
BSCS	-0.60	0.54	0.03	-18.36	<.001	<.001	0.29
Step 4							
Age	-0.21	0.11	0.06	-3.75	<.001		
Gender	1.14	0.05	0.69	1.65	.099		
BSCS	-0.54	0.49	0.03	-16.17	<.001		
GSES	-0.39	0.19	0.06	-6.13	<.001	<.001	0.03
Step 5							
Age	-0.15	0.08	0.05	-2.75	.006		
Gender	1.22	0.05	0.67	1.81	.070		
BSCS	-0.48	0.43	0.03	-14.38	<.001		
GSES	-0.34	0.16	0.06	-5.41	<.001		
SONA	-0.29	0.22	0.04	7.41	<.001	<.001	0.04
Step 6.a							
Age	-0.14	0.07	0.05	-2.53	.012		
Gender	1.40	0.06	0.67	2.08	.038		
BSCS	-0.47	0.43	0.03	-14.04	<.001		
GSES	-0.36	0.17	0.06	-5.77	<.001		
SONA	0.27	0.20	0.04	6.74	<.001		
VI	0.12	0.07	0.05	2.43	.015	.015	0.004
Step 6.b							
Age	-0.15	0.08	0.05	-2.78	.006		
Gender	1.24	0.05	0.67	1.85	.065		
BSCS	-0.48	0.44	0.03	-14.40	<.001		
GSES	-0.34	0.16	0.06	-5.48	<.001		
SONA	0.28	0.02	0.04	7.24	<.001		
VC	0.04	0.02	0.05	0.82	.410	.410	0.000
Step 6.c							
Age	-0.15	0.08	0.05	-2.87	.004		
Gender	1.06	0.04	0.66	1.60	.111		
BSCS	-0.47	0.42	0.03	-14.12	<.001		
GSES	-0.41	0.20	0.06	-6.42	<.001		
SONA	0.29	0.22	0.04	7.60	<.001		
HI	0.23	0.12	0.05	4.20	<.001	<.001	0.01

Step 6.d							
Age	-0.16	0.08	0.05	-2.98	.003		
Gender	1.32	0.06	0.67	1.97	.050		
BSCS	-0.48	0.04	0.03	-14.33	<.001		
GSES	-0.30	0.14	0.06	-4.62	<.001		
SONA	0.27	0.21	0.04	6.96	<.001		
HC	-0.15	0.07	0.06	-2.52	.012	.012	0.004

Table 5.6. Hierarchical regression predicting Boredom Proneness (Chinese Sample)

	B	*β*	*SE*	*t*	*p*	*p*Δ	*R2*Δ
Step 1							
Age	-0.05	0.01	0.08	-0.68	.494	.494	0.000
Step 2							
Age	-0.04	0.02	0.08	-0.55	.584		
Gender	-0.53	0.02	0.75	-0.71	.481	.481	0.000
Step 3							
Age	0.02	0.01	0.07	0.36	.720		
Gender	-0.24	-0.01	0.64	-0.37	.712		
BSCS	-0.95	-0.51	0.05	-20.17	<.001	<.001	0.26
Step 4							
Age	0.02	0.01	0.07	0.23	.821		
Gender	-0.16	-0.01	0.65	-0.24	.810		
BSCS	-0.95	-0.51	0.05	-20.06	<.001		
GSES	0.06	0.04	0.05	1.40	.162	.162	0.001
Step 5							
Age	-0.01	-0.00	0.07	-0.14	.888		
Gender	0.63	0.02	0.63	1.01	.315		
BSCS	-0.63	-0.3	0.06	-11.07	<.001		
GSES	-0.03	-0.02	0.05	-0.75	.456		
SONA	0.34	0.29	0.04	9.19	<.001	<.001	0.05
Step 6.a							
Age	-0.01	-0.00	0.07	-0.19	.853		
Gender	0.64	0.03	0.63	1.02	.310		
BSCS	-0.59	-0.3	0.06	-10.21	<.001		
GSES	-0.11	-0.06	0.05	-2.06	.039		
SONA	0.34	0.28	0.04	8.98	<.001		
VI	0.14	0.08	0.05	2.84	.005	.005	0.005
Step 6.b							
Age	-0.01	-0.00	0.07	-0.16	.873		
Gender	0.63	0.02	0.63	0.99	.322		
BSCS	-0.63	-0.3	0.06	-10.92	<.001		
GSES	-0.04	-0.02	0.05	-0.81	.419		
SONA	0.35	0.29	0.04	9.19	<.001		
VC	0.02	0.01	0.05	0.32	.746	.746	0.000
Step 6.c							
Age	-0.01	-0.00	0.07	-0.17	.866		
Gender	0.50	0.02	0.64	0.78	.437		
BSCS	-0.61	-0.33	0.06	-10.54	<.001		
GSES	-0.08	-0.04	0.05	-1.42	.156		
SONA	0.35	0.29	0.04	9.26	<.001		
HI	0.07	0.04	0.05	1.48	.139	.140	0.001

Step 6.d							
Age	-0.004	-0.00	0.07	-0.06	.949		
Gender	0.65	0.03	0.63	1.04	.300		
BSCS	-0.64	-0.34	0.06	-11.13	<.001		
GSES	-0.001	-0.00	0.05	-0.02	.983		
SONA	0.35	0.29	0.04	9.26	<.001		
HC	-0.06	-0.04	0.05	-1.21	.229	.229	0.001

Table 5.7. Hierarchical regression predicting Boredom Proneness (UAE Sample)

	B	***β***	***SE***	***t***	***p***	***p*Δ**	***R2*Δ**
Step 1							
Age	-0.24	-0.08	0.15	-1.57	.118	.118	0.01
Step 2							
Age	-0.21	-0.07	0.15	-1.36	.175		
Gender	2.20	0.08	1.45	1.52	.130	.130	0.01
Step 3							
Age	-0.03	-0.01	0.14	-0.22	.823		
Gender	1.14	0.04	1.29	0.88	.380		
BSCS	-0.60	0.47	0.06	-9.73	<.001	<.001	0.22
Step 4							
Age	-0.05	-0.01	0.14	-0.36	.716		
Gender	1.05	0.04	1.28	0.82	.413		
BSCS	-0.65	-0.5	0.06	-10.10	<.001		
GSES	0.23	0.13	0.09	2.55	.011	.011	0.01
Step 5							
Age	-0.06	-0.02	0.13	-0.45	.652		
Gender	1.97	0.07	1.25	1.58	.115		
BSCS	-0.47	-0.36	0.07	-6.45	<.001		
GSES	0.22	0.12	0.09	2.51	.013		
SONA	0.37	0.28	0.07	5.23	<.001	.<.001	0.06
Step 6.a							
Age	-0.09	-0.03	0.13	-0.68	.496		
Gender	2.06	0.08	1.23	1.68	.094		
BSCS	-0.44	-0.35	0.07	-6.19	<.001		
GSES	0.09	0.05	0.09	1.02	.311		
SONA	0.34	0.03	0.07	4.75	<.001		
VI	0.23	0.17	0.07	3.33	<.001	<.001	0.02
Step 6.b							
Age	-0.05	-0.02	0.13	-0.42	.677		
Gender	1.98	0.07	1.24	1.59	.112		
BSCS	-0.47	-0.37	0.07	-6.60	<.001		
GSES	0.13	0.07	0.09	1.39	.164		
SONA	0.38	0.29	0.07	5.41	<.001		
VC	0.15	0.11	0.07	2.16	.031	.031	0.01
Step 6.c							
Age	-0.06	-0.02	0.13	-0.48	.632		
Gender	1.78	0.07	1.26	1.42	.158		
BSCS	-0.46	-0.36	0.07	-6.35	<.001		
GSES	0.15	0.09	0.10	1.46	.145		
SONA	0.38	0.29	0.07	5.33	<.001		
HI	0.10	0.06	0.09	1.13	.258	.258	0.00
Step 6.d							

Age	-0.06	-0.02	0.13	-0.50	.621		
Gender	1.53	0.06	1.25	1.23	.220		
BSCS	-0.47	-0.37	0.07	-6.61	<.001		
GSES	0.10	0.06	0.10	1.01	.311		
SONA	0.37	0.27	0.07	5.18	<.001		
HC	0.20	0.14	0.08	2.65	.009	.009	0.01

Despite the fact that the regression models suggested only variable and small influences of cultural norms on boredom proneness, some exploratory moderation analyses were nevertheless conducted to test whether the association between boredom proneness and the sense of negative agency (given its consistent association with boredom proneness across samples) was influenced by culture across the four domains of individualism-collectivism. Using the PROCESS macro model (Hayes, 2021) the sense of negative agency was entered as the predictor, each domain of individualism-collectivism was entered as the moderator (in separate models) and boredom proneness was entered as the outcome variable. There was a significant main effect between the sense of negative agency and boredom proneness in each moderation model, across all three samples. In addition, there was a significant main effect of vertical individualism on boredom proneness in all three samples, such that the endorsement of vertical individualism positively predicted boredom proneness. In the Canadian and Chinese samples, there was a significant main effect of horizontal individualism on boredom proneness, where horizontal individualism positively predicted boredom proneness in both samples (Canadian Sample; b= 0.14, BCa CI [0.02, 0.26], t=2.25, p <.025; Chinese Sample; b= 0.09, BCa CI [0.01, 0.18], t=2.14, p <.033). There was also a significant main effect of horizontal collectivism on boredom proneness in the Canadian and UAE samples, such that horizontal collectivism negatively predicted boredom proneness in the Canadian sample, while positively predicting boredom proneness in the UAE

sample. (Canadian Sample; *b*= -0.30, BCa CI [-0.43, -0.17], t=-4.52, *p* <.001; UAE Sample; *b*= 0.17, BCa CI [0.03, 0.31], t=2.45, *p* <.015; Table 8). Finally, there was only one significant moderation effect, observed in the Chinese sample, such that the relation between boredom proneness and the sense of negative agency was significantly moderated by vertical collectivism (*b*= -0.01, BCa CI [-0.02, -0.00], t=-2.66, *p* =.008) (Table 5.8).

Table 5.8. Analysis showing moderating effect of vertical collectivism (Chinese Sample)

	B	***SE***	***T***	***p***	***LLCI***	***ULCI***
SONA	0.59	0.03	18.66	<.001	0.53	0.66
VC	-0.00	0.05	-0.05	.958	-0.09	0.09
Int_1	-0.01	0.00	-2.66	.008	-0.02	-0.00

Table 5.9. Conditional effects of the focal predictor at values of the moderator (VC – China)

VC	Effect	***SE***	***t***	***p***	***LLCI***	***ULCI***
-7.32	0.66	0.04	14.79	<.001	0.57	0.74
-0.00	0.59	0.03	18.66	<.001	0.53	0.66
7.32	0.53	0.03	15.34	<.001	0.46	0.60

The simple slope test (Figure 5.3; Table 5.9) of this moderation indicated that at lower levels of vertical collectivism, higher levels of boredom proneness were linked to a stronger sense of negative agency ($B_{simple} = 0.65$, $p < 0.001$).

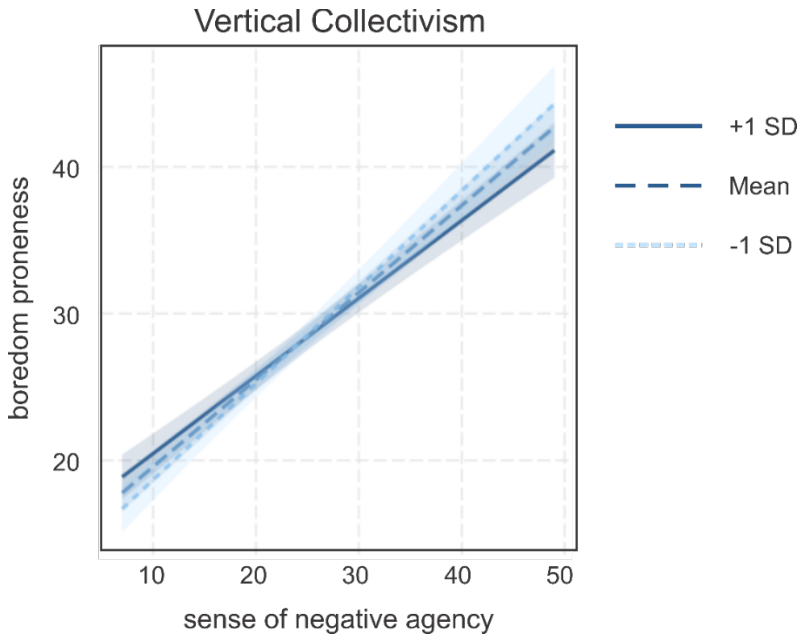


Figure 5.3. Interaction term for the moderation by vertical collectivism on the relation between boredom proneness and the sense of negative agency.

5.4 Discussion

The experience of boredom and its attendant consequences are widespread. As evidenced in the previous chapters of this thesis, high levels of boredom proneness have been consistently associated with a diminished sense of agency (Dadzie et al., 2024; Gorelik & Eastwood 2023). Given the universality of boredom, it was expected that known relationships between the sense of agency and boredom would replicate across different cultures. The main hypothesis raised in addition to that, posited a stronger relationship for cultures that predominantly endorsed individualist ideals. The four-way typology of the scale used to assess culture ensured that not only was individualism and collectivism examined on opposite ends of a continuum, but that variations in power distance, another important dimension of cultural adherence were also captured (Hofstede, 1980). While full configural and metric invariance were established for the

individualism-collectivism scale, scalar invariance was not (see Appendix D). Nevertheless, the results highlight some interesting findings despite these limitations.

Consistent with the first hypothesis, boredom proneness was negatively associated with the sense of agency in all three samples. That is, regardless of cultural embeddedness, those high in boredom proneness reported experiencing a diminished sense of agency (Figure 5.2, Tables 5.2-5.4). This was only reliable when the negative sense of agency, or, in other words, the feelings that one lacks control over how they pursue goals and act on the world around them was examined consistent with findings from previous chapters of this thesis. Boredom proneness has, in part, been characterized as a conundrum—what Eastwood and Gorelik (2019) call a desire bind. The highly boredom prone recognise the desire to be meaningfully engaged but fail to launch into any action that might satisfy that desire (see also Mugon et al., 2018). The failure to successfully break out of that desire bind, potentially as a function of a diminished sense of agency, seems to be universal.

Similarly, the relation with boredom proneness and self-control was highly consistent across samples (Figure 5.2, Tables 5.2-5.4), such that those high in boredom proneness tend to report lower levels of self-control. It is worth pointing out that the scale used to measure self-control here, may reflect the *outcomes* of failures of self-control more so than any mechanistic account of successful self-control (Schrader & Tangney, 2024). It will be worthwhile to determine whether different aspects of self-control, from impulse control to goal initiation and maintenance (Hoyle & Davisson, 2016), are more strongly related to boredom proneness and whether such relations differ across cultures. More broadly, profiles of self-regulation may differ across culture. As just one example, the finding that lower levels of self-efficacy are associated with higher levels of boredom proneness was only evident in the Canadian sample (Mugon et al.,

2020). It seems for the Canadian sample, not only do the highly boredom prone feel less agentic in general, they also feel less effective when they do launch into action. In contrast, self-efficacy was unrelated to boredom proneness in our UAE sample and showed a positive relation in the Chinese sample. The lack of an association between boredom and self-efficacy replicates the findings of a study on a sample of female Saudis (Hammdi, 2023), perhaps suggesting that for some cultures feelings of boredom and self-efficacy are disconnected. Why this would be the case, given the consistent associations seen here between boredom proneness and agency is unclear and warrants further research. It is worth pointing out, that while significant in the Chinese sample, the correlation between boredom proneness and self-efficacy was very small and did not explain any additional variance in boredom proneness. Nevertheless, it may be worthwhile to explore more nuanced self-regulatory profiles (e.g., locomotion vs. assessment; Kruglanski et al., 2000; Mugon et al., 2018) as a function of adherence to cultural norms.

When the adherence to cultural norms was examined, our samples did not show the stark differences that one might have expected a priori. That is, it would be expected that the Canadian sample would strongly endorse individualist norms whereas the Chinese and UAE samples would more strongly endorse collectivist ideals. The fact that the emerging picture was more nuanced than this fits with prior work suggesting that Chinese samples may endorse vertical individualism more so than horizontal collectivism (as might be assumed based on the simple distinction between individualism and collectivism; Sividas et al., 2008). For the samples tested here, results showed stronger endorsement of vertical collectivism *and* individualism within the Chinese sample when contrasted with the Canadian sample. Conversely, the Canadian sample endorsed horizontal collectivism and individualism more strongly when directly contrasted with the Chinese sample (this broadly mirrors the results seen by Sividas and colleagues when

contrasting a Chinese and USA sample). Broadly speaking, this pattern may reflect differing levels of adherence to or comfort with societal hierarchies. In other words, the Canadian sample may be less comfortable with unequal power distributions, whereas the Chinese sample demonstrates a preference for interdependence coupled with hierarchical differentiation. When all three samples were compared, the United Arab Emirates endorsed all four dimensions of culture more strongly than either the Canadian or Chinese samples (Figure 5.1). That is, while the Canadian sample was considered to be most representative of individualist ideals, the UAE sample—which a priori might be assumed to reflect a collectivist culture—reported stronger endorsement of individualist ideals when contrasted with the Canadian sample. Given the assertion that both dimensions of cultural adherence (both independence and interdependence) can exist within a society and determine social interactions such that culturally appropriate responses are case specific and situation dependent (Schwartz 1994; Markus & Kitayama 1991), it is plausible that while Emiratis prioritize social cohesion, interdependence and equality, they equally demonstrate an adherence to hierarchy. Regardless of what drives the current results with respect to adherence to cultural norms, it appears clear that the key relations with boredom proneness (i.e., for the negative sense of agency and levels of self-control) were consistent across all three samples.

Results from the regressions indicated that while some domains of cultural endorsement significantly improved the model fit, they explained relatively small amounts of additional variance in boredom proneness (≤ 3%). Vertical individualism emerged a positive predictor of boredom proneness in all three samples (Tables 5.5-5.7). While it did not explain additional variance in boredom proneness in the Canadian sample, it was the only dimension of cultural orientation that consistently predicted boredom proneness across all three samples. What this

may indicate is that individual differences in the endorsement of autonomy (and hierarchy) predicts individual differences in boredom proneness. That is, the more a person adheres to autonomy and the achievement of individual goals, the more likely they are to be boredom prone. While evident in all three samples, it does seem partially consistent with the hypothesis that those endorsing an individualist approach more strongly would also show a stronger relation between boredom proneness and agency. It may be the case that a focus on individual goals heightens feelings of boredom when those goals are unmet.

Vertical collectivism positively predicted boredom proneness in the UAE sample (Table 5.7). The vertical dimension of this scale—both for individual and collectivist goals—is intended to reflect endorsement of a hierarchical societal structure. For the UAE sample, the fact that both vertical dimensions predicted boredom proneness may suggest that both individual and group goals are cast within such a hierarchical structure. Boredom proneness then, may be higher when the individual feels their pursuit of goals (their own or their group's) are determined not by themselves. Further research is needed to replicate the current findings and explore more deeply the potential explanation given here. It is worth noting again that the observed effects were quite small.

For the Canadian sample, horizontal individualism also positively predicted boredom proneness. Again, the preference for uniqueness and personal interest, as opposed to group interests indicated (albeit in one sample only) an increased likelihood to be boredom prone. Horizontal collectivism also predicted boredom proneness in the Canadian sample. The horizontal aspects of this scale—both for individualist and collectivist goals—are thought to reflect the extent to which people endorse equality across members of society. Adherence to such a belief may influence the experience of boredom for the highly boredom prone if individuals

feel they lack opportunities for engagement. A similar relation between horizontal collectivism and boredom proneness was observed in the UAE sample. For this sample the effect seems counter to the relations observed with the vertical dimensions of individualism and collectivism. While these effects are small, there is clearly some need to delve more deeply into the potential cultural influences on boredom proneness.

Despite the relatively small influences of cultural norms observed here, moderation analyses were nevertheless conducted. Of all domains tested across the three samples only one showed a significant moderation—vertical collectivism within the Chinese sample (Figure 5.3). Again, this effect was relatively small and indicated that at lower levels of adherence to collectivist norms of interdependence, social interest and group goals, the relation between boredom and agency was somewhat stronger.

This is the first study to investigate the association between boredom and agency within a cultural context. Given that boredom and the sense of agency have been associated with notable mental health concerns, evaluating the possibility that this association might be culturally influenced is important for considering culturally appropriate assessments and interventions (Fogel et al., 2018; Alarcón, 2009). The current findings, however, indicate that cultural adherence only very minimally influenced the association between these two constructs. It may be worthwhile for future work to employ different metrics of adherence to cultural norms given the fact that it was not possible to establish scalar invariance across the samples tested here and with the current tools used. In addition, all three samples were drawn from undergraduate populations, raising the possibility that a more representative sample would show stronger, or perhaps distinctive relations relative to those seen here. What is clear from the current results is

that the relations between boredom proneness and both agency and self-control are robust to differences across cultures.

Chapter 6: General Discussion

The idea that boredom emerges in situations of constraint, where there is little room to fully exercise agency, has been alluded to in a range of studies across many decades (O'Hanlon, 1981; Fenichel, 1953; Geiwitz, 1966). More recently, work has shown that individual experiences of boredom are influenced by perceptions of control over a situation, such that lower perceptions of control were associated with higher feelings of boredom (Struk et al., 2021). The work presented in this thesis directly tests the notion that agency is a critical determinant of the experience of boredom (Danckert and Eastwood, 2020). With the premise that a considerable degree of self-control is required to be an effective agent, Chapter 2 explored the association between boredom proneness and agency within a self-regulatory framework. Results showed that boredom proneness was predicted by a diminished sense of agency over and above other common determinants of the trait (e.g., self-control and regulatory modes; Tables 2.1 and 2.2). It is noteworthy that in Chapter 2, and across multiple samples, it was the negative sense of agency—the feeling that one *lacks agency*—that showed the strongest association with boredom proneness.

The objective of Chapter 3 was to determine whether the diminished perception of agency among the highly boredom prone was due to a more general failure to *perceive* agency. If accurate perception of agency was key to feeling that one has agency, then highly boredom prone individuals would be expected to demonstrate deficits in perceiving agency even in actors and situations external to themselves. Thus, in Chapter 3, the Heider and Simmel animation usually deployed to measure attributions of agency was used to explore the extent to which both state and trait boredom would determine perceptual ratings of agency. Here, being situationally bored

was associated with lower perceptual judgements of agency, while boredom proneness showed no association with the attribution of agency. Whatever the cause of diminished perceptions of agency among the highly boredom prone (Chapter 2), it does not appear to be due to failures in attributing agency more generally. Chapter 3 then explored the notion that a disengaged attentional state, a well-known correlate of boredom and boredom proneness (Leary et al., 1986; Damrad-Frye & Laird; Eastwood et al., 2012), was the pathway through which situational boredom led to lower judgements of agency. Higher self-reported levels of state boredom indicated less engagement with external information—the animation—which gave rise to lower reported perceptions of agency. It is plausible that this association was primarily because the nature of the video—both its length and somewhat predictable content—made little demands on the cognitive capacity of participants. Despite the very short nature of the animation (around 90 seconds in duration), poorer attentional performance, as indicated by a failure to detect incidental colour changes in the shapes, did indeed mediate the relation between state boredom and judgements of agency. Whether this would hold true for judgements of agency in human actors remains an open question.

In Chapter 4, highly boredom prone individuals demonstrated an intolerance of disruptions to agency as evidenced by their tendency to reset the game more often after delays were introduced between their movements and those of the paddle on screen. Finally, the objective of Chapter 5 was to determine possible differences in the association between boredom proneness and the sense of agency as a function of adherence to the distinct cultural norms of individualism and collectivism. Results showed that culture exerted little influence on this association as the highly boredom prone reported diminished levels of agency across three distinct cultures. The fact that the relationship between boredom proneness and the sense of

agency was stable across distinct cultures in spite of the dictates of cultural adherences and preferences that inform a wide range of other individual differences (Leung et al., 2011; Triandis and Suh, 2002), suggests that this relation is quite robust. Once again, across all three cultures tested, the sense of negative agency (i.e., the feeling that one lacks agency) showed the strongest association with boredom proneness.

The consistent association between boredom proneness and the sense of negative agency seen throughout the thesis suggests a possible mechanism for the so-called failure to launch deemed to be characteristic of the highly boredom prone (Mugon et al., 2018). That is, the perception that one has little control and can effect only minimal change in their environment, may deter the individual from taking any meaningful action. The ruminative tendencies of the assessment mode of goal pursuit would likely amplify this failure to launch (Mugon et al., 2018). In some sense, this association between a failure to launch and a loss of agency may represent a kind of learned helplessness. The highly boredom prone person may feel that they have little or no capacity to influence their circumstances having continuously experienced the conundrum of boredom. It would be worthwhile to investigate whether the sense of negative agency manifests as a kind of learned helplessness (Tapal 2017) that would prolong the course of boredom particularly for those who experience it more frequently. It may be the case that the sense of negative agency accounts for other motivational factors associated particularly with the trait of boredom proneness. The tendency to procrastinate, excessive and seemingly purposeless internet use and other avoidance behaviours characteristic of boredom proneness would fall within this domain.

Recall from the introduction that boredom has previously been cast within self-regulatory, attentional and meaning based accounts, and while each framework highlights some

mechanism that drives the trait, a proposed construct that subsumes each of these accounts is that of agency (Gorelik and Eastwood 2024). Results from Chapters 2 and 5 examined agency within a self-regulatory account of boredom proneness. Whether the sense of agency represents a distinct mechanism or merely another aspect of self-regulatory control warrants further research. Regardless, results from these chapters indicated that feelings of agency (or more accurately, a lack of agency) explains variance in boredom proneness over and above other self-regulatory variables. Deficits in self-regulatory control, coupled with a diminished sense of agency (Chapter 2), may also manifest as a lack of persistence or a difficulty with staying on task, which can be interpreted from results in Chapter 4. Here, highly boredom prone individuals who reset the Pong game more frequently in response to the introduced delays may have been more intolerant to these disruptions in agency and find it more difficult to persist with tasks. Further work would be needed to ascertain whether the tendency to reset during the Pong game was indeed driven by self-regulatory deficits.

In recent work, the factor structure of the measure of self-control used throughout this thesis was re-evaluated, such that scale items were considered to assess outcomes and failures of self-control more so than the actual mechanisms underlying the construct (Schrader & Tangney, 2025). This work posits that the construct of self-control is better conceptualized when bipartite or tripartite distinctions are made between initiatory or inhibitory self-control on the one hand, and impulse control, goal initiation and goal persistence on the other (Hoyle & Davisson, 2016). The initiatory domain of self-control would assess the tendency to begin and persist with tasks while the inhibitory domain assesses the ability to refrain from engaging in activities that are likely to have detrimental outcomes, or to delay immediate gratification in favour of longer term goals. Given these recent findings, it would be important to further investigate the extent to

which the initiatory and inhibitory domains of self-control contribute to boredom proneness. It is plausible that the initiatory domain of self-control which indicates difficulties with goal initiation and persistence, would be more pertinent when the individual fails to launch into meaningful action. However, a lack of inhibitory self-control would likely result in problematic behaviours such as problem gambling and sensation seeking which those higher in boredom proneness are known to engage in. Disambiguating the influence of distinct domains of self-control would clarify the association between boredom and agency. It may be the case that the initiation of goals mediates the relation between boredom proneness and agency given that boredom prone individuals tend to procrastinate and fail to launch into meaningful action (Vodanovich et al., 1999; Wang et al.; 2021, Mugon et al., 2018). Alternatively, given the association between boredom proneness and problematic behaviours indicative of poor impulse control—sensation seeking, alcohol use disorder, problem gambling, problematic smartphone use—it may well be that the inhibitory domain of self-control mediates the association between boredom proneness and the sense of agency, such that engaging in these impulsive behaviours creates an avenue, albeit a maladaptive one, for the highly boredom prone to re-establish a sense of agency. Once again, further research is needed to differentiate between these possibilities.

While the sense of agency may be assumed retrospectively (Wegner, 2002; Moore et al., 2009), after the successful completion of an action, it is possible for the individual to predict a sense of agency related to prospective action choices (Wolpert and Miall, 1996). The conundrum of boredom indicates a desire to engage despite a failure to successfully launch into action. For the highly boredom prone, prospectively predicting a sense of agency over available actions and their outcomes may be particularly challenging. Indeed, recent work (Danckert & Elpidorou 2023; Trudel et al., 2025) conceptualizes this as an error of predictive coding, where those higher

in boredom proneness fail to accurately assess the outcomes and values of available options for engagement. As such, the highly boredom prone may fail to launch not only because they fail to predict what makes for optimal engagement but may also be lacking in their ability to predict how much agency they can exert over future actions.

Situations perceived as lacking in meaning have also been consistently associated with state boredom (Van Tilburg & Igou, 2012, 2017a), while individuals who lack a sense of life meaning are thought to experience boredom more frequently (Barbalet, 1999; Fahlman et al., 2009). What is less clear is the association between agency and meaning. A low sense of agency likely leads to a low perception of meaning in a myriad of situations, which may manifest in challenges with goal pursuit. That is, it becomes challenging to pursue a goal that to begin with, does not seem meaningful. Conversely, successful goal pursuit will likely increase one's sense of life meaning. It is also plausible that in ascribing agency externally, the individual finds more meaning when observing actors and agents to whom they attribute an immediate cause of events, while actors and situations that appear to lack agency hold little meaning. Future work could continue to draw parallels between boredom and agency while investigating both within a meaning framework.

Limitations and Future Directions

The measure of trait boredom used here—the shortened boredom proneness scale (Struk et al., 2017), is an abridged version of the original 28-item measure (Farmer and Sundberg; 1986) that assesses boredom proneness. Given the unidimensional factor structure of the SBPS, it has been considered an accurate measure for assessing boredom proneness and has been translated into a variety of languages to ensure cultural comprehension where necessary (Gana

and Akremi, 1998; Craparo et al., 2013; Peng et al., 2020; Khadra et al., 2025). While this version of the boredom proneness scale is considered to be a relatively accurate measure of the trait disposition to experience boredom, Gana and colleagues (2018) show that it only accounts for 28% of variance in the trait, with 8% of variance accounted for by the state of boredom. In other words, a substantial portion of variance (64%) in this scale can be attributed to either error variance or some, as yet undiscovered, third variable(s). Future work could explore the association between other measures of boredom proneness and the sense of agency. The Trait Boredom Scale (Gorelik and Eastwood 2023), a more recently developed scale that assesses trait boredom and its relation to different measures of agency, would be a useful tool to deploy in subsequent studies.

Given the problematic factor structure of the Brief Self Control Scale discussed above, it would be important to further investigate the extent to which the initiatory and inhibitory domains of self-control contribute to boredom proneness. Further work would also likely highlight the concept of transcendence (Baumeister et al., 2007), a cardinal principle of self-control important for understanding concepts like delayed gratification. As such, the tendency for the boredom prone individual to choose immediate gratifying rewards in favour of future goals will be more clearly outlined. The boredom prone individual may launch into impulsive behaviours in order to re-establish a sense of agency, an effect that may only be short lived given that these behaviours do not deal with the other need to initiate meaningful goals.

While the undergraduate samples used in Chapter 5 gave meaningful insights into the effect of culture on boredom, they may not be entirely representative of the societies examined. This limits the generalizability of that chapter's findings. Future work could recruit participants

from online platforms such as Prolific or Mechanical Turk, where participants are more likely to constitute a more broadly representative sample.

Given that Experiment 3.2 only incorporated an incidental attention check (i.e., participants were only aware that they had to respond to the colour changes *after* the movie was over), future work could use an experimental design that incorporates a more explicit attentional requirement (e.g., pressing a button for each change colour). The goal of this manipulation would be to investigate the possibility that participants' perceptual judgements of agency would increase under circumstances in which attention was intentionally directed to aspects of the task.

The goal of Chapter 4 was to understand how those higher in boredom proneness feel and respond to a disruption or loss of agency. While the controlled laboratory setting allowed for the convenient manipulation of agency, disrupting agency in real world settings may provide more ecologically valid insights into how those high in boredom proneness cope with threats to their own agency. Decision making tasks that incorporate freedom of choice could measure the sense of agency during action selection. This would be especially useful for understanding the challenges experienced by the boredom prone when attempting to launch.

The two cultures defined a priori as collectivist in Chapter 5 showed either a nonsignificant or positive association between boredom proneness and the positive sense of agency (Figure 5.2), however, the methods used in Chapter 5 gave no insights into the differential associations observed between boredom proneness and the two subscales of the sense of agency. In collectivist cultures where group relations are prioritized, the sense of positive agency is likely defined within the context of the collective, such that individuals report a socially mediated agency. Further work is needed to clarify whether this played a role in the

differential associations observed between boredom proneness and the positive sense of agency as a function of culture.

Conclusion

The goal of this thesis was to identify the role played by the sense of agency in the experience of boredom, particularly for those high in trait boredom proneness. The studies consistently showed that both state and trait boredom are associated with a diminished sense of agency, an association that is stable across cultures. Feelings of a diminished sense of agency are consistent with the highly boredom prone individual's failure to launch and may accurately reflect their experiences (i.e., given that they show no deficits in their capacity to *perceive* agency). While the boredom prone individual demonstrates a general intolerance to disruptions to agency, more work is needed to establish stronger causal associations between the experience of boredom and agency while highlighting other variables that may mediate this association (e.g., self-regulatory variables such as self-control).

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Appendix A: Additional Analyses for Chapter 2

Power analysis conducted using R (R Core team, 2015) indicated that the minimum sample size required to achieve 80% power for detecting a medium effect at a significance criterion of α=.05, was N=84. As such, sample sizes of N=283 (Sample 1) and N=1358 (Sample 2) were considered adequate to test the study hypotheses.

Ethnicities of participants in each sample (Table A1 for sample 1 and Table A2 for sample 2).

Table A.1. Participants' ethnicities for Sample 1.

Ethnicity	**Frequency**	**Percent**
Black/African	5	1.77
East Asian (e.g., Chinese, Japanese)	105	37.1
Hispanic	1	0.35
Indigenous (e.g., First Nations, Inuit)	1	0.35
Middle Eastern/Arabic	11	3.89
Mixed	7	2.47
South Asian (e.g., Pakistani, Indian)	45	15.9
Southeast Asian (e.g., Filipino, Indonesian)	13	4.59
West Indian/Caribbean	4	1.41
White/Caucasian	90	31.8
[Decline to Answer]	1	0.35

Table A.2. Participants' ethnicities for Sample 2.

Ethnicity	**Frequency**	**Percent**
Black/African	33	2.43
East Asian (e.g., Chinese, Japanese)	258	19
Hispanic	23	1.69
Indigenous (e.g., First Nations, Inuit)	2	0.15
Middle Eastern/Arabic	60	4.42
Mixed	51	3.76

Ethnicity	**Frequency**	**Percent**
South Asian (e.g., Pakistani, Indian)	264	19.44
Southeast Asian (e.g., Filipino, Indonesian)	66	4.86
West Indian/Caribbean	22	1.62
White/Caucasian	554	40.8
[Decline to Answer]	18	1.33
Other not listed above	7	0.52

Regression models using the full Sense of Agency scale (as opposed to separately entering the positive and negative subscales as was done in the main text; pp. 28-31).

Table A.3. Hierarchical regression predicting Boredom Proneness (Sample 1)

	B	*SE*	*t*	***P***	***p*Δ**	***R2*Δ**
Step 1						
Age	-0.35	0.13	-2.69	.008		
					.008	.02
Step 2						
Age	-0.36	0.13	-2.75	.006		
Gender	0.89	1.08	0.83	.410		
					.410	.002
Step 3						
Age	-0.27	0.13	-2.05	.041		
Gender	0.43	1.07	0.40	.690		
Ax	2.68	0.72	3.72	<.001		
					<.001	.05
Step 4						
Age	-0.27	0.12	-2.23	.027		
Gender	1.02	1.01	1.01	.313		
Ax	3.64	0.69	5.25	<.001		
Loc	-3.94	0.64	-6.19	<.001		
					<.001	.11
Step 5						
Age	-0.24	0.12	-2.01	.045		
Gender	1.33	0.97	1.38	.170		
Ax	2.80	0.68	4.10	<.001		
Loc	-2.27	0.69	-3.29	.001		
BSCS	-0.32	0.06	-5.14	<.001		
					<.001	.07

Step 6						
Age	-0.23	0.12	-1.92	.056		
Gender	1.17	0.97	1.21	.228		
Ax	2.86	0.68	4.20	< .001		
Loc	-1.79	0.74	-2.44	.016		
BSCS	-0.31	0.06	-4.92	< .001		
GSES	-0.21	0.11	-1.80	.073	.073	.01
Step 7						
Age	-0.20	0.11	-1.76	.079		
Gender	1.19	0.94	1.27	.204		
Ax	2.90	0.66	4.39	<.001		
Loc	-1.65	0.72	-2.30	.022		
BSCS	-0.25	0.06	-4.01	<.001		
GSES	-0.08	0.11	-0.71	.481		
SAS	-0.19	0.04	-4.23	<.001		
					<.001	.04

BPS=Boredom Proneness Scale; BSCS=Brief Self-control Scale; GSES=General Self-efficacy Scale; Loco=Locomotion regulatory mode; Ax=Assessment regulatory mode; SAS=Sense of Agency Scale; SOPA=Sense of Positive Agency; SONA=Sense of Negative Agency. * p<.05, ** p<0.01, *** p<0.001.

Table A.4. Hierarchical regression predicting Boredom Proneness (Sample 2)

	B	***SE***	***t***	***p***	***p*Δ**	***R2*Δ**
Step 1						
Age	-0.29	0.08	-3.42	<.001		
					<.001	0.01
Step 2						
Age	-0.29	0.08	-3.40	<.001		
Gender	0.37	0.61	0.60	.546		
					.546	0.00
Step 3						
Age	-0.23	0.08	-2.80	.005		
Gender	0.18	0.59	0.30	.765		
Ax	3.51	0.36	9.78	<.001		
					<.001	0.07
Step 4						
Age	-0.15	0.08	-1.89	.060		
Gender	0.60	0.55	1.09	.275		
Ax	4.53	0.34	13.24	<.001		
Loc	-4.87	0.34	-14.32	<.001		
					<.001	0.12
Step 5						
Age	-0.13	0.07	-1.84	.066		

Gender	0.93	0.53	1.76	.078		
Ax	3.43	0.34	10.17	<.001		
Loc	-3.09	0.36	-8.71	<.001		
BSCS	-0.33	0.03	-12.05	<.001		
					<.001	0.08
Step 6						
Age	-0.11	0.07	-1.49	.135		
Gender	0.62	0.52	1.19	.233		
Ax	3.45	0.33	10.33	<.001		
Loc	-2.43	0.37	-6.59	<.001		
BSCS	-0.31	0.03	-11.33	<.001		
GSES	-0.29	0.05	-5.88	<.001		
					<.001	0.02
Step 7						
Age	-0.08	0.07	-1.14	.255		
Gender	0.59	0.51	1.16	.248		
Ax	3.66	0.33	11.19	<.001		
Loc	-2.52	0.36	-7.00	<.001		
BSCS	-0.25	0.03	-8.88	<.001		
GSES	-0.19	0.05	-3.67	<.001		
SAS	-0.15	0.02	-8.06	<.001		
					<.001	0.03

BPS=Boredom Proneness Scale; BSCS=Brief Self-control Scale; GSES=General Self-efficacy Scale; Loco=Locomotion regulatory mode; Ax=Assessment regulatory mode; SAS=Sense of Agency Scale; SOPA=Sense of Positive Agency; SONA=Sense of Negative Agency.
* p<.05, ** p<0.01, *** p<0.001.

Appendix B: Additional Data for Chapter 3

List of all 10 questions from Heider and Simmel Task adapted from the Douglas et. Al 2016 study

Table B.1. Questions Assessing the Judgement of Agency

1. Did you think the behavior of the shapes was:	**2. As you were watching the video, to what extent did you think the shapes were:**
Intentional?	Conscious?
Thoughtful?	Alive?
Controllable?	Purposeful?
The result of conscious decisions?	Experiencing beliefs, feelings, and desires?
The product of free will?	Human-like?

Table B.2. Participants' self-reported ethnicities for Sample 1 & 2

	Sample 1		**Sample 2**	
Ethnicity	**Frequency**	**Percent**	**Frequency**	**Percent**
Black/African	9	5	9	4.09
East Asian (e.g., Chinese, Japanese, Korean)	35	19.44	53	24.09
Hispanic	4	2.22	3	1.36
Middle Eastern/Arabic	8	4.44	12	5.45
Mixed	5	2.78	8	3.64
South Asian (e.g., Pakistani, Indian)	31	17.22	45	20.45
Southeast Asian (e.g., Filipino, Vietnamese,Indonesian)	6	3.33	8	3.64
West Indian/Caribbean	5	2.78	1	0.45
White/Caucasian	74	41.11	80	36.36
[Decline to Answer]	1	0.56	1	0.45
Other not Listed Above	2	1.11		

Appendix C: Additional Data for Chapter 4

Table C.1. Participants' self-reported ethnicities

Ethnicity	Frequency	Percent
Black/African	6	3.26
East Asian (e.g., Chinese, Japanese, Korean)	27	14.67
Hispanic	2	1.09
Hispanic/Latine	1	0.54
Middle Eastern/Arabic	13	7.07
Mixed	9	4.89
South Asian (e.g., Pakistani, Indian)	40	21.74
Southeast Asian (e.g., Filipino, Vietnamese, Indonesian)	11	5.98
West Indian/Caribbean	1	0.54
White/Caucasian	72	39.13
[Decline to Answer]	1	0.54
Other not Listed Above	1	0.54

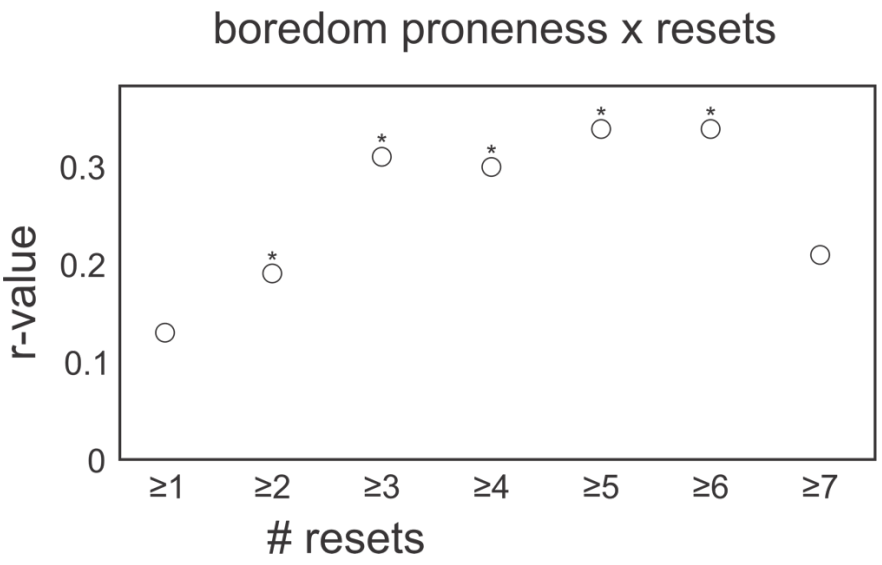


Figure C.1. Correlations between boredom proneness and the number of resets as a function of a minimum number of resets. The figure shows correlations including a minimum of seven resets.

Appendix D: Additional Data for Chapter 5

Below are t-tests comparing adherence to distinct cultural norms conducted within samples. VI=vertical individualism; VC=vertical collectivism; HI=horizontal individualism; HC=horizontal collectivism. All tests were Bonferroni corrected for multiple comparisons.

Table D.1. Canadian Sample

	Mean	***t***	***Df***	***P***	**95% CI (range for difference in means**
VI **VC**	19.62 22.59	-10.05	1578.6	<.001	-3.54 – -2.39
VI **HI**	19.62 26.47	-24.24	1543.3	<.001	-7.40 – -6.29
VI **HC**	19.62 27.03	-26.69	1519.9	<.001	-7.95 – -6.86
VC **HI**	22.59 26.47	-14.28	1570.7	<.001	-4.41 – -3.35
VC **HC**	22.59 27.03	-16.66	1554.7	<.001	-4.96 – -3.92
HI **HC**	26.47 27.03	-2.21	1583	.027	-1.05 – 0.06

Table D.2. Chinese Sample

	Mean	***t***	***Df***	***p***	**95% CI (range for difference in means**
VI **VC**	23.11 25.67	-8.40	2343	<.001	-3.16 – -1.97
VI **HI**	23.11 25.36	-7.14	2339	<.001	-2.87 – -1.64
VI **HC**	23.11 23.76	-2.16	2336.7	.031	-1.24 – -0.06
VC **HI**	25.67 25.36	0.99	2334.1	.321	-0.30 – 0.92

VC **HC**	25.67 23.76	6.45	2341.1	<.001	1.33 – 2.50
HI **HC**	25.36 23.76	5.22	2320.9	<.001	1.00 – 2.21

Table D.3. UAE Sample

	Mean	***T***	***Df***	***p***	**95% CI (range for difference in means**
VI **VC**	23.69 29.48	-9.98	681.12	<.001	-6.93 – -4.65
VI **HI**	23.69 30.25	-11.97	677.6	<.001	-7.64 – -5.49
VI **HC**	23.69 27.72	-7.19	681.17	<.001	-5.13 – -2.93
VC **HI**	29.48 30.25	-1.39	672.92	.165	-1.87 – 0.32
VC **HC**	29.48 27.72	3.07	678.61	.002	0.64 – 2.88
HI **HC**	30.25 27.72	4.71	680.57	<.001	1.48 – 3.60

Below are t-tests comparing adherence to distinct cultural norms conducted between Asians and Europeans in the Canadian sample. VI=vertical individualism; VC=vertical collectivism; HI=horizontal individualism; HC=horizontal collectivism. All tests were Bonferroni corrected for multiple comparisons.

Table D.4. Canadian Sample - European ethnicities

	Mean	***t***	***Df***	***P***	**95% CI (range for difference in means**
VI **VC**	19.62 22.59	-10.05	1578.6	<.001	-3.54 – -2.39
VI **HI**	19.62 26.47	-24.24	1543.3	<.001	-7.40 – -6.29
VI **HC**	19.62 27.03	-26.69	1519.9	<.001	-7.95 – -6.86
VC **HI**	22.59 26.47	-14.28	1570.7	<.001	-4.41 – -3.35
VC **HC**	22.59 27.03	-16.66	1554.7	<.001	-4.96 – -3.92
HI **HC**	26.47 27.03	-2.21	1583	.027	-1.05 – 0.06

Table D.5. Canadian Sample - Asian ethnicities

	mean	***t***	***Df***	***P***	**95% CI (range for difference in means**
VI **VC**	20.70 23.39	-10.03	1918.6	<.001	-3.21 – -2.16
VI **HI**	20.70 26.39	-21.80	1902.1	<.001	-6.19 – -5.17
VI **HC**	20.71 26.46	-22.17	1897.3	<.001	-6.26 – -5.24
VC **HI**	23.39 26.39	-11.85	1918.3	<.001	-3.50 – -2.50
VC **HC**	23.39 26.46	-12.18	1915.7	<.001	-3.56 – -2.57
HI **HC**	26.39 26.46	-0.28	1923	.783	-0.55 – 0.41

Below are stepwise hierarchical regressions predicting boredom proneness using the full Sense of Agency Scale scores (note, in the main text, only the Negative Sense of Agency Scale scores were used; pp 95-100).

Table D.6. Hierarchical regression predicting Boredom Proneness (Canada)

	B	*SE*	*t*	*p*	*p*Δ	*R2*Δ
Step 1						
Age	-0.29	0.07	-4.23	<.001	<.001	0.02
Step 2						
Age	-0.28	0.07	-4.21	<.001		
Gender	0.81	0.83	0.97	.332	.332	0.001
Step 3						
Age	-0.22	0.06	-3.86	<.001		
Gender	1.84	0.70	2.64	.009		
BSCS	-0.60	0.03	-18.36	<.001	<.001	0.29
Step 4						
Age	-0.21	0.06	-3.75	<.001		
Gender	1.14	0.69	1.65	.099		
BSCS	-0.54	0.03	-16.17	<.001		
GSES	-0.39	0.06	-6.13	<.001	<.001	0.03
Step 5						
Age	-0.19	0.05	-3.42	<.001		
Gender	1.15	0.68	1.70	.089		
BSCS	-0.48	0.03	-14.41	<.001		
GSES	-0.29	0.06	-4.58	<.001		
SAS	-0.17	0.03	-6.38	<.001	<.001	0.03
Step 6.a						
Age	-0.17	0.05	-3.05	.002		
Gender	1.40	0.68	2.07	.039		
BSCS	-0.47	0.03	-13.91	<.001		
GSES	-0.33	0.06	-5.10	<.001		
SAS	-0.16	0.03	-6.01	<.001		
VI	0.15	0.05	3.23	.001	.001	0.008
Step 6.b						
Age	-0.19	0.05	-3.44	<.001		
Gender	1.20	0.68	1.78	.076		
BSCS	-0.49	0.03	-14.49	<.001		
GSES	-0.31	0.06	-4.76	<.001		
SAS	-0.17	0.03	-6.35	<.001		
VC	0.08	0.05	1.62	.105	.105	0.002
Step 6.c						
Age	-0.19	0.05	-3.55	<.001		
Gender	0.97	0.67	1.46	.145		
BSCS	-0.47	0.03	-14.01	<.001		
GSES	-0.37	0.07	-5.69	<.001		
SAS	-0.19	0.03	-6.97	<.001		
HI	0.26	0.06	4.75	<.001	<.001	0.02

Step 6.d						
Age	-0.20	0.05	-3.61	<.001		
Gender	1.25	0.68	1.85	.065		
BSCS	-0.48	0.03	-14.40	<.001		
GSES	-0.26	0.07	-3.98	<.001		
SAS	-0.16	0.03	-5.76	<.001		
HC	-0.14	0.06	-2.28	.023	.023	0.004

Table D.7. Hierarchical regression predicting Boredom Proneness (China)

	B	*SE*	*t*	*p*	*p*Δ	*R2*Δ
Step 1						
Age	-0.05	0.08	-0.68	.494	.494	0.000
Step 2						
Age	-0.04	0.08	-0.55	.584		
Gender	-0.53	0.75	-0.71	.481	.481	0.000
Step 3						
Age	0.02	0.07	0.36	.720		
Gender	-0.24	0.64	-0.37	.712		
BSCS	-0.95	0.05	-20.17	<.001	<.001	0.26
Step 4						
Age	0.02	0.07	0.23	.821		
Gender	-0.16	0.65	-0.24	.810		
BSCS	-0.95	0.05	-20.06	<.001		
GSES	0.06	0.05	1.40	.162	.162	0.001
Step 5						
Age	0.02	0.07	0.33	.746		
Gender	0.60	0.65	0.93	.354		
BSCS	-0.79	0.05	-15.11	<.001		
GSES	0.12	0.05	2.63	.009		
SAS	-0.21	0.03	-6.56	<.001	<.001	0.03
Step 6.a						
Age	0.02	0.07	0.25	.799		
Gender	0.69	0.64	1.08	.281		
BSCS	-0.71	0.06	-12.90	<.001		
GSES	0.01	0.05	0.14	.885		
SAS	-0.23	0.03	-7.06	<.001		
VI	0.22	0.05	4.28	<.001	<.001	0.01
Step 6.b						
Age	0.01	0.07	0.20	.846		
Gender	0.62	0.64	0.96	.337		
BSCS	-0.75	0.05	-13.82	<.001		
GSES	0.06	0.05	1.24	.214		
SAS	-0.24	0.03	-6.97	<.001		
VC	0.12	0.05	2.33	.020	.020	0.003
Step 6.c						
Age	0.02	0.07	0.29	.776		
Gender	0.39	0.65	0.60	.548		
BSCS	-0.73	0.06	-13.33	<.001		
GSES	0.04	0.05	0.72	.470		
SAS	-0.24	0.03	-7.17	<.001		
HI	0.15	0.05	3.02	.003	.003	0.006

Step 6.d						
Age	0.02	0.07	0.28	0.78		
Gender	0.61	0.65	0.94	0.35		
BSCS	-0.78	0.05	-14.66	<.001		
GSES	0.10	0.05	1.90	.058		
SAS	-0.21	0.03	-6.57	<.001		
HC	0.04	0.05	0.70	.482	.482	0.000

Table D.8. Hierarchical regression predicting Boredom Proneness (UAE)

	B	*SE*	*t*	*p*	*p*Δ	*R2*Δ
Step 1						
Age	-0.24	0.15	-1.57	.118	.118	0.01
Step 2						
Age	-0.21	0.15	-1.34	.175		
Gender	2.20	1.45	1.52	.130	.130	0.01
Step 3						
Age	-0.03	0.14	-0.22	.823		
Gender	1.14	1.29	0.88	.380		
BSCS	-0.60	0.06	-9.73	<.001	<.001	0.22
Step 4						
Age	-0.05	0.14	-0.36	.716		
Gender	1.05	1.28	0.82	.413		
BSCS	-0.65	0.06	-10.10	<.001		
GSES	0.23	0.09	2.55	.011	.011	0.01
Step 5						
Age	-0.05	0.14	-0.34	.733		
Gender	1.39	1.28	1.09	.277		
BSCS	-0.57	0.07	-8.05	<.001		
GSES	0.30	0.09	3.24	.001		
SAS	-0.13	0.05	-2.60	.010	.010	0.01
Step 6.a						
Age	-0.08	0.13	-0.63	.531		
Gender	1.62	1.25	1.30	.195		
BSCS	-0.52	0.07	-7.33	<.001		
GSES	0.15	0.10	1.54	.124		
SAS	-0.14	0.05	-2.76	.006		
VI	0.29	0.07	4.07	<.001	<.001	0.03
Step 6.b						
Age	-0.04	0.14	-0.30	.768		
Gender	1.43	1.27	1.13	.259		
BSCS	-0.58	0.07	-8.11	<.001		
GSES	0.22	0.10	2.23	.027		
SAS	-0.16	0.05	-3.07	.002		
VC	0.17	0.07	2.34	.020	.020	0.01
Step 6.c						
Age	-0.05	0.14	-0.37	.711		
Gender	1.17	1.29	0.91	.364		
BSCS	-0.56	0.07	-7.74	<.001		
GSES	0.23	0.11	2.15	.032		
SAS	-0.16	0.05	-2.91	.004		
HI	0.13	0.09	1.39	.165	.165	0.00

Step 6.d						
Age	-0.05	0.13	-0.39	.697		
Gender	0.93	1.27	0.73	.464		
BSCS	-0.57	0.07	-8.06	<.001		
GSES	0.17	0.10	1.66	.098		
SAS	-0.15	0.05	-2.97	.003		
HC	0.24	0.08	3.09	.002	.002	0.02

Below are the full results for the moderation analyses for all samples using the full Sense of Agency Scale (Tables D9 through D11) and only the Negative Sense of Agency Scale (Tables D12 through D14).

Table D.9. Moderation analysis using the full sense of agency scale (Canada)

	B	***SE***	***t***	***p***	***LLCI***	***ULCI***
SAS	-0.33	0.03	-11.43	<.001	-0.39	-0.28
VI	0.19	0.05	3.67	<.001	0.09	0.30
Int_1	-0.00	0.00	-0.76	.448	-0.01	0.01
SAS	-0.35	0.03	-11.89	<.001	-0.41	-0.29
VC	-0.02	0.06	-0.30	.764	-0.13	0.09
Int_1	0.00	0.00	0.44	.664	-0.01	0.01
SAS	-0.37	0.03	-12.39	<.001	-0.42	-0.31
HI	0.22	0.06	3.57	<.001	0.10	0.35
Int_1	-0.00	0.01	-0.49	.621	-0.01	0.01
SAS	-0.32	0.03	-10.48	<.001	-0.38	-0.26
HC	-0.23	0.07	-3.38	<.001	-0.37	-0.10
Int_1	-0.00	0.01	-0.22	.830	-0.01	0.01

Table D.10. Moderation analysis using the full sense of agency scale (China)

	B	***SE***	***t***	***p***	***LLCI***	***ULCI***
SAS	-0.39	0.03	-13.29	<.001	-0.45	-0.33
VI	0.41	0.04	9.34	<.001	0.32	0.49
Int_1	-0.02	0.00	-4.94	<.001	-0.03	-0.01
SAS	-0.44	0.03	-13.18	<.001	-0.50	-0.37
VC	0.32	0.05	6.58	<.001	0.22	0.41
Int_1	-0.01	0.00	-2.67	.008	-0.02	-0.00
SAS	-0.41	0.03	-12.96	<.001	-0.47	-0.35
HI	0.34	0.04	7.95	<.001	0.26	0.43
Int_1	-0.02	0.00	-4.77	<.001	-0.03	-0.01
SAS	-0.39	0.03	-12.55	<.001	-0.45	-0.33
HC	0.19	0.05	4.05	<.001	0.10	0.29
Int_1	-0.03	0.00	-6.83	<.001	-0.04	-0.02

Table D.11. Moderation analysis using the full sense of agency scale (UAE)

	B	***SE***	***t***	***p***	***LLCI***	***ULCI***
SAS	-0.31	0.04	-6.87	<.001	-0.40	-0.22
VI	0.34	0.07	4.73	<.001	0.20	0.48
Int_1	-0.01	0.01	-1.79	.075	-0.02	0.00
SAS	-0.32	0.05	-6.49	<.001	-0.42	-0.22
VC	0.13	0.09	1.56	.120	-0.04	0.30
Int_1	-0.01	0.01	-1.43	.154	-0.02	0.00
SAS	-0.33	0.05	-6.31	<.001	-0.43	-0.22
HI	0.14	0.11	1.34	.182	-0.07	0.35
Int_1	-0.02	0.01	-2.36	.019	-0.03	-0.00
SAS	-0.32	0.05	-6.77	<.001	-0.41	-0.23
HC	0.24	0.08	2.87	.004	0.07	0.40
Int_1	-0.01	0.01	-1.75	.080	-0.02	0.00

Table D.12. Moderation analysis using the sense of negative agency scale (Canada)

	B	***SE***	***t***	***p***	***LLCI***	***ULCI***
SONA	0.49	0.04	10.94	<.001	0.40	0.57
VI	0.12	0.05	2.25	.025	0.02	0.23
Int_1	-0.00	0.01	-0.18	.859	-0.01	0.01
SONA	0.52	0.04	11.97	<.001	0.43	0.60
VC	-0.10	0.06	-1.72	.087	-0.21	0.01
Int_1	-0.00	0.01	-0.47	.638	-0.02	0.01
SONA	0.51	0.04	12.00	<.001	0.43	0.60
HI	0.14	0.06	2.25	.025	0.02	0.26
Int_1	0.01	0.01	0.89	.372	-0.01	0.02
SONA	0.47	0.04	10.95	<.001	0.39	0.56
HC	-0.30	0.07	-4.52	<.001	-0.43	-0.17
Int_1	0.01	0.01	1.24	.215	-0.01	0.03

Table D.13. Moderation analysis using the sense of negative agency scale (China)

	B	***SE***	***t***	***p***	***LLCI***	***ULCI***
SONA	0.54	0.03	16.35	<.001	0.48	0.61
VI	0.15	0.05	3.35	<.001	0.06	0.24
Int_1	-0.00	0.00	-0.33	.744	-0.01	0.01
SONA	0.59	0.03	18.66	<.001	0.53	0.66
VC	-0.00	0.05	-0.05	.958	-0.09	0.09
Int_1	-0.01	0.00	-2.66	.008**	-0.02	-0.00
SONA	0.56	0.03	17.75	<.001	0.50	0.63
HI	0.09	0.04	2.14	.033**	0.01	0.18
Int_1	-0.00	0.00	-0.25	.803	-0.01	0.01
SONA	0.59	0.03	18.32	<.001	0.53	0.66
HC	-0.07	0.05	-1.58	.113	-0.17	0.02
Int_1	-0.00	0.00	-1.13	.259	-0.01	0.00

Table D.14. Moderation analysis using the sense of negative agency scale (UAE)

	B	***SE***	***t***	***p***	***LLCI***	***ULCI***
SONA	0.55	0.06	8.56	<.001	0.43	0.68
VI	0.24	0.07	3.47	<.001	0.10	0.37
Int_1	0.00	0.01	0.13	.894	-0.02	0.02
SONA	0.61	0.07	9.29	<.001	0.48	0.74
VC	0.12	0.07	1.76	.080	-0.01	0.25
Int_1	-0.01	0.01	-0.66	.507	-0.02	0.01
SONA	0.61	0.07	9.25	<.001	0.48	0.74
HI	0.13	0.08	1.77	.078	-0.02	0.28
Int_1	0.00	0.01	0.02	.981	-0.02	0.02
SONA	0.61	0.07	9.19	<.001	0.48	0.74
HC	0.17	0.07	2.45	.015*	0.03	0.31
Int_1	-0.00	0.01	-0.49	.627	-0.02	0.01

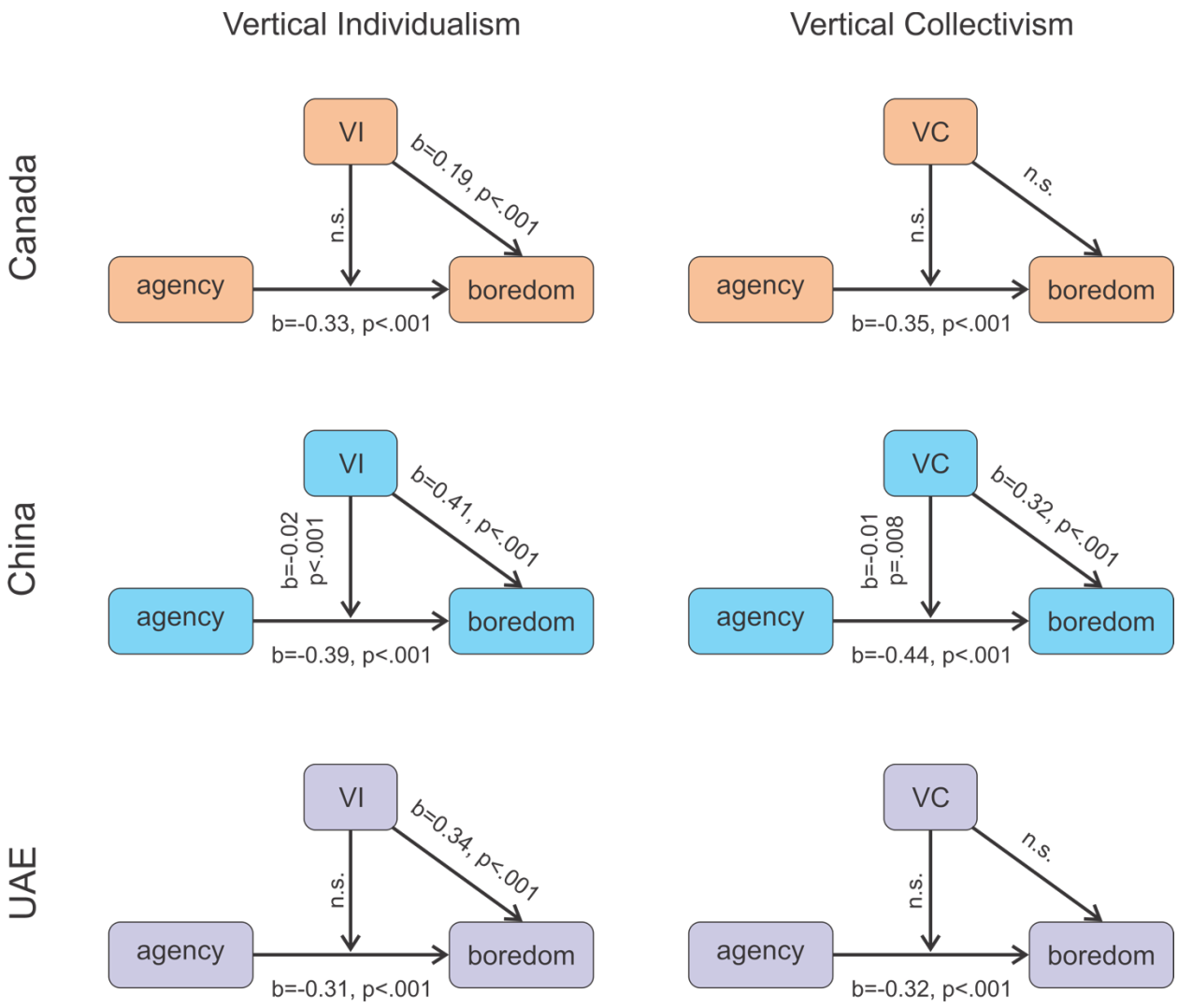


Figure D.1. Box and arrow diagrams showing moderating effects of vertical individualism (left) and vertical collectivism (right) domains of the culture orientation scale. Canada=upper rows in orange; China=middle rows in blue; UAE=lower rows, in purple.

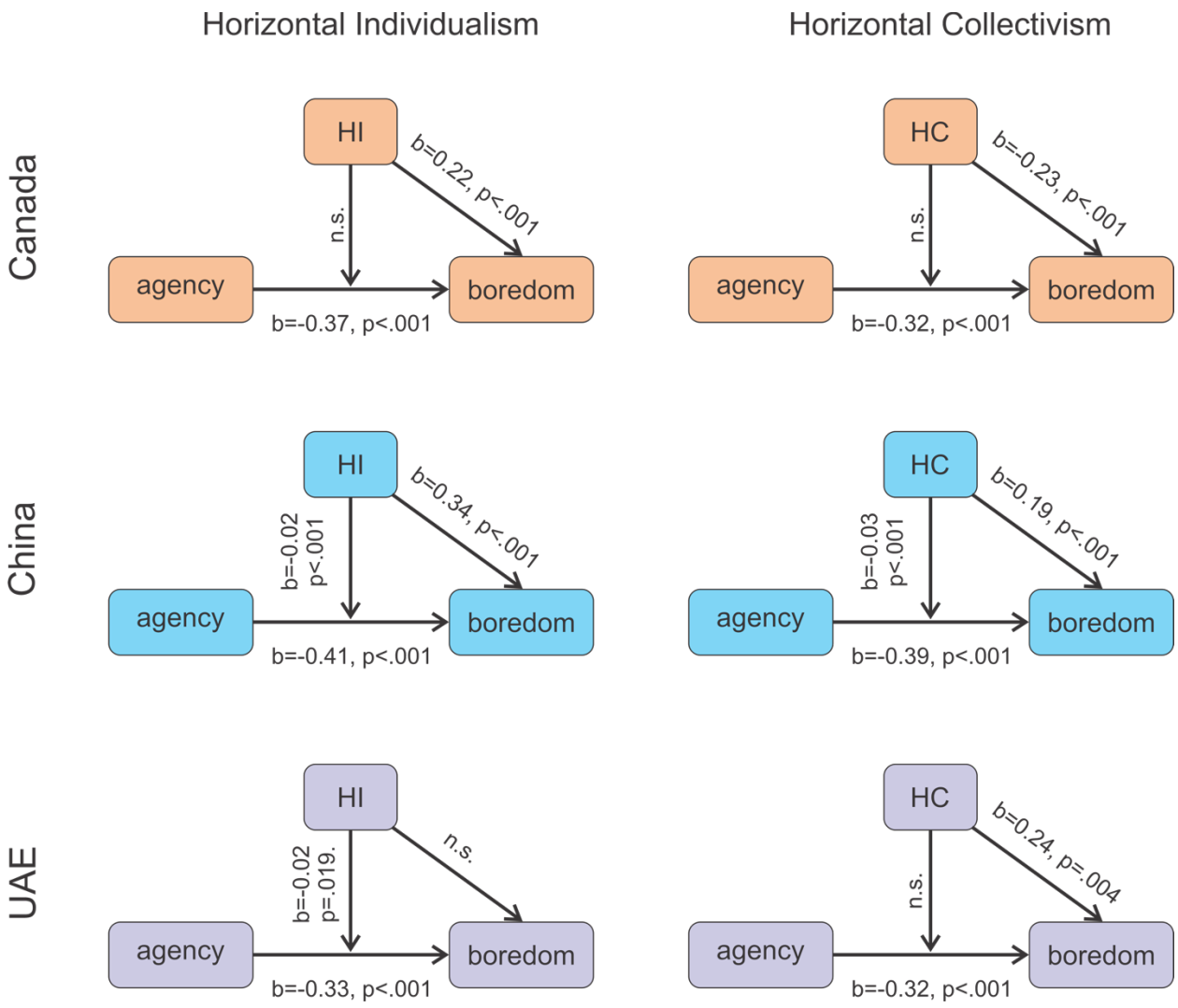


Figure D.2. Box and arrow diagrams showing moderating effects of vertical individualism (left) and vertical collectivism (right) domains of the culture orientation scale. Canada=upper rows in orange; China=middle rows in blue; UAE=lower rows, in purple.

Below are the model fit indices for Measurement Invariance for the individualism/collectivism scales.

Table D.15. Model Fit Indices for the Measurement Invariance Models of the 3 samples (Ind-Col)

						Difference tests				
Model	CFI	*TLI*	RMSEA [90% *CI*]	SRMR	*df*	ΔCFI	ΔTLI	ΔRMSEA	ΔSRMR	Δ*df*
Configural invariance	.983	.979	.046 [.042, .050]	.053	294					
Metric invariance	.972	.969	.056 [.053, .060]	.063	360	-.01 [a]	-.01	.01	.01	24
Scalar invariance	.950	.948	.073 [.069, .076]	.076	342	-.02 [c]	-.02	.02	.01	24
Partial scalar invariance	*	*	*	*	*	*	*	*	*	*

Note. df = degrees of freedom; CFI = comparative fit index; TLI = Tucker Lewis Index; RMSEA = root mean square error of approximation; 90% *CI* = 90% confidence interval; SRMS = Standard Root Mean Square Residual.

[a]Difference between configural and metric invariance models.

[b]Difference between metric and scalar invariance models

*It appeared that all items within each of the four factors were problematic for the scalar invariance test; therefore we could not claim (partial) scalar invariance