

BOREDOM AND THE NEED FOR AGENCY

by

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DISSERTATION ABSTRACT

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Humans are highly motivated to avoid boredom. What is the functional role of boredom, and why is it so aversive? An empirical study tested the hypothesis that a need for agency, or control over one's actions and their effects, plays a role in our avoidance of boredom. The study also explored the role of an individual difference called experiential avoidance, which captures the tendency to avoid negative internal experiences, sometimes via problematic behaviors. Results were integrated with current clinical techniques that use mindfulness and acceptance-based approaches to address such avoidance of internal experiences.

In the study, one hundred twenty-three adults completed a series of computer tasks in which their sense of agency was manipulated. After being oriented to high and medium levels of agency, participants completed a series of 30-second low agency trials in which they had the opportunity to escape to high or medium agency, at a cost. The amount of money they were willing to forego indicated their motivation to avoid low agency, or "need for agency." After a break, they were then asked to complete a series of 30-second trials in which they did nothing, but again had the option to escape to high or medium agency at a cost. The amount of money they were willing to forego in this task indicated their motivation to avoid doing nothing, or "need for action." Results

demonstrated that on average, people were willing to give up money to avoid both low agency and to avoid a boring situation (doing nothing). Furthermore, their motivation to avoid boredom indeed was driven by the extent to which they felt that doing nothing afforded them a low sense of agency. Finally, those who were higher in experiential avoidance demonstrated a higher need for agency and action, and those lower in mindfulness demonstrated a higher need for agency. These results demonstrate that the motivation to avoid boredom may be rooted in a need for agency, and that acceptance-based clinical approaches may have success addressing this avoidance and the problematic behaviors that follow.

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TABLE OF CONTENTS

Chapter	Page
I. THEORETICAL REVIEW	1
Introduction.....	1
What Is Boredom, and Why Is It So Aversive?.....	2
What Do People Do to Avoid Boredom?	5
Motivational States Triggered by Boredom.....	7
Boredom As a Trigger That Motivates Agency Restoration	9
Need for Agency: Methodological Considerations.....	11
Experiential Avoidance and Its Relation to Boredom	16
The Way Forward: Connecting Boredom, Agency, and Acceptance.....	24
II. EXPERIMENTAL METHODS	29
The Present Study	29
Participants.....	30
Procedure	31
Analysis Strategy and Hypotheses.....	40
III. EXPERIMENTAL RESULTS.....	45
Task Validation.....	45
Need for Agency and Action	53
Keypress Results.....	64
IV. DISCUSSION.....	73
Summary.....	73
The Relationship Between Boredom and Agency	74

Chapter	Page
Integrating Results with Clinical Approaches	76
The Search for Agency as a Search for Meaning	81
Limitations and Future Directions	82
REFERENCES CITED.....	86

LIST OF FIGURES

Figure	Page
1. Model of need for agency	26
2. Overview of experiment procedure	31
3. Task structure for the orientation task	34
4. Screen appearance during low agency/escape task.....	37
5. Staircasing algorithm used during both escape tasks.....	38
6. Subjective experience ratings by trial type	46
7. Correlations between changes in experience from one trial type to another	47
8. Relationship between boredom proneness and mean reported boredom during each trial type.....	50
9. Relationship between mindfulness and mean reported boredom during each trial type	50
10. Relationship of distress endurance and aversion with mean reported boredom....	51
11. Relationship between boredom proneness and mean reported frustration	52
12. Relationship of individual difference measures with mean reported frustration while doing nothing	52
13. Histogram of points of subjective equivalence (PSEs) for each task and each escape option.....	54
14. Number of people who gave up money in each escape task.....	55
15. Experiential avoidance weakly predicts need for agency and action using traditional linear regression.....	56
16. Depression weakly predicts need for action using traditional linear regression....	56
17. Using negative binomial regression, experiential avoidance predicts need for agency and need for action	57
18. Using negative binomial regression, mindfulness predicts need for agency	58

Figure	Page
19. Probability of giving up money to escape from doing nothing increases with experiential avoidance, anxiety, and depression	58
20. Subjective experience during low agency predicts need for agency, using zero-inflated negative binomial regression	60
21. .Sense of agency while doing nothing predicts need for action.....	61
22. Probability of giving up money to escape from doing nothing increases with frustration.....	61
23. Experiential avoidance and sense of agency while doing nothing interact to predict the likelihood of giving up money to avoid doing nothing	62
24. Experiential avoidance and boredom while doing nothing interact to predict the likelihood of giving up money to avoid doing nothing.....	63
25. Mean number of keypresses made during each trial type.....	64
26. Relationship between mean sense of agency and mean number of keypresses made in each trial type	65
27. Relationship between mean boredom and mean number of keypresses made in each trial type.....	66
28. Timecourses for subjective experiences in each trial type.....	67
29. During high agency, number of keypresses predicted subsequent sense of agency and boredom	68
30. During medium agency, number of keypresses predicted subsequent change in sense of agency, boredom, and frustration.....	69
31. During low agency, number of keypresses predicted subsequent change in sense of agency	70
32. Functional role of keypresses during high agency, for those low in mindfulness	72

LIST OF TABLES

Table	Page
1. Means, Standard Deviations, and Correlations Between Individual Difference Measures	33
2. Subjective Experience by Trial Type.....	46
3. Changes in Experience from High to Medium Agency.....	48
4. Changes in Experience from High to Low Agency.....	48
5. Changes in Experience from High Agency to Doing Nothing	48
6. Contingency Table for Giving Up Money in Each Escape Task.....	63

CHAPTER I
THEORETICAL REVIEW

Introduction

Although emotion and motivation are often studied separately, the two are quite intertwined (Beall & Tracy, 2017). The classic “fight or flight” response to fearful situations is a particularly salient example: fear motivates humans and non-human animals alike to fight back, flee the scene, or freeze. More generally, high arousal emotions often motivate people to act, and negative emotions motivate people to avoid or change the situation. Emotions are more than just subjective internal experiences: they propel us to respond in a variety of ways, some more adaptive than others. This functionalist account of emotion assumes that *feeling is for doing* (Zeelenberg, Nelissen, Breugelmans, & Pieters, 2008).

Boredom is an emotion whose motivational implication is understudied. What is boredom for? People seem to be motivated to avoid boredom, at all costs. Wilson and colleagues (2014) showed this most dramatically in a study in which participants chose to shock themselves over doing nothing at all. Notably, these participants actually rated the electric shocks as quite unpleasant – they indicated they would pay up to five dollars to avoid the shocks. Their decisions to shock themselves suggest that doing nothing – and perhaps being bored – is even more aversive than the unpleasant shocks, and that humans will go to great lengths to avoid doing nothing, sometimes at a cost.

In this dissertation, I explore three topics relating to boredom and the motivation to avoid it. First of all, what makes boredom so aversive, and what behaviors do people

engage in to avoid it? Second, does a need for agency, or a sense of control over our actions and their effects, play a role in our experiences of and reactions to boredom? If so, how might we measure need for agency? Finally, people avoid unpleasant experiences (including boredom) in a variety of maladaptive ways, and a great deal of research in clinical psychology has sought to find the best ways to alter these maladaptive behavior patterns. So, a final question is, can we draw upon this body of literature on avoidance of unpleasant internal experiences, referred to in the literature as *experiential avoidance*, to reveal how maladaptive behaviors associated with boredom might be best redirected?

Below, I discuss the possibility that boredom gives rise to a motive to restore agency. If this is empirically true, the result would suggest that we have a need for agency in the sense that a deficit of agency impels us to replenish it. The motive to restore agency can sometimes prompt harmful behaviors. Furthermore, I will hypothesize that there are multiple pathways to avoiding boredom: finding alternative behaviors that fulfill the need for agency (which is not always successful), and reducing the need for agency itself. The second of these pathways is indirectly supported by recent trends in acceptance-based clinical approaches, but warrants further research.

What Is Boredom, and Why Is It So Aversive?

On average, boredom is an unpleasant state, ranging from being slightly aversive to very aversive, depending on various factors. An experience sampling study demonstrates that boredom occurring in situations that give the actor less freedom or control tends to be more aversive, and the more negative the boredom, the higher the arousal that accompanies it (Goetz et al., 2014).

Boredom is a particularly puzzling emotion, because although it is aversive, it is hard to pinpoint exactly what makes it so unpleasant. Research shows that boredom is distinct from other negative emotions like anger, frustration, and sadness, in that it tends to signal a lack of meaning or challenge (van Tilburg & Igou, 2012; Westgate & Wilson, in press). Compared to their reflections of other negative emotions, when participants reflected on their experiences of boredom, they gave higher ratings to questions about feeling restless and unchallenged, thinking the situation served no important purpose, feeling like doing something different, purposeful, meaningful, or more challenging (van Tilburg & Igou, 2012). However, overly-challenging situations may be experienced as boring as well (Acee et al., 2010), suggesting that people are motivated to find an optimal level of stimulation or challenge.

One reason why boredom may emerge in non-optimal circumstances is because it is hard to engage meaningfully with those situations. This is reminiscent of Csikszentmihalyi's theory of optimal experiences known as "flow experiences," which have neither too much nor too little stimulation, challenge, or control (1975). According to Csikszentmihalyi, flow experiences occur when there is a balance between personal abilities and the abilities a task requires; a mismatch results in boredom and/or anxiety (1975).

Furthermore, in asking people about boredom that occurred in under-challenging versus overly-challenging situations, two boredom factors emerged: task-focused boredom (feelings of tediousness and meaninglessness) and self-focused boredom (feelings of frustration and dissatisfaction). Specifically, under-challenging situations were characterized by task-focused boredom, whereas over-challenging situations

included both task-focused and self-focused boredom (Acee et al., 2010). This finding, along with the observation that there are varying levels of valence and arousal associated with boredom, highlights the fact that experiences labeled as “boredom” can be somewhat heterogeneous.

The heterogeneity of boredom makes it a difficult construct to measure and study. For example, two of the most commonly used measures of trait boredom do not clearly tap into the same construct. Boredom Proneness (BPS; Farmer & Sundberg, 1986) measures an individual’s inability to stay focused and connected to the environment, while the Boredom Susceptibility Scale (ZBS, a subscale of Sensation-Seeking; Zuckerman, 1979) depicts boredom susceptibility as an intrinsic need for more external stimulation (Mercer-Lynn, Flora, Fahlman, & Eastwood, 2013). Accordingly, BPS and ZBS are not highly correlated, and they correlate with different negative outcomes; most notably, neuroticism and experiential avoidance correlate positively with BPS, but negatively with ZBS (Mercer-Lynn et al., 2013).

Attention likely plays a role in boredom experiences, and may help further differentiate between different types of boredom susceptibility. The BPS includes two factors which measure the need for external and internal stimulation, which one research team labeled as agitated boredom and apathetic boredom, respectively (Malkovsky, Merrifield, Goldberg, & Danckert, 2012). They found that agitated boredom was related to ADHD and insensitivity to attention errors, whereas apathetic boredom was related to attention lapses. In the context of social interactions, people rate other people’s egocentric and commonplace behaviors as being most boring out of many potentially boring behaviors, and this was similarly explained as being due to the fact that situations

requiring a lot of effortful attention may be perceived as boring (Leary, Rogers, Canfield, & Coe, 1986). This explanation is consistent with the finding that those with attention deficits may be more prone to some types of boredom (Malkovsky et al., 2012). Boredom also correlates positively with attention problems, and negatively with intrinsic motivation, effort, self-regulation, and academic performance (Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010). Given the above findings, boredom may be triggered when effortful attention is required to engage in the present task, signaling that the current situation does not afford an optimal level of meaning or challenge.

What Do People Do to Avoid Boredom?

People respond to boredom in many ways. These coping behaviors constitute some way of avoiding boredom, but some are more adaptive than others. People are able to increase their motivation to do boring tasks by actively making them more interesting when quitting is not an option; for example, when told there were health benefits to the boring task, people worked harder to avoid boredom by varying the procedure or context, making the task more challenging, or adding interest with an artistic component (Sansone, Weir, Harpster, & Morgan, 1992). Mind-wandering can be construed as another relatively harmless way that people make boring situations more interesting. Although noticing your mind has wandered may induce negative feelings, the experience itself is often pleasurable (Mason, Brown, Mar, & Smallwood, 2013), and in line with that, one study found that more interesting off-task thoughts were associated with a better mood (Franklin et al., 2012). Thus, although a certain amount of focus may be necessary to complete a boring task, mind-wandering may be a relatively innocuous way to avoid boredom.

However, as mentioned above, other responses to boredom are quite maladaptive. In particular, efforts to avoid boredom often result in negative health behaviors. Boredom is more often reported as the cause of emotional eating than other negative emotions are, and is the most frequently endorsed reason for emotional eating (Koball, Meers, Storf-Isser, Domoff, & Musher-Eizenman, 2012). Boredom is one of the strongest and most intense antecedents of binge eating, and it shows one of the biggest decreases from before to during the binge episode, suggesting that binge eating may be functionally used to combat boredom (Stickney & Miltenberger, 1999). Among those with compulsive hair-pulling (trichotillomania), boredom is reduced with each pulling-episode along with other negative emotions, potentially reinforcing this behavior as a method of avoiding boredom (Diefenbach, Mouton-Odum, & Stanley, 2002). Similarly, for those with excoriation (skin-picking) disorder, boredom is heightened prior to picking, and temporarily reduced when picking occurs (Snorrason, Smári, & Olafsson, 2010). Boredom is also sometimes reported as the cause of smoking (Amos, Wiltshire, Haw, & McNeill, 2006).

Furthermore, boredom is related to a variety of psychopathology symptoms (Sommers & Vodanovich, 2000), pathological gambling (Blaszczynski, 1990), delinquency (Newberry & Duncan, 2001), and anger and aggression (Dahlen, Martin, Ragan, & Kuhlman, 2004), although it is unclear whether or not these responses are functional attempts to avoid boredom. Procrastination may also be thought of as coping mechanism for boredom – if you do not engage in the boring task, you will not be bored – and indeed, boredom proneness has been found to be related to several types of procrastination (Blunt & Pychyl, 1998; Vodanovich & Rupp, 1999). Whether via procrastination, negative health

behaviors, or other symptoms of psychopathology, boredom often leads individuals to thwart their own best interests.

Motivational States Triggered by Boredom

A functionalist approach suggests that there is a purpose to boredom and its unpleasant phenomenology. Perhaps boredom triggers a motivational state signaling a deficit in some psychological need that needs to be restored. This is a common pattern in human behavior; internal motivational states often reveal human needs. Hunger is a clear example; it signals the need for food, and motivates food-seeking behavior. Food is a physical need, but evidence for psychological needs exists as well. For example, when self-esteem is threatened in one domain, it is often reasserted in other domains (Tesser, 2001). A similar pattern is found for sense of meaning, in that people react to threats to a sense of meaning in one domain by restoring meaning in other domains (Heine, Proulx, & Vohs, 2006). Reward seems to be a psychological need as well; it has been argued that a neural hyporesponsivity to reward drives overeating behavior (Stice, Spoor, Bohon, Veldhuizen, & Small, 2008), indicating that people are motivated to restore reward to an optimal level when it is diminished. Does boredom similarly signal the lack of some psychological need?

Need for Meaning

One of the distinguishing characteristics of boredom is a lack of meaning (van Tilburg & Igou, 2012), and indeed, people seem to be motivated to seek out a certain level of meaning, in that they react to threats to meaning in one domain by restoring meaning in other domains (Heine et al., 2006). Several findings demonstrate that people attempt to reassert a sense of meaning in response to boredom. Boredom also can lead to

an increase in nostalgia, which may be an attempt to reassert a sense of meaning (van Tilburg, Igou, & Sedikides, 2013). People also demonstrate an increased in-group versus out-group preference when bored, which may similarly be an unconscious attempt to regain a sense of meaning as it relates to identity (van Tilburg & Igou, 2011). A parallel effect is found when people are reminded of their own mortality; in-group bias increases, potentially as an unconscious attempt to restore a sense of meaning or self-esteem, according to terror management theory (Castano, Yzerbyt, Paladino, & Sacchi, 2002; Greenberg et al., 1990). Furthermore, experimentally inducing a sense of meaning in life decreases boredom (Fahlman, Mercer, Gaskovski, Eastwood, & Eastwood, 2009), suggesting that these efforts to reassert meaning may be successful at avoiding the aversive experience of boredom. It is unclear whether these reassertions of meaning deal equally with different kinds of boredom (e.g. agitated vs. apathetic boredom), but it may depend on the extent to which a particular kind of boredom involves a lack of meaning. Interestingly, all these reassertions of meaning are arguably tied to one's sense of self, whether it be a narrative self (in the case of nostalgia and meaning in life), or one's static identity (in the case of in-group bias).

Need for Agency

Although boredom often seems to be signaling the need to remedy insufficient levels of meaning, not all boredom coping behaviors are reassertions of meaning. Some coping tactics are seemingly meaningless; for example, when covertly videoed, those who are bored manipulate the objects in their surroundings, perhaps to avoid the aversive state of boredom (Woods & Miltenberger, 1996). Many coping tactics are somewhat self-destructive actions, such as overeating, delivering electric shocks (as in Wilson et al.,

2014), and other forms of self-harm. Is pain creating a sense of meaning, or are these actions affording the bored individual some benefit other than meaning?

One possibility is that boredom is also aversive because it indicates a lack of control or agency that must be replenished. This relationship between boredom and control is echoed by Csikszentmihalyi in the depiction of flow experiences, which appear incompatible with boredom (1975). In particular, when in flow, one has “no active awareness of control, but is simply not worried by the possibility of lack of control” (p. 44). This implies not only an optimal level of control or agency, but also implicit certainty that this need will be met.

Below, I will further investigate the possibility that agency is a need, and that boredom signals that the need for agency has not been met. The term “agency” refers to the sense that one has control over actions and their effects on the external world. Thus, the terms agency and control are used somewhat interchangeably, though agency generally refers more to the phenomenological experience of being an agent, or being an “I” versus a “me,” rather than referring to the actual process of exerting control.

Boredom as a Trigger That Motivates Agency Restoration

The idea that humans search for control in their lives is an intuitively plausible one. Scattered findings across many domains give some support to this idea; for example, experiential avoidance (the avoidance of aversive experiences) mediates the relationship between lack of control and disordered eating, suggesting that disordered eating is a way of avoiding the aversive experience of lack of control, or perhaps regaining an adequate level control when it is threatened (Fulton et al., 2012). Even mind-wandering, which often occurs in response to boredom and is often construed as an escape from goal-

directed thought, is arguably a goal-directed process itself, and includes feelings of control or agency (Smallwood & Schooler, 2006). Furthermore, mind-wandering occurs more in practiced versus novel tasks (Mason et al., 2007), suggesting that it requires executive control resources, and is less likely to occur when those resources are consumed by a novel task. This is supported by neuroimaging data demonstrating that mind-wandering involves both default and executive control networks (Christoff, Gordon, Smallwood, Smith, & Schooler, 2009). Given that mind-wandering is a controlled process, the fact that it occurs spontaneously when we are bored serves as a hint that our minds may not be content to exist with sub-optimal levels of agency.

Effects of Boredom and Agency on Time Perception

The precise relationship between boredom and agency is unclear, but their relationship to a third variable – time perception – may help illustrate the depth of their relationship. Time tends to contract with agency and expand with boredom, indicating that the perceptual processes underlying sense of agency and boredom may be related. For example, individuals with high boredom proneness perceive time to be passing more slowly than those with low boredom proneness do (Danckert & Allman, 2005; Watt, 1991). In the realm of agency, the time between intentional actions and their outcomes is perceived to be shorter in comparison to the same interval without agency (Wen, Yamashita, & Asama, 2015a). This time contraction due to agency is known as the intentional binding effect, and is thought to be the result of a slowed internal clock, rather than a period of time being eliminated during estimation (Wen et al., 2015a; Wenke & Haggard, 2009). In flow states, which are characterized by a lack of boredom and also a lack of threat to agency, people experience time passing extraordinarily quickly, if they

perceive it at all (Csikszentmihalyi, 1975). An effect similar to that of flow states is found for those under the influence of psychedelic drugs like psilocybin; not only is one's sense of agency altered (Lebedev et al., 2015), but time is distorted, with short intervals often being underestimated (Wittman et al., 2007). Several theories exist regarding the perceived speed of time; including the idea that serotonin plays a role (Wittman et al., 2007) as well as the idea that time-slowness may signal a deficit in information flow (Zakay, 2014). The latter idea is consistent with the above discussion on motivational states signaling various needs. Boredom may be a specific case of this time-slowness "information deficit," and coping by exerting control over our surroundings may afford us an increase in information (meaningless or not), consequently making time pass more quickly.

Need for Agency: Methodological Considerations

A deficit in agency may motivate agency-seeking behavior, whether or not boredom serves as the motivating signal. Below I consider several constructs related to need for agency, and then consider potential ways to manipulate sense of agency in order to observe the resulting agency-seeking behavior.

Constructs Related to the Need for Agency

Ego-dissolution. The effects of several drugs provide some interesting examples of altered states of self and agency. In particular, psychedelic drugs (including psilocybin and lysergic acid diethylamide, or LSD) are often accompanied by a loss of ego (labeled "ego-dissolution"), whereas drugs like cocaine tend to augment the ego ("ego-inflation"; Lebedev et al., 2015; Nour, Evans, Nutt, & Carhart-Harris, 2016). However, it might be more accurate to say these drugs alter the *need* for ego as well; ego-dissolution items

such as “I experienced a decrease in my self-importance” and “I felt far less absorbed by my issues and concerns” – which are endorsed for psychedelic experiences – indicate not only a reduced sense of self, but also a reduced motivation toward maintaining a sense of self. Similarly, ego-inflation items like “I felt especially keen and competitive” – endorsed as relating to cocaine experiences – indicate an appetitive motivation towards maintaining self-esteem; they do not necessarily indicate that self-esteem was unwavering. The effects of these drugs provide a powerful example of when the sense of agency – and perhaps the need for agency as well – is dramatically altered.

Some important implications about loss of agency arise from neuroimaging studies of psychedelic experiences. One implication from this work is that a reduced need for agency may be incompatible with dopamine-driven addictive processes. The extent of ego-dissolution experienced by participants under psilocybin is correlated with disintegration of a network that has strong dopaminergic connections, which are heavily involved in addiction (Lebedev et al., 2015). The disintegration of this network (presumably due to ego-dissolution) suggests that a reduced need for agency is not compatible with addictive processes. One implication of this finding is that certain psychedelic drugs, in the right context, could have a therapeutic effect on addictive behavior; the more conservative implication is that reducing a need for self or agency may induce those same therapeutic effects. This is relevant to the hypothesis that a heightened need for agency may be partially responsible for motivating boredom-induced problem behaviors, which often appear addictive in nature.

Reactance. Though it is not precisely the construct of interest, one of the closest existing constructs to the need for agency is that of reactance, an individual’s tendency to

resist outside control and fight for personal autonomy. Reactance has been particularly relevant in considering how interpersonal dynamics contribute to one's sense of personal autonomy or control. Reactance has been studied extensively in the context of therapy, and thus one common measure of reactance is the Therapeutic Reactance Scale, which includes verbal and behavioral reactance subscales (Dowd, Milne, & Wise, 1991). Those who are highly reactant tend to be defensive, aggressive, dominant, and autonomous, and nonaffiliative, according to self-report (Dowd & Wallbrown, 1993), and do better with less directive types of therapeutic treatment (Beutler, Harwood, Michelson, Song, & Holman, 2011). Higher reactance is also associated with psychopathology characterized by struggles for autonomy, such as borderline personality disorder and obsessive-compulsive disorder (Seibel & Dowd, 2001). In a different interpersonal context – that of romantic relationships – a similar effect is observed. When controlling individuals express goals for their significant others, those who are highly reactant pursue the opposing and suboptimal goal, perhaps as an attempt to regain control (Chartrand, Dalton, & Fitzsimons, 2007). These findings all point to the possibility that humans are indeed motivated to maintain a certain level of agency, and will attempt to replenish it when it is threatened.

Need for autonomy and control. Needs for autonomy and control also assume a central role in Self-Determination Theory (SDT). According to SDT, needs for autonomy and control motivate regulatory behavior and explain important differences in personality (Deci & Ryan, 1985). This existing line of work again suggests that people differ in the ways they react to a lowered sense of autonomy, control, or agency.

Measuring the Need for Agency

Several testable questions arise from the possibility that boredom is a motivational state signaling insufficient agency. First of all, do people seek to maintain an optimal level of agency? If so, in low agency situations, is it boredom that motivates this agency-seeking behavior? Similarly, do boring situations motivate action (as in Wilson et al., 2014) because of their lack of agency? And perhaps most provocatively – can we alter an individual’s need for agency as a way of decreasing the likelihood of boredom coping behaviors occurring? If this is true, then it makes sense to think of boredom as a loss of the self: not only a loss of “me” (a loss of meaning) but also a loss of “I” (a loss of agency).

To answer the above questions regarding the need for agency and boredom coping behaviors, a way of reliably measuring the need for agency is required. Although the literature on reactance strongly suggests that some kind of “need for agency” does exist, it is limited to a certain class of threats to agency – threats due to interpersonal influence. In many cases, though, boredom does not feel as though it is imposed by others. Thus, reactance – which is usually triggered by interpersonal exertions of control – may not fully describe people’s internal and behavioral responses to boredom.

However, the literature on sense of agency may inform the development of a “need for agency” measure. A handful of paradigms have been used to manipulate one’s sense of agency by altering the expected cause-and-effect relationships between personal actions and their outcomes. Methods include varying the temporal discrepancy between actions and their effects (Spengler, von Cramon, & Brass, 2009; Wen et al., 2015a), varying how closely learned expectations align with actual outcomes (Spengler et al., 2009), varying the strength of the goal (Wen, Yamashita, & Asama, 2015b), priming the

outcome both consciously and nonconsciously (Aarts, Custers, & Wegner, 2005; Renes, van Haren, & Aarts, 2015), and increasing cognitive load, which decreases sense of agency (Hon, Poh, & Soon, 2013). Using manipulations such as these, one could reduce participants' sense of agency, and then measure how people react given opportunities to replenish that agency. The value of agency – which may similarly behave as a malleable individual difference measure – could be revealed by presenting people with a series of choices between multiple tasks that vary in the level of agency they induce.

The above evidence supports the idea that sense of agency is malleable. Furthermore, sense of agency does not appear to be an all-or-nothing phenomenon – brain activity is related to agency scales with perceived sense of agency (Farrer et al., 2003), so it is reasonable to imagine this construct as a continuous measure. But is it possible that “need for agency” is also malleable? One piece of evidence for this possibility is that reactance is more common for independent versus interdependent cultures; those in more independent cultures demonstrate more intrinsic motivation when given their own choices, and less motivation when choices are made for them, while interdependent cultures demonstrate the opposite (Iyengar & Lepper, 1999). Thus the “value” of control may not be set in stone, and can vary across contexts. It remains a testable question whether we can actively manipulate this hypothesized “need for agency” construct.

Why might we want to manipulate an individual's need for agency? If a heightened need for agency is what drives boredom and associated problem behaviors, then decreasing this need might help people circumvent those maladaptive coping behaviors. As the literature on reactance demonstrates, a high need for control is not

generally associated with positive outcomes. Another illuminating result from the literature on reactance demonstrates that those with higher reactance feel more out of control when trying to suppress irrelevant thoughts in a writing task (Kelly & Nauta, 1997). In other words, a higher need for control paradoxically leaves people feeling out of control when they try to exert control over their thoughts. Avoidance often paradoxically increases whatever is being avoided, whether one is avoiding a lack of control or some other aversive internal experience. This is most dramatically illustrated by a body of work on behaviors labeled as “experiential avoidance,” discussed in detail below. Importantly, this work demonstrates that working towards acceptance of unpleasant emotions without reacting to them may prove to be more useful than avoidance. Whether or not boredom and sense of agency are related, the avoidance of both boredom and low agency may lead to detrimental outcomes. I propose that clinical approaches for other avoidance behaviors may be appropriate for the avoidance of boredom and low agency as well.

Experiential Avoidance and Its Relation to Boredom

Responding to aversive emotions with maladaptive behaviors is not unique to the case of boredom, and has been studied extensively in the clinical literature. Researchers coined the term “experiential avoidance” to refer to the many ways people avoid unpleasant internal experiences, often in maladaptive ways. Experiential avoidance is an individual difference in how negative internal experiences are perceived and how willing an individual is to endure those experiences (Chawla & Ostafin, 2007). This term usually carries a negative connotation, as much of the research suggests that avoiding rather than accepting unpleasant experiences results in negative outcomes (Machell, Goodman, &

Kashdan, 2015; Kashdan, Barrios, Forsyth, & Steger, 2006). The construct of experiential avoidance is an attempt to explain a potential higher-order factor accounting for many different problem behaviors, with the argument that this higher-order factor predicts many problem behaviors that ostensibly share a common emotion regulation function (Kingston, Clarke, & Remington, 2010). This common function likely underlies many forms of self-destructive behaviors, including disordered eating, non-suicidal self-injury, and body-focused behaviors like hair-pulling and skin-picking. In this framework, some of the maladaptive behaviors that accompany boredom might be attempts to avoid the aversive experience of boredom. If this is true, experiential avoidance should moderate the relationship between boredom and associated problem behaviors, but this has not been tested. Below I review several classes of behaviors for which the role of experiential avoidance has been explored, to illustrate how experiential avoidance may play a role in the avoidance of boredom and low agency.

Experiential Avoidance and Disordered Eating

Experiential avoidance is closely tied to disordered eating, which is relevant to the study of boredom given that boredom often precipitates problematic eating behavior. Experiential avoidance predicts eating disorder symptoms, and it has been suggested that depressive rumination is an important experiential avoidance strategy in those with disordered eating (Cowdrey & Park, 2012). Indeed, experiential avoidance also mediates the relationship between depression and eating disorder symptoms in those with anorexia, suggesting that an unwillingness to experience aversive emotions explains the link between those negative emotions and self-destructive avoidance behaviors (Wildes, Ringham, & Marcus, 2010). In the same vein, according to Heatherton and Baumeister's

theory of binge-eating, binge-eating is a way of avoiding the aversive experience of self-awareness (1991).

Experiential Avoidance and Self-Harm

In the case of self-injury, many functions have been proposed, but there is considerable support for the theory that self-injury is an attempt at emotion regulation, with the goal of avoiding aversive internal experiences (Klonsky, 2007). The experiential avoidance model of self-harm (Chapman, Gratz, & Brown, 2006) similarly describes self-harm as a method of providing relief from distressing emotions, thus providing negative reinforcement for the self-harm behaviors, although it is unclear what mechanism underlies this process. Self-harm may interfere with negative emotions at many points in the emotion generation process, including via attentional deployment (distraction), situation selection, and situation modification (through social reinforcement), among others (McKenzie & Gross, 2014).

Applying Knowledge from Experiential Avoidance to Boredom

Although boredom has barely been studied in this body of literature (if at all), the concept of experiential avoidance extends nicely to boredom and its resulting problem behaviors. I propose that future work seeking to understand the problem behaviors associated with boredom may benefit from drawing on several themes from the experiential avoidance literature: the power of negative reinforcement, the futility of delayed punishment, and the utility of mindfulness-based and acceptance-based therapeutic techniques.

The power of negative reinforcement. In the experiential avoidance literature, aversive emotional states can be thought of as both a stimulus cue and a reinforcer of

behavior, in that they both signal the need for avoidance behaviors, and they also reinforce those behaviors with their reduction (Chapman et al., 2006; Diefenbach et al., 2002). For example, among those with trichotillomania (compulsive hair-pulling), boredom, anxiety, and tension have been found to decrease with hair-pulling, potentially reinforcing the behavior (Diefenbach et al., 2002). In line with this finding, proneness to experiential avoidance correlates with severity of trichotillomania; those who are more prone to avoidance have more frequent urges to pull, more trouble controlling urges, and more distress surrounding these symptoms (Begotka, Woods, & Wetterneck, 2004). In the same vein, using experience sampling methods, researchers demonstrated that guilt, anger, and self-loathing increase before a self-harm episode and decrease afterward (Arney, Crowther, & Miller, 2011). Finally, expectancies about the negative reinforcement of eating predicted symptoms of bulimia nervosa above and beyond general emotion dysregulation, suggesting that expectancies about the relief derived from eating help maintain symptoms of the disorder (Hayaki, 2009). Similarly, any negative aspects of boredom and reduced sense of agency that are relieved with problematic coping behaviors are worth investigating more closely, keeping in mind the power of negative reinforcement.

The futility of punishment. While self-harm may bring temporary relief from some negative emotions, other emotions simultaneously increase, including negative ones that should serve as punishment (e.g. shame). Paradoxically, these increased negative emotions often precipitate future self-harm episodes. Thus, although these avoidance behaviors may only be paving the way for more aversive experiences in the future – a punishment that seems worth avoiding – those prone to experiential avoidance will often

thwart their best interests. For example, experiential avoidance mediates the relationship between negative cognitions (fear of negative evaluation, shame, and beliefs about appearance) and hair-pulling severity in trichotillomania (Norberg, Wetterneck, Woods, & Conelea, 2007). This is a paradoxical relationship; if shame really evolved to punish “bad behavior,” then we would expect less of that behavior in the future. However, emotions like shame can actually lead to more avoidance, more subsequent self-harm, and more shame, creating a vicious cycle.

Another experiment uncovered a similar conclusion. When faced with the option to experience one electric shock now or three shocks later, those prone to experiential avoidance are more likely to pick the “three shocks later” option, despite it being an explicitly worse overall outcome (Salters-Pedneault & Miller, 2013). Thus, for those prone to avoiding negative experiences, it may not be helpful to think of how bad the delayed negative outcome will be, because they will likely still avoid the present negative experience if they have the option. Some forms of cognitive reappraisal seek to bring the negative future outcome into the forefront of one’s mind (Giuliani, Calcott, & Berkman, 2013); however, these techniques may not work for those especially prone to experiential avoidance. These implications are important when considering how to decouple boredom from its associated problem behaviors.

The role of acceptance and mindfulness. Another relevant lesson to be learned from the literature on experiential avoidance and associated problem behaviors is the ubiquity of acceptance and mindfulness among some of the most successful therapeutic approaches. The relatively recent “third wave” of therapeutic approaches centers around these themes, in contrast to the two waves (behavioral and cognitive) that preceded it.

Acceptance may be particularly important for those who are prone to experiential avoidance behaviors. Avoidance of negative emotions can paradoxically cause more negative emotions, which in turn gives rise to more avoidance, creating a vicious cycle (Chapman, Dixon-Gordon, & Walters, 2011). A stance of acceptance is thought to help break the cycle of avoidance by reducing the judgment of negative emotional states as “bad” and worth avoiding; mindfulness is thought to reduce experiential avoidance by extinguishing the conditioned response to negative emotions (Lynch, Chapman, Rosenthal, Kuo, & Linehan, 2006). The value of acceptance-based approaches can potentially extend to reversing the problem behaviors that stem from the avoidance of boredom.

One primary focus of second-wave approaches, like cognitive-behavioral therapy (CBT), is to alter or fix dysfunctional beliefs and cognitions (Hayes, 2004). While this approach has proven effective for helping many people and gained widespread acceptance in the field, this approach does not work for everyone. One potential reason is that this approach implies that beliefs can be wrong or unacceptable. This is particularly difficult for those who have been chronically invalidated and punished for their negative emotions, often by caregivers during childhood, as is characteristic of those with borderline personality disorder (BPD; Lynch et al., 2006). In contrast, third wave approaches, which includes therapies like dialectical behavioral therapy (DBT) and Acceptance and Commitment Therapy (ACT), focus more heavily on acceptance of difficult emotional experiences, with the goal of understanding the function of behavior (Hayes, 2004). For example, one primary focus in ACT is to encourage people to live according to their own personal values, not according to an absolute truth (Hayes, 2004).

Similarly, a central tenet of DBT is to hold two opposing orientations – the need to change and the need to accept one’s current state – instead of merely focusing on the need to change (Lynch et al., 2006).

Although there is still considerable overlap between CBT and newer approaches like ACT, one key difference is that reduction of negative affect is seen as a success in CBT, while the goal of ACT is to increase quality of life and ability to engage in valued actions, while accepting any negative emotions that arise (Orsillo, Roemer, Lerner, & Tull, 2004). In other words, acceptance is not seen as a strategy for reducing negative affect (although it might do so in the process), but rather a way of shifting one’s goal from decreasing negative affect to increasing the ability to pursue a valued life. In this case of boredom and low agency, these techniques would help people make decisions in line with their values rather than acting to avoid the unpleasant experience of boredom or low agency; however, the individual would not necessarily see a reduction in these negative experiences.

Effectiveness of acceptance-based approaches for reducing experiential avoidance. These third wave approaches show promising effectiveness, though debate still exists in the literature regarding details like effect sizes and appropriate control conditions (Kahl, Winter, & Schweiger, 2012). For example, DBT is most widely used for those with BPD, a population characterized by intense emotional reactions and a history of those reactions being invalidated (Lynch et al., 2006). One study found that those with borderline personality disorder (BPD) are less willing to endure distress in order to achieve goals (Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2006). However, increasing the use of DBT skills, which include emotional acceptance and distress

tolerance, decreases the likelihood of suicide attempts, non-suicidal self injury episodes, and depression, along with increasing anger control (Neacsiu, Rizvi, & Linehan, 2010). Emotional non-acceptance was also found to mediate the relationship between emotional abuse and experiential avoidance, implying that learning to accept difficult emotions might break the tie between avoidance and abuse (Gratz, Bornovalova, Delany-Brumsey, Nick, & Lejuez, 2007).

Acceptance-based approaches show some promise for several forms of self-harm, including body-focused repetitive behaviors like hair-pulling and skin-picking. There is also some preliminary evidence that ACT, sometimes combined with habit reversal therapy (HRT), can reduce symptoms in those with trichotillomania (Flessner, Busch, Heideman, & Woods, 2008; Twohig, Hayes, & Masuda, 2006; Woods, Wetterneck, & Flessner, 2006) and excoriation disorder (Capriotti, Ely, Snorrason, & Woods, 2015; Flessner et al., 2008; Twohig et al., 2006). Given this success, it has also been proposed that DBT-enhanced HRT could be particularly helpful given DBT's focus on specific concrete emotion regulation skills. Indeed, this DBT-enhanced HRT decreased trichotillomania symptom severity and impairment, and increased emotion regulation compared to a control group (Keuthen et al., 2012). Though many of these studies are only preliminary, they are particularly relevant given that the reduction of boredom is negatively reinforced in both trichotillomania and excoriation disorder.

Finally, emotional acceptance is crucial for decreasing disordered eating as well. For example, validating the existence of difficult emotions (which can be considered a form of acceptance) is thought to be a necessary component in helping those with bulimia nervosa feel ready to change (Wilson, 2004). In those undergoing ACT, experiential

avoidance reduction leads to a reduction in binge eating (Lillis, Hayes, & Levin, 2011). Mindfulness also has been found to negatively predict eating disorder symptoms (Cowdrey & Park, 2012). Again, given that boredom is related to disordered eating, these results are particularly relevant (though only correlational); accepting whatever aversive aspects of boredom lead to dysregulated eating may be crucial for reducing the maladaptive behavior.

Avoidance and acceptance in the context of boredom. Although acceptance has not been explicitly studied in relation to boredom, those who use avoidance tactics when coping with boredom tend to have the least success. For example, trait-based and state-based analyses show that cognitive-approach strategies lead to greater reductions in boredom than behavioral-avoidance strategies (Nett, Goetz, & Hall, 2011). In a study by Nett, Goetz, and Daniels exploring the different ways people cope with boredom in academic settings, three groups emerged (2010): reappraisers (who tried to change their view of the situation, or reframe the importance of the subject), criticizers (who expressed disapproval with the situation, and/or requested changes), and evaders (who avoided boredom by occupying themselves with something else). The reappraisers had the best outcomes: the least boredom and anxiety, and the most interest and enjoyment (Nett et al., 2010). These results all suggest that avoidance tactics are not useful when it comes to boredom, and thus a contrasting stance of acceptance toward one's boredom (and potentially, a lowered sense of agency) may lead to better outcomes.

The Way Forward: Connecting Boredom, Agency, and Acceptance

The relationship between boredom, agency, and acceptance is a complicated one that deserves further investigation. We are motivated to avoid boredom and the potential

deficits in meaning and agency that it signals, yet we know from several lines of work that brute force avoidance rarely works. Trying to replenish a sense of agency may paradoxically result in even less perceived agency. A stance of acceptance towards one's lack of agency may be more fruitful than trying to regain agency through alternate means (e.g. self-destructive behaviors, such as overeating, or seemingly harmless behaviors, such as fidgeting).

The idea that acceptance of a lack of agency is more important than regaining agency poses an issue for research on emotion regulation work: emotion regulation is often construed as emotional control, but sometimes more control leads to less regulation (Gratz & Roemer, 2004). This perspective led to the development of the Difficulties in Emotion Regulation Scale (DERS), which focuses on these nuances of controlling actions while experiencing emotions, and predicts both deliberate self-harm and partner abuse (Gratz & Roemer, 2004). A shift from emotional control to emotional acceptance is present in the shift from second-wave to third-wave therapeutic approaches (Orsillo et al., 2004). Research seeking to understand the interplay of negative emotions with well-being may benefit from following this example, in the case of boredom along with other negative emotions.

In summary, two potential pathways exist for circumventing problem behaviors associated with boredom. First, people often find alternative ways to fill deficits in agency, often in self-destructive or other unproductive ways. Besides the fact that many efforts to replenish a sense of agency are objectively unhealthy, those efforts may also create a paradoxical rebound effect. Instead, I consider a second pathway: finding ways to decrease the need for agency at the outset, so that a lack of agency is not perceived to

be so aversive, or so that it does not motivate behavioral reactions. This second pathway is more in line with acceptance ideology: the goal is to accept occasional lack of agency, rather than try to replenish it through alternate means. Testing the utility of this approach would require several things: (1) demonstrating that a need for agency exists; (2) developing a way of measuring and understanding the variability in that need for agency; and (3) testing potential methods for manipulating it. Drawing on the clinical literature, manipulations focusing on acceptance and mindfulness may be the most fruitful for the final objective. Although there is much work to be done to understand the relationships among boredom, agency, and acceptance, these pursuits promise to illuminate the causes and effects of a particularly puzzling aspect of motivation – our seemingly insatiable thirst for agency and action.

In the rest of this dissertation, I will begin to connect boredom, agency, avoidance, and acceptance. To start, I will investigate whether a need for agency exists at all. In my framework, need for agency is a construct that can only be measured indirectly by measuring current sense of agency, and the motivation to increase sense of agency from its current level (Figure 1). I will therefore try to reduce people’s sense of agency to as low a level as possible, effectively zeroing their sense of agency. Then, the resulting motivation to restore agency should represent their need for agency (Figure 1).

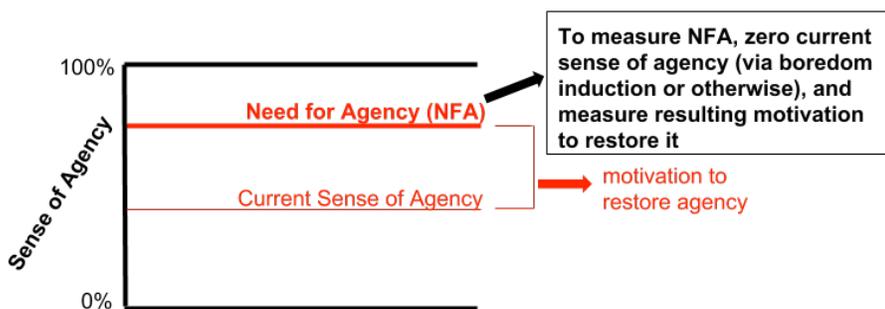


Figure 1. Model of need for agency.

In order to measure their motivation to restore agency, I will use a behavioral task to determine the maximum amount of money individuals are willing to forego to escape from each of two tasks: a low agency task, and a task where they are asked to do nothing. Willingness-to-pay tasks like these have been used previously to determine the value of self-disclosure (Tamir & Mitchell, 2012) and the subjective cost of effort (Westbrook, Kester, & Braver, 2013). The rationale for the first task is to determine how motivated people are to escape from low agency (hopefully, a level close to zero), the measure I call “need for agency.” The rationale for the second task is to use a task that seems boring at face value, and see whether experiencing it reduces sense of agency. I will also measure how motivated people are to escape from doing nothing. Because I do not know a priori that agency will be reduced while doing nothing, I call the motivation to escape from doing nothing “need for action,” because action is what is objectively missing from the “do nothing” task. However, I suspect need for action is highly overlapping with need for agency. To explore this, I will test whether the avoidance of doing nothing is driven by the degree of low agency each person feels. This would suggest that boredom-avoidance behaviors are indeed driven by a need for agency.

This study will also approach several of the suggestions derived from clinical literature. Specifically, higher motivation to escape from low agency and/or doing nothing would suggest a higher level of experiential avoidance; I will explore whether this individual difference is related to need for agency. Furthermore, experiential avoidance might moderate the effect of boredom or agency on escape behavior, just as it moderates the effect of emotions and cognitions on other problematic behaviors. Finally, I will explore the role that mindfulness plays on need for agency, given that mindfulness

skills are often effective at reducing experiential avoidance. Does mindfulness relate to need for agency, and/or moderate the effect of subjective experience on behavior?

Although a mindfulness intervention designed to reduce the need for agency is outside the scope of this project, initial evidence that mindfulness protects against boredom-avoidance behaviors would pave the way for future intervention work.

CHAPTER II
EXPERIMENTAL METHODS

The Present Study

In this study, I plan to test whether a sense of agency, a subjective sense of controlling one's actions and their effects, is a psychological need that manifests in boring situations. I define something to be a "need" if it has an optimal level such that people are motivated to restore it when it is threatened, depleted, or decreased in some way. In addition, people should find it aversive to not have a need fulfilled, hence the motivation to restore it. This definition draws from some of the conditions for fundamental motives outlined by Baumeister and Leary in their discussion of the need to belong (1995), for example, that a fundamental motive should elicit goal-oriented behavior designed to satisfy it. However, my conditions are slightly less strict, as I am not claiming agency to be a *fundamental* need.

By my working definition of a need, people will be motivated to restore agency when it is threatened if and only if agency is a need. In this study, I will reduce people's sense of agency, and then test whether they are willing to forego monetary gains in order to escape to a higher agency task. Furthermore, people may vary in how motivated they are to restore agency. I predict that this outcome, which we call "need for agency," will correlate positively with experiential avoidance, boredom proneness, reactance, desirability of control, and anxiety, and negatively with mindfulness. I expect that need for agency will not be related to depression, as the characteristics of depression do not, at face value, relate to a motivation to restore agency when it is threatened. Exploring how

need for agency relates to other individual differences will inform how it may be used as a meaningful measure in future research.

Furthermore, if sense of agency is a need, then the low agency situation should drive people to seek higher agency specifically because of the decrement in agency that the low agency task causes. And if boredom is a signal of low agency, then people should also seek higher agency because of the potential boredom associated with low agency, though we cannot say a priori whether the low agency task will be boring.

Recall that I began by asking why people are so motivated to avoid boredom. Therefore, if people avoid boredom because of the lack of agency that accompanies it, then a face-valid boring task (e.g., doing nothing) should motivate agency-seeking behavior particularly when the task is perceived to afford little agency. I will ask participants do nothing, and I will explore whether they forego monetary gains to avoid doing nothing. The extent to which people avoid doing nothing will be called “need for action,” and I expect that it overlaps considerably with need for agency. In fact, if need for action is indeed driven by a lowered sense of agency, this would confirm that the preference for doing something versus nothing arises from that same need for agency.

Participants

One hundred twenty-three adults between the ages of 18 and 35 (M age = 22.07 years, SD = 4.66 years) were recruited from a Pacific Northwest university and surrounding community. The sample consisted of 39 males and 84 females, with 67% White (not of Hispanic origin), 11% Hispanic, 8% Asian or Pacific Islander, 3% American Indian or Alaskan Native, 3% Black (not of Hispanic origin), 1% South Asian or Indian, 1% Middle Eastern, and 6% reporting other ethnicity. Participants reported

their subjective socioeconomic status (SES) on a scale from 1 to 10, where 1 = lowest SES and 10 = highest SES, with $M = 6.30$ and $SD = 1.63$ (Adler, Epel, Castellazzo, & Ickovics, 2000). Participants were recruited via the psychology and linguistics departments' human subjects pool ($n = 88$) and Craigslist ($n = 35$), and were told they would be compensated at least \$15 for a 90-minute study. Participants were required to have normal or corrected-to-normal vision.

Power Analysis

The sample size was chosen based on a power analysis using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007). I estimated a small effect size (.25), and determined the needed sample to achieve 80% power, with an alpha of .05. Our primary analysis would be a one-tailed single-sample t-test, which required $N = 101$; correlational analyses would require $N=120$. Thus I planned to collect 120 data points, plus several more in case any data points had to be discarded (hence my final sample size of 123).

Procedure

Overview

The study session consisted of a set of self-report measures, three MATLAB tasks, and a brief exit survey. Participants were compensated \$10 plus a bonus of \$5-\$17, depending on their decisions in the final two MATLAB tasks (Figure 2).

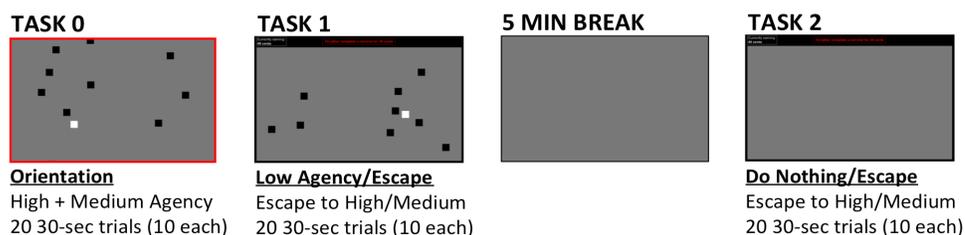


Figure 2. Overview of experiment procedure. After completing individual difference questionnaires, participants completed the following tasks. Note that in the two escape tasks (Tasks 1 and 2), participants have the option to escape to a high or medium agency trial (to which they were oriented during Task 0).

Individual Difference Measures

First, participants completed self-report measures of experiential avoidance (Acceptance and Action Questionnaire, or AAQ; Hayes, Strosahl, Wilson, & Bissett, 2004; and three subscales from the Multidimensional Experiential Avoidance Questionnaire (MEAQ): behavioral avoidance, distress aversion, and distress endurance; Gámez, Chmielewski, Kotov, Ruggero, & Watson, 2011), boredom proneness (Farmer & Sundberg, 1986), anxiety (Generalized Anxiety Disorder 7-item scale, or GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006), reactance (Therapeutic Reactance Scale, or TRS; Dowd, Milne, & Wise, 1991), desirability for control (Burger & Cooper, 1979), mindfulness (Five Facet Mindfulness Questionnaire - Short Form, or FFMQ-SF; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006), and depression (Center for Epidemiological Studies Depression Scale, or CESD; Radloff, 1977). Correlations between these self-report measures can be found in Table 1.

Task 0: Agency Orientation

In the first computerized task, participants were oriented to two levels of agency about which they would make decisions in Tasks 1 and 2 (Figure 3). They completed two kinds of randomly interleaved trials that varied in the level of agency they induced. The purpose of this task was to familiarize participants with two relatively acceptable levels of agency, and to have them associate each of them with a color (red or blue). This allowed us to ask participants to make decisions about high and medium agency trials in later tasks, without ever referring to them as “high” or “medium” agency trials.

Table 1

Means, Standard Deviations, and Correlations Between Individual Difference Measures

Variable	<i>M</i>	<i>SD</i>	AAQ	BP	CESD	DC	FFMQ	GAD	MEAQ1	MEAQ2	MEAQ3
AAQ	3.16	1.03									
BP	3.54	.68	.58**								
CESD	.88	.56	.67**	.64**							
DC	4.81	.70	-.34**	-.27**	-.18*						
FFMQ	3.33	.45	-.60**	-.61**	-.52**	.40**					
GAD	1.01	.71	.54**	.45**	.69**	-.06	-.49**				
MEAQ1	3.21	.79	.12	.16	.11	-.16	-.26**	.08			
MEAQ2	3.45	.81	.18*	.20*	.11	-.17	-.19*	.15	.48**		
MEAQ3	4.56	.70	-.33**	-.34**	-.24**	.44**	.46**	-.12	-.44**	-.12	
TRS	2.5	.35	.09	.12	.09	.40**	.07	.18	-.17	.05	.17

Note: *M* and *SD* are used to represent mean and standard deviation, respectively. MEAQ1 = Behavioral Avoidance, MEAQ2 =

Distress Aversion, MEAQ3 = Distress Endurance. * indicates $p < .05$. ** indicates $p < .01$.

In each trial, participants were presented with a screen containing a white square (the square under their control), and several black squares (Figure 3). The black squares moved at random, to reinforce the impression that computer-controlled motion existed, while the white square only moved when the participant pressed an arrow key. Participants were required to make at least ten movements per thirty-second trial.

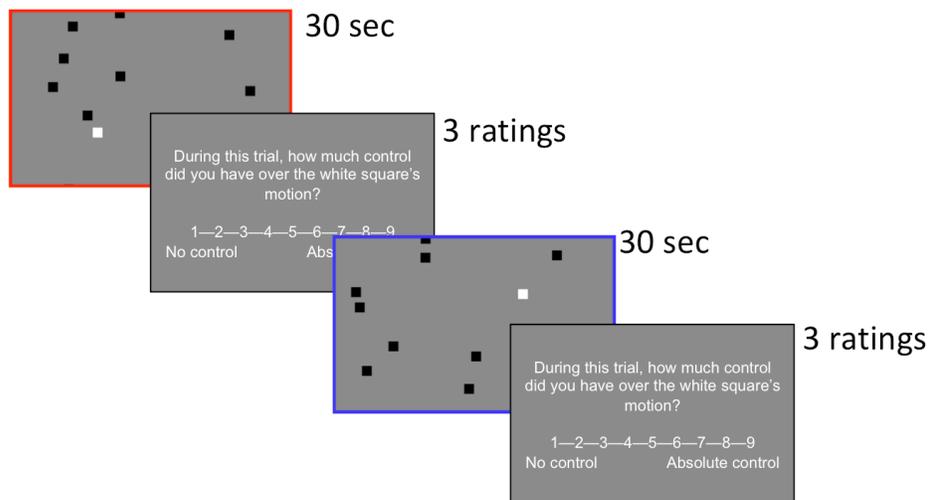


Figure 3. Task structure for the orientation task. Participants completed 10 high agency and 10 medium agency trials, randomly interleaved, and each agency level was randomly assigned to have a red or blue border (counterbalanced across subjects). Each trial lasted 30 seconds, and was followed by three ratings of experience (agency, boredom, and frustration).

In paradigms like these, increasing the delay between button press and subsequent motion on the screen consistently gives participants a decreased sense of agency (Wen et al., 2015a; Ebert & Wegner, 2010; Kühn et al., 2011; Farrer, Valentin, & Hupé, 2013; Kawabe, 2013). Thus, in high agency trials, movement initiated between 0 and 200 ms after each button press; in medium agency trials, movement initiated between 300 and 500 ms after each button press. Additionally, altering the learned contingencies between action and outcome can lessen the sense of agency one experiences (Spengler et al., 2009). Thus, in high agency trials, the intended direction of the square always moved in

the expected direction, whereas in medium agency, the intended direction of the square was reversed 10% of the time, or at least once per trial. Participants completed ten thirty-second trials for each of the two agency levels, with randomized trial order.

In addition, to further differentiate between the two agency levels, the screen had a red or blue border throughout each trial, associated with high and medium agency levels, respectively (counterbalanced across subjects). Later in the paradigm, the trial types were referred to using these colors (e.g. “a red trial”).

Before completing a practice trial, participants were told the following (adapted from Wen et al., 2015a): “In each trial, you will see many squares on the screen, and you have control of the white square. You can send a signal to the white square by pressing any of the four arrow keys to move it up, down, left, or right. However, the computer will sometimes disrupt your signals, by either delaying them, blocking them, or changing them. There’s no real goal in each trial, other than to stay focused on the screen and move the square around the screen however you would like. Also, you will need to make at least ten movements before the trial is over or else the trial will be extended until you do.” After completing a practice trial, they were also told that they would see a red or a blue border around the screen during each trial, and that these borders marked two different kinds of trials about which they would make decisions later in the experiment.

With the temporal delays and the preface they were given beforehand, participants may have felt that the computer was blocking their button presses or generating motion on its own. Thus, they may not have felt that they had perfect control over the white square. This was intentional; the goal of this task is to manipulate sense of agency. Therefore, after each trial, when the participant had made at least 10 movements or 30

seconds had passed (whichever happened later), they were asked how much control they felt they had over the white square's motion during that trial on a 9-point scale (1=no control, 9=absolute control). They were also asked to rate their boredom and frustration during the prior trial (1=not at all bored/frustrated, 9=extremely bored/frustrated). Keypresses were also recorded during each trial.

After completing these twenty trials, participants moved on to Task 1. See Figure 3 for a diagram of the task structure.

Task 1: Low Agency/Escape Task

In the next task, participants completed twenty trials similar to those in Task 0, with a few key differences. First, low agency was induced by even longer latencies between keypresses and square movement (600-800ms), and a higher probability of switching the intended direction of movement (30%). Furthermore, participants were told that in this part of the experiment, they would earn between 30 and 50 cents for each trial, and that they would have the option to escape to a red or blue trial at any point during the trial by pressing the spacebar. However, the red or blue trial would not necessarily earn them as much money as the primary trial. The purpose of this task was to enable me to measure how much participants would be willing to pay to avoid a task that afforded only a low level of agency.

At the start of each trial, the current payment (e.g. 40 cents) was displayed at the top left corner of the screen. Additionally, the escape option was displayed at the top of the screen giving their escape option (e.g. "I'd rather complete a blue trial for 35 cents"). The escape option would have equal or smaller payout compared to the primary low agency trial. The escape option remained on the screen for the entirety of the trial, giving

the participants some time to choose to escape from the low agency trial. If they chose to escape, they would spend the remaining trial time in the alternative trial. Regardless of the type of trial they chose to complete, they were asked to rate their sense of agency, boredom, and frustration after each trial. See Figure 4 for a picture of the screen during the low agency/escape task.



Figure 4. Screen appearance during low agency/escape task. If participants wished to complete the alternative trial (red or blue), they pressed the spacebar and were taken to the alternative trial for the remainder of the 30 second trial.

The task used a staircasing procedure to find the maximum amount of money participants were willing to forego. The discrepancy between the low agency trial and the escape option varied from 0 to 30 cents, and participants started with a discrepancy of 15 cents (Figure 5).

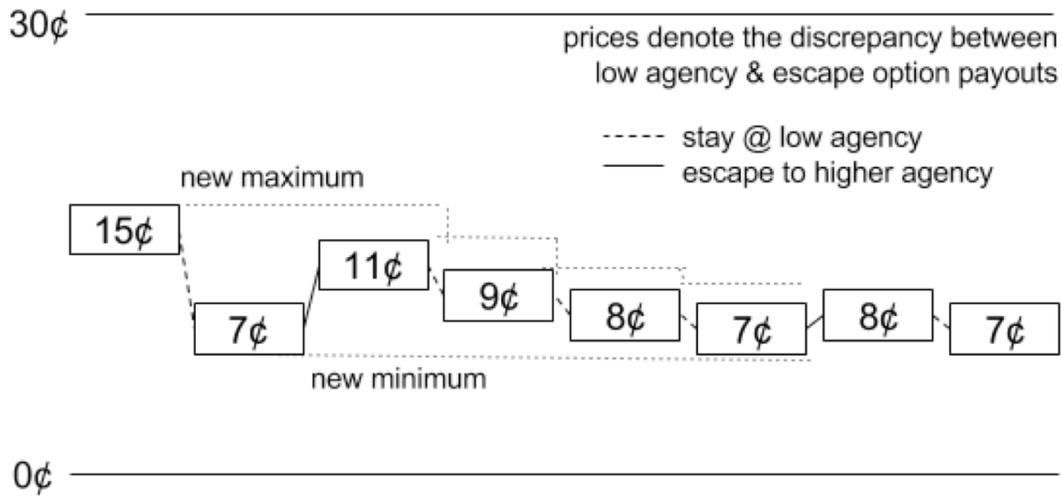


Figure 5. Staircasing algorithm used during both escape tasks. Note that in each task, a separate staircase was used for each escape option (high and medium agency). Also, the first three trials of each escape tasks were treated as one decision, such that at least two (of three) escapes functioned as an initial “escape,” and zero or one escape functioned as an initial “stay.”

Exploratory period. Because participants seemed to require a few trials before feeling fully oriented to the task, the first three trials served as an initial exploratory period during which the we held the discrepancy constant at 15 cents. If participants chose to escape at least two of the three times, this was treated as an initial “escape,” and fourth trial’s discrepancy increased to 22 cents (the halfway point between 15 and 30 cents), to make escaping less favorable. If participants chose to escape one time or not at all during the first three trials, this was treated as “not escaping,” and the fourth trial’s discrepancy was decreased to 8 cents (the halfway point between 0 and 15 cents), to make escaping more favorable. This exploratory period was intended to make sure that during that exploratory period, a single initial decision to escape or stay did not push participants into a particular half of the discrepancy range; instead, the initial three decisions did so collectively.

From this point on, when the escape option was chosen on a given trial, the discrepancy increased to the halfway point between the current discrepancy and the current maximum. When the escape option was not chosen, the discrepancy decreased to the halfway point between the current discrepancy and the current minimum (rounded to the nearest cent, erring on the side of less adjustment). The current minimum and maximum started at 0 and 30 cents, and adjusted with each choice (with the first 3 trials serving as one collective choice; see above). This algorithm was able to zero in on the maximum amount of money a participant is willing to forego for agency in approximately 6 trials. A separate staircase was used for each escape option (high and medium agency), and the two escape options were randomly interleaved throughout the twenty trials.

Task 2: Do Nothing/Escape Task

The next task involved doing nothing, and to some, doing nothing may seem like a welcome break at first. Thus, participants were first asked to take a five minute break to rest their mind. They were instructed to sit quietly without touching the computer (which displayed a solid grey screen to prevent distraction). They were also specifically instructed not to sleep. By doing nothing before starting the second escape task, participants should not have felt in need of a break. The purpose of this task was to explore how much participants would be willing to pay to avoid doing nothing, just as they avoided low agency.

After their break, participants completed the do nothing/escape task, identical to the low agency/escape task, except that each trial consisted of doing nothing for 30 seconds instead of completing a low agency trial. The goal of this escape task was to find

out whether people would forego money to do something rather than nothing. As before, they had the option to escape to a high or medium agency trial for an equal or lower payout by pressing any key on the keyboard. Once again, ten trials were completed for each escape option (high and medium agency) for a total of twenty trials, with the payout discrepancies adjusted in the staircase fashion described in Task 1. We expected that most people would find doing nothing to be a low agency activity as well, though we did not claim this to be an agency induction a priori. However, we collected agency boredom, agency, and frustration ratings after each trial in order to further investigate these possibilities.

Exit Survey

Before being compensated, participants answered to questions as an exit survey:

(1) How did you make decisions in the monetary tasks? Did you have any strategies? (2) Did the decisions in the monetary tasks remind you of any decisions you make in your daily life? I asked these questions to get open-ended insight into how participants approached these novel tasks, and whether they had any insight into how experimental decisions might be analogous to their own real-world decisions.

Analysis Strategy and Hypotheses

Manipulation Check

To understand the subjective experience of our different trial types, I will explore agency, boredom, and frustration during each of the trial types. First, I will determine whether sense of agency decreased across the high, medium, and low agency trials to verify that the agency manipulation worked as intended. I will also look at boredom and

frustration ratings across these trial types to get a more complete picture of the subjective experience of decreased agency.

Next, I will verify that doing nothing truly was boring by comparing boredom ratings while doing nothing versus during high and medium agency. I will also compare agency ratings while doing nothing to those in the high and medium agency trials. I predict that people will feel both boredom and a low sense of agency when asked to do nothing, compared to the high and medium agency tasks, indicating that boredom might indeed be a signal of low agency. I will also explore frustration ratings while doing nothing to more fully understand the subjective experience of doing nothing.

Exclusion

One participant was excluded from analyses involving the low agency/escape task data, as they indicated to the experimenter that they did not know how to escape during the task. Another participant was excluded from analyses involving the do nothing/escape task data, as they were attempting to sleep during each of the 30-second trials where they were supposed to be doing nothing or escaping.

Need for Agency

Need for agency will be estimated from the monetary choices made by participants in the low agency escape task. For each of the two possible comparisons (high > low agency, medium > low agency), the amount of money a participant is willing to forego will be the final discrepancy from the staircasing procedure. This will be known as the point of subjective equivalence (PSE), and in theory should be the value discrepancy at which there is a 50% probability of that participant choosing high or medium agency over low agency.

For the low agency escape task, I expect to find that the PSE for the high > low agency comparison is significantly different than zero, given that people should be willing to lose some money to do the high versus low agency trials. The medium > low PSE should also be different than zero, but less extreme than the high > low PSE. The implication of this result would be confirmation that sense of agency does indeed function as a psychological need.

Need for Action

I expect to find similar results for the do nothing/escape task. In particular, the PSEs for both the high agency > doing nothing comparison and the medium agency > doing nothing comparison should be significantly different than zero, the former being more extreme. The implication of this result would be confirmation that people would rather do something than nothing, even if it costs them. I call these PSEs “need for action” because they indicate the extent to which people will seek action (even meaningless action) over doing nothing. I do not call these PSEs “need for agency” because we do not yet know if doing nothing is an agency manipulation; it is possible that people avoid doing nothing because it is aversive in some other way that does not involve agency. Regardless, I also predict that PSEs for the two different escape tasks will be positively correlated, given that both should be driven by an unwillingness to endure aversive experiences.

Individual Differences That Predict Need for Agency and Action

I predict that need for agency and need for action (indicated by PSEs) will be positively predicted by experiential avoidance, boredom proneness, and anxiety,

reactance, desirability for control, and negatively by mindfulness. I do not expect a priori that they will be predicted by depression.

Subjective Experiences That Predict Need for Agency and Action

Subjective experience ratings can help elucidate why people are choosing to give up money to escape low agency and boredom. What is it about each escape task that causes people to escape? I will therefore examine whether agency, boredom, or frustration ratings predict need for agency and need for action. Specifically, if it is the low sense of agency driving people to escape from low agency or doing nothing, then sense of agency during each escape task should predict PSEs. Furthermore, if boredom is really a signal of low agency that motivates people to restore their sense of agency, then boredom should predict agency-seeking behavior (in this case, the PSEs). Thus, I will take people's ratings for the trials in each escape task where they chose not to escape, and determine whether they predict need for agency or need for action (indicated by PSEs).

This relationship may be moderated by experiential avoidance and mindfulness, both of which tap into reactions to aversive emotions. The implication of such a result would be informative for integrating the earlier results with clinical theory. In particular, if experiential avoidance and mindfulness moderate the above effect, this suggests that boredom-related problem behaviors have similar clinical roots as other problem behaviors, further suggesting that existing clinical approaches may help reduce the boredom-related behaviors as well.

Raw versus baselined ratings. In using agency, boredom, and frustration ratings as predictors, we can look at the raw ratings (from the task in question) or the baselined ratings (i.e., the ratings from the task in question minus the ratings during high agency).

A separate rationale exists for using each of these predictors. First, it is reasonable to guess that the *difference in experience* between the current aversive task and escape option is what drives the escape behavior. In this case, one would expect baselined ratings predict people's willingness to escape to high agency from low agency or doing nothing. However, it is also possible that people are not truly able to compare the two experiences in the moment, and instead, their escape behavior is driven by the current experience only (i.e., the raw ratings). Because both are plausible, I look at both raw and baselined ratings in the analyses below.

Keypresses as an Additional Dependent Measure

During the tasks, I restricted people's agency so that their only options were to escape (in the escape tasks) or make keypresses (except while doing nothing, unless they escaped). Therefore the number of keypresses made in each trial may serve as an additional dependent measure. Specifically, if agency is a need we are motivated to restore, participants may try to restore their lack of agency in any trial by making more keypresses. I therefore will explore whether subjective experience of agency, boredom, and frustration predicts the number of keypresses made in each type of trial. I will also explore whether individual differences predict keypresses, and/or whether they moderate the effects of subjective experience on keypresses. I will use aggregated and multilevel timecourse data to explore these potential explanations of keypress behavior.

CHAPTER III

EXPERIMENTAL RESULTS

Task Validation

First, I wanted to confirm that our agency and boredom manipulations worked. For the first two tasks, this means checking whether high, medium, and low agency trials really did cause people to vary in their sense of agency as measured by in-task self-report questions. I also wanted to examine the extent to which lower agency was accompanied by an increase in boredom to begin exploring the hypothesis that boredom arises as a signal of low agency. Finally, I looked at frustration ratings as well to get a more complete picture of the subjective experiences relating to changes in boredom and agency.

To validate the do nothing/escape task, I verified that doing nothing was indeed boring; specifically, I checked whether it was more boring than the escape options (high and medium agency). I also explored whether doing nothing induced less agency and more frustration than high and medium agency.

Subjective Experience During the Four Trial Types

Compared to the high agency trials, medium agency trials induced less agency ($\beta = -.60, t(243.29) = -22.04, p < .0001$), marginally more boredom ($\beta = .053, t(243.08) = 1.75, p = 0.08$), and more frustration ($\beta = .25, t(243.11) = 7.12, p < .0001$). In the low agency trials, compared to high and medium agency trials, they reported less agency ($\beta = -.49, t(243.82) = -30.96, p < .0001$), more boredom ($\beta = .086, t(243.24) = 4.91, p < .0001$) and more frustration ($\beta = .16, t(243.36) = 8.03, p < .0001$).

A similar pattern was found while doing nothing. Compared to high and medium agency trials, doing nothing induced less agency ($\beta = -.17, t(244.51) = -5.75, p < .0001$), more boredom ($\beta = .14, t(241.13) = 6.61, p < .0001$) but no more frustration ($\beta = -.029, p = 0.21$). See Figure 6 and Table 2 for means and standard deviations of agency, boredom, and frustration, for each trial type.

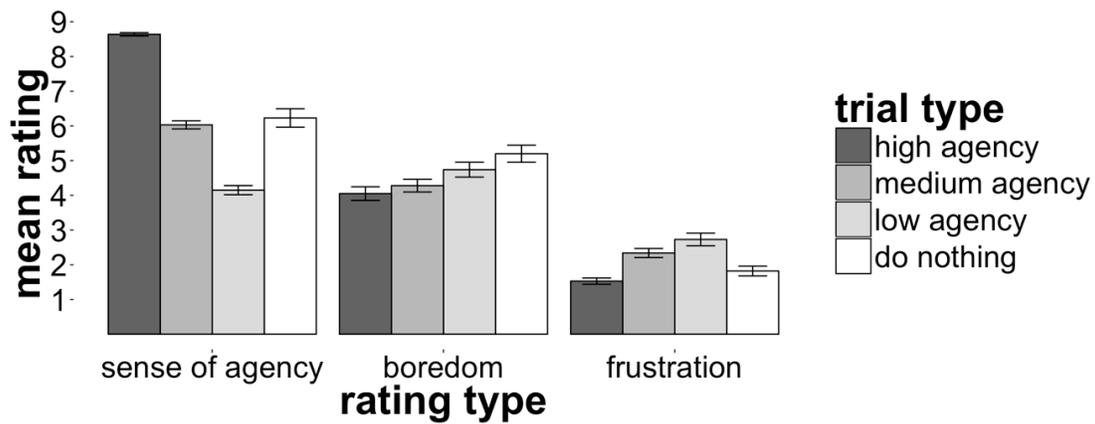


Figure 6. Subjective experience ratings by trial type.

Table 2

Subjective Experience by Trial Type

Trial type	Agency	Boredom	Frustration	n
High agency	8.64 (0.52)	4.05 (2.18)	1.53 (0.99)	123
Medium agency	6.03 (1.28)	4.28 (2.04)	2.34 (1.44)	123
Low agency	4.15 (1.46)	4.74 (2.37)	2.73 (2.02)	122
Doing nothing	6.23 (2.89)	5.2 (2.68)	1.82 (1.53)	119

Note: Ratings were made on a 1-9 scale, where higher ratings indicated a higher sense of agency, boredom, or frustration.

Correlations Among Changes in Subjective Experience

The relationship between agency and boredom in these tasks can be further understood by exploring how changes in agency relate to changes in boredom. Again, I

also included changes in frustration in these analyses to more fully understand the dynamics of subjective experience in these tasks.

Indeed, changes in subjective experience from high to medium agency were correlated across rating type. In other words, increases in boredom from high to medium agency were accompanied by decreases in agency ($r(122) = -0.24, p = 0.01$) and increases frustration ($r(122) = 0.38, p < .0001$). The same correlations exist for changes in ratings from high to low agency, and from high agency to doing nothing (all $ps < .05$). See Figure 7 and Tables 3-5 for correlations between changes in subjective experience.

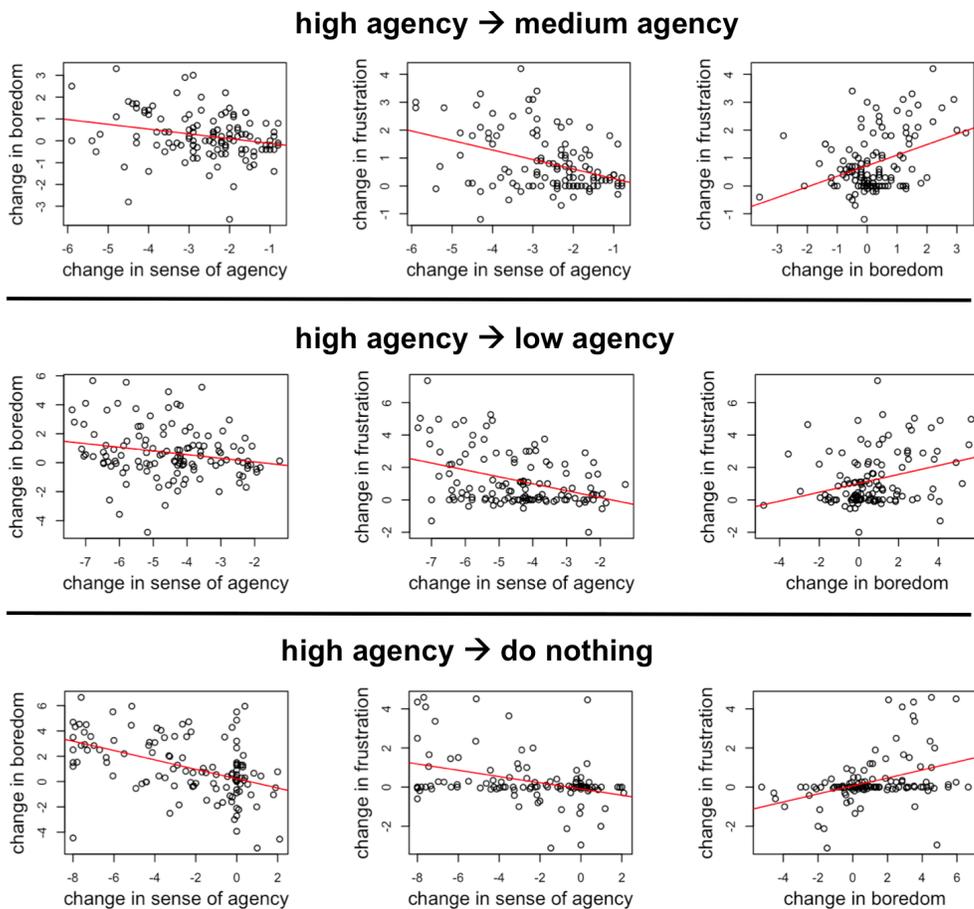


Figure 7. Correlations between changes in experience from one trial type to another. Changes in experiences of agency, boredom, frustration from high agency to each other trial type were correlated.

Table 3

Changes in Experience from High to Medium Agency: Means, Standard Deviations, and Correlations

Variable	<i>M</i>	<i>SD</i>	change in agency	change in boredom
change in agency	-2.61	1.17		
change in boredom	0.23	1.05	-.24**	
change in frustration	0.81	1.03	-.39**	.38**

Note. Ratings were made on a 1-9 scale with higher numbers indicating more of the experience. *M* and *SD* are used to represent mean and standard deviation, respectively. * indicates $p < .05$. ** indicates $p < .01$.

Table 4

Changes in Experience from High to Low Agency: Means, Standard Deviations, and Correlations

Variable	<i>M</i>	<i>SD</i>	change in agency	change in boredom
change in agency	-4.5	1.47		
change in boredom	0.68	1.79	-.21*	
change in frustration	1.21	1.65	-.38**	.30**

Note. Ratings were made on a 1-9 scale with higher numbers indicating more of the experience. *M* and *SD* are used to represent mean and standard deviation, respectively. * indicates $p < .05$. ** indicates $p < .01$.

Table 5

Changes in Experience from High Agency to Doing Nothing: Means, Standard Deviations, and Correlations

Variable	<i>M</i>	<i>SD</i>	change in agency	change in boredom
change in agency	-2.41	2.95		
change in boredom	1.12	2.35	-.46**	
change in frustration	0.29	1.25	-.38**	.39**

Note. Ratings were made on a 1-9 scale with higher numbers indicating more of the experience. *M* and *SD* are used to represent mean and standard deviation, respectively. * indicates $p < .05$. ** indicates $p < .01$.

Individual Differences That Predict Subjective Experience

To further validate these tasks, I explored whether individual differences predict subjective experience during the tasks. Specifically, one can explore whether measures related to boredom proneness and distress tolerance correlate with agency, boredom, and frustration during the tasks.

Traits associated with reported agency in the tasks. None of the self-report measures consistently and significantly correlated with agency ratings across multiple trial types. However, mindfulness was weakly correlated with agency ratings while doing nothing ($r(118) = 0.16, p = 0.08$). Behavioral avoidance also correlated with sense of agency during medium agency ($r(122) = -0.19, p = 0.04$) and weakly correlated during low agency ($r(121) = -0.15, p = 0.1$).

Traits associated with task boredom. Boredom proneness correlated with reported boredom in all trial types such that higher boredom proneness predicted higher reported boredom (high: $r(122) = 0.24$, medium: $r(122) = 0.25$, low: $r(121) = 0.18$, do nothing: $r(118) = 0.23$; all $ps < .05$ except during low agency, $p = 0.05$; Figure 8). Mindfulness negatively correlated with boredom ratings (high: $r(122) = -0.2$, medium: $r(122) = -0.19$, do nothing: $r(118) = -0.23$, all $ps < .05$), though not in the low agency trials (Figure 9). Finally, distress endurance negatively predicted reported boredom (Figure 10) during high ($r(122) = -0.18, p = 0.04$) and medium agency ($r(122) = -0.21, p = 0.02$), and marginally so while doing nothing ($r(118) = -0.16, p = 0.09$). Distress aversion positively predicted reported boredom while doing nothing ($r(118) = 0.22, p = 0.02$; Figure 10).

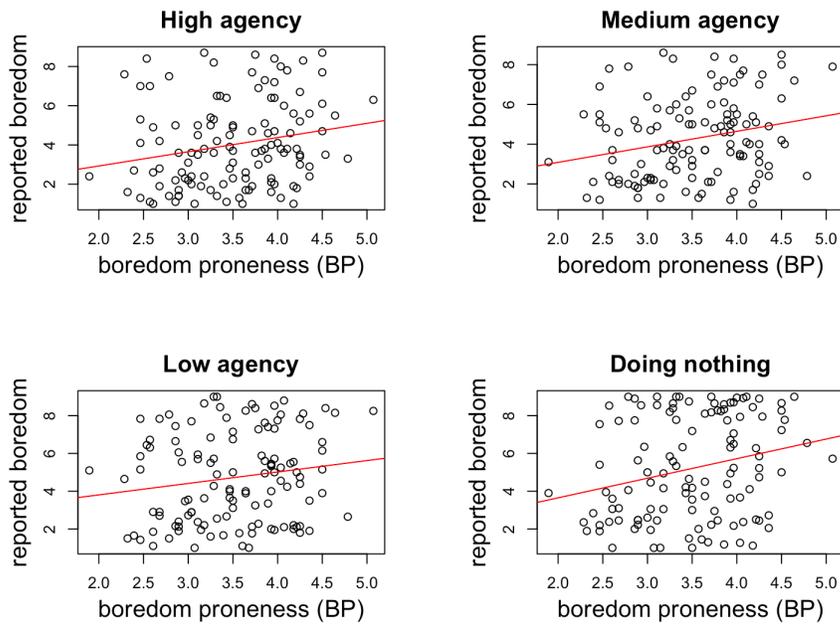


Figure 8. Relationship between boredom proneness and mean reported boredom during each trial type. Higher boredom proneness scores predicted higher reported boredom in all trial types (though weakly so during low agency).

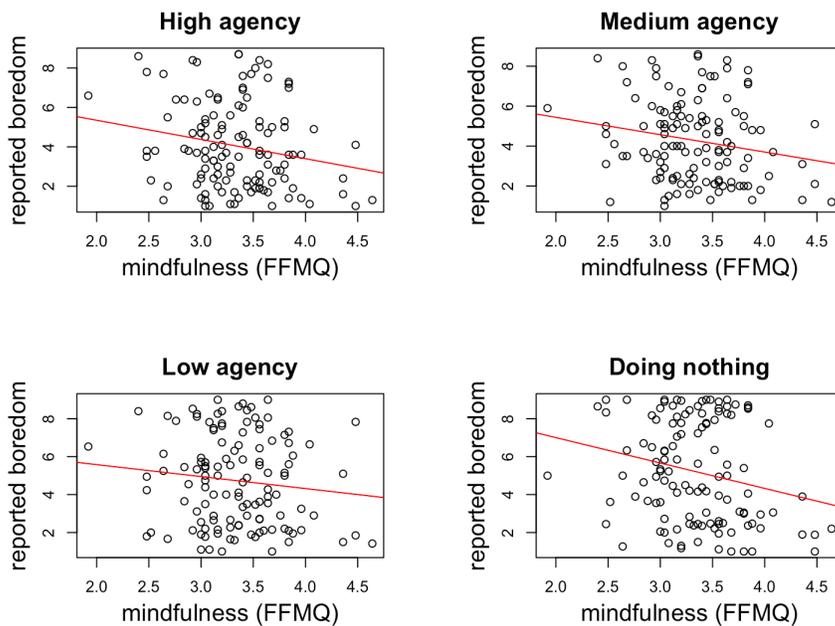


Figure 9. Relationship between mindfulness and mean reported boredom during each trial type. Mindfulness predicted reported boredom in all trial types except low agency.

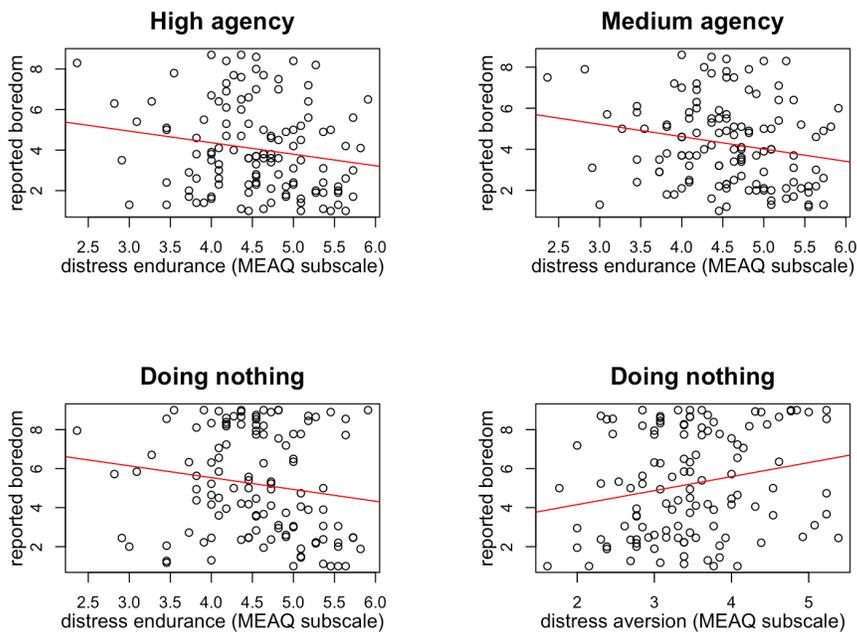


Figure 10. Relationship of distress endurance and aversion subscales with mean reported boredom. Distress endurance was negatively correlated with mean reported boredom for high and medium agency, and weakly negatively correlated while doing nothing. Distress aversion was positively correlated with reported boredom while doing nothing.

Traits associated with task frustration. Boredom proneness positively predicted frustration during all trial types (high: $r(122) = 0.16$, medium: $r(122) = 0.22$, low: $r(121) = 0.17$, do nothing: $r(119) = 0.22$; Figure 11), though marginally so during high agency trials ($p = 0.07$) and low agency trials ($p = 0.06$). Another notable pattern was that many self report measures predicted frustration while doing nothing (boredom proneness: $r(119) = 0.22$, depression: $r(119) = 0.25$, desirability of control: $r(119) = 0.19$, mindfulness: $r(119) = -0.23$, anxiety: $r(119) = 0.40$, and reactance: $r(119) = 0.19$; all $ps < .05$; Figure 12).

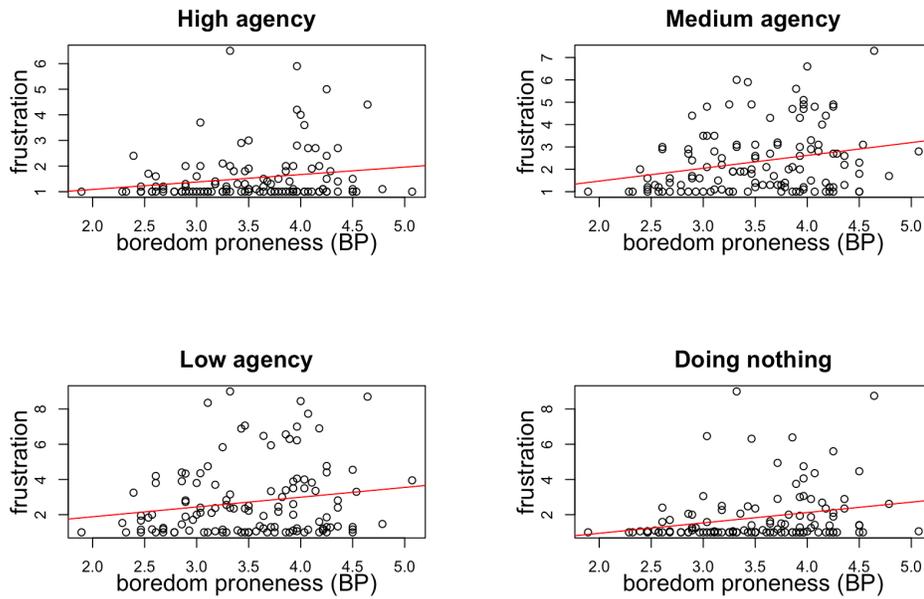


Figure 11. Relationship between boredom proneness and mean reported frustration. Higher boredom proneness scores predicted higher mean reported frustration in all trial types, though weakly so during high and low agency trials.

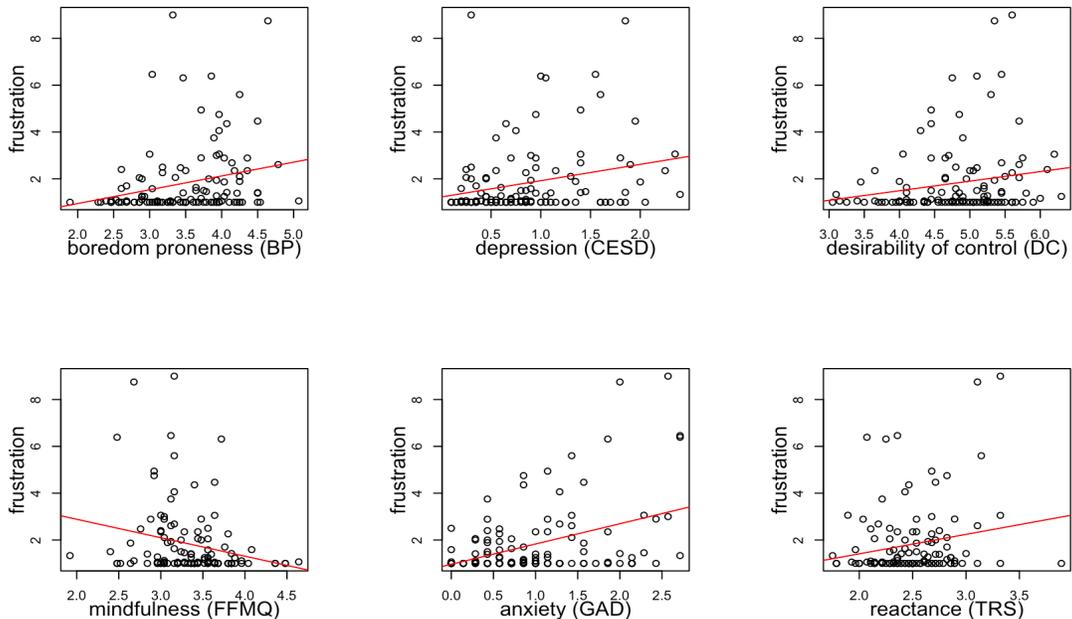


Figure 12. Relationship of individual difference measures with mean reported frustration while doing nothing. Boredom proneness, depression, desirability of control, anxiety, and reactance were positively correlated with mean reported frustration while doing nothing, and mindfulness was negatively correlated with mean reported frustration while doing nothing.

Need for Agency and Action

One of my key hypotheses was that people would be willing to give up at least some money to escape low agency (in the first escape task) and doing nothing (in the second escape task). The paradigm was designed to zero in on the maximum amount of money people would give up to escape lack of agency or action, the amount called the “point of subjective equivalence” (PSE). We therefore tested whether PSEs were greater than zero, on average.

Indeed, in the low agency task, people gave up a mean of 1.52 cents to escape to high agency, and a mean of 0.7 cents to escape to medium agency, both of which were significantly greater than zero ($SDs = 4.29$ and 2.97 , $ts(121) = 3.91$ and 2.59 , $p < .001$ and $p = 0.01$, Cohen’s $ds = .35$ and $.23$). Similarly, while doing nothing, people gave up a mean of 2.12 cents to escape to high agency, and a mean of 1.7 cents to escape to medium agency, both of which were significantly greater than zero ($SDs = 5.98$ and 5.68 , $ts(121) = 3.92$ and 3.3 , $p < .001$ and $p = 0.001$, Cohen’s $ds = .36$ and $.30$). Note that gender did not predict PSEs, nor did it predict whether or not people gave up any money.

Individual Differences That Predict Need for Agency and Action

Next I tested whether any individual differences were associated with need for agency and action (as indicated by PSEs). Recall that need for agency is measured as the amount of money participants are willing to give up to escape from low agency to high or medium agency, and need for action is the amount of money participants are willing to give up to escape from doing nothing to high or medium agency. To simplify the analyses, I only looked at the PSEs for escaping to high agency for each of the two escape tasks.

There are several potential approaches for exploring how individual differences are associated with PSEs. To start, traditional linear regression can be used. However, linear regression assumes that error is normally distributed around zero, but my dependent variable (PSE) is positively skewed, reducing the likelihood that error will be distributed as expected. Additionally, PSEs take on non-negative integer values only, with many zeros and sporadic non-zero values (Figure 13). In these cases, alternative approaches such as Poisson regression and negative binomial regression are appropriate. Because the PSEs are “overdispersed,” meaning the variance is much larger than the mean, I use negative binomial regression, because Poisson regression assumes equal mean and variance.

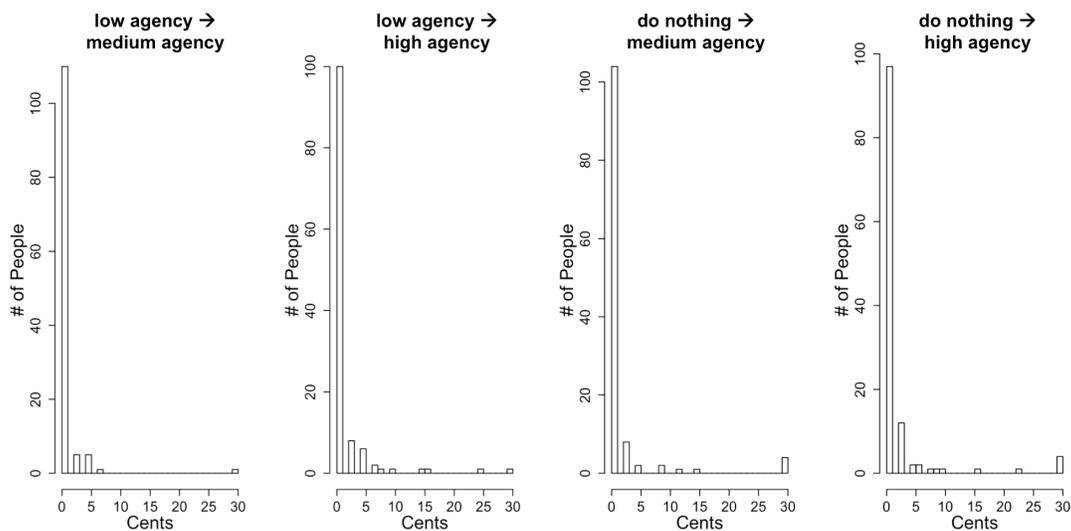


Figure 13. Histogram of points of subjective equivalence (PSEs) for each task and each escape option (high or medium agency). PSEs indicate the maximum amount of money a person is willing to forego to escape from the primary task (low agency or do nothing) to high or medium agency.

Because of the non-normality of the PSE distribution, a third way to look at predictors of PSEs is to treat PSE as a two-level categorical variable, where those who did not give up money are coded as 0s and those who give up at least 1 cent are coded as

1 (Figure 14). In this case, logistic regression is used to predict the binary outcome. Logistic regression uses an exponentiated linear equation to predict odds of giving up money versus not giving up money. I therefore report exponentiated coefficients to indicate the extent to which the odds of giving up money increase multiplicatively with each unit increase in the predictor.

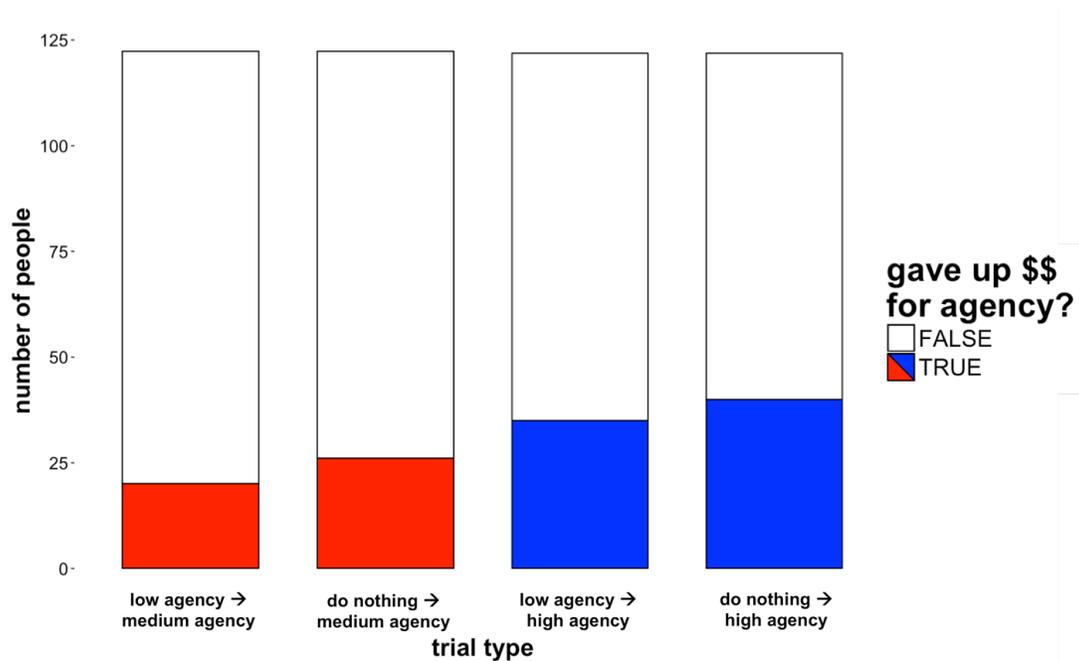


Figure 14. Number of people who gave up money in each escape task (low agency or do nothing), for each escape option (high or medium agency).

For both negative binomial and logistic regression, model parameters are estimated using maximum likelihood estimation. The chi-square statistic reported for each of these types of models is a test of whether adding the predictor in question to the model significantly reduces the deviance resulting from maximum likelihood estimation.

Linear regression. None of the individual differences were significantly correlated with need for agency or action, but experiential avoidance (AAQ) was weakly correlated with need for agency ($r(121) = 0.17, p = 0.07$; Figure 15) and with need for

action ($r(121) = 0.15, p = 0.1$; Figure 15). Depression was also weakly correlated with need for action ($r(121) = 0.16, p = 0.07$; Figure 16).

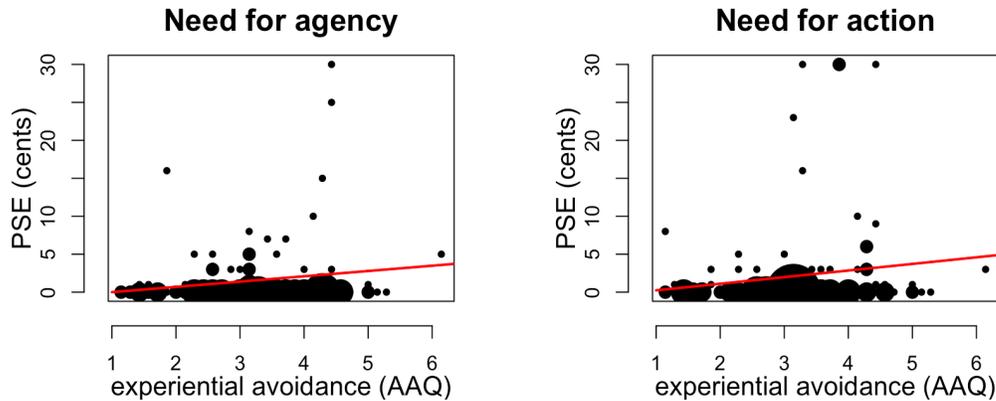


Figure 15. Experiential avoidance (AAQ) weakly predicts need for agency and need for action using traditional linear regression. Need for action and need for agency are measured as the point of subjective equivalence (PSE) in each escape task (low agency/escape task and do nothing/escape task). Those with higher experiential avoidance scores gave up more money to avoid low agency (left panel) or to avoid doing nothing (right panel). The size of each point on each graph is scaled to represent the number of data points at that location.

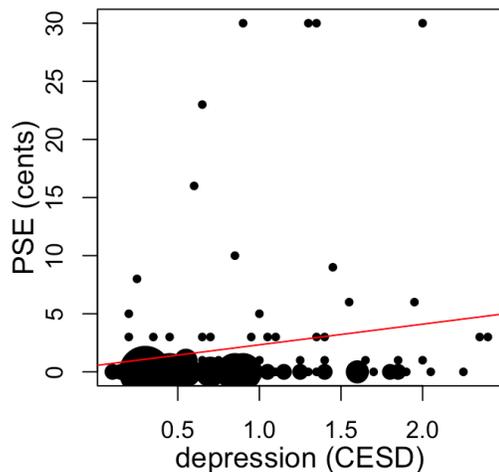


Figure 16. Depression weakly predicts need for action using traditional linear regression. Need for action is measured as the point of subjective equivalence (PSE) in the do nothing/escape task. Those with higher depression scores gave up more money to avoid doing nothing. The size of each point on the graph is scaled to represent the number of data points at that location.

Although experiential avoidance was marginally correlated with both need for agency and need for action, a traditional linear regression approach does not appear to be appropriate here. It is evident that the regression line does not pass through the center of the data, meaning the error is not normally distributed around zero (Figure 15). I therefore use negative binomial regression to further explore these relationships.

Negative binomial regression. Using negative binomial regression, experiential avoidance marginally predicted need for agency ($e^b = 1.61, \chi^2(1) = 3.65, p = 0.06$; Figure 17) and significantly predicted need for action ($e^b = 1.74, \chi^2(1) = 4.32, p = 0.04$; Figure 17). Mindfulness also marginally predicted need for agency ($e^b = 0.33, \chi^2(1) = 2.97, p = 0.08$; Figure 18). Note that an exponentiated coefficient (e^b) indicates how much the dependent variable (need for agency or action) increases multiplicatively with each unit increase in the predictor (experiential avoidance or mindfulness).

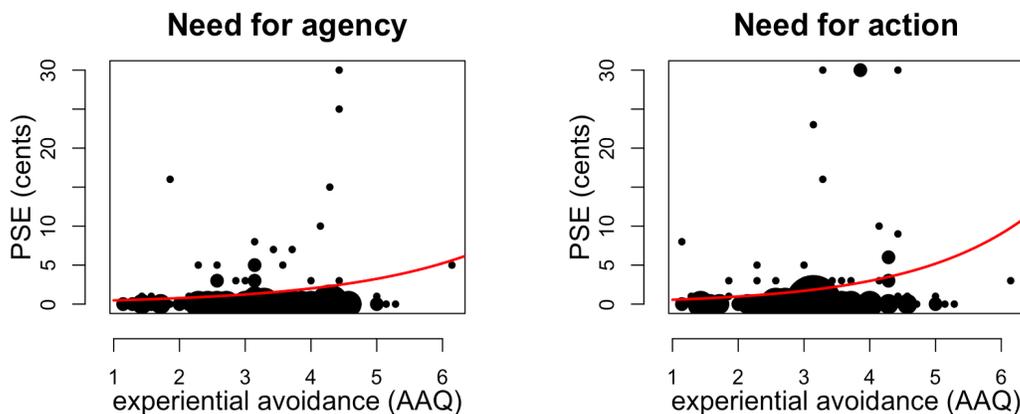


Figure 17. Using negative binomial regression, experiential avoidance (AAQ) predicts need for agency and need for action. Need for action and need for agency are measured as the point of subjective equivalence (PSE) in each escape task (low agency/escape task and do nothing/escape task). Those with higher experiential avoidance scores gave up more money to avoid low agency (left panel) or to avoid doing nothing (right panel). The size of each point on each graph is scaled to represent the number of data points at that location.

Logistic regression. Using logistic regression, depression significantly predicted the odds of giving up money to avoid doing nothing ($e^b = 2.04$, $\chi^2(1) = 4.20$, $p = 0.04$), and experiential avoidance ($e^b = 1.43$, $\chi^2(1) = 3.44$, $p = 0.06$) and anxiety ($e^b = 1.68$, $\chi^2(1) = 3.70$, $p = 0.05$) did so marginally (Figure 19). Note that for logistic regression, an exponentiated coefficient (e^b) indicates how much the odds of giving up money increases multiplicatively with each unit increase in the predictor (experiential avoidance, depression, or anxiety).

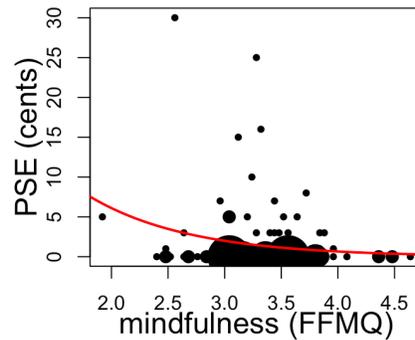


Figure 18. Using negative binomial regression, mindfulness (FFMQ) predicts need for agency. Need for agency is measured as the point of subjective equivalence (PSE) in the low agency/escape task. Those with lower mindfulness scores gave up more money to avoid low agency. The size of each point on each graph is scaled to represent the number of data points at that location.

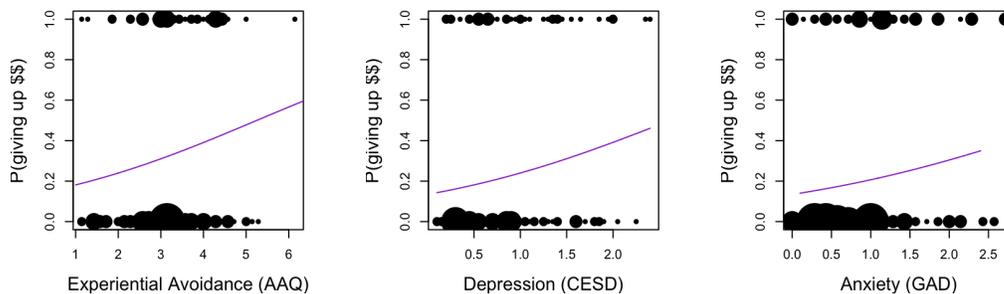


Figure 19. Probability of giving up money to escape from doing nothing increases with experiential avoidance, anxiety, and depression. Logistic regression revealed that higher experiential avoidance, anxiety, and depression scores increased the probability of giving up money to avoid doing nothing by escaping to high agency. The size of each point on each graph is scaled to represent the number of data points at that location.

Subjective Experiences That Predict Need for Agency and Action

The extent to which people felt highly bored, low in agency, or highly frustrated during the tasks might have predicted how much money they were willing to give up to escape the experience. I therefore tested whether any of these subjective experience ratings predicted need for agency or action. I use only negative binomial regression and logistic regression here, having seen that the traditional linear regression is inappropriate given the distribution of our dependent variable.

Negative binomial regression. If there are many proportionally more zeros than usual (meaning people are generally not willing to give up any money, in our case), zero-inflated negative binomial regression may be used. This approach assumes there are two processes leading to excessive zeros: one process that determines whether or not someone gives up money, and one that determines the amount of money they give up. The Vuong test is a test of fit that can be used to determine whether the regular or zero-inflation model has better fit. The analyses below use zero-inflation because the Vuong test confirmed that there was better fit with zero-inflation. Note that zero-inflation was not used for the above analyses, again because of the results of the Vuong test.

Sense of agency and boredom during low agency predict need for agency. I used zero-inflated negative binomial regression to predict PSEs from subjective experience ratings during low agency. Baseline sense of agency ratings during low agency significantly predicted need for agency ($e^b = 1.51, z = 2.19, p = 0.03$; Figure 20), and raw boredom ratings marginally predicted need for agency ($e^b = 0.77, z = -1.91, p = 0.06$; Figure 20). Counter to the intuitive expectation, smaller decreases in sense of agency and

lower levels of boredom predicted willingness to give up money to avoid low agency.

Frustration did not predict need for agency.

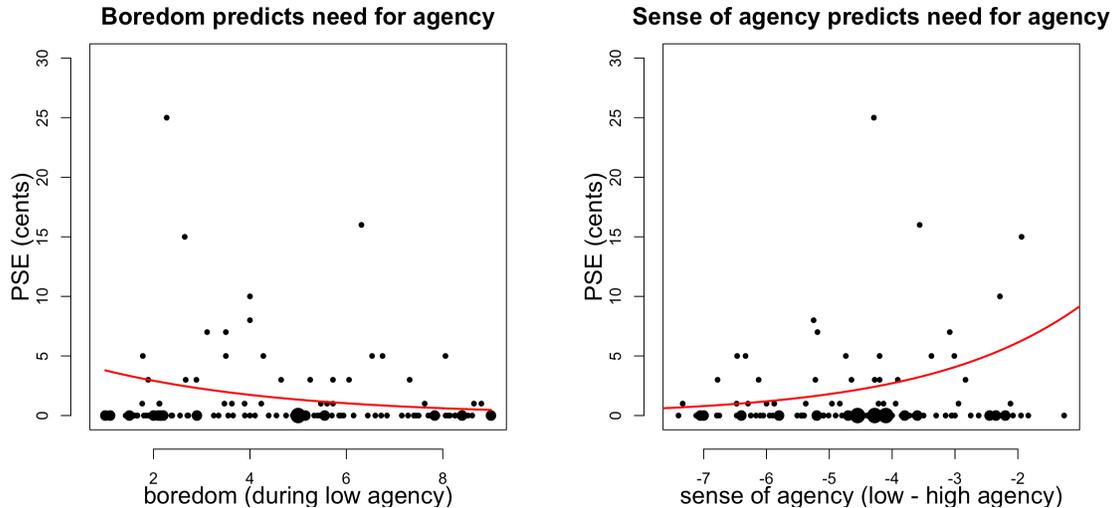


Figure 20. Subjective experience during low agency predicts need for agency, using zero-inflated negative binomial regression. Counter to expectation, those who experienced less boredom and smaller decreases in sense of agency gave up more money to escape low agency.

Sense of agency while doing nothing predicts need for action. I again used zero-inflated negative binomial regression to predict need for action from agency, boredom, and frustration while doing nothing. Only sense of agency while doing nothing predicted need for action, such that lower sense of agency predicted higher need for action. Specifically, the raw agency scores predicted need for action significantly ($e^b = 0.84$, $z = -2.08$, $p = 0.04$; Figure 21), and the baselined agency scores predicted need for action marginally ($e^b = 0.85$, $z = -1.86$, $p = 0.06$; Figure 21).

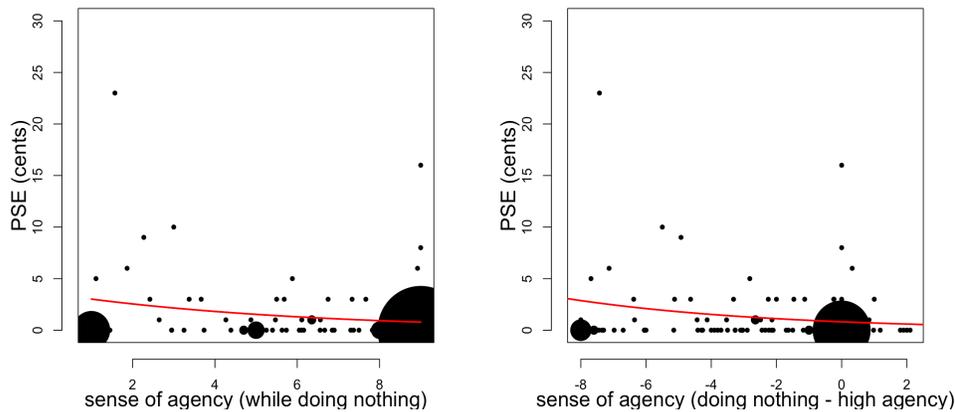


Figure 21. Sense of agency while doing nothing predicts need for action. Zero-inflated negative binomial regression revealed that a lower sense of agency, raw or baselined, predicted giving up more money to avoid doing nothing by escaping to high agency. The size of each point on each graph is scaled to represent the number of data points at that location.

Logistic regression. Sense of agency, boredom, and frustration did not significantly predict the odds of giving up money during low agency or while doing nothing. However, I found that frustration marginally predicted the odds of giving up money while doing nothing such that more frustration predicted higher odds of giving up money (Figure 22). This relationship was present using both raw frustration ratings ($e^b = 1.26, \chi^2(1) = 3.35, p = 0.07$) and baselined frustration ratings ($e^b = 1.33, \chi^2(1) = 3.29, p = 0.07$).

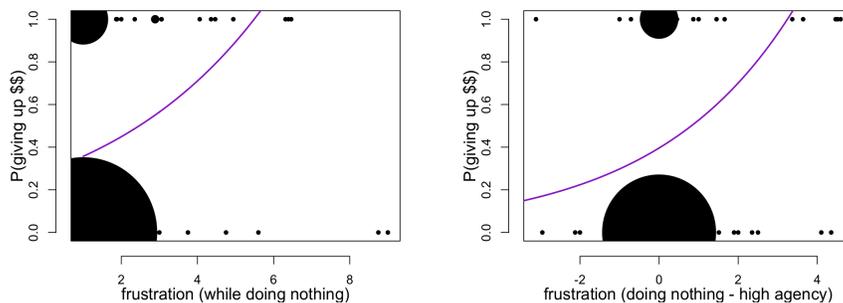


Figure 22. Probability of giving up money to escape from doing nothing increases with frustration. Logistic regression revealed that those who experiences more raw or baselined frustration while doing nothing were more likely to give up money by escaping to high agency. The size of each point on each graph is scaled to represent the number of data points at that location.

Interactions. I also explored whether certain individual differences predisposed participants to make different decisions in response to their subjective experience. The most notable interactions existed between experiential avoidance and subjective experience while doing nothing; while doing nothing, those higher in experiential avoidance demonstrated higher likelihood to give up money in response to low agency and high boredom. Specifically, those higher in experiential avoidance were more likely to give up money while doing nothing if they experienced lower sense of agency, using both raw agency ratings ($e^b = 0.88, \chi^2(1) = 3.35, p = 0.07$; Figure 23) and baselined agency ratings ($e^b = 0.87, \chi^2(1) = 3.47, p = 0.06$; Figure 23), though the significance level was above threshold. They also appeared to be more likely to give up money while doing nothing if they experienced more boredom while doing nothing ($e^b = 1.26, \chi^2(1) = 7.14, p = 0.008$; Figure 24).

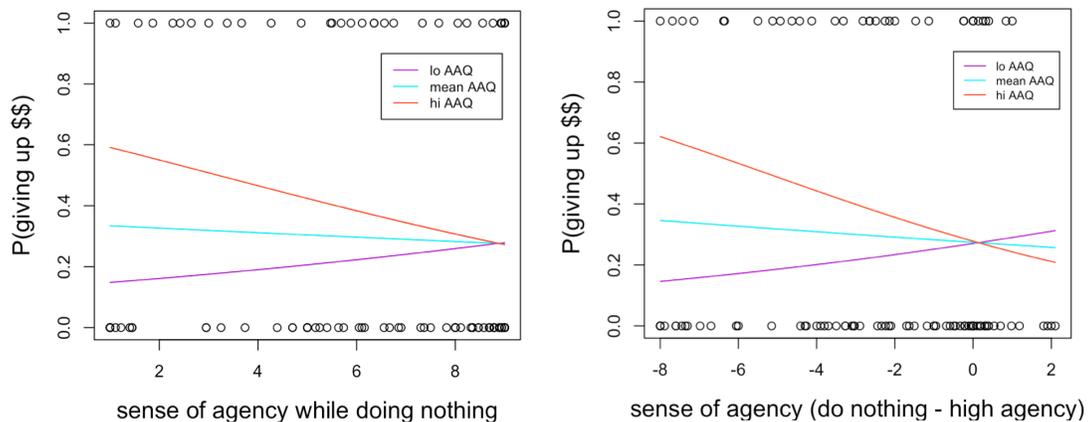


Figure 23. Experiential avoidance (AAQ) and sense of agency while doing nothing interact to predict the likelihood of giving up money to avoid doing nothing. Those high in experiential avoidance had a higher likelihood of giving up money to avoid doing nothing when they felt a lower sense of agency, raw or baselined.

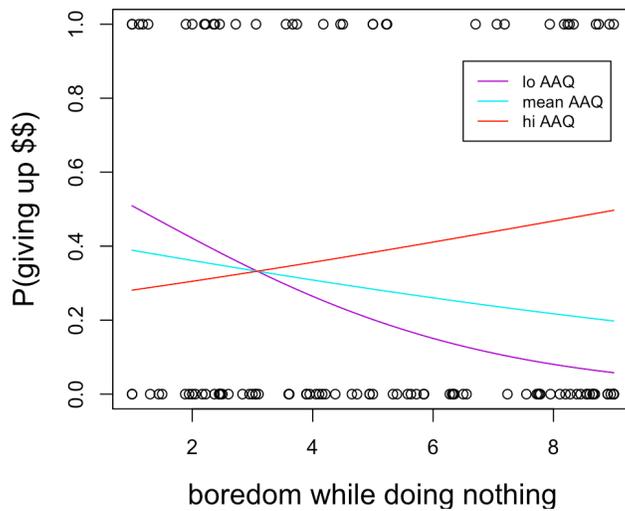


Figure 24. Experiential avoidance (AAQ) and boredom while doing nothing interact to predict the likelihood of giving up money to avoid doing nothing. Those high in experiential avoidance had a higher likelihood of giving up money to avoid doing nothing when they felt a higher level of boredom.

Relationship Between Need for Agency and Need for Action

I expected that need for agency and need for action would be highly overlapping constructs, if not completely overlapping. Therefore, I also examined the relationship between need for agency and need for action. Because both variables are so highly skewed, I treated them both as categorical variables and conducted a chi-squared test of independence. Indeed, need for agency and need for action are not independent ($X^2(1) = 19.76, p < .0001$). See Table 6 for observed contingencies.

Table 6
Contingency Table for Giving Up Money in Each Escape Task

	Did not escape doing nothing	Escaped doing nothing	Total
Did not escape low agency	68	18	86
Escaped low agency	13	22	35
Total	81	40	121

Keypress Results

As level of agency decreased, people made fewer keypresses on average (Figure 25). This is to be expected, because lower agency trials had longer latencies between keypresses and movements, preventing people from making as many keypresses per trial. When people escaped to high or medium agency, they made a similar number of keypresses as they did in the high and medium agency trials.

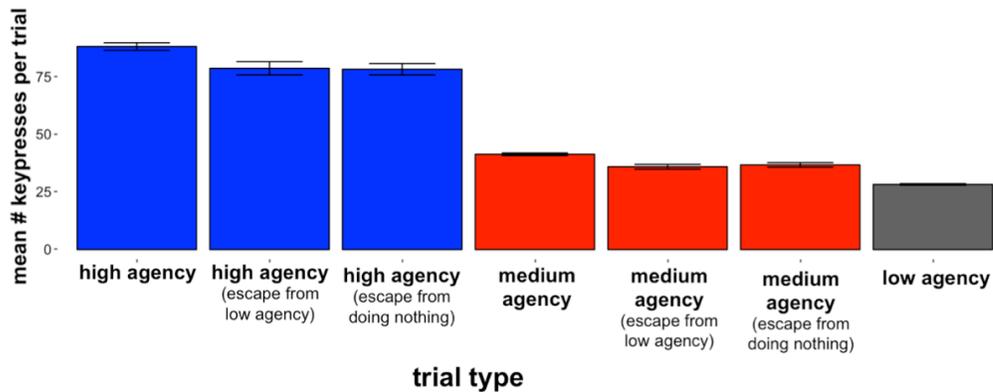


Figure 25. Mean number of keypresses made during each trial type.

Individual Differences That Predict Keypresses

None of the self report measures correlated with the mean number of keypresses made in any trial type.

Subjective Experiences and Keypresses

Correlations between sense of agency and keypresses. Sense of agency during medium agency and while doing nothing was related to the number of keypresses made in those conditions (Figure 26). Specifically, those who felt lower sense of agency during medium agency made more keypresses ($r(122) = -0.19, p = 0.04$), and those who felt a lower sense of agency while doing nothing also made more keypresses after escaping to

high agency, using both raw agency ratings ($r(82) = -0.26, p = 0.02$) and baselined agency ratings ($r(82) = -0.28, p = 0.01$).

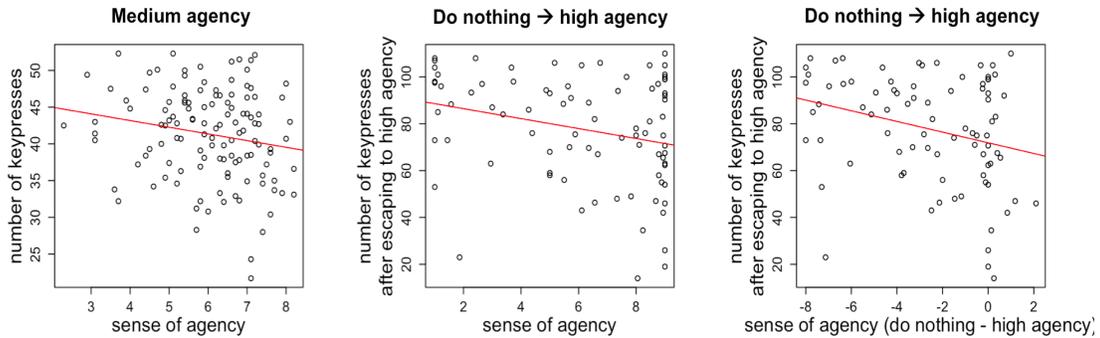


Figure 26. Relationship between mean sense of agency and mean number of keypresses made in each trial type. Mean sense of agency was positively correlated with mean number of keypresses for medium agency, and mean sense of agency while doing nothing positively correlated with mean keypresses made after escaping from doing nothing to high agency, whether raw or baselined sense of agency scores were used.

Correlations between boredom and keypresses. Average boredom ratings were also correlated with average number of keypresses in all trial types (Figure 27).

Specifically, people who were more bored also made more keypresses in the high ($r(122) = 0.22, p = 0.01$), medium ($r(122) = 0.25, p = 0.01$), and low agency trials ($r(121) = 0.22, p = 0.01$). Furthermore, people who were more bored while doing nothing made more keypresses after escaping to high agency ($r(82) = 0.21, p = 0.05$).

Correlations between frustration and keypresses. Frustration was not related to the number of keypresses made in any trial type.

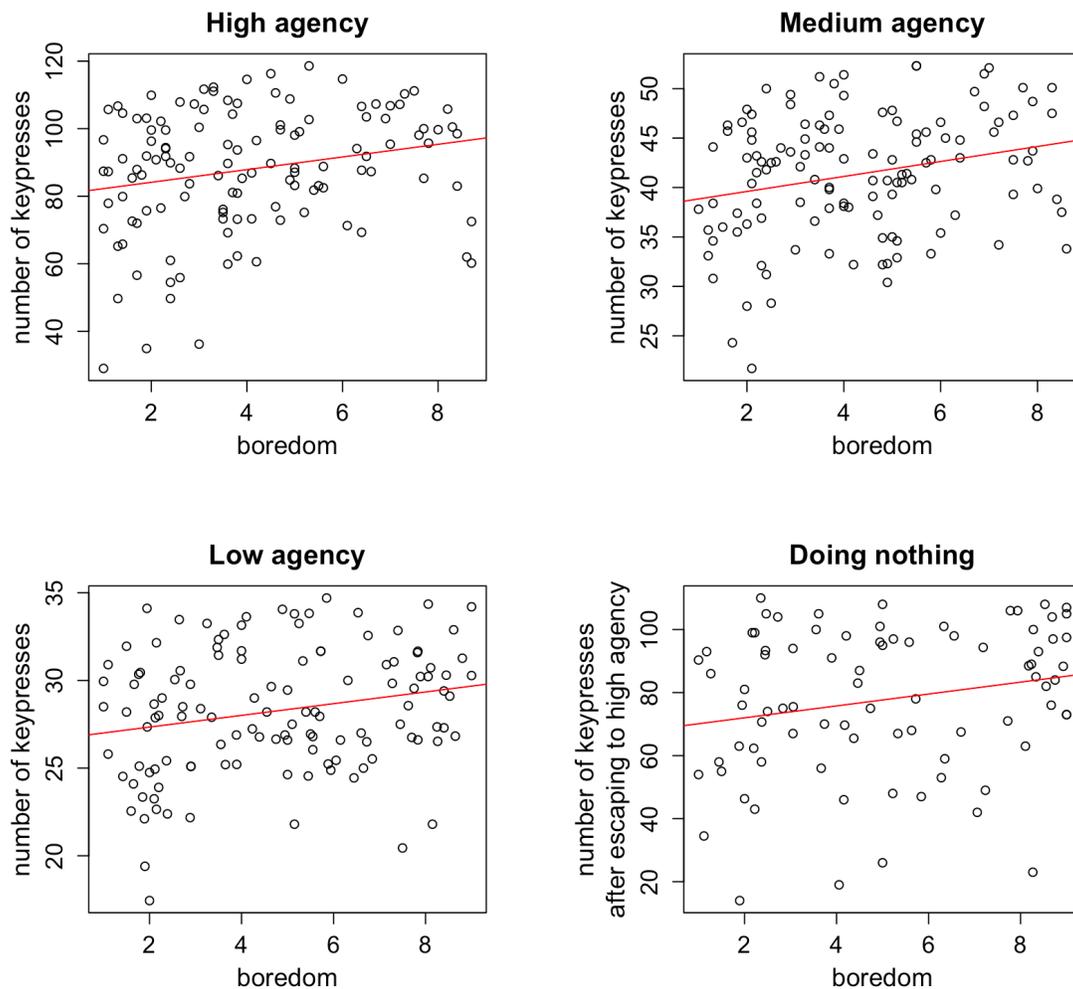


Figure 27. Relationship between mean boredom and mean number of keypresses made in each trial type. Mean boredom was positively correlated with mean number of keypresses for high, medium, and low agency, and mean boredom while doing nothing positively correlated with mean keypresses made after escaping from doing nothing to high agency.

Using timecourse data to understand relationships between subjective experience and keypresses. The direction of causality in the relationships between ratings and keypresses is unclear from the above analyses. For example, people may have made more keypresses because they were bored, or they may have become more bored after making more keypresses. The same is true for the relationship between sense of agency and keypresses. Thus, I further explore these relationships by examining the

relationship between keypresses on a given trial and the resulting subjective experience, which was assessed later in that trial. I will also explore whether subjective experience on a given trial predicts the number of keypresses made on the following trial. Note that I will only explore high, medium, and low agency for these analyses, as participants made no keypresses while doing nothing.

In general, people’s ratings of agency and frustration stayed fairly steady throughout each task. Boredom seemed to steadily increase in high, medium, and low agency, but stayed fairly steady while doing nothing (Figure 28).

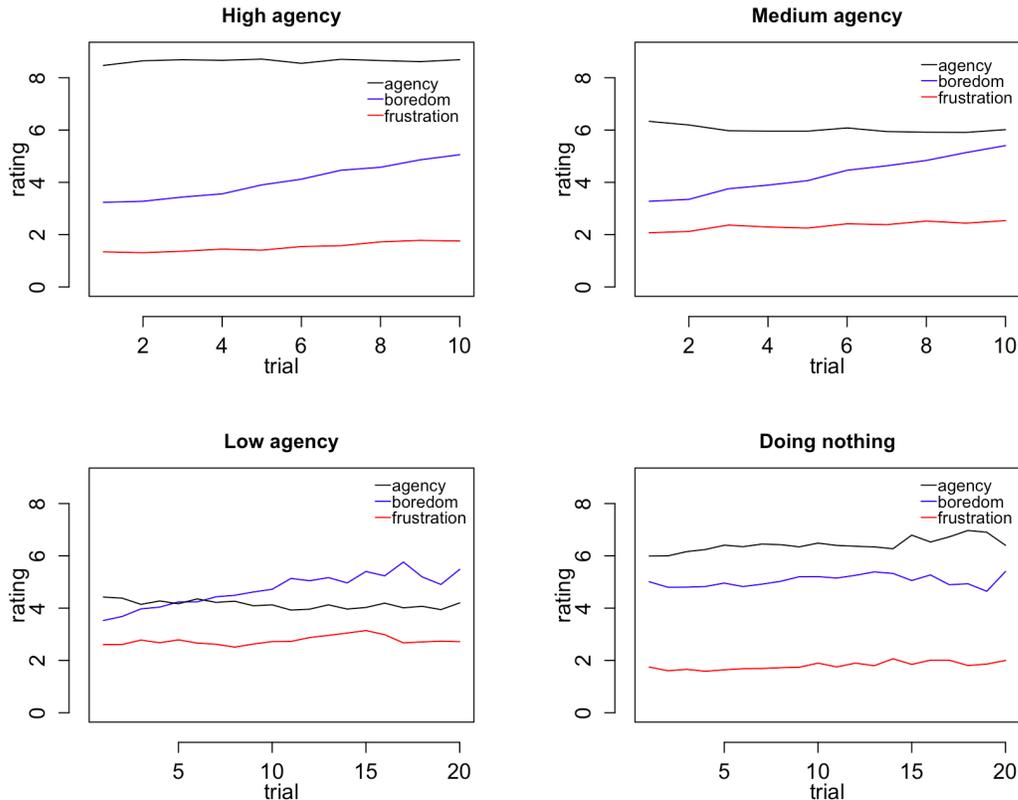


Figure 28. Timecourses for subjective experiences in each trial type. Agency, boredom, and frustration were rated on a 1-9 scale where higher scores indicated more of the experience.

Do keypresses predict subsequent ratings? Multilevel modeling was used to test whether more keypresses on a given trial resulted in higher sense of agency, boredom,

and frustration ratings during high, medium, and low agency. These models represent a time series of trials “nested” within participants, so they allow for the simultaneous examination of within-subjects trial-by-trial data and comparisons of trial-wise effects across subjects. Furthermore, if keypresses are really changing people’s experience of agency, boredom, and frustration, then more keypresses should lead to more increases (or decreases) in each rating compared to the trial before. We therefore also tested whether keypresses predicted changes in ratings from the prior trial to the current trial.

High agency. During high agency, number of keypresses predicted sense of agency and boredom in each trial, such that more keypresses led to higher sense of agency ($t(1148.21) = 3.45, p = 0.001$; Figure 29) and more boredom ($t(1218.35) = 2.52, p = 0.01$; Figure 29). Keypresses were not related to changes in sense of agency, boredom, or frustration. This suggests a functional role of keypressing such that engaging in this behavior restored agency.

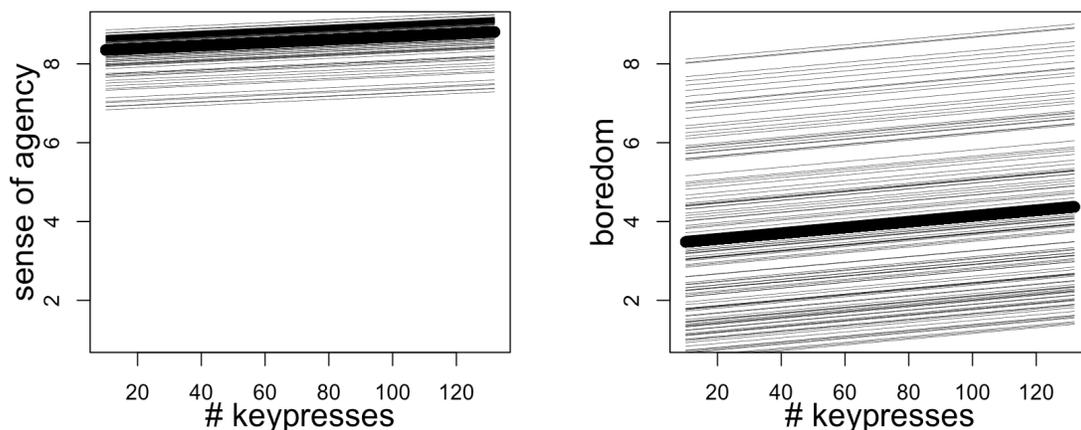


Figure 29. During high agency, number of keypresses predicted subsequent sense of agency and boredom. Trials where participants made more keypresses resulted in higher ratings of agency and boredom immediately following the trial. Agency and boredom were rated on a 1-9 scale where higher scores indicated more of the experience. Multilevel models were used where slope was held constant and intercepts were allowed to vary randomly for each subject. Thin lines on each graph represent the predictions for each subject; the thick line represents the mean prediction.

Medium agency. During medium agency, number of keypresses predicted sense of agency, boredom, and frustration on each trial, such that more keypresses led to lower sense of agency ($t(1212.9) = -4.39, p < .0001$), higher boredom ($t(1211.64) = 4.23, p < .0001$), and higher frustration ($t(1211.86) = 2.06, p = 0.04$). Keypresses also predicted change in each of these ratings, such that more keypresses led to decreases in sense of agency ($t(1185.08) = -3.6, p < .001$), increases in boredom ($t(1193.47) = 2.28, p = 0.02$), and increases in frustration ($t(1227.82) = 2.03, p = 0.04$) compared to the trial prior (Figure 30). Note that because medium and high agency were interleaved in the initial orientation task, the trial prior could have been medium agency or high agency.

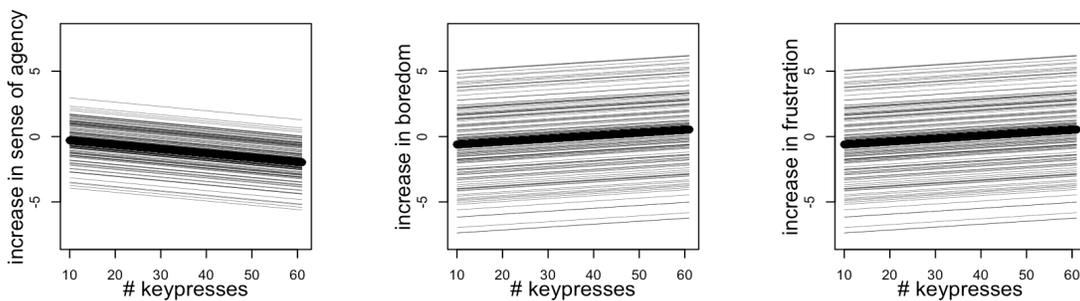


Figure 30. During medium agency, number of keypresses predicted subsequent change in sense of agency, boredom, and frustration. Trials where participants made more keypresses resulted in lower ratings of agency and higher levels of boredom and frustration immediately following the trial. Agency, boredom, and frustration were rated on a 1-9 scale where higher scores indicated more of the experience. Multilevel models were used where slope was held constant and intercepts were allowed to vary randomly for each subject. Thin lines on each graph represent the predictions for each subject; the thick line represents the mean prediction.

Low agency. During low agency, number of keypresses predicted lower sense of agency ($t(2242) = -4.92, p < .0001$). Number of keypresses also predicted a decrease in sense of agency from the trial prior ($t(2055.25) = -2.68, p = 0.01$; Figure 31).

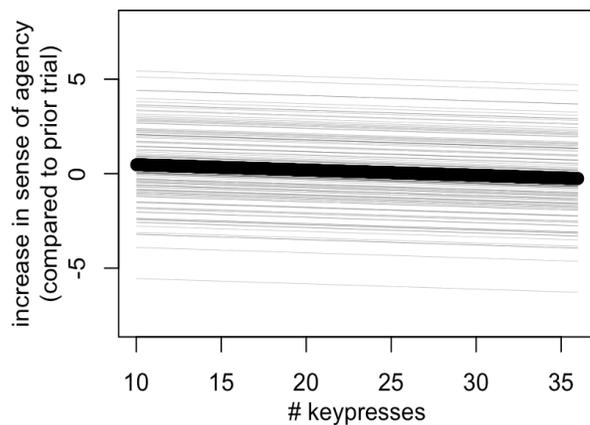


Figure 31. During low agency, number of keypresses predicted subsequent change in sense of agency. Trials where participants made more keypresses resulted in bigger decreases in ratings of agency immediately following the trial. Agency was rated on a 1-9 scale where higher scores indicated more of the experience. A multilevel model was used where slope was held constant and intercepts were allowed to vary randomly for each subject. Thin lines on the graph represent the predictions for each subject; the thick line represents the mean prediction.

Summary. Keypresses appear to have a strong effect on sense of agency, and some effects on boredom and frustration. In high agency, more keypresses lead to a higher sense of agency, but in medium and low agency, more keypresses lead to a lower sense of agency. More keypresses induced higher boredom in high and medium agency, but not low agency. Keypresses increased frustration during only medium agency, perhaps because they were interleaved with the very agentic high agency trials.

Do prior ratings predict subsequent keypresses? Sense of agency, boredom, and frustration did not predict keypresses on the trial following. In other words, on average, people did not respond to their subjective experience by pressing more keys.

Interactions of subjective experience and individual differences. I also explored whether some people are more predisposed to react to their sense of agency, boredom, and frustration by pressing more keypresses on the trial following. Furthermore, if keypressing is a functional behavior intended to reduce an aversive experience (e.g., low

agency, boredom, or frustration), then for those particular people, those aversive experiences should be reduced on the trials following.

Indeed, it appears that during high agency, those who are low in mindfulness react to low sense of agency by pressing more keys on the following trials ($t(1141.94) = 2.51$, $p = 0.01$; Figure 32). Interestingly, for those low in mindfulness, more keypresses are followed by increases in sense of agency ratings ($t(763.29) = -3.06$, $p = 0.002$; Figure 32). Therefore, keypresses during high agency do seem to restore a sense of agency for those who are lower in mindfulness. The same pattern is evident for those higher in boredom proneness, higher in depression, and lower in desirability of control, such that they make more keypresses in response to lower sense of agency, and the high number of keypresses successfully restores sense of agency.

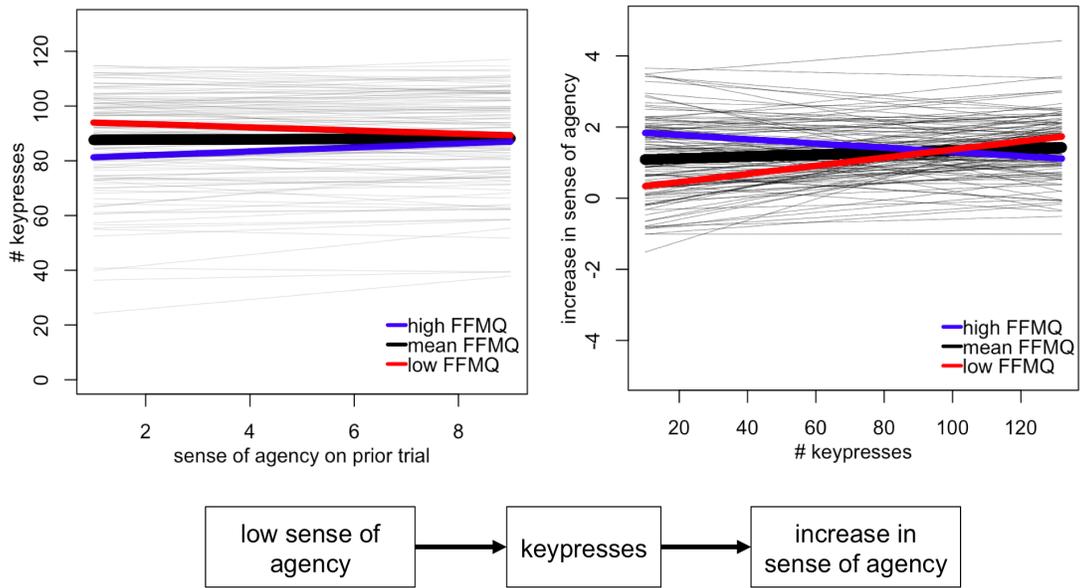


Figure 32. Functional role of keypresses during high agency, for those low in mindfulness. During high agency, for those low in mindfulness (FFMQ), sense of agency predicted number of keypresses such that a lower sense of agency on a given trial predicted more keypresses on the trial following. Number of keypresses also predicted subsequent change in sense of agency such that more keypresses predicted an increase in agency on the trial following (for those low in mindfulness). Agency was rated on a 1-9 scale where higher scores indicated more of the experience. A multilevel model was used where intercepts, but not slopes, were allowed to vary randomly for each subject (although slopes did vary as a function of mindfulness). Thin lines on the graph represent the predictions for each subject; the thick line represents the mean prediction for high, mean, and low mindfulness.

CHAPTER IV

DISCUSSION

Summary

The purpose of my dissertation study was to test the hypothesis that people generally have a need for agency and action. I found that people indeed demonstrated a need for agency and a need for action, and that these two constructs are highly related. Furthermore, experiential avoidance predicted both greater need for agency and need for action, and mindfulness reduced predicted need for agency. Sense of agency predicted need for action, suggesting that the motivation to escape from doing nothing is driven by a need to restore agency. Finally, experiential avoidance moderated the effect of boredom and agency on need for action, such that more avoidant individuals were willing to give up more money in order to avoid high boredom and low agency experienced while doing nothing.

Additionally, analyses of keypress behavior suggest a functional account of agency-seeking. During high agency, those low in mindfulness used keypresses as a functional way of increasing their sense of agency when it was reduced. Finally, those who felt less agency and more boredom while doing nothing made more keypresses when they escaped to high agency. Because more keypresses lead to higher sense of agency during high agency, this also suggests a functional account of keypresses after escaping from doing nothing.

These results are compelling for several reasons. First, they suggest that need for agency does exist, and that it drives the motivation to escape from doing nothing. For

example, those who chose to shock themselves over doing nothing in the study by Wilson and colleagues (2014) may have been trying to restore a sense of agency. In addition, this study conceptually replicates the Wilson study by showing that people will incur personal costs to avoid doing nothing; in the case of Wilson, they chose to administer shocks that they said they would pay to avoid; in the present study, they chose to earn less money to avoid doing nothing. Furthermore, the roles of experiential avoidance and mindfulness on behavior in these tasks extend the clinical theory discussed in Chapter 1 to a new realm: the avoidance of boredom and suboptimal agency. I will discuss these implications in detail below.

The Relationship Between Boredom and Agency

This study was a first step at determining the role of need for agency in driving our aversion to boredom. This required first determining whether sense of agency was a need at all, which I did by exploring whether a low agency task provoked agency-seeking, deriving each person's "need for agency" from their agency-seeking behavior. To further examine whether a lack of agency drives our aversion to classically "boring" situations, I explored whether a face valid boring task – doing nothing – would similarly provoke agency-seeking. Because I did not know a priori whether doing nothing would be considered low in agency or high in boredom, or whether the degree of low agency would drive escape behavior, I called this measure "need for action," since their behavior demonstrated an avoidance of doing nothing, whether or not agency or boredom were involved. I also could have called it "boredom avoidance," since the task was designed to be boring. Thus the question remains: are need for agency and need for action the same thing? Do people avoid boredom as a means of restoring a sense of agency?

To start, I observed several important relationships between boredom and agency. Boredom increased as agency decreased; the lower agency trials were rated as more boring than the high and medium agency trials. Furthermore, decreases in agency ratings from one trial type to another were accompanied by increases in boredom. But what happens as agency decreases and boredom increases? How does motivation to restore agency relate to the avoidance of boredom?

At the very least, I found that agency-seeking and boredom avoidance were not independent; those who chose to escape from low agency were also more likely to escape from doing nothing, presumably because of boredom. The more compelling result is that the lower the sense of agency participants felt while doing nothing, the more money they were willing to forego to escape from doing nothing. In other words, the motivation to escape from doing nothing may indeed be a desire to return to an optimal sense of agency.

The novel implication is that boring situations may be aversive because of the degree of low agency they afford, or more precisely, when they afford a suboptimal sense of agency. Recall that boredom experiences are somewhat heterogeneous, varying in the degree of aversiveness, for example (Goetz et al., 2014). Boring situations which are not perceived to be highly aversive are not likely those which motivate problematic avoidance behaviors; for example, the more aversive a boring situation is, the higher the arousal bored people will experience, suggesting a motivation to escape (Goetz et al., 2014). Furthermore, Goetz and colleagues suggest that more aversive boredom experiences often occur in situations with less freedom or control, for example, in academic achievement settings (2014). The results from this study confirm this by

demonstrating that when bored, the less agentic a person feels (and likely, the more aversive the boredom feels), the more motivated they are to escape from the situation, even at a cost. Therefore, even if boredom does not always induce a suboptimal sense of agency, when it does, it is likely to be aversive and motivate avoidance behavior.

Integrating Results with Clinical Approaches

Our study was partially inspired by recent clinical approaches addressing problem behaviors. In particular, therapies including DBT and ACT construe many detrimental behaviors as efforts to avoid negative internal experiences, and use an accepting stance toward those negative experiences, finding success with mindfulness-based strategies. Thus, although we collected an inventory of self-report measures loosely related to boredom and agency, experiential avoidance and mindfulness were most relevant to these clinical inspirations. Thus, I investigated specifically whether experiential avoidance and mindfulness were related to agency-seeking behavior, with the thought that those who were more avoidant and less mindful might be less willing to endure a deficit in agency.

Experiential Avoidance Predicts Escape Behavior

The construct of experiential avoidance is exactly what it sounds like: the avoidance of unpleasant experiences. Therefore, those who are high in experiential avoidance should not necessarily experience more negative emotions, but rather they should be more prone to avoiding them. On the other hand, a measure like boredom proneness should predict experienced boredom (and it did). Indeed, experiential avoidance predicted need for agency and need for action, which makes sense given that a low agency task and doing nothing are likely perceived to be aversive. Furthermore, experiential avoidance should strengthen the relationship between subjective experience

and avoidance behavior. Indeed, experiential avoidance moderated the effect of agency and boredom on escape behavior; specifically, while doing nothing, those higher in experiential avoidance were more likely to respond to their reduced sense of agency and increased boredom by escaping to the high agency trials. In other words, avoidant people experienced just as much agency and boredom as everyone else, but demonstrated less willingness to endure it, particularly in the face of extreme boredom or low agency.

Recall that experiential avoidance is a construct that is intended to explain a class of behaviors that all serve a common emotion regulation function (Kingston et al., 2010). These results suggest that boredom avoidance behaviors may similarly serve an emotion regulation function as well. The results derived from our keypress data, described below, further elucidate this functional explanation.

Boredom and Agency as Both Cues and Reinforcers

In all trial types, we restricted people's agency so that their only potential avenues for exerting agency were to escape (in each escape task), or to make more or fewer keypresses (in the high, medium, and low agency trials, or after escaping in either escape task). Thus, their keypress behavior can give additional insight into their experience of agency and boredom in several ways: (1) how did keypresses increase or decrease their sense of agency and boredom, and (2) to what extent did they use keypresses as a functional way of restoring agency? In this sense, keypresses may be both causes and effects of subjective experiences. In turn, those subjective experiences like boredom and agency can be construed as both cues and reinforcers of behavior (if the negative experience decreases). This is reminiscent of clinical descriptions of experiential avoidance patterns, where negative internal experiences can serve as both cues and

reinforcers (Chapman et al., 2006; Diefenbach et al., 2002); for example, shame may be a cue for self-harming behaviors, as well as a reinforcer if the behavior reduces the negative emotion. Indeed, agency and boredom were related to keypress behavior in several interesting ways.

Keypresses and agency.

Keypresses as a cause of agency changes. Those who felt lower sense of agency during medium agency made more keypresses, and those who felt lower sense of agency while doing nothing also made more keypresses after escaping to high agency, using both raw and baselined agency ratings. The direction of causality is unclear without looking more closely at the timecourse data, however. For example, people may have made more keypresses because they felt low agency, or they may have felt a lower sense of agency after making more keypresses. The latter was true; more keypresses induced a higher sense of agency during high agency, but a lower sense of agency during medium and low agency. This makes sense, because as participants make more keypresses in these lower agency conditions, they have more instances of expectancy violations (time delays and direction-switching), confirming their perceived decrease in agency. This suggests that keypresses are effective at restoring agency in the high agency trials, but counterproductive in medium and low agency trials. This may explain why escaping to high agency (from either escape task) was more common than escaping to medium agency, where agency could not be restored adequately.

Keypresses as an effect of agency changes. Although sense of agency did not predict subsequent keypresses on average, several individual differences moderated the effect of agency on keypresses. In particular, those low in mindfulness, high in boredom

prone to depression, high in depression, or low in desirability of control pressed more keys when they felt a lower sense of agency. Interestingly, this behavior seems functional; for these same individuals, keypresses do increase sense of agency on the next trial, although keypresses do not increase agency on the next trial on average.

Further evidence suggests that keypresses are used as a functional way of restoring agency while bored. People who felt less agency while doing nothing (on average) made more keypresses if and when they escaped to high agency. Although this is aggregated data, one can still infer from these results that lower average agency while doing nothing led to more keypresses on escape trials, because the opposite direction is not plausible; it is unlikely that more keypresses on those sporadic escape trials caused less agency while doing nothing. This is because the primary source of those trial-by-trial agency ratings was likely the period of doing nothing immediately prior, not the experience during those sporadic escape trials (which had their own ratings). Furthermore, most of the escape trials occurred later in the task, once the earning discrepancy had lowered enough for people to find escaping worthwhile. This suggests that for those who experienced doing nothing as a low agency task, they used keypresses as a functional way to restore agency, because keypresses were positively related to sense of agency during high agency trials like the ones to which they escaped.

Summary. Taken together, these results suggest that meaningless actions (like keypresses) can serve as a functional way of restoring agency, at least temporarily. Furthermore, these meaningless actions are cued by a decrease in agency, and the resulting increase in agency may serve to reinforce the avoidance behavior, just like

boredom both cues and reinforces problematic behaviors like binge eating and self-harm (Diefenbach et al., 2002; Snorrason et al., 2010; Stickney & Miltenberger, 1999).

Keypresses and boredom.

Keypresses as a cause of boredom changes. Boredom & keypresses were correlated in high, medium, & low agency trials. Once again, however, the direction of causality is unclear without looking more closely at the timecourse data. For example, people may have made more keypresses because they were bored, or they may have become more bored after making more keypresses. The latter appeared to be true; more keypresses predicted more boredom in high and medium agency, but only led to increases from the trial prior during medium agency.

Keypresses as an effect of boredom changes. People who were more bored on average while doing nothing made more keypresses after escaping to high agency. As was discussed above, although this is aggregated data, it still suggests that higher levels of average boredom led to more keypresses on escape trials; the opposite direction of causality is not plausible for the same reasons discussed above. Therefore keypresses seemed to be a functional behavioral response to regulating boredom when participants were asked to do nothing.

Summary. Taken together, these results suggest that meaningless actions (like keypresses) can serve as a functional way of reducing boredom, at least temporarily. Furthermore, these meaningless actions appear to be cued by boredom, and the resulting decrease in boredom may serve to reinforce the avoidance behavior, just like boredom both cues and reinforces problematic behaviors like binge eating and self-harm (Diefenbach et al., 2002; Snorrason et al., 2010; Stickney & Miltenberger, 1999).

Mindfulness and Experiential Avoidance

Mindfulness-based skills are often used in therapeutic approaches that successfully mitigate experiential avoidance. In particular, mindfulness is thought to reduce experiential avoidance by extinguishing the conditioned response to negative emotions (Lynch et al., 2006). In this study, I found that those low in mindfulness were more willing to give up more money to escape doing nothing, and that they showed more extreme reactions to reduced sense of agency (demonstrated by keypress behavior during high agency trials). Given the role of mindfulness in reducing avoidance behaviors, one explanation for this result is that those low in mindfulness should be less well-equipped to disconnect any potential behavioral responses from the reduced agency that cue those responses, whereas those high in mindfulness may be more able to experience the unpleasantness of low agency without the judgment that leads to behavioral reactions. This suggests that some sort of mindfulness intervention could break the connection between low agency and avoidance behaviors, effectively reducing need for agency.

The Search for Agency as a Search for Meaning

Recall that one of the distinguishing characteristics of boredom is a lack of meaning (van Tilburg & Igou, 2012). Given this, one possibility is that the need for agency is at least partially related to a need for meaning. Someone who experiences a high level of agency is aware that they cause effects, and their observations of those effects may serve as meaningful information. On the other hand, in a low agency or boring situation, information from these same observations of a person's effects on the world may be contradictory or nonexistent, perhaps leading to a deficit in cohesive, meaningful experience. This fits with the suggestion that time dilation, which is common

in boredom, is a deficit in information flow; perhaps boredom induces time dilation because of its deficit in agency and subsequent deficit in meaningful information (Zakay, 2014). Furthermore, perhaps boredom is combated with agency because that agency restores an optimal level of information flow, which in turn restores a sense of meaning.

According to Sartre, we interact with our world in order to make meaning of our existence; in his famous words, “existence precedes essence” (Sartre, 2007, p. 22). This is aligned with the idea that we seek agency in order to find this meaning. Acting as an agent of free will has been extensively discussed by existentialist philosophers; according to them, free will, or at least the illusion of it, is inevitable and part of what makes meaning and identity. In the words of Sartre, “freedom is precisely the nothingness which is *made-to-be* at the heart of man and which forces human-reality *to make itself* instead of *to be*” (Sartre, 1992, p. 568). In other words, nothingness is part of existing, and we exert agency to make it meaningful.

Limitations and Future Directions

How Accurate Is the Need for Agency Measure?

In this study, I set out not only to show that sense of agency is a need we seek to restore when it is threatened, but also to develop a paradigm that could measure need for agency as an individual difference. In my theoretical framework, it is difficult to accurately measure an individual’s need for agency, because it manifests as the combination of two potentially observable factors: current sense of agency, and motivation to increase sense of agency from the current level (Fig 1). I approached this by trying to zero everyone’s sense of agency (in each escape task) and then observing their motivation to seek higher agency. The premise here is that their motivation to seek

higher agency, indicated by PSEs, is driven by the difference between need for agency and current sense of agency, which I attempted to bring close to zero. However, people varied considerably in how much agency they felt in each of the escape tasks, so it is not clear how this baseline should be incorporated to accurately calculate need for agency in line with the way we proposed it theoretically. In order to more precisely measure each person's need for agency, we would need to tailor the escape tasks such that for each person, the task adjusted until it reached each person's personal version of "zero agency," or at least a level of agency that is comparable in some way to that of others.

In summary, I did show that people will seek agency when it is lowered, and that they will seek action while doing nothing (in particular, when lack of action feels like lack of agency). By our definition of a need, this demonstrates that agency is a need, although the outcome measure is not necessarily the precise individual difference we intended to measure, but instead a combination of need for agency and the sense of agency experienced in each escape task.

Future Directions

This study is only a starting point for investigating the need for agency; there are several important research directions that may extend the results of this study. Several questions that may motivate future work are discussed below.

Is need for agency domain-general? Another relevant extension of this line of work would be to explore whether sense of agency is a domain-general need. If it is, a decrease in agency in one domain should lead to agency-seeking in another domain. In our paradigm, we started with a specific domain of agency: participants' sense of agency while pushing a square around the screen. In the do nothing/escape task, we did begin to

explore whether sense of agency is a domain-general need; the decreased sense of agency while doing nothing is arguably a different domain than the sense of agency afforded by square-pushing. The results of Wilson and colleagues also hint at this possibility; when asked to do nothing, people chose to restore agency with an unrelated action: shocking themselves (instead of pushing a square around the screen). However, given that the context is still quite similar in both my study and that of Wilson and colleagues, future work should further explore the possibility that need for agency is truly domain-general. In a future study, sense of agency could be decreased in a completely unrelated domain (e.g. in a social interaction), and the resulting motivation to restore agency (e.g. in a task like the current one) could be measured.

Is avoiding boredom always maladaptive? In my study, I focused on the cases where people avoid boredom and/or a lack of agency in unhealthy ways. It is important to note that avoiding either boredom or lack of agency is not necessarily bad. Just like other unpleasant emotions, boredom is likely unpleasant precisely because it was adaptive to avoid it in some cases. For example, boredom may inspire people to explore their surroundings, pursue artistic endeavors, exercise, or engage in a number of other healthy activities. However, even these pursuits may not be optimal if they are used to avoid a task that is mandatory and/or more urgent than these alternative activities. The important takeaway here is that context matters when determining whether avoidance is maladaptive or not, including the context of what an individual's current goals and values are. Future work should incorporate the role of context and personal goals and values in studying boredom avoidance to fully understand when avoidance is beneficial versus harmful.

Can interventions reduce unhealthy avoidance of boredom? One motivation for studying need for agency is to understand how it relates to our reactions to boredom. As was mentioned above, if a need for agency does explain maladaptive reactions to boredom, it is possible that manipulating need for agency, perhaps via a mindfulness intervention, may reduce the motivation for agency-seeking and the subsequent maladaptive behaviors. Because of the role of mindfulness and acceptance in mitigating experiential avoidance and related behaviors, this avenue seems particularly promising. Though these future directions are beyond the scope of this project, a better understanding of need for agency may lead to innovative and useful new techniques for reducing problematic boredom-related behaviors.

Summary. The current study was only a first step in demonstrating that sense of agency is a psychological need, and that need for agency plays a role in our avoidance of boredom. There are many promising avenues for future work inspired by this study, including finding reliable ways to measure need for agency as an individual difference, determining the extent to which need for agency is a domain-general need, and designing interventions that can effectively reduce need for agency and the avoidance behaviors associated with it. These future directions will not only further our understanding of boredom and agency, but also expand the existing literature on avoidance behaviors and the utility of acceptance techniques.

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