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BRIEF REPORT

Thought-Control Difficulty Motivates Structure Seeking

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Struggling to control one's mind can change how the world appears. In prior studies testing the compensatory control theory, reduced control over the external environment motivated the search for perceptual patterns and other forms of structured knowledge, even in remote domains. Going further, the current studies test whether difficulty controlling thoughts similarly predicts structure seeking. As hypothesized, thought-control difficulty positively predicted perceptions of causal connections between remote events (Study 1a) and nonexistent objects in visual noise (Study 1b). This effect was mediated by aversive arousal (Study 2) and caused specifically by thought-control difficulty as distinct from general difficulty (Study 3). Study 4 replicated the effect with a sample of meditators learning to control their thoughts, showing that thought-control difficulty was a powerful predictor of structure seeking. These findings reveal a novel form of motivated perception.

Keywords: compensatory control theory, thought suppression, self-regulation, structure seeking

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Controlling one's mind can be difficult. People often struggle to concentrate or avoid undesired thoughts of past mistakes, future worries, and distracting temptations. Although common, the experience of thought-control difficulty may shape perception in surprising ways. Prior research shows that people compensate for a lack of personal control over the external environment by seeking structured knowledge (Landau, Kay, & Whitson, 2015). They want to view things in simple, clear, and consistent ways, even when doing so does not directly address their lack of control. Broadening the scope, the current work tests whether difficulty controlling one's internal environment predicts the search for perceptual patterns and causal connections—even when none objectively exist.

As background, early work showed that when people feel they lack control, they try to restore control by asserting personal agency (Bandura, 1989; Lefcourt, 1982). Compensatory control theory (CCT; Kay, Gaucher, Napier, Callan, & Laurin, 2008) goes further, proposing that reduced control can motivate efforts to project structure onto the environment. This is because perceiving the environment as well-structured is necessary for any attempt, in any domain, to pursue goals and generally to view the self as in control. One can reliably control an environment where objects have recognizable form and events have clear causes, whereas a confusing or chaotic environment affords few reliable opportunities to influence outcomes (cf. Rothbaum, Weisz, & Snyder, 1982). Affirming structure, then, is a means of fluidly compensating for reduced personal control in an unrelated context.

Supporting studies show that chronically low and situationally reduced personal control predicts diverse tendencies to seek simple, clear, and consistent interpretations of external stimuli (Landau et al., 2015). For example, reduced control heightens perceptions of causal connections between remote events (as expressed in belief in conspiracy theories; Whitson & Galinsky, 2008) and preference for fixed hierarchies over looser forms of social organization (Friesen, Kay, Eibach, & Galinsky, 2014).

Although illuminating, this work addresses only how people adjust to the demands of their external environment. This emphasis is reflected in traditional definitions of personal control as influ-

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ence over social and physical environments (Morling & Evered, 2006; Rothbaum et al., 1982; Skinner, 1995) as well as CCT's claim that people maintain personal control to guard against "randomness and chaos within the social environment" (Kay et. al., 2008; p. 19).

Correspondingly, reduced control is traditionally operationalized in terms of external circumstances. For example, researchers have reminded participants of uncontrollable hazards or blocked their ability to adjust ambient noise (Landau et al., 2015).

Broadening the empirical scope allows us to examine compensatory responses to a lack of control over one's internal environment. Thought control is defined here as intentional efforts to maintain in focal awareness those thoughts that are congruent with current goals. Hence, thought-control difficulty is the subjective sense of failing to maintain focus on desired thoughts despite effortful attempts. This can manifest as inability to suppress unwanted thoughts (Wegner, Schneider, Carter, & White, 1987) or inaccessibility of thoughts that one is trying to bring into consciousness (e.g., the tip-of-the-tongue state; Schwartz & Metcalfe, 2011).

This definition establishes boundary conditions distinguishing thought-control difficulty from related phenomena. The emphasis on goal congruence suggests that even when thoughts appear to be outside conscious control, they will not elicit thought-control difficulty if they fit salient goals. Such thoughts include sudden flashes of creative insight or gut-level intuitions retrieved without effort. Similarly, the experience of rumination, or a prolonged period of ongoing thought revolving around one particular topic (Martin & Tesser, 1996), will elicit thought-control difficulty only to the extent that recurring thoughts are undesired.

Equally critically, thought-control difficulty is distinct from a preoccupation with the content of subjective experience. Researchers have identified compensatory reactions to several types of cognitions, including uncertainty, guilt, mortality, and regret (Koole, Greenberg, & Pyszczynski, 2006; McGregor, Zanna, Holmes, & Spencer, 2001). These reactions reflect efforts to cope with threatening implications of a particular cognition for such valued psychological structures as a sense of self-worth, a coherent identity, and a meaningful cultural worldview. As such, they are mediated by aversive arousal (e.g., Kay, Moscovitch, & Laurin, 2010). Thought-control difficulty can also elicit aversive arousal, but in this case, it signals a perceived failure to regulate, at a metacognitive level, one's ability to choose what is and is not coming to mind, regardless of the content of the relevant thoughts. Indeed, thought-control difficulty should still be aversive when thought content is trivial (e.g., a white bear). The aversiveness specifically is due to an inability to control the occurrence of thoughts. This is distinct from grappling with the implications of the content of a particular disturbing thought, such as self-uncertainty or mortality.

With these boundary conditions in mind, the central question is whether thought-control difficulty predicts the structure-seeking tendencies observed in response to lacking control over the external environment. Evidence for this possibility would deepen our theoretical understanding of control motivation. Although past research has shown that people often lack control over their thoughts (Kelly & Kahn, 1994), traditional control perspectives (Rothbaum et al., 1982; Seligman, 1975) do not address intrapsychic control dynamics or their possible link with compensatory efforts to impose structure onto the world. Also, as alluded to, such evidence would expand CCT's definition of control threat to encompass not only impaired influence over one's social and physical surroundings but also impaired efforts to regulate one's own mind, even in the absence of situational obstacles to effective action.

At a practical level, it is important to assess whether the increasingly popular interventions aimed at controlling thoughts—which range from psychotherapy to mindfulness-meditation—might unintentionally increase the desire for structure in unrelated domains.

We examined this effect in five studies. Studies 1a-b modeled individual differences in thought-control difficulty using established measures (Wegner & Zanakos, 1994).

Studies 2 and 3 manipulated thought-control difficulty using materials inspired by research on thought suppression and ironic processing. For example, people asked to refrain from thinking about white bears reported more unwanted thoughts of bears than those not instructed to suppress (Wegner et al., 1987). Given that thought suppression is one form of thought-control difficulty, it is expected to increase structure-seeking. Study 4 sought ecological validity by measuring meditators' difficulty avoiding intrusive or distracting thoughts when meditating.

We examined effects on two structuring tendencies: perceiving events as causally related in objectively implausible ways; and seeing objects in visual noise, even when none objectively exist.

One alternative possibility is that our predicted effect is driven not by thought-control difficulty, specifically, but by general feelings of difficulty (e.g., in accomplishing an external task). If structure provides predictable and coherent conceptions of how the world works, then it is possible that general feelings of difficulty increase preference for causal connections and clear patterns, even when tangential to the task at hand. Studies 3 and 4 assessed this alternative by comparing the effects of thought-control difficulty versus general difficulty across two real-world contexts.

We aimed to recruit enough participants to detect a medium effect size ($d = 0.5$; Cohen, 1992). Data were analyzed only after the required sample size target was met or after all interested participants at meditation centers had completed the study. We report all the variables we measured and manipulated in our studies. All self-report items were measured on 7-point scales unless stated otherwise.

Study 1a

Self-reported difficulty controlling thoughts was hypothesized to predict perception of causal connections between remote events.

Figure 1. Sample pictures used in Study 1b: a hidden boat (left) and no hidden object (right).

Figure 2. Examples of instructions used in the low (left) and high (right) thought-control difficulty conditions. The page advanced automatically to the next trial after 30 sec.

Method

Participants. We recruited 120 adults (51 males, M_{age} = 34.72, SD = 12.00) from Amazon's Mechanical Turk (Mturk). We excluded data from nine participants for reporting they were distracted or had technical difficulties.

Thought-control difficulty. Thought-control difficulty was measured with the 15-item White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994; α = .96; details in supplement).

Causal connection perception. Participants read six scenarios describing separate events. For each scenario, they indicated on an 11-point scale whether they believed the events were *not connected at all* to *very connected* (α = .75). This measure is previously validated (Whitson & Galinsky, 2008).

Results

Regressing causal connection perceptions onto WBSI scores revealed that thought-control difficulty positively predicted the tendency to see remote events as causally linked, B = .22, SE = .07, $t(109)$ = 2.40, p = .02, d = 0.45.[1]

Study 1b

Study 1b aims to conceptually replicate Study 1a using a different population and a converging measure of structure seeking.

Method

Participants. We recruited 120 students from a large Southeastern University and obtained 101 complete responses (50 males, M_{age} = 22.39, SD = 4.42). No participants were excluded because this was a field study.

Thought-control difficulty. Participants completed the WBSI described in Study 1a (α = .87).

Illusory object perception. Participants viewed 24 gray-scale pictures of visual noise (Whitson & Galinsky, 2008). Half contained hidden objects (e.g., sailboat; Figure 1 shows sample pictures). For each picture, participants were asked whether they saw an object and, if so, what it was.

Results

Regressing total number of perceived objects onto WBSI scores revealed that participants who reported greater thought-control difficulty were more likely to see objects hidden in the 24 pictures, B = .21, SE = .39, $t(99)$ = 2.18, p = .03, d = 0.43. Looking only at the 12 pictures without hidden objects, thought-control difficulty predicted illusory object perception, B = .23, SE = .25, $t(99)$ = 2.34, p = .02, d = 0.47. Thought-control difficulty was weakly associated with correctly identifying objects hidden in 12 pictures with objects, B = .13, SE = .20, $t(99)$ = 1.32, p = .19.

Study 2

Study 2 tests causation by manipulating thought-control difficulty and further probes mechanism. Recent models delineating the substrates of threat and defense effects suggest that, although different threats may trigger distinct compensatory reactions, they all share a similar mechanism: aversive arousal or anxiety (Jonas et al., 2014; Kay et al., 2010). This suggests that aversive arousal—specifically anxiety, nervousness, and helplessness—will mediate the effect of thought-control difficulty on perception of structure-conferring causal connections.

We also included the Personal Need for Structure (PNS) Scale to measure individual differences in preference for simple, clear-cut knowledge (Neuberg & Newsom, 1993). We predicted that high (vs. low) thought-control difficulty would increase PNS.

Method

Participants. We recruited 120 adults (52 males, M_{age} = 35.33, SD = 12.85) from MTurk. We excluded data from nine participants for reporting they were distracted or had technical difficulties.

Thought-control difficulty manipulation. All participants completed a focusing task consisting of three different 30-s trials. In each trial, participants randomly assigned to the high thought-control difficulty condition were instructed to view a sentence on the screen at all times (e.g., "Do not think of a lamp") and not think about the object mentioned in the sentence (a lamp). Participants in the low thought-control difficulty condition received a sentence that told them specifically to think of the same object (see Figure 2 for an example). A different sentence and corresponding object was used for each trial (details in supplement).

Thought-control ability. Self-perceived thought-control ability was assessed with a single item: "To what extent did you feel that you can control your thoughts during the focusing task?"

[1] After controlling for demographic characteristics, thought-control difficulty significantly predicted structure seeking (details in supplement).

Perceived difficulty across trials. Two items (e.g., "To what extent did you feel competent at focusing task?") assessed how difficult participants felt the task was.

Aversive arousal. Participants indicated how anxious, nervous, and helpless they felt during the task.

Causal connection perception. This was the same as in Study 1a.

PNS. Twelve items assessed participants' preference for well-structured knowledge.

Results

Participants in the high (vs. low) thought-control difficulty condition reported feeling less able to control their thoughts during the task and more difficulty doing so (see Table 1). As expected, experiencing high (vs. low) thought-control difficulty increased participants' perception of causal connections and felt aversive arousal. Thought-control difficulty did not have the expected effect on PNS scores. This might be because the items capture not only an active search for structured knowledge—the specific outcome of current interest—but also an appreciation of structured knowledge one already possesses (e.g., "I enjoy having a clear and structured mode of life").

Mediation. Aversive arousal mediated the effect of thought-control difficulty on causal connection perception (see Figure 3), 95% biased-corrected confidence intervals (5,000 samples): [.0216, .4505].

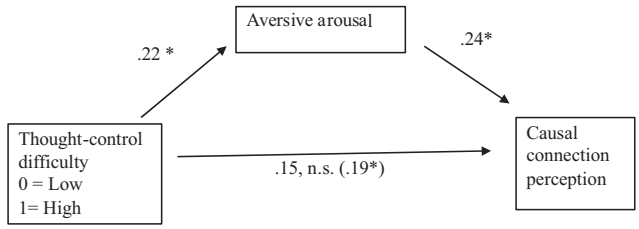

Figure 3. Effect of thought-difficulty (high vs. low) on causal connection perception, mediated by aversive arousal (Study 2). * $p < 0.05$. All coefficients are standardized.

Study 3

The current theoretical account suggests that structure-seeking observed thus far is predicted by feelings of thought-control difficulty as distinct from general feelings of difficulty. Not all difficulties pertain to having control, and people can experience control-related difficulties without also feeling thought-control difficulty. Study 3 assessed discriminate validity by replacing the low thought-control difficulty condition with an induction of general difficulty. Targeting ecological validity, we revised the manipulation to refer to thought-control difficulty in the workplace, a real-world context of goal pursuit.

Method

Participants. We recruited 160 employees (83 males, M_{age} = 35.76, SD = 9.33) from MTurk. We excluded data from one participant with missing data and 19 participants who reported being distracted or experiencing technical difficulties.

Thought-control difficulty manipulation. Participants were randomly assigned to recall an episode in the workplace of either thought-control difficulty or general difficulty (details in supplement).

Ability to control thoughts. One item, "I feel in control of my thoughts," assessed self-perceived ability to control thoughts during the recalled episode.

Causal connection perception. This was the same as in Study 1a.

Results

Participants reminded of thought-control difficulty (vs. general difficulty) in their workplace felt less able to control their thoughts, and they were more likely to perceive causal connections between remote events (see Table 2).

Study 4

Study 4 examines another real-world context: mindfulness-meditation practice. Mindfulness-meditation technique involves active control of which thoughts are salient. Hence, practitioners' experience of distracting and intrusive thoughts during meditation serves as a measure of thought-control difficulty.

Critically, other aspects of a meditation session may feel difficult independent of thought-control difficulty. Maintaining an upright posture can be painful. Also, thoughts with unpleasant contents, such as regrets or worries, may arise. When meditators following technique choose to simply observe and acknowledge

Table 1
Independent-Samples t-tests Results for High vs. Low Thought-Control Difficulty Conditions

Variables	Cronbach's alpha (α)	Low thought-control difficulty		High thought-control difficulty		Test statistic	p	Cohen's d
		M	SD	M	SD			
Ability to control thoughts	—	5.11	1.87	3.71	1.88	$t(109) = 3.92$	<.001	.75
Perceived difficulty across trials[a]	.69	2.91	1.37	3.85	1.50	$t(109) = -3.47$	<.001	.66
Causal connection perception	.65	4.37	1.76	5.07	1.71	$t(109) = -2.13$	.04	.40
Aversive arousal	.84	2.32	1.35	3.02	1.77	$t(109) = -2.35$	.02	.44
Need for structure	.94	4.53	1.44	4.80	1.33	$t(109) = -1.03$	.31	.19

[a] Items were coded so that higher scores indicated greater perceived difficulty.

Table 2
Results of Independent-Samples t-tests of Variables Across General vs. Thought-Control Difficulty Condiions (Study 3)

Variables	Cronbach's alpha (α)	Thought-control difficulty		General difficulty		Test statistic	*p*	Cohen's *d*
		M	*SD*	*M*	*SD*			
Ability to control thoughts	—	5.06	1.33	5.88	1.26	$t(132) = 3.60$	<.001	.63
Causal connection perception	.80	5.33	2.27	4.59	2.08	$t(139) = -2.02$	.04	.34

these thoughts without trying to actively control (e.g., suppressing or dispelling) them, thought-control difficulty is not experienced. Nevertheless, awareness of the thoughts' unpleasant contents may contribute to a general sense that meditation is difficult.

Because perceived mindfulness and general difficulty are expected to correlate highly with thought-control difficulty, they should also predict structure seeking. However, if thought-control difficulty is the key motivating factor, then general difficulty and perceived mindfulness should no longer predict structure seeking after controlling for thought-control difficulty. That is, only the experience of thought-control difficulty, and not other difficult experiences during meditation, should uniquely predict structure-seeking.

Method

Participants. We contacted meditation centers in North America to recruit 167 meditators (62 males, $M_{age} = 52.56$, $SD = 16.04$). We did not exclude any of the participants because the exclusion variables were irrelevant.

Participants meditated for 15 min before answering questions about their meditation session (details in supplement):

Perceived mindfulness. Three items (e.g., "To what extent were you able to notice and settle your awareness on your breath?") assessed the ability to achieve mindfulness (Hafenbrack, Kinias, & Barsade, 2014).

Thought-control difficulty. Two items (e.g., "To what extent did you experience distracting thoughts?") assessed the experience of distracting thoughts.

General perceived difficulty. Three items (e.g., "Generally, I felt that being mindful was quite difficult") assessed feelings of general difficulty meditating.

Causal connection perception. This was the same as in Study 1a (α = .64).

Results

Hierarchical multiple regression was used to investigate the predictive power of thought-control difficulty after controlling for general difficulty and perceived mindfulness (see Table 3). On their own, both perceived mindfulness (Model 1, $p = .05$) and general difficulty (Model 2, $p = .02$) were significant predictors of causal connection perceptions. However, when all three predictors were entered simultaneously, only thought-control difficulty was a significant predictor (Model 4, $B = .22$, $p = .02$) of causal connection perceptions.

General Discussion

Five studies provide converging evidence that thought-control difficulty motivates people to seek out structured interpretations of the world. Dispositionally high and situationally increased thought-control difficulty predicted greater causal connection perception (Study1a and 2) and illusory object perception (Study 1b). Aversive arousal mediated this effect (Study 2), supporting the claim that thought-control difficulty is subjectively threatening. Studies 3 and 4 assessed whether this effect is alternatively due to general felt difficulty and revealed that thought-control difficulty has a privileged link to structure-seeking.

By revealing an unexamined consequence of impaired thought control on perception, these findings broaden CCT's scope and deepen our theoretical understanding of control motivation's downstream consequences. The current account distinguishes between difficulty managing which thoughts are in/out of consciousness and efforts to cope with the threatening implications of a particular thought (e.g., for one's self-esteem or meaning in life). The latter is the focus of the large literature on existential threat and compensation, which encompasses theories of personal uncertainty (McGregor et al., 2001) and terror management (Koole et

Table 3
Results for Hierarchical Multiple Regression Analyses With Causal Connection Perception as the DV (Study 4)

Independent variable	Cronbach's alpha (α)	Model 1			Model 2			Model 3			Model 4		
		B	*SE*	*t*	*B*	*SE*	*t*	*B*	*SE*	*t*	*B*	*SE*	*t*
Perceived mindfulness	.87	−.15*	.10	−1.98				−.10	.11	−1.22	−.07	.11	−.93
General difficulty	.87				.18*	.09	2.33	.14	.09	1.73	.03	.10	.36
Thought-control difficulty	.84										.22*	.10	2.40
R^2				.02			.03			.04			.08
ΔR^2							.01			.01			.03*
F				3.91			5.41			3.45			4.29

Note. $n = 167$ (standardized betas).
* $p < .05$.

al., 2006) among others. Still, it is likely that thought-control difficulty and threatening cognitive contents interrelate in interesting ways that deserve future study. For example, would people respond with compensatory structure-seeking to unwanted rumination on a self-enhancing thought?

Future work should also examine whether thought-control difficulty triggers compensatory responses that have been examined in the CCT literature thus far (e.g., religiosity) and also further investigate cross-cultural differences (Wang, Whitson, & Menon, 2012).

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