



On incidental catalysts of elaboration: Reminders of environmental structure promote effortful thought



Ryan Rahinel ^{a,*}, Nelson Borges Amaral ^b, Joshua J. Clarkson ^a, Aaron C. Kay ^c

^a Carl H. Lindner College of Business, University of Cincinnati, 2925 Campus Green Drive, Cincinnati, OH 45221, United States

^b Kogod School of Business, American University, 4400 Massachusetts Avenue NW, Washington, DC 20016, United States

^c Fuqua School of Business, Duke University, 100 Fuqua Drive, Durham, NC 27708, United States

HIGHLIGHTS

- Reminding people of structure in their environment leads to greater elaboration on decisions
- Structure therefore leads people to be more certain of their choice and choose options dominant on argument strength
- Results imply that elaboration can be shaped by environmental features that bear no relationship to the evaluative task
- The results suggest that structure may be functional in part because it leads to more thorough, considered decisions

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ABSTRACT

Life is filled with situations in which cognitive elaboration can powerfully sway outcomes, and yet our understanding of the contextual factors that impact elaboration are greatly limited to those entwined with the focal evaluation, judgment, or decision. In response, this research tests whether a more fundamental, incidental feature of the environment—structure—might influence the extent to which individuals engage in elaboration. Three studies demonstrate that incidental reminders of structure increase elaboration (Experiment 1), which in turn impacts individuals' confidence in their choice (Experiment 2) as well as the choice itself (Experiment 3). Collectively, the findings offer novel insight into the role of structure in promoting elaboration, and suggest that structure-seeking may be functional in part because it leads to more thoughtful, considered judgments and decisions.

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1. Introduction

Cognitive elaboration is the objective or subjective degree to which people process issue-relevant stimuli in an evaluation, judgment, or decision (Petty & Cacioppo, 1986; Petty & Wegener, 1999; see Barden & Tormala, 2014). Researchers have long been interested in elaboration, as it can both sway evaluative outcomes (e.g., policies to endorse, impressions to form, brands to purchase) and make such outcomes more persistent and resistant (Petty, Haugtvedt, & Smith, 1995). Given these powerful implications, it is important to understand how not only the evaluative stimuli in a task but also the contextual factors surrounding the task determine individuals' investments in elaboration.

Accordingly, prior work has identified several contextual factors that influence elaboration. Some exert a direct influence on one's motivation to elaborate (e.g., personal relevance; Johnson & Eagly, 1989; Petty &

Cacioppo, 1990; Petty, Cacioppo, & Haugtvedt, 1992), whereas others exert a direct influence on one's ability to elaborate, as in the case of external distractions (Petty, Wells, & Brock, 1976; Petty, Wells, Heesacker, Brock, & Cacioppo, 1983) or fast presentations (Smith & Shaffer, 1995). Regardless of this distinction, the means by which these factors operate are united in that their influence is enabled by clear, proximal relationships to the evaluative task. In this research, we forward the general notion that elaboration is also shaped by fundamental characteristics of the environment that bear no clear relationship to the evaluative task. Specifically, this research considers the novel proposition that elaboration can be affected by reminding one of *structure* present in one's environment.

1.1. The importance of structure

Across a variety of domains, humans display a marked preference for structure, whether that structure manifests in the form of symmetry (Etcoff, 1999; Garner, 1974), patterns (Koffka, 1935), or causal relationships (Heine, Proulx, & Vohs, 2006; Lerner, 1980). Indeed,

* Corresponding author.

E-mail addresses: ryan.rahinel@uc.edu (R. Rahinel), namaral@american.edu (N.B. Amaral), joshua.clarkson@uc.edu (J.J. Clarkson), aaron.kay@duke.edu (A.C. Kay).

though people vary in their chronic needs for predictability, clear answers, and order (Neuberg & Newsom, 1993; Webster & Kruglanski, 1994), people across the spectrum of these dispositional needs tend to perceive and endorse evidence of structure in situations where personal control feels lost. For instance, those in a state of low control perceive structure in randomness (Whitson & Galinsky, 2008) and show greater endorsement of external systems with capacity to restore structure (Kay, Gaucher, Napier, Callan, & Laurin, 2008; Whitson, Galinsky, & Kay, 2015).

Despite extensive work on the contexts that give rise to structure-seeking, the dispositional differences in structure-seeking across people, and the ways in which structure-seeking can manifest in everyday behavior, there has been a recent surge of interest in understanding the functions and consequences of imbuing the world with structure (Landau, Kay, & Whitson, 2015). For instance, research has found that reminders of structure reduce anxiety, which is typically produced in response to random outcomes (Tullett, Kay, & Inzlicht, 2014; cf., Proulx, Inzlicht, & Harmon-Jones, 2012). Likewise, structure communicates contingencies between actions and outcomes, and therefore evidence of structure encourages behavior in the service of goal pursuit (Kay, Laurin, Fitzsimons, & Landau, 2014). In the current work, we move beyond the consequences of structure for affect and behavior, and instead study its function in the realm of cognition. Specifically, we posit that structure's role in assuring non-random outcomes also shapes one of the basic cognitive processes underlying attitude formation and decision making: cognitive elaboration.

1.2. Structure as a catalyst to elaboration

There are competing perspectives on the potential relationship between structure and elaboration. Past work describes the dispositional need for structure (and closely related need for closure) as a preference for an answer vs. ambiguity on a given topic, which is facilitated by abstracted mental procedures (i.e., “cognitive structuring” Neuberg & Newsom, 1993) and/or truncated processing (Kruglanski & Freund, 1983; Neuberg & Newsom, 1993; Webster & Kruglanski, 1994). Consistent with this notion, correlational studies have found that personal needs for both structure and closure correlate negatively with need for cognition (Neuberg & Newsom, 1993; Webster & Kruglanski, 1994), and individuals high in need for structure (and closure) are more likely to use less effortful, stereotypical, trait-based processing when making social judgments (Dijksterhuis, van Knippenberg, Kruglanski, & Schaper, 1996; Moskowitz, 1993). Directly applying this line of reasoning to our context suggests that the presence of structure should lead to less elaboration.

Such associations between structure and elaboration should certainly hold when structure is studied as a dispositional, preference-laden, cognitive trait, since cognitive structuring inherently allows people to arrive at desired answers through less elaboration. However, the question we ask here is whether such relationships might hold when structure (or the lack thereof) is instead given as a basic feature of the task environment. We propose that this form of structure instead signals that reliable relationships exist between the potential objects of elaboration (e.g., concepts, objects, actions, and outcomes), as implied in recent work (Kay et al., 2014; Landau et al., 2015). This signaling is important insofar as axioms of information processing dictate that reasoning processes (e.g., induction, deduction, association) have value only when reliable relationships exist (Anderson & Bower, 1973; Evans, Newstead, & Byrne, 1993), since elaboration offers a means of both revealing such relationships, and in our context, capitalizing upon them. This line of reasoning suggests that in our context, the negative relationship between structure and elaboration implied by previous correlational studies may in fact be in the opposite direction. We sided with this contextualized reasoning, and therefore hypothesized that structure would lead to greater elaboration.

To illustrate this rationale more concretely, consider two well-known games that reflect environments of varying intrinsic structure – bingo and chess – and the value that elaboration affords a player within each game. Note first that these games both involve judgments containing inherent uncertainty (e.g., making a chess move or choosing a bingo card). In bingo, the outcome of each trial is random (i.e., there is no structure) and, as such, there is no rational value to elaborating on any systematic means by which to increase one's favorable outcomes, as they do not exist. Conversely, in chess, the outcome of the game is not random but rather a function of a series of relationships between the pieces in both their current locations and possible movements. Thus, there is considerable value in elaborating upon the system of relationships between the pieces to uncover which move or moves would yield the best outcomes. Consequently, chess moves tend to be made with greater elaboration than the selection of bingo cards. Of course, these examples are not exact; some bingo players may erroneously believe that relationships actually exist (based on superstition or illusory correlations), and conversely, chess masters may have well-developed heuristics that allow them to forego elaboration on every move. However, the point is to merely illustrate the value of elaboration (and therefore prevailing tendencies to elaborate) within contexts associated with different levels of structure. Moreover, our research capitalizes on this conceptual insight and tests the novel proposition that structure stimulates elaboration even when the source of structure (e.g., the structured or random growth pattern of trees) occurs in a context separate from that of the potential elaboration (e.g., product choice). That is, the structure is incidental to the task context.

1.3. Overview of experiments

We test our hypothesis in preference formation and decision making contexts where incidental structure could signal that greater elaboration is helpful in obtaining more desirable outcomes (e.g., a more accurate preference or a choice better matched to one's preferences). Importantly, to isolate the effect of incidental structure, we not only activate reminders of structure in a context separate from that of the focal response (see also Kay et al., 2014), but also control for dispositional variation in individuals' need to reflect upon and consider information via the rational subscale of the REI-40 (Pacini & Epstein, 1999). In our experiments, we explore the direct effect of incidental structure on elaboration (Experiment 1), as well as the downstream consequences of this relationship for both individuals' confidence in their choices (Experiment 2) and individuals' likelihood to base their choices on argument quality (Experiment 3).

The results provide converging evidence that incidental reminders of structure stimulate elaboration, and as a result, produce elaboration's associated outcomes. Such findings not only point to the important role of the broader environment in determining elaboration, but also illustrate an important function of structure. That is, in addition to the ability of structure to stimulate long-term goal pursuit (Kay et al., 2014), structure also helps people make more thorough, considered judgments and decisions.

2. Experiment 1

This experiment tests the core prediction that reminders of structure lead to greater elaboration on a decision in an unrelated context. Specifically, participants completed a sentence-descrambling task including words that conveyed either structure or no-structure, and then completed an ostensibly unrelated choice task. Participants' decisions in this task were consequential in that their choices represented activities they would subsequently engage in.

It is important to note that although participants' decisions were consequential, the specific options in the choice set were not differentiated in ways that made any option objectively better than another. Therefore, the “best” option for any given person was simply the one

that most closely matched their idiosyncratic preference. Thus, while we expected structure to affect the amount of elaboration on the choice, we did not expect structure (or any ensuing elaboration from it) to have any effect on the particular option chosen.

2.1. Method

2.1.1. Participants

Based on our experience with similar procedures, we sought to recruit 100 participants. At the end of the study participation deadline, we had recruited 94 undergraduate students ($M_{\text{age}} = 19.37$, 58 females) who participated in exchange for course credit.

2.1.2. Procedure

For this study, we manipulated structure via a sentence-descrambling task (adopted from Kay et al., 2014). Each participant was presented with 16 five-word sets and was tasked with descrambling each set into a grammatical four-word sentence. In the structure condition, eight of the sentences contained words such as *systematic*, *patterns*, and *organized*. In the no-structure condition, the words were replaced with words such as *chance*, *random*, and *unpredictably* (see Appendix A in supplementary online materials for five-word sets in each condition). Each participant was given up to 5 min for the task.

Participants were then told that they would later be given 3 min to do one of six activities,¹ and then asked to select their preferred activity. Given that individuals' perceptions of elaboration have been shown to correlate with their actual amount of elaboration (see Barden & Petty, 2008), we measured their perceived elaboration about the choice using two items (adapted from Barden & Petty, 2008; Wan, Rucker, Tormala, & Clarkson, 2010): "How much did you deliberate about your choice?" and "How much did you think about which option to go with?" (1 = not at all; 7 = very much; $\alpha = .92$). Upon completing these items, we gave participants 3 min to engage in their selected activity. Participants then completed the rational subscale of the REI-40 (Pacini & Epstein, 1999), before indicating their gender and age. They were then thanked for their participation.

2.2. Results

2.2.1. Choice

We first ran a multinomial logistic regression model with option choice as the dependent measure, structure as a dummy-coded predictor (0 = no-structure; 1 = structure), and rational processing as a continuous predictor. Consistent with expectations, there was no effect of structure on option choice ($\chi(5) = 5.96$, $p = .31$, Cramer's $V = .11$). That is, structure did not influence participants' selected activity.

2.2.2. Elaboration

We then submitted the elaboration index to an Analysis of Covariance (ANCOVA), with structure as the independent variable and chronic elaboration tendencies (as indexed by the rational processing subscale of the REI-40) as a covariate. The results revealed a significant effect of structure on elaboration ($F(1, 91) = 4.28$, $p = .043$, Cohen's $d = .43$). As predicted, those in the structure condition ($M = 4.86$, $SD = 1.38$) reported greater elaboration on their choice than did those in the no-structure condition ($M = 4.20$, $SD = 1.64$).²

¹ Choice options were as follows: "Watch a video on YouTube", "Read news on CNN.com", "Catch up on some work", "Check your email", "Surf a social networking site (e.g., Facebook)", and "Browse an online store (e.g., Amazon.)"

² As would be expected, there was a significant positive direct effect of rational processing on elaboration ($\beta = .48$; $F(1, 91) = 4.28$, $p = .041$). Importantly, however, removing this covariate from the model did not affect the significance level of the structure effect ($F(1, 92) = 4.43$, $p = .038$).

2.3. Discussion

This study confirms the core prediction of our framework, as people who were reminded of structure (vs. no-structure) reported elaborating more about their decision. This effect is especially intriguing given that the structure manipulation was disassociated from any particular context (including that of the actual decision), the chosen option represented an activity that individuals knew they would be doing, and the effect occurred despite no differences in chosen options and controlling for dispositional differences in rational processing. Thus, incidental reminders of structure exert a clear influence on individuals' elaboration. Given the important consequences of differences in elaboration (see Barden & Tormala, 2014), we explored the downstream outcomes of these differences in the subsequent study.

3. Experiment 2

Researchers have repeatedly documented the important consequences of heightened elaboration (Petty et al., 1995; see also Barden & Tormala, 2014). For instance, heightened elaboration results in judgments held with greater certainty (Barden & Petty, 2008; Wan et al., 2010), as elaboration both provides a greater depth of information to base one's decision as well as a signal that their decision is based on thoughtful reasoning (see also Rucker, Tormala, Petty, & Brinol, 2014). Given the documented effect of structure on elaboration (Experiment 1), we predicted that reminders of structure (versus no structure) would lead to greater certainty in one's choice, and this certainty should stem from increased elaboration. Moreover, since one might argue that this proposed effect of structure on certainty stems from reduced decision difficulty or heightened perceptions of option similarity (instead of heightened elaboration), we included measures of these constructs to test their viability as alternative explanations to our elaboration-based hypothesis.

3.1. Method

3.1.1. Participants

We sought to recruit approximately 100 participants. At the end of the study participation deadline, we had recruited 92 undergraduate students who participated in exchange for course credit. We did not obtain any demographics data from the participants.

3.1.2. Procedure

Participants were assigned to either a structure or no-structure condition. To manipulate structure, we adapted an article manipulation used in prior work on structure (see Kay et al., 2014). In the structure condition, participants read an article that described trees as growing leaves and branches via a system of patterns, symmetry, and identifiable relationships. In the no-structure condition, the article instead described that trees grow leaves and branches in a random, haphazard, and unsystematic way (see Appendix B in supplementary online materials for articles). Participants then indicated which of six small gifts³ they would choose if a small gift was offered in future studies instead of course credit (choice options adopted from Lee, Amir, & Ariely, 2009). As in Experiment 1, the options were not differentiated in ways that made certain options more or less desirable.

We then administered 2-item measures of several constructs related to the choice (measured on 7-point scales anchored by "not at all" and "very"). To measure *decision certainty*, we asked how confident they were in their choice and how convinced they were that they made the best choice ($\alpha = .90$). To measure *elaboration*, we asked participants how thorough they were in processing the options and how much

³ Choice options were as follows: "LED keychain w/voice recorder", "FM tuner pen", "Quick release LED keychain", "Voice recorder pen", "Super-bright LED clip light", and "LED multi-tool kit". Pictures of each option were also provided.

attention they paid to the features of the options when making their choice ($\alpha = .75$). To measure *option similarity*, we asked participants how similar the options were to each other and how substitutable they were for each other ($\alpha = .66$). To measure *decision difficulty*, we asked participants how difficult the choice was to make and how easy the choice was to make (reverse scored; $\alpha = .85$). Finally, participants completed the rational subscale of the REI-40 (Pacini & Epstein, 1999) before being thanked for their participation.

3.2. Results

3.2.1. Choice

A preliminary multinomial logistic regression model with option choice as the dependent measure, structure as a dummy-coded predictor (0 = no-structure; 1 = structure), and rational processing as a continuous predictor revealed no effect of structure ($\chi(5) = 4.61, p = .47$, Cramer's $V = .10$). Again, structure did not affect participants' choices, as expected.

3.2.2. Post-decision measures

We analyzed the post-decision measures using a series of ANCOVAs with structure as a factor and rational processing as a covariate. The results are summarized in Table 1. In short, reminders of structure (vs. no-structure) significantly increased decision certainty ($F(1,89) = 4.82, p = .031$, Cohen's $d = .47$), as well as elaboration on the decision ($F(1,89) = 5.16, p = .026$, Cohen's $d = .48$). Structure reminders had no effect on either option similarity or decision difficulty (both $F_s < 1$).

3.2.3. Mediation analyses

Following the statistical procedures provided by Preacher and Hayes (2004), we assessed the mediating role of elaboration in the effect of structure on decision certainty by constructing a 95% confidence interval (CI) around the indirect effect (see also Shrout & Bolger, 2002; Hayes, 2013), while controlling for rational processing. Specifically, this approach involves bootstrapping procedures that compute a 95% CI around the indirect effect, and mediation is indicated by a CI that does not include zero. The result of this analysis (using 5000 bootstrapped samples) revealed a significant mediating pathway through elaboration (indirect effect = .1180, 95% CI: .010, .333). This result offers evidence that elaboration significantly mediates the effect of structure on participants' decision certainty, and thus offers evidence that our basic effect can be leveraged to shape downstream outcomes associated with greater elaboration.⁴

3.3. Discussion

These findings both extend and bolster our framework in several ways. First, the results conceptually replicate the effect of structure on elaboration despite the use of an alternative manipulation of structure and an alternative choice context. Second, the results demonstrate that these differences in elaboration can exhibit important consequences. Specifically, the positive effect of structure on elaboration led individuals to report greater confidence in their choice. Third, the results directly rule out alternative accounts for the effect of structure on decision certainty, as structure had no effect on either decision difficulty or perceptions of option similarity. In sum, reminders of structure heighten individuals' elaboration on their choices, which results in greater certainty in their choices.

⁴ Removing the rational processing covariate from the model did not change the significance of the indirect effect when using elaboration as a mediator (indirect effect = .1086, 95% CI: .005, .329). Additionally, there were non-significant indirect effects when attempting to mediate the effect of structure on decision certainty with either decision difficulty (indirect effect = .0335, 95% CI: -.227, .307) or option similarity (indirect effect = .0193, 95% CI: -.026, .140).

4. Experiment 3

The previous studies demonstrated that reminders of structure affect *how* one chooses, but could structure also affect *what* one chooses? We investigate this question in the current study by again leveraging previous findings from the elaboration literature. Specifically, attitudes based on greater elaboration are more likely to be based on the merits of a persuasive appeal (i.e., the quality of message arguments), whereas information about message sources (e.g., the familiarity of the endorser) should carry more weight for those who engage in less elaboration (e.g., Petty, Cacioppo, & Schumann, 1983). Thus, we hypothesized that structure (vs. no-structure) would lead to heightened favorability, preference, and choice for an option dominant on the strength of arguments relative to an option dominant on endorser familiarity.

4.1. Method

4.1.1. Materials pretests

We constructed two ads such that one brand had strong arguments and an unfamiliar endorser, whereas the other brand had weak arguments and a familiar endorser. The endorser-dominant ad used a famous actor (George Clooney) while the arguments-dominant ad depicted a stranger (Andrew from Oklahoma). To ensure that we were manipulating only the endorser's familiarity (and not the valence of their statements), we asked 25 participants to rate each endorser's statement (1 = very negative; 7 = very positive). Their statements did not differ in positivity (Clooney $M = 5.28, SD = 1.28$; Andrew $M = 5.32, SD = 1.52$; $t(24) = .15, p > .88$, Cohen's $d = .06$). The same 25 participants then read four attribute descriptions for popcorn and rated each description's favorability on two 7-point scales (very unappealing/appealing, sounds terrible/great; all α 's $> .94$). From the ratings of the four descriptions, we selected one highly-rated description for the arguments-dominant ad ($M = 5.54, SD = 1.44$) and one lowly-rated description for the endorser-dominant ad ($M = 3.70, SD = 1.50$; $t(24) = 4.82, p < .001$, Cohen's $d = 1.97$).

4.1.2. Participants

Given our experience with similar procedures, we hoped to recruit approximately 200 participants. At the end of the study participation deadline, we had recruited 199 undergraduate students who participated in exchange for course credit. We did not obtain any demographics data from the participants.

4.1.3. Procedure

This experiment had three between-subjects conditions (structure, no-structure, and baseline). To manipulate structure, we used the manipulation from Experiment 2. In the additional baseline condition, participants read about the role of trees in the world without any mention of the presence or absence of structure (see Appendix B in supplementary online materials or Kay et al., 2014). After completing the manipulation, participants were asked to imagine that they were choosing popcorn for a party. Advertisements for two brands of popcorn (counterbalanced and selected via the aforementioned pretest; see Appendix C in supplementary online materials for ads) were shown to the participants.

We then had participants indicate their preference in two ways. Specifically, participants indicated their choice between the two brands, as well as the strength of their preference between the brands on a continuous scale (0 = strongly prefer Brand X, 100 = strongly prefer Brand Y). Finally, participants completed the rational subscale of the REI-40 (Pacini & Epstein, 1999) before being thanked for their participation.

Table 1
Means, standard deviations, and correlations of post-decision measures in Experiment 2.

	Mean (SD)		Correlations			
	No-Structure	Structure	Decision certainty	Elaboration	Option similarity	Decision difficulty
Decision certainty	5.17 (1.32) _a	5.75 (1.23) _b				
Elaboration	4.51 (1.40) _a	5.07 (1.14) _b	.24*			
Option similarity	4.60 (0.99) _a	4.42 (1.19) _a	-.12	.07		
Decision difficulty	3.26 (1.49) _a	3.20 (1.38) _a	-.47***	.004	.18	

Notes. For means: subscripts that vary indicate means that are statistically different, and subscripts should be interpreted within row. For correlations: * $p < .05$, ** $p < .01$, *** $p < .001$. All computations done using rational processing as a covariate (correlations computed as partial correlations). Removing rational processing as a covariate did not change the significance level any result.

4.2. Results

4.2.1. Choice

To analyze the effect of structure on choice shares, we ran a logistic regression with brand choice (0 = endorser-dominant brand; 1 = arguments-dominant brand) as the outcome, condition (structure [reference category], no-structure, baseline) as a categorical independent variable, and rational processing as a control variable. The omnibus effect of condition was marginally significant (Wald's $\chi^2 = 5.25$, $p = .072$). The beta coefficients showed that those in the structure condition were significantly more likely to choose the arguments-dominant brand (82.81%) than those in the no-structure condition (65.67%; $\beta = -0.95$, Wald's $\chi^2 = 4.87$, $p = .027$, Odds Ratio = .39), and marginally more likely to do so than those in the baseline condition (66.18%; $\beta = -0.80$, Wald's $\chi^2 = 3.41$, $p = .065$, Odds Ratio = .45). A follow-up model excluding the structure condition showed that there was no difference in choice proportions between the no-structure and baseline conditions (Wald's $\chi^2 = .08$, $p = .78$, Odds Ratio = 1.11). These findings support the argument that reminders of structure increase elaboration.⁵

4.2.2. Preference

We then analyzed participants' preference ratings. We coded responses such that higher ratings indicated greater preference for the arguments-dominant brand. These preference data were then submitted to an ANCOVA with condition (structure, no-structure, baseline) as a factor and rational processing as a covariate. The results revealed a marginal omnibus effect of structure on participants' brand preferences ($F(1, 195) = 2.95$, $p = .055$). Planned contrasts showed that those in the structure condition exhibited a significantly stronger preference for the arguments-dominant brand ($M = 67.81$, $SD = 22.13$) than those in either the no-structure condition ($M = 58.70$, $SD = 25.75$, $t = 2.12$, $p = .035$, Cohen's $d = .38$), or baseline condition ($M = 57.82$, $SD = 24.44$; $t = 2.10$, $p = .037$, Cohen's $d = .43$). Mimicking the choice results, no preference difference was observed between those in the no-structure and baseline conditions ($p = .99$, Cohen's $d = .0$).⁶

4.2.3. Discussion

In this study, we explored the extent to which reminders of structure—by promoting elaboration—can influence which options individuals choose. The findings demonstrate that reminders of structure

demonstrated a relatively stronger preference for the arguments-dominant (relative to the endorser-dominant) brand. Moreover, this preference was stronger than both the no-structure and baseline condition, which demonstrates that individuals' default in this context was to perceive no structure. Such findings therefore illustrate how reminders of structure can in fact increase elaboration, and how such an increase in elaboration can influence people's actual choices.

5. General discussion

Cognitive elaboration plays a central role in persuasion, judgment, and decision making, and its extent is thought to depend on direct and interactive effects of dispositional tendencies, evaluative stimuli, and contextual factors related to the nature of the evaluative task (Petty & Wegener, 1999). Here, we demonstrate that a basic environmental characteristic – structure – with no clear relationship to the evaluative task also exerts influence. Specifically, we hypothesized and subsequently found that incidental reminders of structure result in greater elaboration (Experiment 1), which impacts both the certainty with which individuals hold to their choices (Experiment 2), as well as the specific choices they make (Experiment 3). Moreover, these effects were shown to occur across different manipulations of structure, different measures and outcomes of elaboration, and for different evaluative stimuli, thus attesting to the robustness of the effect. Overall, these findings point to the importance of structure, and the broader environment more generally, in shaping elaboration and its downstream outcomes.

The utility of studying environmental structure becomes even more apparent when one considers that its ability to stimulate elaboration stems from signaling that elaboration would be beneficial in obtaining answers or better outcomes. This suggests that exposure to or reminders of environmental structure may qualify, enhance, or otherwise moderate existing findings in the elaboration literature. For example, a number of papers have demonstrated that ambivalence leads to greater elaboration (Jonas, Diehl, & Brömer, 1997; Maio, Bell, & Esses, 1996), particularly when the message is relevant (see Petty, Briñol, & Johnson, 2012) or pro-attitudinal (Clark, Wegener, & Fabrigar, 2008). Our results suggest that this effect may be enhanced by environmental structure, since structure may spur thoughts that investments in elaboration can reduce one's ambivalence. Similarly, upticks in elaboration resulting from expectation violations (Mahesharan & Chaiken, 1991; Smith & Petty, 1996) may also be moderated by the presence or salience of structure, since structure could signal that elaboration could help reconcile expectations with reality. In considering these potential effects, it is important to reinforce that structure signals the presence of conditions that make possible the uncovering of better outcomes through elaboration, irrespective of how easy or difficult such an uncovering might be. Thus, any effect of metacognitive difficulty (ease), which has been known to also increase (decrease) particular forms of processing (see Alter, Oppenheimer, Epley, & Eyre, 2007), may materialize subsequent to the process described in our work, and particularly in contexts with a sufficient level of perceived structure to capitalize upon.

⁵ Removing the rational processing covariate from the model changed the structure vs. baseline condition comparison, as the estimated coefficient turned from marginally significant to significant ($\beta = -.90$, Wald's $\chi^2 = 4.63$, $p = .031$). As such, the omnibus effect of condition also increased (Wald's $\chi^2 = 5.84$, $p = .054$).

⁶ Removing the rational processing covariate from the model changed only the significant of the omnibus effect of condition, as it turned from marginally significant to significant ($F(1, 196) = 3.41$, $p = .035$).

Beyond its implications for work on elaboration and processing, our work also connects to past work on illusory pattern perception and control. Past work has demonstrated that low personal control encourages the perception of patterns when there are objectively none (Whitson & Galinsky, 2008). Our findings from the no-structure and baseline conditions in experiment 3 suggest that people naturally perceived no structure in the task, while the structure condition was presumably able to alter this perception and therefore boost elaboration. This pattern of results suggests that incidental reminders of structure could lead to illusory pattern perceptions and bolstered feelings of personal control. Of course, we neither use tasks with no objective structure (e.g., bingo card selection) nor measure perceptions of task structure or feelings of control, so future research is needed to test these possibilities.

Finally, our findings also draw interesting connections to existing research on social class and decision making. Specifically, work by Evans, Gonnella, Marcynyszyn, Gentile, and Salpekar (2005) has shown that low-income adolescents are more heavily exposed to chaotic, unstructured environments than their better-off counterparts. Our findings suggest that such environments are likely to foster decisions based on shallow levels of thought and processing, which may ultimately contribute to perpetuating the harsh circumstances such adolescents already face in their daily lives. This logic also parallels recent findings showing that poverty impedes cognitive function (Mani, Mullainathan, Shafir, & Zhao, 2013), and ultimately results in poorer decision making (Haushofer & Fehr, 2014). Indeed, such statements are especially troubling given that the financially disadvantaged often face narrower margins for error in decision making (Bertrand, Mullainathan, & Shafir, 2006). These works, in conjunction with our findings, suggest that another reason why structure-seeking may be functional is that it leads to more thoughtful judgments and decisions. Future work should continue to consider other ways in which structure might enable critical aspects of daily life.

Appendix A. Supplementary materials

Supplementary materials to this article can be found online at <http://dx.doi.org/10.1016/j.jesp.2016.01.001>.

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