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Wanting a bird's eye to understand why: Motivated abstraction and causal uncertainty

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HIGHLIGHTS

- Causal uncertainty activates a goal to think abstractly.
- Causal uncertainty increases resumption to interrupted abstract thinking task.
- Abstract thinking task completion leads to post-fulfillment decrease in motivation.

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ABSTRACT

When negative events occur (e.g., a breakup, a mass shooting), people naturally ask themselves *why* such things happen. Recent research has shown that more abstract thinking about negative events fosters less uncertainty about why those events happened. The present research examined a downstream consequence of this effect, namely, whether causal uncertainty activates a goal to think more abstractly. We drew on principles of goal activation, to show that after leading participants to feel more uncertain about a negative event, they were more likely to resume an experience that afforded an opportunity to think more abstractly (i.e., focusing on similarities rather than differences; Experiments 1A and 1B). In further support of our motivational framework, we also show that after leading participants to feel more uncertain about a negative event, they no longer exhibited a more positive attitude toward an experience that afforded an opportunity to think more abstractly once they had the opportunity to actually engage in more abstract thinking (Experiment 2). Theoretical and practical implications are discussed.

1. Introduction

> "Think left and think right and think low and think high. Oh, the thinks you can think up if only you try."
> [From the book "Oh, the Thinks You Can Think!" by Dr. Seuss]

People are often motivated to achieve a variety of goals, including behavioral and performance standards (Gollwitzer & Brandstätter, 1997), emotional states (Gross & John, 2003), and general feelings of competence and belonging (Reis, Sheldon, Gable, Roscoe, & Ryan, 2000). Cognitive processes certainly play a key role in such goal pursuits. Indeed, research on motivated reasoning shows that people may strive to arrive at certain conclusions, which allows them to think what they want to think (Kunda, 1990). Furthermore, as the opening quote illustrates, people can also be motivated to think in a certain way (Gollwitzer & Bayer, 1999; Kruglanski & Webster, 1996; Neuberg, 1989). The present research tests whether the experience of causal uncertainty motivates people to think at a higher, more abstract level. Specifically, we test key motivational principles established in the goal literature to examine people's pursuit and fulfillment of an abstract thinking goal.

1.1. Motivated cognition

The field of motivation is mainly concerned with the activation and pursuit of goals, and the consequences of goal pursuit (Elliot & Thrash,

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2002; Ferguson & Bargh, 2004; Fitzsimons, Chartrand, & Fitzsimons, 2008; Gollwitzer & Moskowitz, 1996; Hassin, Aarts, Eitam, Custers, & Kleiman, 2009). Much of this research focuses on tangible goals (for review, see Gollwitzer & Moskowitz, 1996). For example, motivation researchers commonly deal with goals that center on things such as reducing unhealthy food consumption (Papies, Stroebe, & Aarts, 2008), promoting prosocial behavior (Weinstein & Ryan, 2010), fostering academic success (Fishbach, Friedman, & Kruglanski, 2003), and even engaging in sexual intercourse (Aarts, Gollwitzer, & Hassin, 2004).

Of course, social psychologists have also long been interested in examining less tangible goals, including what we will refer to throughout this article as *thinking goals* (Andrade, 2005; Hauser-Cram, Sirin, & Stipek, 2003). Thinking goals are desired cognitive states associated with certain thought content or processes. Thinking goals, as they relate to thought content, refer to *what* people want to think. Motivated reasoning is a manifestation of these goals as it "concerns the outcome of a given reasoning task" (Kunda, 1990, p. 480). For example, people often change their attitudes to match their behavior to reduce cognitive dissonance (Elliot & Devine, 1994; Festinger, 1957). People also tend to be wishful thinkers who feel motivated to have positive illusions and expectations about themselves, others, and the world (Campbell & Sedikides, 1999; Crocker & Luhtanen, 1990; Lerner, 1980; Murray & Holmes, 1997; Weinstein, 1980). At other times, people may be motivated to lower the perceived value or importance of objects and events (Taber & Lodge, 2006; Veling, Holland, & van Knippenberg, 2008).

Most germane to our research are thinking goals related to modes of thinking, which reflect *how* people want to think. Indeed, studies have shown that people can be motivated to think in different ways. For instance, people can be motivated to quickly seize definite answers (Kruglanski & Webster, 1996), be free of biases (Neuberg, 1989), think deliberately (Gollwitzer & Bayer, 1999), and be creative and open-minded (Fitzsimons et al., 2008). Since having a goal to think a certain way relates to a process of thinking, it is relatively free of what the end-product of the thought process may be. To illustrate, consider a person who recently ended a romantic relationship. She may have learned from similar past experiences that occupying her mind with distractions helps keep her sad feelings at bay. Thus, her breakup would activate a goal to be distracted. While her thinking goal (distracting oneself) remains constant, the specific content of the goal pursuit could manifest in many forms (e.g., suddenly gaining an interest in baseball, becoming curious about the etiology of words). Similarly, the present research explores the pursuit of a goal to think in a certain way, namely, more abstractly.

Regardless of whether motivated cognition relates to a particular content or a way of thinking, it can have meaningful effects on people's attention and perception (Balcetis & Dunning, 2006, 2007; Bradley et al., 2003; Veltkamp, Aarts, & Custers, 2008), memory (Dijksterhuis, van Knippenberg, Kruglanski, & Schaper, 1996; Lemay & Neal, 2013; Shu, Gino, & Bazerman, 2011), information processing (De Dreu, Koole, & Oldersma, 1999; Ditto, Scepansky, Munro, Apanovitch, & Lockhart, 1998; Taber & Lodge, 2006), social interactions (De Grada, Kruglanski, Mannetti, & Pierro, 1999), attitudes and judgments (Chernev, 2001; Fazio, Zanna, & Cooper, 1977; Lerner & Simmons, 1966), and decision-making (De Dreu, Nijstad, & van Knippenberg, 2008; Verplanken & Holland, 2002). As highlighted here, prior research on motivated cognition has mainly examined its consequences.

The present research aims to move beyond past work by examining more deeply what it means for a thinking style to be motivated. Specifically, we explore whether principles of goal pursuit apply to people's goal to think in a more abstract way. As far as we know, the present research is the first to directly use key experimental paradigms of motivational principles to test the activation and fulfillment of a goal to adopt a mode of thinking.

1.2. Motivation to abstract

Recently, we investigated the role that abstraction plays in reducing causal uncertainty (Namkoong & Henderson, 2014). A basic property of human cognition is that individuals can mentally represent or construe objects and events at different levels of abstraction (Burgoon, Henderson, & Markman, 2013). Higher-level, more abstract construals tend to be relatively simpler and more cohesive than lower-level, more concrete construals (Reyna, 2012; Trope & Liberman, 2011; Vallacher & Wegner, 1987). This is because higher-level construals of objects and events emphasize superordinate, central features and omit incidental features without significantly changing the meaning of events. For example, construing a relationship conflict more abstractly would likely involve thinking about more essential, defining aspects of the conflict (e.g., incompatible personality traits that endure over time, or a general theme that emerges consistently across arguments), whereas a more concrete construal would highlight idiosyncratic details about the conflict (e.g., when or where it occurred, or the particulars of how it differs from other conflicts).

People are at times motivated to think in a more abstract way. For example, people tend to make more global dispositional attributions to explain positive outcomes of their actions, but more situational and context-specific attributions for negative outcomes. This bias is largely based on one's motivation to view the self in a more positive light (for reviews, see Campbell & Sedikides, 1999; Mezulis, Abramson, Hyde, & Hankin, 2004). Similar to this self-serving bias, people may be motivated to generalize favorable aspects of their ingroups and negative aspects of their outgroups (Maass, Salvi, Arcuri, & Semin, 1989). These effects are partly explained by a highly salient protective motivation toward ingroups (Maass, Ceccarelli, & Rudin, 1996; Maass, Milesi, Zabbini, & Stahlberg, 1995). In the present research, we explore another factor that may motivate people to think more abstractly, namely, when people feel uncertain about causal relationships.

1.3. Causal uncertainty as a trigger for an abstraction goal

Negative life events, such as a breakup, often baffle people because they are difficult to make sense of. One of the first questions people naturally ask themselves in these circumstances is *why* such things happen (Wong & Weiner, 1981). Indeed, the desire to understand causal relationships is such a powerful motive that the lack of understanding can produce a host of negative consequences. For example, research shows that causal uncertainty is associated with social anxiety, depression, and low self-esteem (Boucher & Jacobson, 2012; Edwards, Weary, & Reich, 1998).

Prior work has examined the role that causal uncertainty plays in cognitive processing. Specifically, this work has highlighted the cognitive strategies people adopt in order to improve their causal understanding (for a review, see Weary, Tobin, & Edwards, 2010). For example, people who are chronically uncertain about causes and who place high importance on causal understanding tend to examine causal explanations more carefully (Tobin & Weary, 2008; Weary & Jacobson, 1997). People with high causal uncertainty are also better at adjusting for cognitive heuristics and biases, such as the availability heuristic and correspondence bias (Vaughn & Weary, 2003; Weary, Vaughn, Stewart, & Edwards, 2006).

Recently, Helzer and Edwards (2012) found that causal uncertainty activates an abstract construal, presumably because of people's desire to restore a sense of certainty. Extending their work, Namkoong and Henderson (2014) showed that an abstract construal indeed reduces experiences of causal uncertainty. Together, these findings suggest that causal uncertainty may motivate people to construe events more abstractly. Namkoong and Henderson (2014) provided indirect evidence for how an abstract thinking goal can originate in

the first place under circumstances associated with high causal uncertainty. Indeed, it is possible that, over time, people repeatedly benefit from more abstract thinking when experiencing causal uncertainty. And, as a result, people would develop a positive association between causal uncertainty and a more abstract way of thinking. Because of this positive association, experiencing causal uncertainty may activate a goal to think more abstractly. The findings of Helzer and Edwards (2012) imply that many individuals who experience causal uncertainty may activate, and ultimately fulfill, a goal to think more abstractly. Taken together, previous research hints at the motivational process underlying the relationship between causal uncertainty and abstract thinking.

The present research directly tests the pursuit of a goal to think in a more abstract way, triggered by causal uncertainty. By doing so, the research presented in this article makes several important contributions to the literature. First, we provide a theoretical mechanism that integrates the findings of Helzer and Edwards (2012) and Namkoong and Henderson (2014) to provide a more complete picture of the role that abstraction plays in causal uncertainty. Specifically, we examine the motivational consequences of causal uncertainty both before and after people have an opportunity to actually think more abstractly, and extend the literature on motivated abstraction by introducing an important antecedent, namely, causal uncertainty. Second, we contribute more broadly to the field of motivated cognition, by directly testing the motivational properties of a thinking goal. To test our theory that causal uncertainty activates a goal to think in a more abstract way, the following experiments rely on established guidelines for distinguishing motivational from non-motivational effects (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001; Förster, Liberman, & Friedman, 2007; Martin & Tesser, 2009).

2. Experiment 1A

The first experiment used the task interruption and resumption paradigm taken from the self-regulation literature (Bargh et al., 2001; Förster et al., 2007) to test our theory that causal uncertainty activates a goal to think more abstractly. A key characteristic of goal pursuit is the high rate of task resumption after disruption (Bargh et al., 2001; Gollwitzer & Liu, 1995; Weiner, 1965). That is, when people are interrupted while pursuing a goal, they want to return and complete the goal. For example, Bargh et al. (2001) found that participants who were primed with a high-performance goal (vs. no goal) during a word puzzle task were more likely to reengage (rather than move on to a more enjoyable task) after the word puzzle had been disrupted.

Similarly, we hypothesized that participants who experienced high (vs. low) causal uncertainty would be more likely to resume a task after being interrupted if the task afforded the opportunity to think in a more abstract way. In fact, we predicted that heightened causal uncertainty would lead people to resume a task that affords more abstract thinking, but not a task that affords more concrete thinking, even when people could choose to complete a more enjoyable task.

2.1. Method

Eighty-five University of Texas undergraduate students (40 females; $M_{age} = 19.67$, $SD_{age} = 1.03$) participated in this experiment for course credit.[1] The experiment relied on a 2 (causal uncertainty: high vs. low) × 2 (task construal: abstract vs. concrete) between-participants design.

2.1.1. Manipulation of uncertainty

At the beginning of the session, we told participants that there would be a total of three independent parts to the survey (each lasting for 2 min). Specifically, we told them that they would engage in a Relationship Conflict Task, a Picture Impression Task, and a Humor Evaluation Task (in this order). See Appendix A for the descriptions of the tasks.

In the Relationship Conflict Task, participants recalled a relationship conflict and described it with either high or low casual uncertainty. Following the procedure of Namkoong and Henderson (2014; Experiment 1), we asked participants to either write about aspects of the conflict that they still had difficulty understanding in terms of why it happened (high causal uncertainty condition) or aspects that they now understood very well (low causal uncertainty condition). Specifically, we used the following instructions (low causal uncertainty instructions in parentheses):

> A lot of times, conflicts happen and people don't understand why they happened. Other times, conflicts happen and people fully understand why they happened. For your particular conflict, what are some aspects of this conflict that you have a very *difficult time understanding* (*clear understanding*) in terms of why they happened? What things about it do you *still not really understand* (*understand really well*)?

To verify the effectiveness of our manipulation, we created a composite of participants' causal uncertainty by averaging their responses ($r = .54$, $p < .0001$) to two 7-point items ("I feel like I have a very good understanding about the conflict." and "I feel like there are many things about this conflict that I still don't fully understand." [reverse-coded]; 1 = Strongly disagree, 7 = Strongly agree).

2.1.2. Task construal and interruption

After manipulating and measuring causal uncertainty, we directed participants to an allegedly unrelated survey titled the Picture Impression Task. Here, we randomly assigned participants to either "Focus on Similarities" or "Focus on Differences" between pairs of pictures. Focusing on similarities between things fosters thinking at a more abstract level, whereas focusing on differences between things fosters thinking at a more concrete level (Fujita & Roberts, 2010; also see Burgoon et al., 2013). Indeed, a more abstract construal involves ignoring or assimilating details to create a simpler, more coherent representation of events (Liberman, Sagristano, & Trope, 2002) For example, when thinking about a person enjoying a picnic at the park and another person doing homework in the library, identifying a common thread between the two events may require considerations of more abstract values and goals (e.g., "they are both engaged in activities that promote their overall well-being") while ignoring lower-level details about each event (e.g., "the former event took place at the park, and the latter event in the library").

In the Picture Impression Task, as the first pair of pictures started to load and when participants could only see the very top portion of the pictures, we abruptly interrupted participants with an unrelated task. The top portion of the pictures had no information so participants were unable to identify the content of the pictures and thus unable to experience a shift in construal level (see Appendix B). We interrupted participants with a typing task that supposedly measured their natural typing speed as a part of the survey data collection process. We emphasized that the sudden interruption was important for capturing their natural typing habits. Forty-nine

[1] Sample sizes were determined based on the availability of subject pool resources.

nonsense words appeared on the screen with an instruction that said "Type all nonsense words accurately in your natural speed." It was important for us to insert an interruption that preoccupied participants' cognitive attention, as we were concerned that abstraction could be achieved by some participants via spontaneous thought (see Helzer & Edwards, 2012). The screens that we presented to participants for the task interruption procedure are shown in Appendix B.

2.1.3. Task resumption

The dependent variable of this experiment was the proportion of participants who decided to resume the interrupted task. After participants finished typing all nonsense words, they continued to the next screen where they could select to either resume the interrupted Picture Impression Task, or switch to the Humor Evaluation Task instead. We described the Humor Evaluation Task as involving reading and evaluating humorous stories (see Appendix A for the full description). We clearly stated that they could only complete one of the two remaining tasks. To ensure that the perceived duration and required effort of each task did not influence participants' choice, we reminded them again that both tasks would last 2 min, and even told them that each task consisted of the same number of episodes (5 pairs of pictures for the former, and 5 humorous stories for the latter).

2.1.4. Pilot test for construal manipulation check

To confirm the notion that focusing on similarities (vs. differences) is considered by participants as affording more abstract thinking, we ran a separate pilot test as a manipulation check. Ninety-seven University of Texas undergraduate students enrolled in psychology courses participated in this test. Except for not having the causal uncertainty manipulation, the procedure of the pilot study was the same as the main study (Experiment 1A). Specifically, participants in the pilot study were told they would be completing two tasks, namely the "Picture Impression Task" and the "Humor Evaluation Task," and they expected each to last 2 min. Then, they were randomly assigned to either the similarity focus condition or the difference focus condition, as in the main experiment. The descriptions used to explain the Picture Impression Task were also identical to those used in the main experiment. Then, as in the main experiment, participants were interrupted as the pictures began to load, but instead of the nonsense word typing task, they were shown manipulation check questions.

The manipulation check questions were created based on the abstraction literature. Abstract (vs. concrete) cognitive processing requires identifying central meaning and underlying reasons behind events, and finding overarching themes and general patterns (for a review, see Burgoon et al., 2013; Trope & Liberman, 2003, 2011). Thus, we asked participants "to what extent do you think the Picture Impression Task – finding *similarities* (*differences*) across pairs of pictures – that you are about to do will require you to do the following? (1 = not at all, 7 = very much)" Below this question, participants saw the following items: "Focusing on the essence or central meaning of the pictures; Thinking about the fundamental reason behind the actions in each picture; Thinking more abstractly about the pictures; Looking for overarching themes between pictures; Thinking at a more general level; Looking for patterns in the pictures."

The six items were averaged to form a single measure ($\alpha = .77$), and we used this measure to examine whether participants in the similarity focus condition found the Picture Impression Task to afford more abstract thinking than those in the difference focus condition. Note that, as in the main experiment, participants did not actually engage in the Picture Impression Task; they simply saw a description of the task and then were interrupted to answer the manipulation check questions. Also following the design of the main experiment, the pilot test was a between-participants design, so they evaluated either the similarity-focus task, or the difference-focus task, but not both. As predicted, an independent t-test revealed that participants in the similarity focus condition thought the Picture Impression Task would evoke more abstract thinking ($M = 5.34$, $SD = .88$) compared to those in the difference focus condition ($M = 4.35$, $SD = 1.11$; $t(95) = 4.83$, $p < 0.0001$, $d = .98$).

2.1.5. Pilot test to rule out alternative explanations

We conducted another pilot study to rule out potential alternative explanations related to perceived task enjoyment and effort. We wanted to ensure that the Humor Evaluation Task was indeed perceived as a more enjoyable alternative and would be chosen at a higher rate if people's goal to think abstractly was not activated. We also wanted to make sure that people experiencing high causal uncertainty were not simply choosing an easier task (as opposed to a task that afforded more abstract thinking). So, in this pilot study, we asked participants how enjoyable and difficult they thought each task would be. Forty-eight University of Texas undergraduate students (30 females; $M_{age} = 21.04$, $SD_{age} = 1.18$) participated in the pilot study. For each task (similarity-focused Picture Impression Task, difference-focused Picture Impression Task, and Humor Evaluation Task), participants first read the task description (identical to what was used in the main experiment; see Appendix A), then rated on 7-point scales how difficult they anticipated the task to be, and how fun or enjoyable they anticipated the task to be. We randomized the order of the evaluated tasks.

To analyze the pilot data, we ran a series of paired t-tests. We first examined the anticipated difficulty associated with each task. Participants thought that the similarity-focused Picture Impression Task ($M = 2.85$, $SD = 1.53$) would be significantly more difficult than both the difference-focused Picture Impression Task ($M = 2.30$, $SD = 1.27$; $t(47) = 2.81$, $p = .007$, $d = .39$), and the Humor Evaluation Task ($M = 2.15$, $SD = 1.23$; $t(47) = 3.61$, $p = .001$, $d = .50$). The difference was not significant between the difference-focused Picture Impression Task and the Humor Evaluation Task ($t(47) = 1.29$, $p = .20$). Second, we examined how fun or enjoyable participants thought each task would be. As expected, participants thought the Humor Evaluation Task would be more fun and enjoyable ($M = 4.69$, $SD = 1.63$), compared to both the similarity-focus Picture Impression Task ($M = 3.85$, $SD = 1.35$; $t(47) = 2.98$, $p = .005$, $d = .56$), and the difference-focus Picture Impression Task ($M = 3.60$, $SD = 1.42$; $t(47) = 4.03$, $p = .0002$, $d = .71$). Lastly, there was a marginal gap between the similarity- and difference-focus Picture Impression Tasks ($t(47) = 1.95$, $p = .06$, $d = .29$).

Returning to our main prediction, we expected that participants experiencing causal uncertainty would show higher rates of task resumption when the interrupted task was associated with more abstract (vs. concrete) thinking. To measure task resumption, we gave participants an opportunity to engage in a more enjoyable task that involved reading humorous stories. The pilot study confirmed that the Humor Evaluation Task was indeed perceived as a more enjoyable alternative to participants. Also, the similarity-focus Picture Impression Task was perceived as the most difficult task of all three, ruling out the possibility that people experiencing causal uncertainty would choose this task simply because it seems easier.

2.2. Results

2.2.1. Manipulation check

The causal uncertainty manipulation was successful. Participants in the high (vs. low) causal uncertainty condition reported feeling more uncertain about the cause of their relationship conflict ($M = 3.27$, $SD = 1.63$ vs. $M = 2.31$, $SD = 1.27$; $t(83) = 3.03$, $p < .01$, $d = .66$).

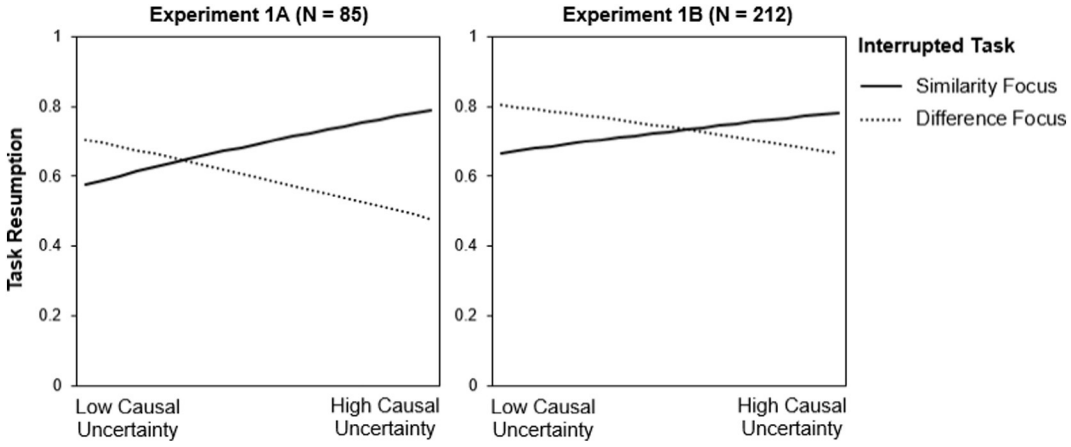

Fig. 1. Task resumption rate in Experiments 1A (left) and 1B (right). Predicted probabilities (based on a binary logistic regression model) of task resumption as a function of causal uncertainty and interrupted task focus.

2.2.2. Task resumption

A binary logistic regression with uncertainty condition, task construal, and their interaction entered as predictors and the task resumption rate as the dependent variable revealed only the expected interaction effect ($B = 1.97$, $SE = .97$, Wald $= 4.18$, $p = .04$). Among participants in the high causal uncertainty condition, a significantly greater proportion of participants chose to resume if they were interrupted from a more abstract (vs. more concrete) thinking task ($M = 78.95\%$ vs. $M = 47.83\%$; $B = -1.41$, $SE = .70$, Wald $= 4.04$, $p = .04$, OR $= 4.09$). This difference was not significant in the low causal uncertainty condition ($M = 57.69\%$ vs. $M = 70.59\%$; $B = .57$, $SE = .66$, Wald $= .73$, $p = .40$, OR $= 0.57$). As shown in Fig. 1 (left), the significant difference in task resumption among participants in the high causal uncertainty condition is driven by both an increased resumption rate of participants interrupted from the similarity focus task, and a decreased resumption rate of participants interrupted from the difference focus task. In other words, as causal uncertainty increased, the likelihood of resuming increased for an opportunity that afforded more abstract thinking, but decreased for an opportunity that afforded more concrete thinking. This is consistent with the notion that goal pursuit involves both approach and avoidance processes (Fishbach, Zhang, & Trope, 2010; Förster et al., 2007; Higgins, 2000).

2.3. Potential alternative explanations

Experiences that facilitate goal attainment are typically evaluated positively, whereas experiences that hinder goal attainment are typically evaluated negatively (Förster et al., 2007). For instance, people with an active goal to eat healthy assign more positive value to healthy food and more negative value to unhealthy food (Laran & Janiszewski, 2009). Indeed, we found that participants who experienced greater causal uncertainty were more (less) attracted to an activity that affords more abstract (concrete) thinking. However, one may wonder whether our effects can be accounted for by people's tendency to desire activities that are easy or emotionally comforting. In the next section, we discuss why these explanations are unlikely to account for our findings.

2.3.1. Anticipated task difficulty

Is it possible that participants in this experiment expected that focusing on similarities (as opposed to differences) would be easier, leading those with high causal uncertainty to be more likely to resume after being interrupted? Prior research suggests that more abstract thinking is not inherently less effortful compared to more concrete thinking (Fujita, Eyal, Chaiken, Trope, & Liberman, 2008; Liberman et al., 2002; Smith & Trope, 2006). In fact, the pilot study indicated that identifying similarities between two different pictures was perceived to be more difficult than both of the other tasks. Thus, it is highly unlikely that participants were simply choosing a task that seemed easier.

2.3.2. Anticipated mood

One may also question whether participants who experienced causal uncertainty simply gravitated toward experiences that afforded more abstract thinking because they believed such experiences would elicit more positive feelings. Research has found that more abstract thinking can foster positive evaluations (Updegraff & Suh, 2007). However, whether more abstract thinking improves

Table 1
Summary of data characteristics of Experiments 1A (left) and 1B (right).

	Experiment 1A (N = 85)	Experiment 1B (N = 212)
Gender; age	40 females; $M_{age} = 19.67$, $SD_{age} = 1.03$	136 females; $M_{age} = 20.64$, $SD_{age} = 4.22$
Institution	Undergraduate students in University of Texas marketing classes	Undergraduate students in (1) University of Texas psychology classes, and (2) University of Nevada marketing classes
Participation environment	Computer lab with proctor guidance	Survey link distributed to students; students completed survey at their own time & location without proctor
Avg. study duration	11 min	21 min
Avg. typing interruption duration	96 s	118 s

emotional states when people are focused on negative events is unclear. On one hand, research suggests that more abstract construals can provide a psychological buffer against negative evaluations and experiences (Kross, Ayduk, & Mischel, 2005; Vess, Arndt, & Schlegel, 2011). On the other hand, more abstract construals can result in an over-generalization of negative incidents and lead to stronger emotional reactions to negative outcomes (Corcoran & Mussweiler, 2010; Watkins, Moberly, & Moulds, 2008).

The task interruption and resumption paradigm used in this experiment rules out this alternative explanation because the alternative task that participants could choose to do involved reading humorous stories. The pilot study confirmed this, showing that participants thought the Humor Evaluation Task would be the most fun and enjoyable. If participants' goal was to simply be in a better mood state, rather than to think more abstractly, we would not have found our demonstrated effect; that for participants experiencing high causal uncertainty, being interrupted from a more abstract (vs. more concrete) task resulted in a higher task resumption rate. In sum, it seems unlikely that differences in anticipated mood can account for our observed effects.

Experiment 1A confirms our theory that more abstract thinking becomes an active goal when causal uncertainty increases. Using a task interruption and resumption paradigm from prior motivation research, we found that participants with high causal uncertainty were more likely to resume after being interrupted from a more abstract (vs. more concrete) construal task, even when they could choose a more pleasurable task instead. In contrast, task construal was not a significant determinant of task resumption in the low causal uncertainty condition.

3. Experiment 1B

The purpose of Experiment 1B was to replicate the effect of Experiment 1A with a larger sample size. We collected data from college students again ($N = 212$, 136 females; $M_{age} = 20.64$, $SD_{age} = 4.22$). Due to the way the subject pool system was set up for these students, the experiment did not take place in a controlled computer lab setting as it did in Experiment 1A. Rather, students received a URL (a web link) to the experiment, and had complete freedom when choosing when and where they could participate. Table 1 summarizes the differences in sample characteristics between the original and replicated experiments. The design and procedure of this experiment were identical to those of Experiment 1A.

3.1. Results

3.1.1. Manipulation check

The causal uncertainty manipulation was successful. Participants in the high (vs. low) causal uncertainty condition reported feeling more uncertain about the cause of their relationship conflict ($M = 3.34$, $SD = 1.53$ vs. $M = 2.63$, $SD = 1.38$; $t(210) = 3.56$, $p < .0001$, $d = .49$).

3.1.2. Task resumption

A binary logistic regression with uncertainty condition, task construal, and their interaction entered as predictors and the task resumption rate as the dependent variable revealed only the expected interaction effect ($B = 1.31$, $SE = .65$, Wald $= 4.12$, $p = .04$), replicating the finding from Experiment 1A. The interaction shows that, as causal uncertainty increases, the task resumption rate increases for participants interrupted from a similarity-focus task, but decreases for those interrupted from a difference-focus task. Fig. 1 shows the findings from Experiments 1A & 1B, side-by-side.

In this experiment, however, the simple effects analysis in the high causal uncertainty condition was not statistically significant ($B = .59$, $SE = .45$, Wald $= 1.70$, $p = .19$). As illustrated in Fig. 1, this is because the overall task resumption rate in the difference focus condition was higher in Experiment 1B compared to Experiment 1A. That is, participants in this experiment were, in general, more likely to resume the Picture Impression Task in the difference focus condition. When people have limited cognitive capacity, they are more likely to focus on differences than on similarities (Sherman, Conrey, & Groom, 2004; Sherman & Frost, 2000; Sherman, Lee, Bessenoff, & Frost, 1998). And we have supporting evidence that many of our participants in this experiment were indeed under high cognitive load.

As summarized in Table 1, participants in Experiment 1A completed the study in a controlled lab setting, whereas participants in this experiment were sent a web address via email and completed the study on their own. As one might expect, this led to a significant number of students taking the survey in distracting conditions. Before participants exited Experiments 1A and 1B, we asked them: "Any problems or comments? Is there anything we should know that happened during your session? Were you interrupted by someone or something? … Please be honest and detailed when answering this question… This will not affect your completion status or extra credit earnings in any way."

In Experiment 1A, only 4 out of 85 students reported being distracted (4.7% of the sample): specifically, 1 student mentioned being distracted by another participant entering the computer lab, 1 student mentioned being distracted by the typing noise of other participants, and 2 students admitted they were listening to music through an earphone. In Experiment 1B, however, out of 212 respondents, 18 (8.5%) admitted to listening to music, 8 (3.8%) said they were watching a video or television, and 34 (16%) reported talking to someone or being in a space where people were talking — e.g., in a classroom during lecture. Together, more than 28% of the sample reported completing Experiment 1B in a distracting environment, which is almost six times greater than that of Experiment 1A. Furthermore, participants in Experiment 1B spent twice as much time completing the identical study, and also spent a longer time during the task interruption phase, compared to those in Experiment 1A (see Table 1).

As noted earlier, a series of studies by Sherman and colleagues have established that when people have limited cognitive resources, they experience an increased inclination to pay attention to differences and inconsistencies (as opposed to similarities and consistencies). This is a plausible explanation for why the baseline preference for the difference focus task is higher in Experiment 1B, compared to Experiment 1A.

Regardless of this difference between the two experiments, it is important to note that the predicted interaction between casual uncertainty and task construal remains constant in both: that is, as causal uncertainty increased, people were more likely to resume to an abstract thinking task (i.e., focusing on similarities; facilitates goal for abstraction), and less likely to resume to a concrete thinking task (i.e., focusing on differences; hinders goal for abstraction).

In the next experiment, we seek evidence for post-attainment decrement in motivation after goal satiation. That is, we test whether participants who experience high causal uncertainty cease to show an increased preference for more abstract stimuli once they have had an opportunity to actually engage in more abstract thinking.

4. Experiment 2

The present experiment continues to examine the notion that causal uncertainty activates a goal to think more abstractly. In this experiment, we again made participants feel more (vs. less) causally uncertain about a relationship problem, and then allowed them to actually think more abstractly (goal fulfillment) or more concretely (goal failure) in order to examine the effect of goal completion on

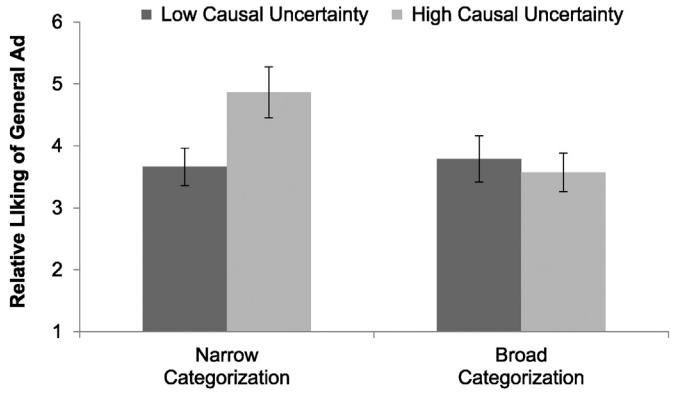

Fig. 2. Advertisement preference in Experiment 2. Mean liking of general advertisement relative to detailed advertisement (1 = Definitely like detailed advertisement, 6 = Definitely like general advertisement) as a function of causal uncertainty and categorization activity in Experiment 2. Error bars denote one standard error around the mean.

participants' preferences. Researchers have distinguished between motivational and non-motivational phenomena using a variety of goal activation principles, one of them being that motivation diminishes once a goal has been satisfied (Bargh et al., 2001; Ferguson & Bargh, 2004; Fitzsimons et al., 2008; Förster et al., 2007; Gollwitzer & Moskowitz, 1996; Laran & Janiszewski, 2009; Martin & Tesser, 2009).

When a goal is active, individuals assign positive values to objects and activities that increase the chance of goal attainment, or negative values to objects and activities that hinder goal attainment, or both (Ferguson & Bargh, 2004; Förster et al., 2007). For example, people report a greater preference for healthier (tastier) food options when their healthy-eating (indulgence) goal is active (Laran & Janiszewski, 2009). Similarly, unconsciously primed goals to seek prestige and thrift increase people's tendency to choose expensive and economic options, respectively (Chartrand, Huber, Shiv, & Tanner, 2008). Moreover, the evaluation of and engagement with an activity is higher when its strategic process fits with one's goal-pursuit orientation (Higgins, 2000; Higgins, Idson, Freitas, Spiegel, & Molden, 2003). These shifts in value serve a self-regulatory function, as people who assign more value to goal-related targets tend to be more successful in their goal-pursuits (Ferguson & Porter, 2009). Thus, we predicted that individuals with a goal to think more abstractly would value opportunities that afford more abstract thinking more highly compared to those who do not have this goal.

Germane to our experiment, decreased motivation is often expressed by a shift in preference or construct accessibility after a goal is fulfilled (for review, see Fishbach & Dhar, 2007; Wilcox, Vallen, Block, & Fitzsimons, 2009). For instance, Wilcox et al. (2009) found that participants revealed a weaker preference for healthy over indulgent food items (e.g., salads over potato chips) if they believed they had fulfilled their health goal. Also, Liberman and Förster (2000) found that suppressing a construct activates a need to use the construct, but when this need is satisfied, the construct is no longer highly accessible. Thus, we hypothesized that the goal to think more abstractly after experiencing high (vs. low) causal uncertainty should be satisfied once people actually engage in more abstract thinking, leading them to no longer exhibit a more positive attitude toward opportunities that afford more abstract thinking.

A key benefit of this paradigm is that it allows us to confirm that our effects are indeed driven by motivation, rather than cognitive congruency between participants' actual construal level and evaluated stimuli (i.e., a cognitive fluency account). Research has shown that people are more favorable toward messages, pictures, and products when the level at which these things are represented are congruent with people's cognitive orientations, presumably because of increased ease of processing (Kim, Rao, & Lee, 2009; White, MacDonnell, & Dahl, 2011). Since Helzer and Edwards (2012) have already found that priming causal uncertainty actually led to more abstract thinking, one might argue that any preference we observe in the current experiment for abstract stimuli among uncertain individuals is not a consequence of goal activation, but of the cognitive congruency between participants' actual construal level and the evaluated target.

The design of this experiment allows us to rule out this alternative explanation. If it is cognitive congruency that is driving people's preferences in this experiment, then engaging in an abstract thinking task should increase people's liking of more abstract stimuli. A motivational account, however, predicts the opposite. That is, a more abstract thinking task would satiate the abstract thinking goal, resulting in *reduced* attraction toward more abstract stimuli among individuals with high causal uncertainty. Because these two potential mechanisms (cognitive fluency vs. goal fulfillment) would lead to different predictions, we can empirically identify the underlying process through this experiment.[2]

We argued that the abstract thinking goal activated by causal uncertainty is a generalized effect based on past experience (Namkoong & Henderson, 2014), and an abstract thinking style is a general mode of processing information which often affects unrelated contexts (Burgoon et al., 2013). Thus, the effect of an abstract thinking goal should have an impact even in unrelated contexts. Consistent with this prediction, Namkoong and Henderson (2014) found that thinking at an abstract level in one context successfully reduced causal uncertainty in another, unrelated context. So, in this experiment, we measured participant's preference for advertising messages unrelated to the causal uncertainty manipulation.

Persuasive messages often vary in their levels of abstractness (Corcoran, Epstude, Damisch, & Mussweiler, 2011; Hansen & Wänke, 2010; Haws & Poynor, 2008; Kim et al., 2009). For instance, a marketer may decide to highlight the general desirability of a product (e.g., safety) or specific features of the product (e.g., six airbags). We measured whether participants' preference toward a more abstract advertisement in the high causal uncertainty condition shifted downward as a result of fulfilling an abstract thinking goal.

4.1. Method

One hundred and twenty-six University of Texas students (52 females) participated for course credit. This experiment relied on a 2 (causal uncertainty: high vs. low) × 2 (task construal: abstract vs. concrete) between-participants design.

4.1.1. Manipulation of uncertainty

As in Experiments 1A and 1B, we first asked participants to recall a specific relationship conflict they had with a close other. On the next screen, participants wrote about causal aspects of the conflict that they either had difficulty understanding (high causal uncertainty) or

[2] Given that participants were prevented from actually adopting a higher level of construal in Experiments 1A and 1B, we already have suggestive evidence that a cognitive fluency account is unlikely to explain our findings.

understood very well (low causal uncertainty). Then they answered the same manipulation check questions used in the previous experiments.

4.1.2. Categorization task

To manipulate goal fulfillment or failure, we then directed participants to an allegedly separate survey where they either completed a more abstract or more concrete thinking task. Specifically, we used a breadth of categorization task modeled after Ülkümen, Chakravarti, and Morwitz's (2010) task. Categorizing objects into broad and narrow categories reflect more abstract and concrete thinking, respectively (Burgoon et al., 2013). In this task, participants categorized 13 daily activities (e.g., doing homework, cleaning the house) either as broadly or as narrowly as possible. To describe what we meant by broad (narrow) categorization to participants, we used the following instructions: "Categorize all activities AS BROADLY (NARROWLY) AS POSSIBLE. Use a SMALL (LARGE) NUMBER OF CATEGORIES. Focusing on the similarities (differences) between these activities is known to help."

4.1.3. Preference

Finally, in an ostensibly separate survey, we asked participants to indicate their relative preference between two advertisements about a BMW automobile, one being more abstract, and the other being more concrete. We used the abstract and concrete versions of advertisements from Haws and Poynor (2008). The abstract advertisement described the automobile using general statements (e.g., "The enjoyment provided to the driver of such an extraordinary mode of transport is practically immeasurable"). The concrete advertisement described the same automobile using detail-oriented information (e.g., "The 750Li offers more legroom for rear-seat occupants, standard 20-way comfort front seats, and chrome roof moldings"). We assessed participants' relative preference by asking them "Which ad message do you like better?" (1 = Definitely Option A, 6 = Definitely Option B). Whether the abstract or concrete advertisement was presented as Option A or B was counterbalanced, although this did not alter the pattern of our results.

4.2. Results and discussion

4.2.1. Manipulation checks

As predicted, the high (vs. low) causal uncertainty group felt more uncertain about their relationship conflict ($M = 3.14$, $SD = 1.61$ vs. $M = 2.43$, $SD = 1.12$; $t(124) = 2.87$, $p < .01$, $d = .51$). The categorization manipulation was also successful; participants in the broad (vs. narrow) categorization group generated fewer categories ($M = 3.83$, $SD = 2.26$ vs. $M = 5.55$, $SD = 2.74$, $t(124) = 3.85$, $p < .001$, $d = .69$).

4.2.2. Preference

A 2 (uncertainty: high vs. low) × 2 (construal level: narrow categorization vs. broad categorization) between-participants ANOVA revealed only a significant interaction between causal uncertainty and actual construal level, $F(1,122) = 4.26$, $p = .04$, partial $\eta^2 = .03$ (Fig. 2). Further analyses of simple effects showed that the narrow categorization conditions, in which the goal to think more abstractly was presumably not fulfilled, conceptually replicated the finding of previous experiments. That is, we found that participants who felt uncertain (vs. certain) about the cause of a problem expressed a greater relative preference for an advertisement with general (vs. detailed) descriptions ($M = 4.59$, $SD = 1.55$ vs. $M = 3.60$, $SD = 1.68$, $t(60) = 2.38$, $p = .02$, $d = .61$). A very different pattern emerged in the broad categorization conditions. As expected, high causal uncertainty was not associated with a greater preference for the general advertisement, suggesting that participants' abstract thinking goal in the high causal uncertainty condition was satisfied through the broad categorization activity ($M_{uncertain} = 3.59$, $SD_{uncertain} = 1.71$ vs. $M_{certain} = 3.85$, $SD_{certain} = 1.77$, $t(62) = .59$, $p = .56$, $d = .15$). Also consistent with our theory, participants in the high causal uncertainty condition felt less attracted to the general ad after they completed the broad (vs. narrow) categorization task ($M = 3.59$, $SD = 1.71$ vs. $M = 4.59$, $SD = 1.55$, $t(62) = 2.40$, $p = .02$, $d = .61$).

These results support and extend the findings from previous experiments, which demonstrated that causal uncertainty created greater attraction toward opportunities that afforded abstraction, presumably because the goal to think more abstractly was active. In addition, this experiment shows that participants in the high causal uncertainty condition no longer experienced increased attraction toward an experience that afforded more abstract thinking once they completed an activity that actually fostered more abstract (vs. concrete) thinking. Post-attainment decrement in motivation is one of the key principles of goal pursuit (Förster et al., 2007). Hence, the fact that participants were *less* likely to prefer the experience that afforded more abstract thinking once they had engaged in abstraction confirms that attraction toward abstraction is indeed a product of goal pursuit rather than cognitive congruency. This finding also extends Helzer and Edwards' (2012) findings, as they did not examine what happens to people's preferences after engaging in abstraction.

For participants in the low causal uncertainty condition, there should not have been an active goal to think more abstractly. Consequently, no goal should have been satisfied by the categorization task and thus no changes in participants' preferences should have been observed. The results were consistent with this expectation, as the level of abstraction of the categorization task had no effect on participants' advertisement preference in the low causal uncertainty conditions, $M_{abstract} = 3.85$, $SD_{abstract} = 1.77$ vs. $M_{concrete} = 3.60$, $SD_{concrete} = 1.68$, $t(60) = .57$, $p = .57$, $d = .15$.

In the absence of a thinking goal (i.e., in low causal uncertainty conditions), the cognitive congruency between the categorization task and the advertisement could have enhanced people's preference for the congruent advertisement message, but it did not. So why did we did not observe the effect of cognitive congruency in the low causal uncertainty condition after participants engaged in a broad or narrow categorization task? One possible explanation is that our experimental procedure focused on testing goal activation, which could have disrupted participants' fluency experience originating from cognitive congruency.

Indeed, research has shown that the cognitive congruency effect has many boundary conditions. For example, the cognitive congruency effect on persuasion was observed among novices but not among participants who had more knowledge about the topic being evaluated (Kim et al., 2009). Moreover, relying on the "feels right" experience, or the mood-as-information heuristic, is less likely when people have the ability and motivation to engage in more deliberate processing (Kim et al., 2009; Schwarz & Clore, 1983; Srull, 1987). Thus, it is possible that the procedure of recalling a negative event with significant personal relevance, independent of causal uncertainty and the activation of a goal to think more abstractly, lowered the likelihood that participants would rely on heuristics based on cognitive congruency (Schwarz, 2001). This may explain why participants who focused on aspects of their negative experiences that they were certain about, were unaffected by the cognitive congruency between their actual construal level and the subsequently presented advertisement.

Experiment 2 provides further evidence in support of our theory that causal uncertainty motivates people to think more abstractly. That is, the findings from this experiment were consistent with our prediction that an active goal to think at a more abstract level would lead people to prefer more abstract stimuli, but that once the goal is fulfilled, they would no longer be attracted to more abstract thinking.

5. General discussion

> Tiger got to hunt,Bird got to fly;Man got to sit and wonder, "Why, why, why?"Tiger got to sleep,Bird got to land;Man got to tell himself he understand.— From the novel Cat's Cradle, Kurt Vonnegut

Similar to how people can be motivated to do and be certain things, they can also be motivated to think in certain ways. The present research examines a specific type of thinking goal, namely, a goal to think more abstractly, and demonstrates that this goal is triggered when people experience causal uncertainty. Understanding the cause of events, especially negative ones, is a fundamental human need, and the lack of such understanding can be damaging to one's psychological well-being (Boucher & Jacobson, 2012; Edwards et al., 1998; Wong & Weiner, 1981).

In three experiments, we relied on principles of goal activation to test whether people adopt a goal to think in a more abstract way. Specifically, we found that participants who experienced heightened causal uncertainty were more likely to resume an experience that afforded more abstract (vs. concrete) thinking (Experiments 1A & 1B). Moreover, we demonstrated that individuals experiencing high causal uncertainty were more likely to exhibit reduced attraction to an experience that afforded more abstract thinking once they had attained their goal to think more abstractly (Experiment 2). These findings are consistent with the principles of goal activation that highlight persistence prior to goal attainment and decrement in motivation after goal attainment (Bargh et al., 2001; Förster et al., 2007).

The research presented in this article provides a unique extension of prior work on causal uncertainty and abstract construals. Specifically, we add to Namkoong and Henderson's research (2014) by demonstrating that the uncertainty-reducing benefit of more abstract thinking contributes to an overgeneralized association between causal uncertainty and an abstract thinking style; as a result, experiencing causal uncertainty motivates people to think more abstractly. Our findings also complement Helzer and Edwards' research (2012) by elucidating the full process by which causal uncertainty may ultimately lead to more abstract construals. That is, whereas Helzer and Edwards demonstrated what happens when people have an unimpeded opportunity to think more abstractly as a function of causal uncertainty, our findings demonstrate what happens when such opportunities are impeded (Experiments 1A & 1B), and what happens after such opportunities are taken advantage of (Experiment 2). In other words, integrating our findings with those of Helzer and Edwards (2012) and Namkoong and Henderson (2014) provides a complete picture of the motivational process by which people pursue an abstract thinking goal to reduce feelings of causal uncertainty. Hence, a key contribution of the current work is that it places causal uncertainty within the broader context of motivated social cognition research, as we directly illustrate the motivational process thought to underlie the often observed causal uncertainty effects on social cognitive processes.

6. Broader theoretical implications

6.1. Motivated abstraction

Prior research has demonstrated that people are often motivated to evaluate causal relationships at a more abstract level. For example, people often think of personal successes as more global and stable, driven by dispositional, internal forces rather than contextual, external factors (Mezulis et al., 2004). Related to this is the goal of ingroup protection, which presumably motivates people to think more abstractly about desirable ingroup behaviors and undesirable outgroup behaviors (Maass et al., 1996). Furthermore, unexpected behaviors of others are well remembered, possibly because individuals extend cognitive effort to understand unexpected behaviors in connection with other behaviors which may require a more big-picture perspective (Hastie, 1980; Srull, 1981). As these lines of research demonstrate, people are often motivated to think at a higher or lower level due to a variety of factors. Across our studies, we demonstrate that the experience of causal uncertainty is another factor that can motivate a more abstract construal. We posited such an effect based on prior research demonstrating that abstraction reduces feelings of causal uncertainty (Namkoong & Henderson, 2014). That is, the benefit of more abstract thinking is presumably learned and generalized over time, leading people to seek abstract thinking under causal uncertainty. Thus, our findings both complement and extend prior work on motivated abstraction.

6.2. Motivated cognition

Numerous studies have examined the unique characteristics and consequences associated with active and fulfilled goals (Ferguson & Bargh, 2004; Förster et al., 2007; Gollwitzer & Brandstätter, 1997; Laran & Janiszewski, 2009; Wilcox et al., 2009). While these studies focused on behavioral goals, or goals related to performance standards, we extend the literature by examining the motivational process behind a goal to adopt a thinking style. Importantly, we demonstrate that thinking goals share a similar feature with behavioral or performance goals. Our findings show that the activation and fulfillment of a thinking goal shape people's preferences toward means that can help them achieve their goal. People also persist through obstacles to satisfy a thinking goal. Therefore, the present research complements prior research on various types of motivated cognition (Festinger, 1957; Fitzsimons et al., 2008; Gollwitzer & Bayer, 1999; Kruglanski & Webster, 1996; Kunda, 1990; Lerner, 1980; Murray & Holmes, 1997) by adding insight into what consequences they might have as active and fulfilled goals.

6.3. Practical implications

The fact that we demonstrate the effects of causal uncertainty about real problems on people's preferences in unrelated domains implies a number of practical applications of our findings. Many services and products are offered to people who experience uncertainty (Guerra, 2013; Villarica & Bailey, 2009). In times of crises when causal uncertainty is presumably high, telephone “hotlines” are set up, and leaders often try to communicate their support to those who suffer from uncertainty (Burke, 2001; Kerley, 2011; Nagourney, 2011; Wheaton, 2011). In business, Toyota developed a problem-solving tool specifically geared toward reducing causal uncertainty related to their business problems (Marksberry, 2012). The present research highlights the role of an active abstract-thinking goal, in determining people's behaviors and their attitudes toward framed messages.

Goals can guide behavior and cognition so that people act and think in ways that are expected to increase their chances of goal fulfillment — these behaviors include making choices that are relevant to one's goal, but also persistence and continued effort until the goal is fulfilled, even when there are temptations and other obstacles (Bargh, 1994). For example, when a consumer is uncertain why her product has failed, and thus is motivated to think more abstractly, she might increase her effort in searching for abstract information or engaging in tasks that involve more abstract cognitive processing (e.g., talking to other consumers about the similarities between this and other product failures). Our findings in Experiments 1A and 1B also suggest that this consumer will show a high level of persistence while doing so, even at emotional costs and even when it requires more cognitive effort.

Prior work highlights that self-regulatory concerns can determine the effectiveness of framed messages (Cesario, Corker, & Jelinek, 2013). Consistent with this idea, our findings in Experiment 2 suggest that when targeting people who are uncertain about why negative events happen, presenting information at a higher, more abstract level can be effective at capturing their attention and interest. For example, a couple trying to understand why they constantly argue should be more attracted to a counselor whose practice aims to facilitate more global communication between them. Our findings also imply that marketers should benefit from using broader descriptions about their products and services when targeting consumers who are known to be casually uncertain about a problem; similarly, abstract language in advertisements should be more beneficial in industries that are inherently

Table 2
Comparison of key findings (interactions, and simple effects in high causal uncertainty conditions) examined with (left) and without (right) participants whose reported first language is not English.

		All participants	Participants whose first language is English
Exp. 1A	Sample size	85	64
	Interaction	$B = 1.97$, $SE = .97$, $p = .04$	$B = 3.26$, $SE = 1.40$, $p = .02$
	Task resumption in high causal uncertainty	$M_{similarity} = 78.95\%$ $M_{difference} = 47.83\%$ $B = 1.41$, $SE = .70$, $p = .04$, OR = 4.09	$M_{similarity} = 92.31\%$ $M_{difference} = 47.37\%$ $B = 2.59$, $SE = 1.14$ $p = .02$, OR = 13.33
Exp. 1B	Sample size	212	171
	Interaction	$B = 1.31$, $SE = .65$, $p = .04$	$B = 2.01$, $SE = .76$, $p = .008$
	Task resumption in high causal uncertainty	$M_{similarity} = 78.26\%$ $M_{difference} = 66.67\%$ $B = .59$, $SE = .45$ $p = .19$, OR = 1.80	$M_{similarity} = 84.62\%$ $M_{difference} = 64.00\%$ $B = 1.13$, $SE = .53$ $p = .03$, OR = 3.09
Exp. 2	Sample size	126	102
	Interaction	$F(1,122) = 4.26$, $p = .04$ partial $\eta^2 = .03$	$F(1,98) = 4.11$, $p = .04$ partial $\eta^2 = .04$
	Preference for general ad in high causal uncertainty	$M_{broad} = 3.59$ $M_{narrow} = 4.59$ $t(62) = 2.40$, $p = .02$ $d = .61$	$M_{broad} = 3.53$ $M_{narrow} = 4.84$ $t(49) = 2.71$, $p = .009$ $d = .76$

associated with higher causal uncertainty (e.g., medical services or death care businesses).

The present research can also provide insight for effective communication strategies for political leaders. Constituencies should be particularly receptive to public officials who frame their messages in more abstract terms during times when people are prone to feel causally uncertain (e.g., during the aftermath of a natural disaster). Indeed, leaders' approval during times of public uncertainty often hinges on their ability to communicate a broad vision or higher level meaning and avoid bombarding people with trivial details (Loth, 2009). Moreover, because causal uncertainty activates a motivational process toward achieving an abstract thinking style, such implications are pertinent only until this goal is satisfied. This makes the timing of targeted communication strategies a highly relevant factor in determining their effectiveness.

6.4. Future directions

A promising direction for future research would be to examine moderating factors that intensify or dampen the effects found in the present research. For example, one should expect that the degree to which more abstract construals have reduced one's causal uncertainty in the past should moderate the degree to which causal uncertainty motivates one to think more abstractly in the future. In other words, if thinking more abstractly was not beneficial in the past, it is unlikely that one develops a positive association between the experience of causal uncertainty and more abstract thinking. To illustrate, consider feelings of causal uncertainty associated with positive events (e.g., pleasant surprises). People may be eager to know what caused positive events and even successfully reduce feelings of causal uncertainty via an abstraction process; however, uncovering the reason behind these events can dampen the excitement (Wilson, Centerbar, Kermer, & Gilbert, 2005). In other words, for positive events, causal uncertainty is likely associated not only with reduced causal uncertainty but also with reduced pleasant emotions. Thus, the positive association between abstract thinking and causal uncertainty could be weaker, and the goal to think abstractly may not be activated as strongly for positive events. As we only examined the effects of causal uncertainty surrounding negative events in this research, we look forward to future work that examines similar processes in the context of positive events.

Another potential moderator, related to the discussion above, is culture. As we further explored the data of this paper's experiments, we found an additional, notable pattern. Interestingly, when we only analyzed the responses of participants whose reported first language is English, we found that our proposed effect was significantly stronger in all studies (Experiments 1A, 1B, and 2). Table 2 summarizes the key findings. We do not believe this is due to language barrier (e.g., inability to comprehend study questions or instructions) for a couple of reasons. First, participants in all of our experiments were university students at a well-established institution. Second, the overall fluency level was very high. For example in Experiment 2, we asked "How fluent is your English?" (1 = not at all, 7 = very much), and only 5% of the sample selected a point below 7, despite the fact that 19% of the participants said their first language was not English. In addition, when English fluency was included in the model as a control variable, it was not significant and had no impact on other variables.

Thus, we believe that culture is a potential moderator, independent of language fluency. In an attempt to better understand our findings, we examined the data from Namkoong and Henderson (2014), because the proposed psychological mechanism of the present research was based on this paper. The present research proposes that an abstract-thinking goal should be activated when facing causal uncertainty because, as shown in Namkoong and Henderson (2014), people feel less uncertain about why things happen after they get a chance to think abstractly. As individuals repeatedly experience the benefit of abstract thinking for reducing causal uncertainty, later, a goal to think abstractly is presumably automatically activated when people experience causal uncertainty. Indeed, when we examined the data from Namkoong and Henderson (2014), all of which were collected via Amazon Mechanical Turk, the percentages of non-native English speakers were only 4% or less across all of the experiments, significantly lower than those of the present research. This suggests that the proposed mechanism and effect of this line of research may not apply the same way to people with different cultural backgrounds.

Prior research suggests that culture can determine how people process similarities and differences. For example, individuals in Eastern cultures tend to think more holistically than their Western counterparts, meaning, they are more prone to see connections between disparate events (Han & Schmitt, 1997; Monga & John, 2007; Nisbett, Peng, Choi, & Norenzayan, 2001). For individuals with an Eastern cultural background, focusing on similarities the same way those from Western

cultures do may not be as beneficial, because the holistic thinking style would lead them to see relationships between highly distinctive events even when lacking logical connections. Despite the consistent pattern we observe in our data, closely examining this potential cultural moderator is beyond the scope of the present research because we do not have a large enough number of non-native English speakers in our samples. We also lack information about the precise cultural background of the non-native English speakers in our samples. Thus, we believe this is an important area for future research.

Researchers should also examine whether an abstract thinking goal is activated and/or operated automatically (Bargh, 1994; Chartrand & Bargh, 1996; Moskowitz, 2002; Oettingen, Grant, Smith, Skinner, & Gollwitzer, 2006). According to Bargh (1994), the activation and pursuit of a goal can be automatic in different ways. For example, people may lack awareness of the activation and pursuit of a goal. People may also lack the ability to decide when to activate or deactivate a goal, even if they have awareness. Finally, if a goal is automatic, it would take very little effort to pursue the goal. The present research hints at some of these possibilities for an abstract thinking goal. For instance, the fact that we found preference shifts in domains unrelated to the source of causal uncertainty (both Experiments 1 and 2) suggests that participants lack awareness in one or more stages of their goal pursuit. For example, it is likely people are unaware that experiencing causal uncertainty causes any preference for stimuli that can afford more abstract thinking. Yet, people may become aware that they are seeking abstract things or opportunities to think in more abstract ways. Also, we found that distracting people with a typing task prevented them from spontaneously engaging in abstract thoughts (Experiment 1), which could mean that pursuing an abstract thinking goal is not highly efficient. These are questions that are worth exploring not only from a theoretical point of view but also from a practical point of view, because they can shed light on the strength and effectiveness of subtle abstract persuasive appeals.

Future research should also examine whether the effect of causal uncertainty on abstract thinking applies only to causal uncertainty or more broadly to other types of uncertainty. The present research focuses on understanding causality in past events, but people experience uncertainty in various domains, including uncertainties about future outcomes (Van Dijk & Zeelenberg, 2007), the environment (Mittal & Griskevicius, 2014), affective states (Tiedens & Linton, 2001), and even the self (Hogg, 2000; Rios, Markman, Schroeder, & Dyczewski, 2014; Van den Bos & Lind, 2002). We based our predictions on previous findings by Namkoong and Henderson (2014), which demonstrated that abstract thinking enables people to form simpler mental representations of causal relationships, thus reducing feelings of causal uncertainty. It is possible that abstraction also simplifies mental representations of future events, the environment, affective experiences, and self-concepts. Consequently, experiencing uncertainty in these domains could activate an abstract thinking goal, although this remains to be an open question and potential for future research. On the other hand, it is also possible that certain types of uncertainty might even trigger concrete-thinking goals. For example, one might argue that uncertainty about *how* (as opposed to *why*) things happen is better resolved by focusing on the details (Freitas, Gollwitzer, & Trope, 2004; Trope & Liberman, 2003; Vallacher & Wegner, 1989).

More broadly, it may be of interest to researchers to test the motivational principles underlying other types of motivated cognitions beyond abstraction. For example, how would people react when their goal to form accurate impressions of others (Neuberg, 1989) is interrupted? Also, what would happen after people fulfill their need for cognitive closure (Kruglanski & Webster, 1996)? Similarly, how would people respond if their attempt at restoring their belief in a just-world (Lerner, 1980) was interrupted or if other means to reach the same goal were provided? As illustrated by these empirical questions, using experimental paradigms for testing motivational principles can provide a more in-depth understanding about the constructs of interest.

7. Coda

The present research demonstrated a novel reaction to causal uncertainty, namely, the pursuit of a goal to think more abstractly. This is a useful goal to have, as indicated by recent findings showing that abstraction makes people feel more certain about why negative events happen. The research presented in this article demonstrates how directly examining the pursuit and completion of a thinking goal can shed unique insights into what it means for a cognition to be motivated. We look forward to continued research that examines the interplay between motivation and cognitive processing more broadly.

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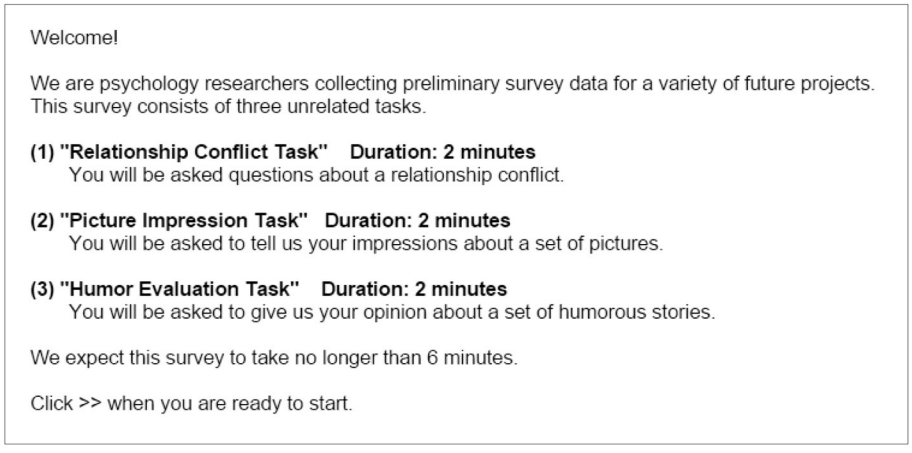
Appendix A. Appendix



Welcome!

We are psychology researchers collecting preliminary survey data for a variety of future projects. This survey consists of three unrelated tasks.

(1) "Relationship Conflict Task" Duration: 2 minutes
You will be asked questions about a relationship conflict.

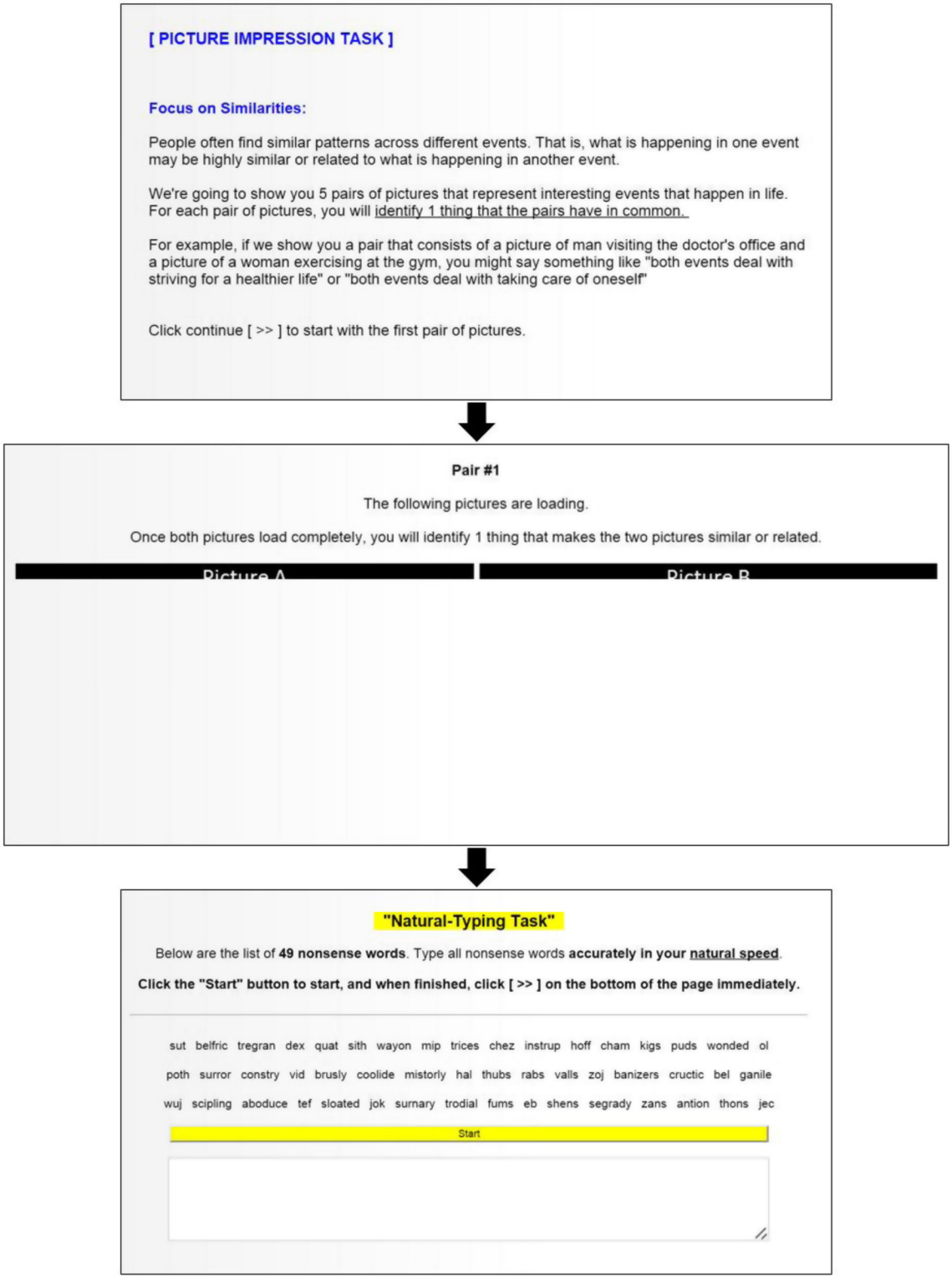
(2) "Picture Impression Task" Duration: 2 minutes
You will be asked to tell us your impressions about a set of pictures.

(3) "Humor Evaluation Task" Duration: 2 minutes
You will be asked to give us your opinion about a set of humorous stories.

We expect this survey to take no longer than 6 minutes.

Click >> when you are ready to start.

Appendix B. Appendix



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