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CAUSAL UNCERTAINTY PROMPTS ABSTRACT CONSTRUAL OF BEHAVIOR

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When people experience Causal Uncertainty (CU; the sense that they have failed to understand the causal structure of the social world) they search for information that will restore their understanding. Three studies explore information processing strategies that guide this search. We hypothesized that CU would promote abstract construal of behavioral information. In Study 1, CU promoted faster spontaneous trait inferences; in Studies 2 and 3, individuals with chronically activated CU beliefs, and those primed with CU, showed broader unitization of the behavioral stream (Study 2) and increased preference for abstract construal of behaviors (Study 3). We argue that these strategies reflect a search for diagnostic causal information about the social world.

People live in a social world that is full of complex causal associations. In order to lend predictability and some semblance of control over this world, individuals must maintain sufficient understanding of its underlying causal structure (Heider, 1958). Thus, on a day-to-day basis, people attempt to understand the causes that underlie their own as well as other people's behaviors, their successes and failures, and their motivations and desires. The belief that one may not be able to accurately understand the *why*s that bring about these and other events in the social world is referred to as Causal Uncertainty (CU; Weary & Edwards, 1994).

Empirical research on the nature and consequences of CU has been guided primarily by the Weary and Edwards (1996) model. According to this model, the CU construct is composed of a set of beliefs about the self as a person who may not understand causation, combined with metacognitive feelings of uncertainty. CU

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beliefs are modeled as self-related cognitions that, like other cognitions, vary in accessibility from person to person and situation to situation (Edwards, Wichman, & Weary, 2009). CU beliefs are available for all people, since everyone has experienced situations in which they felt they couldn't understand the causes of events. Such beliefs can be activated by cues in a person's environment that suggest that she has insufficient understanding of the causal structure of the world, as well as by stimuli that have been associated with CU in the past, such as words related to uncertainty. In addition, people vary in the chronic accessibility of these beliefs, meaning that some people have CU beliefs that are activated in a wider range of situations, with less stimulation, and in response to more ambiguous stimuli. The CU model proposes that when CU beliefs are activated, the other part of the construct, metacognitive feelings of uncertainty, is generated. These are often mild feelings of confusion or puzzlement that suggest to the person that his or her current state of causal knowledge is inadequate (cf. Clore, 1992). The activation of the CU construct, in turn, arouses a motive to restore accurate causal understanding (Weary & Edwards, 1996).

A great deal of research over the last 15 years suggests that CU activation prompts a variety of cognitive strategies aimed at restoring a person's causal understanding of the world around him (for a review, see Weary, Tobin, & Edwards, 2010). To date, empirical work has focused on a host of corrective strategies people use in order to regain their causal understanding. For example, when CU beliefs are activated, people are more likely to correct for judgment biases (Vaughn & Weary, 2003), show greater preference for diagnostic over non-diagnostic social information (Weary & Jacobson, 1997), and integrate relevant situational information into their attributions (Weary, Vaughn, Stewart, & Edwards, 2006)—all in the service of updating their causal models of the world.

The goal of the present work was to explore whether the search for diagnostic causal information associated with CU would bias processing toward abstract features of information in the social world. Research from several theoretical perspectives (Semin & Fiedler, 1988; Trope & Liberman, 2003; Vallacher & Wegner, 1989) explores trade-offs between abstract and concrete features of information, documenting both the variables that encourage abstract versus concrete construal as well as the downstream consequences of such construal. Based upon this existing research and theorizing from the CU literature (Weary & Edwards, 1994; Weary & Edwards, 1996; Weary et al., 2010) we predicted that CU, which indicates that one is failing to understand the causal features of the world, would promote construal of social information in terms of its abstract features—information that aids in the search for diagnostic "dispositional properties of the world" (Heider, 1958, p. 79).

THE HOWS AND WHYS OF SOCIAL COGNITION: THREE PERSPECTIVES ON CONCRETE VERSUS ABSTRACT REPRESENTATION

The notion that information processing can vary in its emphasis upon abstract and concrete features is consistent with several theoretical perspectives. Common to each of these is the idea that preferences for information processing at a particular level of abstraction can be functional: that is, these biases may emphasize features of information that aid people's global assessments of actors and their behavior.

In early empirical work, Vallacher and Wegner (1989) introduced the Behavior Identification Form (BIF) as a means of assessing individual differences in the tendency to construe the social world in terms of abstract versus concrete features of action. On the basis of responses to the BIF, the researchers identified "*how* people," who value and concentrate on the mechanics of behavior, and "*why* people," who value and reference the meaning of behavior. When "*how* people" see a person talking to a child, for example, they are more likely to represent that behavior as *using simple words*, whereas "*why* people" will be more likely to encode the same behavior as *teaching something*.

Moving beyond an individual differences perspective, Trope and Liberman have proposed that, depending upon context, people can represent the same behavior at a high or low level of construal. According to Construal Level Theory (CLT; Trope & Liberman, 2003), high-level construal of behavior emphasizes the central, essential features of the action, while low-level construal highlights the peripheral, incidental features. From a CLT perspective, people's construal of an event depends on their psychological distance from it. Thus, if a person imagines talking to a child one year from now as opposed to one week from now, he or she is more likely to reference the abstract notion of *teaching something* and less likely to think of that behavior as merely *using simple words*. Conversely, as psychological distance constricts people tend to favor more concrete representations of behavior (Fujita, Henderson, Eng, Trope, & Liberman, 2006).

Semin and Fiedler's (1988) analysis of abstract versus concrete representation puts forth the important idea that the level at which an event is construed imposes limits upon the degree to which observers can draw inferences from any particular concrete behavior. An observer can see two people interacting with one another on the sidewalk, for example, and code that behavior (in increasing degrees of abstraction) as *A is talking to B*, *A is helping B*, *A likes B*, or *A is an extraverted person*. Note that as the observer proceeds to greater levels of abstraction, the observed behavior takes on greater social meaning and predictive value, and makes reference to relatively stable properties of the actor. Abstract construal of behavior thus allows people to go beyond a particular behavioral event to infer more about the actor and his likely future behavior.

Taken together, this literature suggests that to represent behavioral information abstractly is to construe an otherwise isolated event in terms of its broader meaning. Construing behavior abstractly provides information about the reasons that a particular event came into being (e.g., *why* versus *how* an event happened), and the relationship between a particular behavioral event and its broader social context (including other events or agents involved in an event). Precisely because it provides information about reasons and relations between events and agents, abstract construal is necessary for causal understanding. To represent behavior concretely, on the other hand, is to construe an event in terms of its particular details, ignoring the broader context from which the act arose.

To illustrate, we return to the behavioral event *talking to a child*. Representing this event abstractly—*teaching something*—requires an inferential leap, but a rich one, in that it provides information about the reasons one might have for talking to the child (teaching), and in turn, the intended effect that talking to the child will have (learning). Construing the behavior concretely—*using simple words*—offers information about the manner of speech, but provides no additional causal information (why is he talking to the child?) over what is already known from the initial description, *talking to a child*.

CAUSAL UNDERSTANDING AS A SEARCH FOR WHYS

Since causal information is uniquely embedded in the abstract features of a behavioral representation, accurate causal understanding depends upon the ability to represent behavior abstractly. Indeed, to ask *why* an event came to be is to ask about the broader meaning associated with behavior (Vallacher & Wegner, 1989). Moreover, in order to model the causal properties of the world, people must encode relations between isolated events or behaviors, and extract from those observations the invariant properties that govern the corresponding events. But causal understanding is abstract in another sense, too. In modeling the invariant causal relationship between events and behaviors, people can abstract away from the accidental features of their present context to infer that similar causes will produce similar effects in the future and in other contexts. These ideas were captured by Heider (1958), who conceived of attribution as a process that links "transient and variable behavior and events" with the "dispositional properties of the world" (p. 79). These invariant properties "dispose objects and events to manifest themselves in certain ways under certain conditions" (Heider, 1958, p. 80) and as such are causal in nature.

Stated another way, behaviors will provide greater diagnosticity as to underlying cause when they are construed abstractly, rather than concretely. Concrete features may not be unimportant to the goal of accurate causal understanding, but they are, in most cases, secondary sources of information about causality. These features may modify one's current understanding of cause and effect, but they are unlikely to provide the basis of such a model if one is not already in place. In part, this is because concrete details of behavior derive their significance from the abstract meaning assigned to an event (Vallacher & Wegner, 1989).

ABSTRACT CONSTRUAL AS A CU REDUCTION STRATEGY

CU activation prompts information processing strategies aimed at restoring one's causal understanding of the world (Weary et al., 2010). The goal of these strategies is accurate causal understanding. According to the CU model, one strategy that should be associated with CU activation is increased sensitivity to the diagnosticity of available information. Consistent with this, Weary et al. (2006) found that CU is associated with correcting for (overly) dispositional attributions, but only when participants were presented with situational information that was perceived as relevant and diagnostic to the judgment. When situational information was of low or ambiguous diagnosticity, people persisted in their dispositional attributions, regardless of CU. Similarly, Weary and Jacobson (1997) showed that higher CU was associated with increased seeking of diagnostic as compared to non-diagnostic information about other people's dispositional qualities.

If causal inference is facilitated by construing behavioral information in terms of its abstract features (Heider, 1958; Semin & Fiedler, 1988; Trope & Liberman, 2003; Vallacher & Wegner, 1989), and if CU activation prompts a search for diagnostic causal information, then CU activation will motivate people to construe behavior in terms of its abstract features. This was the prediction that guided the three studies presented here.

OVERVIEW OF THE PRESENT STUDIES

In these three studies, we explored the effect of CU on information processing both by priming CU beliefs and by exploiting individual differences in chronic activation of CU. All people feel CU from time to time—people's causal knowledge is always incomplete, and CU activation occurs when gaps in these knowledge structures become salient. Thus, in all of our studies, we explored the causal link between CU and abstract construal by priming people with CU using a scrambled sentences task. In addition, past work has shown that people vary in the chronic accessibility of the CU construct. Individual differences in the chronic accessibility of CU beliefs can be captured using the Causal Uncertainty Scale (CUS; Weary & Edwards, 1994). In Studies 2 and 3, in addition to priming CU in half of our participants, we measured these individual differences to explore whether people's resting levels of CU activation are associated with a tendency to construe information in terms of its abstract features. In these two studies, as in others in the CU literature (Edwards et al., 2009; Weary, Jacobson, Edwards, & Tobin, 2001), we expected abstract construal in the control condition to vary as a function of individual differences in chronic CU, such that abstract construal would increase with higher levels of CU. Following Edwards and colleagues (2009), we hypothesized that the CU prime would activate CU beliefs for individuals both high and low in chronic CU. This would result in a similar bias for abstract construal, eliminating any processing differences due to individual differences in chronic CU.

In Study 1, we explored whether the tendency to form spontaneous trait inferences from behavior, that is, to represent a concrete instance of action in terms of its more abstract meaning, was exacerbated following a CU prime. In Study 2, participants watched video footage of a woman performing a sequence of mundane behaviors, and we observed whether they used broader units of meaning to organize their processing of the behavioral stream when experiencing CU. In Study 3, we examined whether CU was associated with a preference for more abstract construal of behavior, as measured by the BIF.

STUDY 1: CU AND TRAIT INFERENCE

People spontaneously encode behaviors in terms of their trait-level properties (McCulloch, Ferguson, Kawada, & Bargh, 2007; Uleman, 1987). When observing a young man carrying an old lady's groceries to her car, people do not only store in memory the concrete behavior, but also encode that behavior in terms of its superordinate features ("helpful"). In Study 1, we explored whether activation of CU would facilitate spontaneous trait inference.

PARTICIPANTS

Thirty-eight Cornell undergraduates participated in exchange for extra credit in their psychology or human development courses.

MATERIALS

Priming Task. Participants were primed with one of two (CU prime or control) scrambled sentences tasks. Both versions, the prime and the control, were puzzles containing 20 five-word scrambled sentences. On each of the 20 trials, participants constructed one four-word grammatically correct sentence. In the control puzzle, all 20 trials resulted in unscrambled sentences that were neutral with regard to CU (e.g., "He took the container" or "She looks very fit"). In the CU prime condition, 10 of the 20 sentences denoted CU (e.g., "Their behavior puzzles me"). At the end of the task participants were asked to rate on a scale of 1 (*Very Easy*) to 9 (*Very Difficult*) the difficulty of the puzzle. Because the difficulty rating did not interact with other variables across any of these studies, it will not be discussed further.

Trait Inference Task. The Trait Inference Task consisted of five blocks, each with 20 trials (McCulloch et al., 2007). On each trial, participants read a short behavioral description (e.g., "purchased a new yellow rain coat"). After 3.5 s, the computer displayed a trait adjective (e.g., "humorous"). Participants were instructed to indicate as quickly as they could whether the trait fit the behavior that preceded it ("yes") or did not fit the behavior ("no").

Participants were randomly exposed to four classes of behavior-trait pairings. Half of the behavior-trait pairings were relevant (e.g., "carried an old lady's groceries" followed by "helpful"), and half were irrelevant ("purchased a new yellow rain coat" followed by "humorous"), which meant that participants responded "yes" to half of the trials and "no" to the other half. The relevant/irrelevant pairings were fully crossed with the valence of the behavior. Participants saw an equal number of positive behavior-trait pairings (helpful and intelligent behaviors, for example) and negative behavior-trait pairings (e.g., stingy and arrogant behaviors).

This resulted in a 2 (Condition: CU prime, control prime) × 2 (Fit: relevant, irrelevant) × 2 (Valence: positive, negative) mixed design, with condition as a between-subjects factor and fit and valence as within-subjects factors. Our prediction, however, was much simpler: To the extent that CU leads people to construe events in terms of their abstract meaning, participants primed with CU should be faster than controls to correctly identify whether there is a fit between the behavior and the proposed trait (McCulloch et al., 2007).

PROCEDURE

Consenting participants were told that the experimental session was composed of two separate studies, both of which examined lexical information processing. Participants first completed the scrambled sentences task. When they had finished, the experimenter sealed their responses in an envelope and then informed the participant that the next experiment would take place in the computer cubicles, located at the end of a separate hallway. In order to dissociate the CU prime from the dependent measure, participants were informed that the second task required "fundamentally different cognitive abilities" than the task they had just completed, so "performance on one would not necessarily predict performance on the other."

After participants completed the trait inference task on the computer, they were debriefed by the experimenter. None of the participants suspected a link between the priming task and the trait inference measure.

RESULTS AND DISCUSSION

Prior to analyzing the data, we removed trials in which participants offered incorrect responses (e.g., trials in which relevant behavior-trait pairings were tagged as "irrelevant" by participants). Participants' responses were highly accurate (Median accuracy = 95%), and correct responses did not differ by condition, $t(36) < 1$. We subjected RTs for the four trial types[1] to a 2 (Condition: CU prime, control prime) × 2 (Fit: relevant, irrelevant) × 2 (Valence: positive, negative) mixed ANOVA.

The ANOVA revealed significant main effects of Fit, $F(3, 34) = 6.95$, $p < .05$, and Valence, $F(3, 34) = 9.28$, $p < .01$, both driven by a Fit × Valence interaction $F(3, 34) = 24.83$, $p < .001$, suggesting that participants were fastest to respond to trials in which positively valenced behaviors were followed by relevant trait adjectives. Of key theoretical importance was the predicted main effect of Condition, $F(1, 36) = 4.27$, $p < .05$, which showed that participants primed with CU were faster to correctly categorize behavior-trait pairings than were participants in the control prime condition (see Figure 1). The condition effect was not qualified by Fit nor Valence, $F(3, 34) < 1$.

The process of inferring traits from behavior is a fundamental aspect of social cognition (Uleman, 1987). The results of Study 1 provide evidence that this process is amplified when people experience CU, the feeling that they have failed to grasp the causal structure of the social world. Consistent with our guiding hypothesis that CU should promote abstract construal of behavior, CU-primed participants showed evidence that they were inferring broader meaning from isolated behavioral events by quickly and accurately categorizing behaviors according to the dispositions they represent.

One could reasonably argue from our findings that CU simply primes faster response times in general. In order to rule out this explanation, in Study 2 we measured behavioral encoding using a unitization task (Newtson, 1973). Participants watched a video of a woman performing a series of mundane actions, and were instructed to divide the behavioral stream into meaningful chunks of action. Following Henderson, Fujita, Trope, and Liberman (2006), we reasoned that abstract construal of these events would be marked by broader division of the behavioral stream, facilitating better comprehension of the links between isolated behaviors, and providing more insight into an actor's overarching reasons for acting, thus allowing for comprehension of what Henderson et al. called "enduring, global dis-

1. Analysis of the RT data distributions revealed normal distributions for the four trial types. As a result, we report analyses using raw RT data. Repeating analyses using log-transformed RTs yields equivalent results.

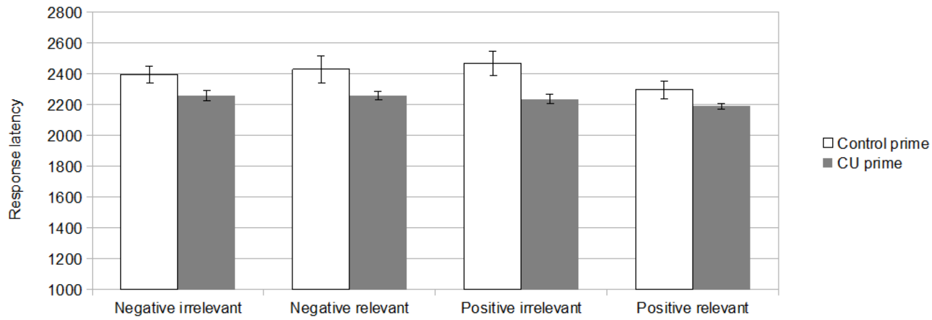

FIGURE 1. Data from Study 1. Reaction time data for Trait Inference task for CU-primed and Control participants. RTs reflect response latencies from the onset of the trait word to the participant's response. Main effect of condition significant at $p < .05$. Error bars represent 1 SE above and below the condition mean.

positions" (p. 847). Thus, as opposed to the quick-and-ready responses that stood for abstract construal in Study 1, in Study 2, abstract construal would be represented by less frequent responses.

STUDY 2

In Study 2, participants' behavioral encoding was measured using a unitization task (Newtson, 1973; see also Henderson et al., 2006; Lassiter, Geers, Apple, & Beers, 2000). As people process ongoing sequences of action, they have to organize that information into manageable chunks (or units) of behavior in order to make the incoming data meaningful. Research has shown that both the kind and the number of units people use to process incoming behavioral information are influenced by a number of motivational goals (Lassiter et al., 2000). We suspected that one such goal might be the desire to restore causal understanding.

We assessed the effect of CU in two ways. First, as in Study 1, we temporarily activated CU beliefs via the scrambled sentences task. In addition, we measured individual differences in chronic accessibility of CU beliefs using the Causal Uncertainty Scale. This methodology allowed us to compare information processing in our primed participants to the information processing of individuals high in chronic CU. Based upon the results of Study 1 and on past work on situational and chronic CU activation (e.g., Edwards et al., 2009; Weary et al., 2001), we expected an interaction between chronic CU and the CU prime. In the control prime condition, we hypothesized that individual differences in CU accessibility would predict greater tendency to construe behaviors abstractly. This encoding would be reflected by broader unitization of the behavioral stream (i.e., fewer units). By inducing CU beliefs via the CU prime, we expected to eliminate processing differences due to chronic levels of CU, promoting broader unitization of the observed behaviors.

Finally, we wanted to ensure that the predicted pattern of responding was due to differences in behavioral construal, not to disengagement with the unitization task. To do this, we administered a surprise recall task to participants at the end of the experimental session. We anticipated that although CU would predict performance on the unitization task, it would be unrelated to performance on the recall task.

METHOD

PARTICIPANTS

Fifty-two undergraduates at Oregon State University participated in exchange for extra credit in their psychology courses. Data from two participants were removed from analysis due to equipment malfunction. Data from an additional two participants were also removed due to outside interruption and self-reported response strategy that resulted in unusable data.

MATERIALS

Unitization Stimulus. Participants watched a 90-second computer video of a woman performing daily behaviors. In the video, the woman enters her apartment with a bag of groceries, unloads the groceries, gets settled in the apartment (lights a candle, turns on a stereo), and exists the room. Participants were instructed by the experimenter and again by the computer that their task was to push the "." key on the computer every time they saw what they judged to be a *meaningful behavior* occur (instructions from Newtson, 1973 and Lassiter et al., 2000 were adapted to suit the present experiment). Responses (the number of button pushes) were recorded by the computer.

Causal Uncertainty Scale. Individual differences in the chronic accessibility of CU were measured with the Causal Uncertainty Scale (CUS; Weary & Edwards, 1994). This self-report measure taps participants' beliefs about the extent to which they can understand and detect cause-and-effect relationships in the social world. The scale is composed of 14 statements concerning participants' confidence in their social attributions (e.g., "When bad things happen to me, I rarely understand why"). Participants indicated their agreement with each statement using a 1 (*Strongly disagree*) to 6 (*Strongly agree*) scale. These scores were summed to create one CUS score, with higher scores representing greater CU. In this and Study 3, internal consistency for the 14 items was strong ($\alpha > .75$).

Priming Task. CU was primed in half of the participants ($n = 26$) using the scrambled sentences CU prime from Study 1. The other half of participants ($n = 22$) completed the control scrambled sentences task.

Recall Task. At the end of the experimental session, participants were given a blank piece of paper and were instructed to write down as many behaviors as they could remember from the video stimulus. Participants were given three minutes to complete the task. Two research assistants coded the recall data for accuracy ($\alpha > .90$).

PROCEDURE

After providing consent, participants were administered one version of the priming task, according to their randomly assigned condition. Once completed, participants were told that they would complete a fundamentally different task, one that explored how people categorize and make sense of social behaviors. Participants were instructed to push a button every time they saw a new *meaningful behavior* occur; they were assured there is no correct or incorrect way to respond and that the point of the task was simply to see how *they* respond.

Following the unitization task, participants completed a series of measures on the computer, including the CUS. (Note that although the CUS was administered after the prime and dependent measure, there was no statistical evidence that the prime altered participants' responses to the measure in either this study, $t(46) = .16$, $p = .87$, or Study 3, $t(145) = .02$, $p = .98$, a finding consistent with the conceptualization of the CUS as a reliable and robust trait measure of chronic CU beliefs). To ensure that the observed effects were due to CU and not to related individual difference measures, participants also completed the Positive And Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), the Need for Cognition Scale (NCS; Cacioppo, Petty, & Kao, 1984), the Mirowsky-Ross (1991) Perceptions of Control Scale (PCS), the Personal Need for Structure Scale (PNSS; Neuberg & Newsom, 1993), the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988), and the Beck Depression Inventory (BDI; Beck, 1967).[2] After completing the computer tasks, participants completed the surprise recall task. After three minutes, the experimenter debriefed participants and invited questions.

RESULTS AND DISCUSSION

The number of units used by participants to break up the behavioral stream (measured in number of button pushes) was summed for each participant, and this number was log transformed to normalize the distribution of responses. Units were analyzed according to participants' continuous scores on the CUS, their Condition, and the CU × Condition interaction. This analysis yielded the predicted interaction of CU and Condition, $t(47) = 1.97$, $p = .05$. Consistent with the logic of the predicted data pattern, the main effects of Condition and CU were nonsignificant, ts < 1.53, ps > .13. Instead, as shown in Figure 2, the interactive effect of chronic and primed CU was to reduce the number of units participants used to parse the behavioral stream.[3]

In order to examine simple effects of chronic CU on behavioral encoding, we regressed units on participants' CUS scores and looked at differences by condition.

2. In this study and Study 3, mediation analyses were conducted to confirm that none of the common correlates of CU could account for our findings. For mediation analyses, we regressed the DV on CU, Condition, CU × Condition, the alternative variable of interest (BDI, BAI, PANAS; PNSS, Need For Cognition, Perceived Control), as well as the Condition × alternative variable interaction. None of these analyses revealed mediation by any of the alternative variables.

3. Readers may be surprised that we did not predict, and did not find, an additive effect of the CU prime on chronic CU. This is consistent with past work in the CU literature (Edwards et al., 2009; Weary et al., 2001) and elsewhere (Higgins & Brendl, 1995; Johar, Moreau, & Schwarz, 2003; Levesque & Pelletier, 2003; Shen, 2004). There are a number of reasons why additive effects may not be obtained (for a discussion see Edwards et al., 2009). In terms of the data presented here, we suspect that the subtle CU reminders embedded in the priming task were sufficiently strong to activate CU beliefs in individuals in whom those beliefs are not currently active (low-CU individuals), but were redundant with CU activation for individuals in whom these beliefs are chronically (i.e., already) accessible (high-CU individuals).

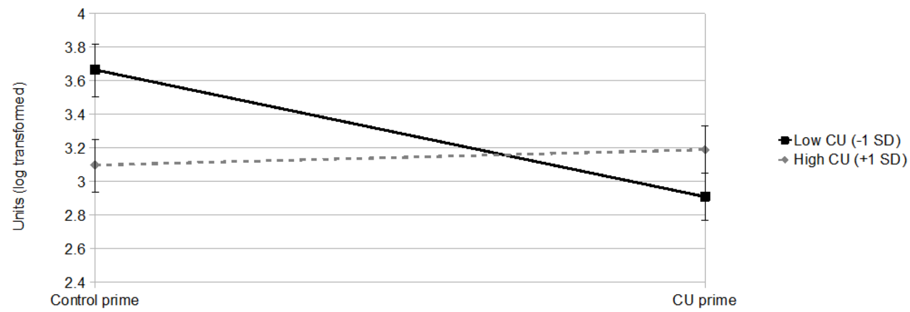

FIGURE 2. Data from Study 2. Units as a function of CU × Condition interaction, p = .05. Main effect of CU is significant for Control prime condition at p < .05, but not for CU prime condition. Error bars represent 1 SE above and below the condition mean.

As predicted, we observed a significant negative relationship between CU and Units, $b(20) = -.44$, $p < .05$, in the control prime condition. Increases in the chronic accessibility of CU beliefs were associated with broader parsing of the behavioral stream. To explore whether priming participants with CU would eliminate processing differences due to chronic CU, we ran the same regression in the CU prime condition. Here, the relationship between chronic CU and units, $b(24) = .08$, $p > .70$, was reduced to nonsignificance, and differed significantly from the relationship observed in the control prime condition, $Z = 1.80$, $p = 0.03$ (one-tailed).

A Matter of Inattention? The same pattern of results could be obtained if CU led not to abstract construal of the behavioral stream, but to inattention to the concrete features of social information. To rule out this possibility, we regressed participants' performance on the surprise recall task on Condition, CU, and the Condition × CU interaction. However, none of these effects was significant, *t*s < 1.4, *p*s > .18. Because there were very few falsely recalled behaviors (*Mean* = .53), an analysis exploring whether abstract construal of the behavioral stream was associated with intrusion errors in memory was not possible. Thus, these data suggest that the observed CU effects were due to actual differences in behavior construal, not CU-induced disengagement with the task.[4]

In sum, Study 2 expands the results from Study 1 in a number of ways. In this study, we used a more naturalistic measure of behavioral processing. Participants freely divided the behavioral stream into self-construed meaningful units of action, and when they did it was revealed that CU prompted a broader unitization style. In addition, these results help to rule out the "artifact" interpretation of Study 1 results; namely, that CU facilitates ready responding to social information

4. To address the objection that the null results on the recall data were due to underpowered tests, we combined this data set with that of another study, upping the total n to 135. These results mimicked those reported above, and added an interesting twist. Although CU was associated with fewer units in our primary data set, $r = -.23$, it was correlated positively with recall in the larger data set, $r = .14$, $p = .07$. This is striking given that, in general, Units and recall were positively correlated, $r(135) = .37$. This pattern of data casts a great deal of doubt on the inattention hypothesis.

generally. In Study 2, abstract encoding was operationalized in a way that required *less frequent* responses to behavioral information.

STUDY 3

Studies 1 and 2 have suggested that both chronically and temporarily activated CU prompt information processing that favors the abstract features of behavior. In Study 3, we sought to replicate the data pattern from Study 2 using a new dependent measure. We measured participants' construal using the Behavior Identification Form (BIF; Vallacher & Wegner, 1989). In the BIF, participants are shown a behavior and asked to choose which of two options (one concrete and one abstract) best characterizes the behavior. According to Vallacher and Wegner (1989), higher levels of abstraction are indicative of a focus upon the *why*s of behavior—the motivational concerns or the purpose that the action serves (e.g., "reading" is done for the purpose of "acquiring knowledge"). By contrast, concrete construal focuses upon the *how*s of behavior—the actual mechanical processes involved in completing the behavior (e.g., "reading" is done by "scanning lines of print").

We anticipated a pattern of results identical with that of Study 2. We expected an interaction between chronic and primed CU, such that chronic CU would be positively associated with scores on the BIF in the control prime condition, but not in the CU prime condition, which should lead to higher overall scores on the BIF.

METHOD

PARTICIPANTS

One hundred forty-six participants completed the Behavioral Identification Form. Study 3 was conducted across three waves of data collection; however, the time of data collection did not interact with the results presented below and will not be discussed further.

MATERIALS AND PROCEDURE

As in Study 2, individual differences in CU were measured using the CUS at the end of the experimental session. Participants were primed using either CU or a Control scrambled sentences task prior to completing the BIF.

Behavior Identification Form. The BIF (Vallacher & Wegner, 1989) presents participants with a variety of social behaviors (e.g., attending class, reading, or joining the Army) and asks them to choose between two options the more appropriate description of the behavior. For each behavior, one possible descriptor is a lower-level construal, the other is a higher-level construal (i.e., *reading* can be described as either *following lines of print* or as *gaining knowledge*). Participants choose between these lower- and higher-level descriptors for 25 behaviors. The number of abstract responses is totaled to represent participants' preference for abstract versus concrete construal.

RESULTS AND DISCUSSION

Participants' responses to the BIF were coded by assigning one point to each trial for which the abstract construal was selected. The resulting composite score ranged from 0 to 25; we regressed this composite on CU score, Condition, and the CU × Condition interaction.

Consistent with the logic of the predicted interaction, there were no main effects of either CU or Condition, *t*s < .89, *p*s > .38. However, as predicted, the regression analysis indicated a significant CU × Condition interaction, $t(145) = 2.36$, $p < .05$. Once again, the relationship between chronic CU accessibility and our measure of abstract construal was significant in the control prime condition, $b = .24$, $p < .05$, and importantly, that relationship was positive, suggesting that increasing levels of CU predict greater preference for abstract construal of behavior. Confirming this, when individuals low in chronic CU (defined as 1 *SD* below the group mean on the CUS) completed the CU prime, their preference for abstract construal increased, $t = 1.94$, $p = .05$. In the CU prime condition, scores on the CUS and the BIF were uncorrelated, $b = -.13$, $p = .24$, and for individuals high in CU, the CU prime had no additional effect on processing, $t < 1.4$, *ns*. As in Study 2, the CU prime significantly reduced the relationship between individual differences in chronic CU activation and BIF scores, $Z = 2.22$, $p < .05$. When primed with uncertainty, participants low and high in chronic CU accessibility did not differ in their preference for abstract representations.

GENERAL DISCUSSION

People experience CU when gaps and inconsistencies in their knowledge of the social world become apparent. When people sense that they have failed to grasp the *why*s of the social world, they seek to restore their understanding by attending to diagnostic information that is relevant to causal understanding. On the basis of theorizing and empirical work, we hypothesized that people may initiate their search for diagnostic causal information by construing behavior in terms of its abstract qualities—the features that highlight the meaning and purpose of an observed act and its relationship to other acts and actors. In three studies, we found support for this hypothesis: CU led people to more readily construe behaviors in terms of the dispositions they represent (Study 1), to portion the behavioral stream into broader units that allow for abstract construal of action (Study 2), and to represent behaviors according to their more abstract features (Study 3).

Information diagnosticity is a key element to understanding the CU-reduction strategies proposed by Weary et al. (2010). In the studies presented here, participants were allowed to process the abstract or concrete features of information, and in the absence of other pieces of diagnostic information, they favored the abstract features of behavior, those features that *prima facie* provide cues to why an actor behaved as she did or what purpose an action was meant to serve—that is, cues to causation.

Does this mean that CU motivates people to ignore the specifics of information? Not at all. If diagnosticity is the important variable to understanding CU-reduction strategies, then under some conditions, we might actually expect CU to promote increased attention to the local, concrete, or specific features of information. The data from these three studies offer evidence that CU motivates abstract construal of information, particularly in contexts where other diagnostic information is unavailable. And, indeed, when one is causally uncertain, an initial move to understand the broader context—the *why*s, or abstract features, of behavior—is a potentially fruitful step toward restoring causal understanding. However, it is clear that in some contexts, people may find concrete information highly diagnostic, especially when one's abstract appraisal of a behavior leaves them wanting. For instance, in the absence of a more abstract understanding of a situation, a person high in CU might focus on concrete pieces of information in the hopes of identifying a covariance that might provide the initial basis for a causal hypothesis.

For an example of how CU motivates interest in diagnostic information above all else, consider the relationship between CU and the correspondence bias. Edwards (1998) established that, in general, CU promotes dispositional inferences, mainly because people high in CU have greater confidence in these attributions than in attributions to the situation. Weary et al. (2006) added a twist: they gave participants information about a target's behavior and supplemented it with situational information that was either a compelling explanation for the target's behavior or not. When the situational information was compelling as a potential piece of causal evidence, people high in CU relative to those low in CU made greater adjustments away from their dispositional attributions. But when the situational information was weak, those high in CU made *stronger* dispositional inferences than did those low in CU. In other words, CU led to a preference for diagnostic information, wherever it was available. In the absence of diagnostic situational evidence, those high in CU used behavior to infer disposition; when situational information was diagnostic, however, they used it to correct for their dispositional attributions.

Although, on balance, the diagnosticity of abstract features of information will exceed that of concrete features, concrete details of a particular behavior may help flesh out one's causal understanding, and to the extent that they do, CU should prompt increased attention toward them. While concrete features may never be sufficient for understanding causality, they may help in the downstream adjustment of one's assessment based upon the bigger picture.

BUT DOES IT HELP? ABSTRACT CONSTRUAL AND CU REDUCTION

An important open question for future research is whether this strategy, energized by CU activation, actually serves the function of restoring one's sense of causal understanding. Indeed, the efficacy of a number of documented CU-reducing strategies has yet to be demonstrated empirically, in part because of the conceptual difficulty associated with creating state-measures of CU. While it is clear from a rich tradition in attribution theory that abstract construal of behavioral information is a necessary ingredient toward restoring causal understanding, it is a question for future research whether this strategy on its own restores a sense of causal understanding or acts as a link in a broader cognitive chain that has the downstream consequence of reducing CU.

Certainly, the CU model stipulates that strategies such as this one are functional in nature, and postulates that, if applied correctly, these strategies will satisfy the goal of accurate understanding, thus temporarily reducing activation of CU beliefs. In a first-pass attempt to empirically address whether the shift to abstract construal is functional, we ran a pilot study in which we presented participants with behaviors, much like those from Study 1 ("Tom usually carries his neighbor's groceries"; "Simon yawned loudly during his teacher's lesson"). Participants in the control condition were asked to indicate the last time they saw a behavior like that one occur. Participants in the experimental condition were asked to generate a trait that describes the actor's behavior. After ten of such trials, participants were asked five modified questions from the CUS ($\alpha = .75$). We modified these questions to be about *current* CU (e.g., "I feel that I do not understand what causes most of the good things that are happening to me right now"; "Recently, when I've seen something good happen to others I am not sure why it happened"). Consistent with the idea that abstract construal may assist in reducing temporary feelings of CU, participants in the experimental condition reported lower current CU than did participants in the control condition, $t(49) = 2.0$, $p = .05$.

These results are preliminary, and future studies are required to tease apart whether thinking abstractly about behavior is reducing CU activation or whether thinking concretely about behavior is inducing CU activation. We must also caution against the conclusion that abstract construal (and other CU-reduction strategies) will lead to weakened chronic accessibility of CU beliefs over time. It is unlikely that momentary reductions in CU activation are sufficient for significant reductions in the chronic accessibility of CU beliefs, although the fact that the person experienced a feeling of success using the abstract construal strategy should increase the expected efficacy of that strategy and thus increase the likelihood of its use in the future (Weary et al., 2010). Second, individual differences in the accessibility of CU beliefs are reflective of the ease with which a person can be made to feel uncertain. In the 2010 expansion of the CU model, Weary et al. (2010) postulated that high CU is associated with increased "error sensitivity," or sensitivity to the discrepancy between one's current and desired states of causal understanding. This means that for individuals with highly accessible CU beliefs, even small discrepancies are associated with uncertainty and the motivation to reduce the discrepancy, and it is unclear whether abstract construal of information will serve to reduce these momentary gaps in perceived causal understanding.

CONVERGENT EVIDENCE FROM FLUENCY AND CONSTRUAL LEVEL

CU may be one of a number of metacognitive alerting cues that motivate people to process information in terms of its abstract, broader, meaning. Recent research across various labs suggests that similar metacognitive cues to both novelty (Forster, 2009) and disfluency (Oppenheimer, 2008) promote abstract information processing. In a recent paper, Forster (2009) predicted and found that novel stimuli, those tagged with a metacognitive sense of unfamiliarity or surprise (both of which, like CU, suggest that the person's knowledge is incomplete or in error), promote a broader, or global processing style. In explaining this effect, Forster offers a rationale that sounds much like our own:

> One may speculate why people would automatically adopt a more global processing style upon perception of novel cues. It could be argued that new information needs to be integrated into existing knowledge structures in order to be understood . . . More abstract categories are broader, and, naturally, more inclusive. If one tries to integrate a new target and is uncertain about the kind of category that would best fit it, it would be functional to activate many broad categories. A global processing style and abstract thinking support this inclusion process. (p. 447)

In addition, recent research by Oppenheimer and colleagues (for a review, see Oppenheimer, 2008) has found that metacognitive disfluency—the feeling that one's current processing is difficult—promotes abstract thinking. Participants in one study were instructed in either an easy-to-read (control condition) or difficult-to-read (metacognitive disfluency condition) font to describe New York City in one or two sentences. When blind coders assessed the abstractness of participants' responses, it was revealed that the brief experience of disfluency participants experienced when reading the instructions led participants to provide more abstract descriptions of New York (Alter & Oppenheimer, 2008).

Yet another research tradition, Construal Level Theory (Trope & Liberman, 2003), provides an additional precursor to abstract construal: psychological distance. Events and behaviors that are experienced as psychologically distal are construed more abstractly than those that are experienced as proximal (Henderson et al., 2006). In fact, fluency researchers have proposed that some of their effects may be due to the fact that disfluent, relative to fluent, information may feel more psychologically distant (Alter & Oppenheimer, 2008; Oppenheimer, 2008).

CU beliefs are activated when one encounters data that do not fit, that is, cannot be explained by, one's current causal model of the world. To the extent that this information violates expectations, it would be experienced as both novel and disfluent, and perhaps, more psychologically distant. The idea that all four metacognitive states (CU, disfluency, novelty, and distance) may in some cases stem from a similar source—expectancy violation—allows for the possibility that similar cognitive mechanisms are at play across research traditions, inviting a slew of future investigation. Note, however, that observing the same effects on a dependent measure in and of itself is not evidence for a similar underlying process. For this, careful empirical work would is needed to isolate specific mechanisms, which themselves may be triggered by distinct psychological precursors.

CONCLUSION

In our studies, epistemic motivation (the desire to understand the causal structure of the world) prompted by CU, led people to focus upon the features of behavior that are most closely linked to the "*why*s" of action perception. Unlike strategies documented in past CU studies, which focus upon corrective processes motivated by CU activation, the shift to abstract construal of information can happen early in cognitive processing and requires minimal cognitive effort. Thus, abstract construal may represent a first step toward restoring causal understanding when one's current attempts do not seem good enough.

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