Social Cognition, Vol. 26, No. 1, 2008, pp. 44-65

THE EFFECTS OF CAUSAL UNCERTAINTY, CAUSAL IMPORTANCE, AND INITIAL ATTITUDE ON ATTENTION TO CAUSAL PERSUASIVE ARGUMENTS

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In two studies, we examined how individual differences in causal uncertainty (CU), causal importance (CI), and initial attitudes affected the processing of a persuasive message that contained causal or non–causal arguments. We predicted that high CU individuals' doubts about their causal understanding of events would be activated when they were presented with counterattitudinal arguments. When these individuals also placed a high value on causal understanding (high CI), they should scrutinize any available causal explanations. As a result, they should be more persuaded by strong compared to weak causal arguments. In support of these predictions, we found in two studies that high CU/high CI participants were more persuaded by strong compared to weak counterattitudinal causal arguments. Mediational analyses in Study 2 revealed that high CU/high CI participants were more persuaded by strong causal arguments because they were more confident in them. Implications for the CU model and persuasion processes are discussed.

Social psychologists long have been interested in how people understand the causes of events in the social world. Early attribution theorists argued that in order to predict and control their social environments, people attribute behavior and events to stable, underlying causes (Heider, 1958). This early work and subsequent research has provided us with a wealth of information about attribution processes (for a review see Gilbert, 1998) and the critical role they play in many different domains.

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This article is based on a doctoral dissertation submitted by Stephanie Tobin to the Ohio State University. We would like to thank committee members Russell Fazio and Richard Petty for their valuable feedback on this research. We also would like to thank members of the 2002–2004 Group for Attitudes and Persuasion and the Weary Lab for their comments on this research and Pablo Briñol and two anonymous reviewers for their comments on an earlier version of this paper. A partial report of the data was presented at the 2004 Society for Personality and Social Psychology meeting.

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Recently, researchers have begun to examine the effectiveness of including causal explanations in persuasive messages. Specifically, Slusher and Anderson (1996) compared the effectiveness of causal and non–causal arguments in changing people's beliefs about the transmission of AIDS. Both types of arguments asserted correctly that AIDS could not be transmitted through casual contact. However, the causal arguments explained the underlying mechanism responsible for AIDS transmission, whereas the non–causal arguments provided covariation data supporting the lack of association between AIDS and casual contact. Participants who received the causal arguments, either alone or along with the non–causal arguments, showed greater belief change than did participants who received only the non–causal arguments.

Causal arguments, then, appear to have great potential in persuasive communication. However, their effectiveness for producing long lasting attitude change likely depends on the extent to which individuals think carefully about them (Petty & Cacioppo, 1986). One factor that is known to influence the amount of message elaboration is the match between characteristics of the persuasive message and perceivers' self–schemas, social identities, attitude bases, or attitude functions (for reviews see Briñol & Petty, 2006; Petty, Wheeler, & Bizer, 2000). For instance, researchers have examined the extent to which participants' attitudes are influenced by argument quality (i.e., strong versus weak arguments) when they receive messages that are matched or mismatched to their levels of self–monitoring, extroversion, or need for cognition (Petty & Wegener, 1998; Wheeler, Petty, & Bizer, 2005). Larger argument quality effects have been observed for matched messages, indicating that greater message elaboration occurs under these conditions.

In the current research, we sought to examine how individual differences in causal uncertainty (CU) could affect the processing of causal arguments. CU refers to doubts about one's own ability to identify the underlying causes of events (Weary & Edwards, 1996). According to the CU model (Weary & Edwards, 1996), a frequent loss of perceived control over events in one's life can lead to chronically accessible, generalized beliefs that one's understanding of the social world might be inadequate. Once such beliefs have developed, then unexpected or ambiguous events can easily trigger CU feelings because, by definition, these types of events signal that one's ability to predict and control events is somewhat inadequate.

Weary and Edwards (1996) argue that when their CU beliefs are activated, high CU individuals often will try to regain a sense of causal understanding and control by engaging in thorough information gathering and processing strategies. In support of this idea, studies have found that compared to those with low CU, high CU participants expend more effort on an impression formation task (Jacobson, 1999) and select more diagnostic questions to ask an interaction partner (Weary & Jacobson, 1997). Additionally, some initial evidence exists to support the idea that CU can affect the processing of a persuasive message. Specifically, Edwards (2003) found that although high levels of CU were not sufficient to prompt elaborative processing, high levels of CU in conjunction with a rational decision-making style increased the amount of thought that individuals devoted to a counterattitudinal persuasive message. In his study, participants who were high in both CU and the judging dimension of the Myers–Briggs Type Indicator listed more thoughts about a message concerning senior comprehensive exams and based their attitudes more on the quality of the arguments, relative to those low in CU or judging.

Edwards' (2003) findings likely were due in part to the counterattitudinal nature of the message. High CU individuals typically engage in extensive processing only

when some aspect of the situation activates their CU beliefs. To the extent that individuals possess attitude–congruent knowledge, counterattitudinal appeals introduce unexpected associations. For example, students who dislike exams probably would not have expected a new exam policy to be beneficial. Such unexpected associations should have triggered greater uncertainty among individuals with chronically accessible CU beliefs (Riley, 1998) and resulted in greater processing of the message, at least when a rational decision-making style also was adopted.

The CU model suggests another potential moderator of CU beliefs and feelings that should have particular relevance to the processing of causal counterattitudinal arguments: causal importance (CI), or the importance that individuals place upon accurate causal understanding. Weary and Edwards (1996) argued that although accurate causal understanding generally facilitates successful adaptation to one's environment, levels of CI can vary from individual to individual and from situation to situation. Conceptually, CU and CI are distinct constructs. Valuing a domain (i.e., high CI) does not necessarily give one confidence in one's abilities in that domain. Similarly, doubting one's abilities in a domain (i.e., high CU) does not necessarily make that domain seem any less important, particularly when it is critical for survival. What, then, determines a person's level of CI? Desire for control and high costs associated with a lack of causal understanding both have been suggested as factors likely to result in increased CI levels (Weary, Tobin, & Edwards, in press). Whatever its antecedents, high levels of CI should increase sensitivity to less–than–desired levels of causal understanding and result in intensified uncertainty resolution efforts.

Accordingly, we predicted that individuals who were high in both CU and CI would have the highest need to resolve uncertainty brought about by a counterattitudinal message. They should assess quickly whether reading the message carefully would help them achieve this goal (Weary & Edwards, 1996). If they detect causal cues (i.e., "because"), they should expend their cognitive resources on processing the message carefully. As a result of their greater attention, high CU/high CI individuals should be more persuaded by strong compared to weak causal arguments.

High CU/low CI participants, on the other hand, should be willing to tolerate small amounts of uncertainty. Thus, we would not expect high CU/low CI participants to think carefully about causal arguments. Finally, low CU participants should not experience CU feelings to the same extent as high CU participants, so they should have little need to attend to causal arguments.

In Study 1, we assessed participants' initial attitudes and chronic levels of CU and CI, and manipulated the type (causal or non–causal) and quality (strong or weak) of persuasive arguments to which they were exposed. In Study 2, we held constant initial attitude (inconsistent with the position of the message) and argument type (causal) and manipulated the quality of the causal explanations. We also assessed confidence in the author's explanations as a potential mediator. We predicted that high CU/high CI participants would feel more confident in the strong compared to weak causal arguments, and as a result, would be more persuaded (Petty, Briñol, & Tormala, 2002).

STUDY 1

In Study 1, we presented participants with a persuasive message against the legalization of gambling in Ohio. We manipulated the quality (strong or weak) and type

(causal or non–causal) of arguments. We predicted that when the arguments were counterattitudinal, as would be the case for participants initially in favor of gambling, high levels of CU and CI would lead participants to attend carefully to the causal arguments. As a result, these participants would be more persuaded by strong compared to weak causal arguments.

Before presenting the details of Study 1, however, we first describe a number of pilot studies that were conducted to (a) establish a reliable measure of CI and (b) create strong and weak versions of our causal and non–causal arguments.

PILOT STUDIES 1–3

Causal Importance (CI)

Previous research on CI has utilized a single–item measure of the construct (Weary, Jacobson, Edwards, & Tobin, 2001). We sought to develop a more reliable measure of CI for use in the current studies. Accordingly, we conducted a series of three pilot studies. In the first study, 293 participants completed the 14–item Causal Uncertainty Scale (CUS; Weary & Edwards, 1994) and 11 items designed to tap CI. We conducted exploratory factor analyses on these items and chose the six best CI items. In the second study, we administered the CUS and six CI items, along with the Beck Depression Inventory (BDI; Beck, 1967) and the Need for Cognition Scale (NCS; Cacioppo, Petty, & Kao, 1984) to 628 participants. We conducted confirmatory factor analyses on the CU and CI items, and examined the associations between CU, CI, BDI, and NCS scores. Lastly, in the third study, we administered the six CI items to 79 participants twice, separated by a seven–week interval, in order to examine test–retest reliability.

Pilot Study 1

In the first pilot study, 107 male and 186 female participants completed the CUS (Weary & Edwards, 1994) and 11 items that were designed to tap CI. The CUS consists of 14 statements expressing beliefs that one does not understand the causes of positive and negative events that happen to oneself and others (i.e., "I do not understand what causes most of the good things that happen to me"). The CI items also referenced good and bad events happening to the self and others, but asked participants how important they thought it was to understand the underlying causes (i.e., "It is important to know the causes for a person's behavior"). Participants rated on 6–point scales the extent to which they agreed or disagreed with each statement.

Using CEFA software (Browne, Cudeck, Tateneni, & Mels, 1998), we conducted exploratory factor analyses on the 25 items using maximum likelihood estimation and oblique varimax rotations. Prior factor analyses of the CUS have revealed that it consists of two highly correlated factors: CU about one's own and other people's outcomes (Edwards, Weary, & Reich, 1998). We wanted to see if the CI items would form a third distinct factor. An examination of the eigenvalues (6.50, 3.40, 1.50, 1.40, 1.10, 1.00, and so on) suggested that a 2– or 3–factor solution might be reasonable.

We tested the fit of 1-, 2-, and 3–factor models by comparing root mean square error of approximation (RMSEA) values and examining factor loadings. RMSEA values greater than .10 indicate unacceptable model fit, values from .08–.10 indicate mediocre fit, values from .05–.08 indicate reasonable fit, and values < .05 indicate

close fit. Our analyses revealed that a 1–factor model provided unacceptable fit (RMSEA = .112), whereas 2–factor (RMSEA = .078) and 3–factor (RMSEA = .066) models both fit the data reasonably well. In both the 2- and 3-factor models, a single CI factor emerged that was uncorrelated with the CU factor(s), *r*s ranged from –.03 to –.08. In the 2–factor model, the CU items loaded on a single CU factor. In the 3–factor model, the CU items loaded on two factors (own and other outcomes) that were positively correlated, $r = .57$, replicating the patterns reported by Edwards et al. (1998).[1]

From the larger set of 11 CI items, we selected the six items with the highest loadings (> .40) on the CI factor. These items were, "I feel like it is important to be able to determine the actual cause or causes of events in my life," "Understanding what causes different events in my life is not crucial for my success and happiness" (reversed); "It would benefit me greatly if I could better understand the causes of events in my life"; "It is important to know the causes for a person's behavior"; "When something good happens to me, it is important to know why it happened"; and "When something bad happens to me, it is important to know why it happened."

We conducted a second set of exploratory factor analyses on the reduced set of items (14 CU and the six CI). Again, we found that the 1–factor model did not fit the data well (RMSEA = .129), whereas the 2–factor (RMSEA = .087) and 3–factor (RMSEA = .07) models provided mediocre and reasonable levels of fit, respectively. In addition, the CI items loaded on a single factor that was uncorrelated with the CU factor(s), *r*s ranged from –.01 to –.08. Overall, the exploratory factor analyses suggest that a 3–factor model best explains the relationships among the 14 CU and six CI items.[2]

Pilot Study 2

In the second study, we sought to replicate the factor structure from the exploratory factor analysis and to provide some convergent and discriminant validity for the six–item CI scale. As part of a mass–pretesting session at the beginning of the quarter, we administered the CUS ($\alpha = .90$), the six–item CI scale ($\alpha = .86$), the BDI ($\alpha =$

1. For exploratory purposes, we ran our main analyses in Studies 1 and 2 using separate CU–own and CU–other subscales. The anti–gambling essay could well trigger CU about one's own and other people's outcomes among pro–gambling participants. Participants might consider the effects of gambling on society as a whole and on their own lives (since the proposal was to introduce gambling into the state in which they currently resided). We found that the effects associated with overall CU scores were best mirrored by CU–other scores in Study 1 and CU–own scores in Study 2. This is likely due to the fact that the CU–other factor accounted for most of the scale variance in Study 1, whereas the CU–own factor accounted for most of the scale variance in Study 2. Thus, the subscale that more closely related to overall CU scores was the best substitute for overall CU scores. The differential weighting of the CU–own and CU–other factors in the factor analyses might have been due to the conditions under which participants completed the CU scale in Studies 1 and 2. In Study 1, the CU scale followed an attitude survey filler task. In the prescreening sample used in Study 2, the CU scale followed the BDI. The BDI might have created a greater focus on the self.

2. We also tested a four–factor model on the larger set of CU and CI items. The improvement in fit of the four–factor model (RMSEA = .061) over the 3–factor model (RMSEA = .066) seemed negligible. In the four–factor model, the selected six CI items still loaded (factor loadings > .30) on a single factor that was uncorrelated with the CU–own and CU–other factors. However, three of the CI items that we had discarded based on the 3–factor model loaded on a fourth factor. Two of these items referred to prediction in the absence of causal understanding, so might have tapped a different construct.

.89), and the NCS (α = .88) to 310 male, 284 female, and 34 gender–unspecified participants.

Using RAMONA (Browne, 2004), we conducted confirmatory factor analyses on the 14 CU and six CI items. First, we specified a 3–factor model, with the six CI items loading on a CI factor and the nine CU–own items (items 1–5, 7–9, 13) and 5 CU–other items (6, 10–12, 14) loading on separate CU factors (as in Edwards et al., 1998). The RMSEA indicated that this model fit the data reasonably well (RMSEA = .062). In addition, all of the estimated factor loadings were significant (all loadings were > .37, *p*s < .001). The two CU factors were positively correlated, $r = .84$, $p < .001$, whereas the CI factor was uncorrelated with CU about both one's own, $r = -.04$, $p = .38$, and other people's, $r = -.07$, $p = .11$, outcomes.

A 2–factor model, with all 14 CU items loading on one factor and all six CI items loading on a second factor, also provided a reasonable fit to the data (RMSEA = .074). Again, all factor loadings were significant (all loadings were > .36, *p*s < .001) and the CI and CU factors were uncorrelated, $r = -.06$, $p = .19$.

Next, we examined the association between CU, CI, BDI, and NCS scores. High NCS individuals enjoy thinking and often engage in effortful cognitive activity (Cacioppo et al., 1984). High CU individuals also are thought to engage in effortful cognitive activity, but these efforts are geared specifically toward causal understanding and are motivated by attempts to regain lost control, not intrinsic enjoyment (Weary & Edwards, 1996). Indeed, past research has found that high CU individuals report lower need for cognition levels (Weary & Edwards, 1994). However, it seemed possible that those who generally like to think (high NCS) also would value specific types of thought focused on analyzing the underlying causes of events (high CI). To test this prediction, we regressed standardized NCS scores on standardized CUS scores, CI scores, and their interaction. Only the main effects of CU, $\beta = -.10$, $t(624) = -2.42$, $p < .05$, and CI, $\beta = .14$, $t(624) = 3.55$, $p < .001$, were significant. As predicted, higher levels of CI and lower levels of CU were associated with higher NCS scores.

Past research has established that a positive association exists between CU and depression (Weary & Edwards, 1994) and between moderate depression and thought about social information (Weary, Marsh, Gleicher, & Edwards, 1993). In thinking about the possible relation between CI and depression, we predicted that when individuals place a high value on causal understanding (high CI) and see themselves falling short of their desired levels of understanding (high CU), the potential for depression would increase (Hyland, 1987). We regressed standardized BDI scores on standardized CUS scores, CI scores, and their interaction. This analysis revealed main effects of CU, $\beta = .51$, $t(624) = 15.12$, $p < .001$, and CI, $\beta = .13$, $t(624) = 3.80$, $p < .001$. Higher CU and CI both were associated with greater depression. In addition, the CU × CI interaction was significant, $\beta = .09$, $t(624) = 2.88$, $p < .01$. Simple slope tests revealed that CI was associated with an increase in depression only when individuals were high, one standard deviation (SD) above the mean in CU, $\beta = .22$, $t(624) = 4.37$, $p < .001$.

Pilot Study 3

In the 0third pilot study, we administered the six CI items to 35 female and 44 male participants twice: first as part of a mass pretesting questionnaire and then 7 weeks later as a part of a seemingly unrelated study. The correlation between time 1 and time 2 CI scores indicated adequate test–retest reliability, $r = .63$, $p < .001$. Weary and

Edwards (1994) reported a similar level of test–retest reliability for the CUS over a six–week interval, $r = .62$, $p < .001$. Overall, then, our measures of CU and CI appeared to be internally consistent, reliable over time, and uncorrelated with each other. Furthermore, the correlations between CI, NCS, and BDI scores support our understanding of CI, yet are small enough not to threaten its status as a distinct construct.

Pilot Study 4

Argument Quality and Type

For Study 1, we created four sets of anti–gambling arguments that differed in their quality (strong or weak) and whether or not they identified causal mechanisms (causal or non–causal). All argument sets contained an introductory statement, followed by four claims about the negative consequences of gambling. We manipulated argument quality by varying the strength of the consequences (Petty & Wegener, 1991). In the strong argument condition, the consequences of gambling were very undesirable: casinos were said to attract mainly in–state rather than out–of–state customers, drive local businesses to bankruptcy, attract predominantly lower class patrons, and increase drug addiction and crime. In the weak argument condition, the consequences of gambling were only somewhat undesirable: casinos were said to attract both in–state and out–of–state customers, take away parking spaces from local businesses, attract predominantly middle class patrons, and increase speeding and parking violations.

We manipulated argument type by varying the data presented to support these claims (Slusher & Anderson, 1996). In the causal argument condition we explained *why* the consequences would occur. In the non–causal argument condition we provided statistics that suggested that the negative effects would in fact occur. For instance, to support the claim that casinos would attract predominantly lower class patrons, the causal supporting data read, "This is because gambling offers low–income people a chance at riches and a solution to financial hardship, and studies show that the desire for positive outcomes and 'feeling lucky' blinds people to the dismal chances they have of beating the odds," whereas the non–causal supporting data read, "At most of the country's casinos, low–income people make up about 78% of the crowd at the slot machines, and studies on other types of gambling, such as state lotteries, show that an unusually large number of the players are poor."

We conducted a pilot study to ensure that when individuals were thinking carefully, our strong causal and non–causal arguments elicited predominantly favorable thoughts and our weak causal and non–causal arguments elicited predominantly unfavorable thoughts (Petty & Cacioppo, 1986). Thirteen male, 44 female, and three gender–unspecified participants were randomly assigned to receive a message that contained strong or weak, causal or non–causal arguments. Four participants' data were excluded from analyses: three participants had already participated in the pilot study and one participant had extensive personal experience with gambling.

Participants were told that the study was part of a research program that examines people's perceptions of issues in the social world, and that they would read and evaluate a short editorial piece. In addition, participants were told to think carefully about and evaluate what was being said as they read the essay. Participants read

one of the four essays, and then listed the thoughts they had while they were reading the essay. They were told simply to write down the thoughts that came to their minds, ignoring spelling, grammar, and punctuation (a phrase could be sufficient). They were urged to be completely honest and list all thoughts they had. Further, they were asked to list as many thoughts as they could, but to enter only one per box. After listing their thoughts, participants rated on a 7–point scale how strong the arguments were (1 = not at all strong, 7 = very strong).

Blind to condition, one of the authors and a research assistant independently coded participants' thoughts as favorable, unfavorable, or neutral/irrelevant with regard to the advocacy (Cacioppo, Harkins, & Petty, 1981; Cacioppo & Petty, 1981; Petty & Cacioppo, 1986). Interrater reliability was found to be high (Kappa = .78). Thought indices were created based on each coder's ratings by subtracting the number of negative thoughts from the number of positive thoughts. Higher numbers indicated more favorable message–relevant thoughts. The indices for the two raters were highly correlated (r = .93, p < .001), so they were averaged to form a single measure of thought favorability.

A 2 (Argument Quality) × 2 (Argument Type) ANOVA on thought favorability revealed a main effect of argument quality, $F(1, 52) = 4.32$, $p < .05$. As expected, strong arguments elicited a more favorable thought profile (M = .46) than did the weak arguments (M = –.93). Similarly, a 2 (Argument Quality) × 2 (Argument Type) ANOVA on perceived strength ratings revealed a main effect of argument quality, $F(1, 52) = 5.04$, $p < .05$. Strong arguments (M = 4.96) were rated as stronger than were weak arguments (M = 4.07). For both measures, the argument type and Argument Type × Argument Quality effects were nonsignificant, Fs ranged from 0.10 to 0.39, ps > .53.

METHOD

PARTICIPANTS

One gender–unspecified, 190 male, and 149 female participants were randomly assigned to conditions in this 2 (Argument Type: Causal, Non–Causal) × 2 (Argument Quality: Strong, Weak) between–subjects factorial design. CU and CI were assessed at the end of the experimental session, after a filler task. The data from 41 participants had to be excluded for various reasons: 22 participants did not complete the prescreening attitude measure, 13 participants skipped through one or more of the main instruction screens or questions in fewer than 300 milliseconds (Bargh & Chartrand, 2000), three participants had participated in Pilot Study 4, two participants had participated in an earlier session of the main study, and one participant reported unintentionally clicking on the wrong answer for at least one of the dependent measures. After these exclusions, the sample consisted of one gender–unspecified, 160 male, and 138 female participants.

PRESCREENING DATA

We assessed initial attitudes toward the legalization of casino gambling in Ohio in a mass prescreening session at the beginning of the quarter. Participants rated the extent to which they agreed with the proposal that casino gambling should be legal-

ized in Ohio (1 = Do not agree at all, 7 = Agree completely), and how they felt about legalizing casino gambling in Ohio on the following semantic differential scales: good/bad, unfavorable/favorable, wise/foolish, harmful/beneficial. Ratings on the five prescreening attitude items were reverse–scored and then averaged to form a pre–message attitude index (α = .94). Higher numbers, then, indicated attitudes that were consistent with the position advocated in the persuasive message (anti–gambling).

PROCEDURE

Participants were assigned to individual computers that guided them through the experiment. After completing some initial demographic information (gender, age, initials, last four–digits of social security number), participants were told that they would complete two different studies, and that they should read and follow all the instructions carefully. They were told that the first study was part of a research program that examines people's perceptions of issues in the social world. The instructions emphasized that this is an important topic of scientific research, and that learning more about how we make sense of issues involving others will help us better understand and predict what will happen in the future. Participants were told that they would be asked to read a short editorial piece written by a leading social scientist and then they would be asked to answer some questions about it.

Depending upon condition, we then presented participants with a set of strong or weak, causal or non–causal arguments. These arguments were the same as those used in the pilot study. In addition, to ensure that the arguments were taken seriously, we attributed them to a high credibility source: Michael Thompson, Ph.D., from the Institute for the Study of Social Issues. This information was presented at the top of the page containing the arguments.

Dependent Measures. Following the essay, participants were asked to report their own opinion on the issue, as their personal views about the legalization of gambling might have influenced their impressions of the essay. Participants again completed the five attitude items from the prescreening questionnaire. Responses to these items were reverse–scored and then averaged to form a post–message attitude index (α = .96). Participants then were informed that they had reached the end of the first study.

CU and CI Scales. For the second study, participants were asked to complete some questionnaires for researchers in the Psychology Department who were collecting reliability and validity data on a number of scales. Participants first completed a filler questionnaire (selected from Roese's Political Attitude Filler Task, 2001), in which they were asked to indicate their agreement with ten different statements (i.e., "One should always be willing to admit mistakes," "Taxes in America are too high"). The filler task was used to take participants' minds off the gambling essay so that any temporary fluctuation in certainty that might have been caused by the persuasive message did not affect their responses to the CU and CI scales.

Next, participants completed the CUS (Weary & Edwards, 1994) and the six–item CI scale. Responses to the CU items were summed together (α = .91), with higher scores indicating higher levels of CU (M = 34.51, SD = 11.75). After reverse scoring the appropriate CI item, responses to the six CI items were averaged together (α = .85) to form a CI index (M = 4.40, SD = 0.98).

RESULTS

CU AND CI SCORES

For all analyses that included continuous predictor variables, we standardized both the continuous predictor and criterion variables prior to computing any interaction terms. Similar to centering (Aiken & West, 1991), standardizing predictor variables reduces multicollinearity. In addition, when both continuous predictor and criterion variables are standardized, the unstandardized coefficients become the correct standardized solutions (Friedrich, 1982).

To examine whether pre–message attitudes or experimental condition influenced CU or CI scores, we regressed CU and CI scores on argument quality (–1 = weak, +1 = strong), argument type (–1 = non–causal, +1 = causal), pre–message attitudes, and all interactions. This set of analyses revealed no significant effects on CU or CI scores, *p*s > .17. Thus, even though we assessed CU and CI at the end of the study, scores were not affected by any of our predictors.

ATTITUDES

Next, we regressed post–message attitudes on CU, CI, pre–message attitudes, argument type, argument quality, and all interactions. This analysis revealed main effects of argument quality, $\beta = .12$, $t(267) = 2.62$, $p < .01$, and pre–message attitudes, $\beta = .67$, $t(267) = 13.28$, $p < .001$. In addition, the CI × Argument Quality, $\beta = .10$, $t(267) = 1.96$, $p = .05$, CU × CI, $\beta = -.11$, $t(267) = -2.09$, $p < .05$, CI × Pre–Message Attitude, $\beta = -.11$, $t(267) = -2.00$, $p < .05$, CU × CI × Pre–Message Attitude, $\beta = .14$, $t(267) = 2.49$, $p < .05$, CU × CI × Pre–Message Attitude × Argument Quality, $\beta = -.14$, $t(267) = -2.43$, $p < .05$, CU × CI × Pre–Message Attitude × Argument Type, $\beta = .11$, $t(267) = 1.98$, $p < .05$, and CU × CI × Pre–Message Attitude × Argument Type × Argument Quality, $\beta = -.21$, $t(267) = -3.68$, $p < .001$, interactions were significant.

To investigate the nature of the highest order (5–way) interaction, we examined whether the 4–way interaction of CU, CI, argument quality, and argument type was significant at one standard deviation above and below the mean initial attitude score ($M = 3.70$, $SD = 1.53$). Following Aiken and West's (1991) recommendations for simple slope tests, we transformed the initial attitude variable so that the level of interest (i.e., + 1 SD, –1 SD) was set to zero. This way, we could examine whether the CU × CI × Argument Quality × Argument Type interaction term was significant for pro–gambling (– 1 SD) and anti–gambling (+1 SD) participants.

Pro–Gambling Participants. As predicted, the CU × CI × Argument Type × Argument Quality interaction was significant for the pro–gambling participants, $\beta = .26$, $t(267) = 3.25$, $p < 01$. Next, we transformed the argument type variable so that we could examine whether the CU × CI × Argument Quality interaction was significant in either the causal or non–causal argument condition. As predicted, we observed a significant CU × CI × Argument Quality interaction in the causal argument condition, $\beta = .39$, $t(267) = 3.05$, $p < .01$. The comparable interaction in the non–causal argument condition was not significant, $\beta = -.13$, $t(267) = -1.35$, $p = .18$.

To investigate the nature of the three–way interaction in the causal argument condition (see the upper two graphs in Figure 1), we transformed the CU and CI variables and examined the effect of argument quality among high CU/high CI, high CU/low CI, low CU/high CI, and low CU/low CI participants. These analysis re-

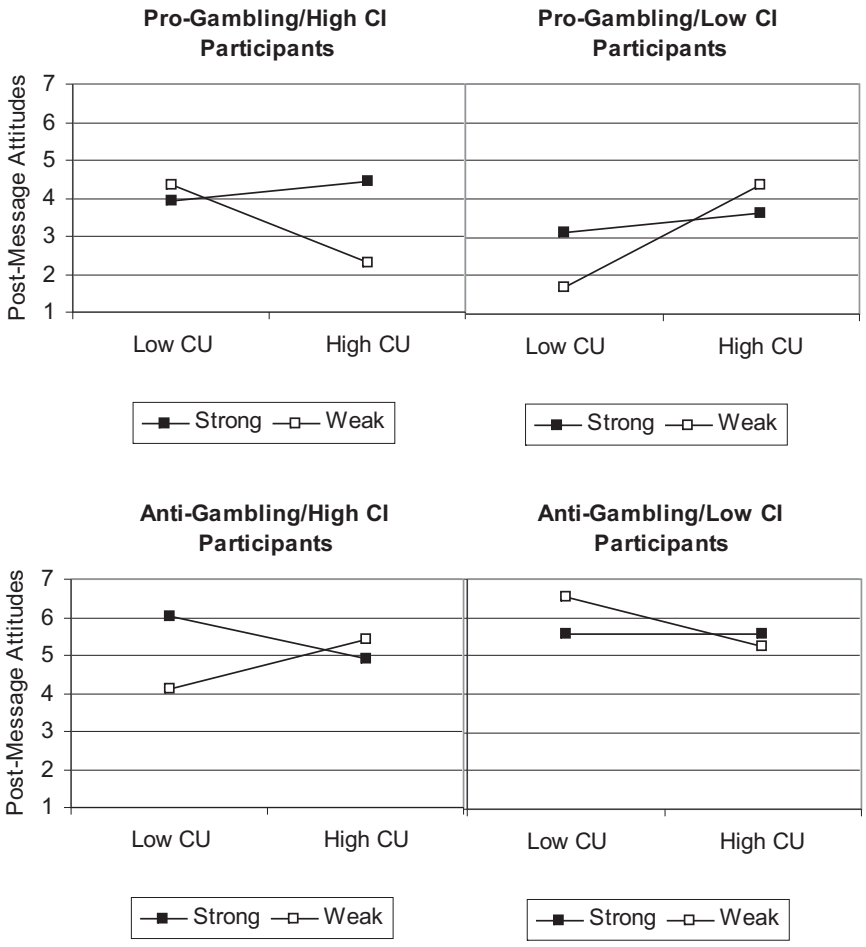

FIGURE 1. Persuasiveness of the causal arguments in Study 1 as a function of initial attitude, CU, CI, and argument quality.
Note. Higher numbers indicate greater persuasion.

vealed a significant effect of argument quality on post–message attitudes for participants who were high in both CU and CI, $\beta = .70$, $t(267) = 2.98$, $p < .01$. As predicted, these participants were significantly more persuaded when the causal arguments were strong compared to weak. Argument quality did not significantly predict attitudes for any other combinations of CU or CI, ps > .10.

Anti–Gambling Participants. Unexpectedly, the CU × CI × Argument Type × Argument Quality interaction also was significant, although opposite in sign, for the anti–gambling participants, $\beta = -.16$, $t(267) = -2.08$, $p < .05$. Further analyses revealed a significant CU × CI × Argument Quality interaction in the causal argument condition, $\beta = -.30$, $t(267) = -2.92$, $p < .01$, but not in the non–causal argument condition, $\beta = .01$, $t(267) = 0.12$, $p = .91$. An examination of the CU × CI × Argument Quality interaction in the causal argument condition (see the lower two graphs in Figure 1) revealed that argument quality affected post–message attitudes among low CU/high CI participants, $\beta = .61$, $t(267) = 3.98$, $p < .001$. Argument quality did not significantly predict attitudes for other combinations of CU or CI, ps > .21.

DISCUSSION

Findings revealed that participants who had general doubts about their own grasp on the underlying causes of events in the social world (high CU) and placed a high value on causal understanding (high CI) attended carefully to a counterattitudinal message that contained causal arguments. Accordingly, these participants were more persuaded by strong compared to weak causal arguments. No effects of CU or CI were observed when the arguments were non–causal.

Unexpectedly, anti–gambling participants who were low in CU and high in CI also appeared to scrutinize the causal arguments. These participants should have been experiencing the highest levels of confidence: their attitudes were consistent with those of an expert and they generally felt confident in their understanding of the causes of events. Although confidence has been linked in past literature to low levels of elaboration (i.e., Tiedens & Linton, 2001), recent research has revealed that confidence can increase message processing when the framing of the message matches the perceiver's level of confidence (Tormala, Rucker, & Seger, 2008). Specifically, Tormala et al. found that participants who were feeling confident thought more about a message that promised to instill confidence than a message that did not. They argued that the confidence framing increased the perceived relevance of the message to the confident participants.

Although our message was not framed explicitly in terms of confidence, the source expertise information likely set up an expectation that the message would convey accurate information. Participants who were experiencing high levels of uncertainty (high CU/counterattitudinal position) in a domain that they valued (high CI) should have attended to the causal arguments in order to improve their causal understanding. Participants who were experiencing high levels of confidence (low CU/proattitudinal position) in a domain that they valued (high CI) might have attended to the causal arguments in order to validate their causal understanding. Thus, it appears that high levels of CI can increase attention to causal arguments from an expert when they are coupled with strong feelings of either uncertainty or confidence.

STUDY 2

In Study 2, we chose for several reasons to focus on extending our understanding of the effect observed among high CU/high CI participants. First, this effect contributes to our understanding of CU reduction strategies. Second, from a practical standpoint pulling individuals toward the other side of an issue can be more of a challenge than "preaching to the choir." Techniques that increase attention to counterattitudinal appeals, then, can be quite valuable.

Study 1 provided evidence that pro–gambling/high CU/high CI participants processed causal arguments in a thoughtful and discriminating manner, but it did so by varying the strength of the consequences associated with gambling. We assumed that the causal explanations themselves were scrutinized, but a direct manipulation of explanation quality would permit a stronger test of this prediction. Accordingly, in Study 2, we held consequence strength and argument type constant and manipulated explanation quality. Specifically, we always presented participants with very undesirable consequences of gambling (as in the strong argument conditions in Study 1) and causal supporting evidence. However, we varied the quality of the causal explanations.

Our strong explanations provided reasonable causal accounts of why gambling would result in undesirable consequences (i.e., drug addiction and crime will increase because "at risk" people can't stop gambling when their money runs out, and will go into debt, steal money, and often turn to alcohol and drugs as a result of their misfortune). Our weak explanations, on the other hand, provided less likely, less satisfying, causal accounts (i.e., drug addition and crime will increase because casinos convey an image of corruption and immorality; once people start to think of their towns this way, they become more likely to use drugs and alcohol, and steal money).

Since high CU/high CI participants only attended to the causal arguments when they were favorably disposed toward gambling in Study 1, we only invited pro–gambling students to participate in Study 2. Consequently, all participants should find the anti–gambling arguments to be counterattitudinal; that, in turn, should activate CU beliefs among high CU individuals. Those high CU individuals who also place a high value on causal understanding (high CI) should respond by scrutinizing the available causal explanations. Their desire for accurate causal explanations and increased attention to the causal arguments should lead high CU/high CI individuals to accept the arguments and change their attitudes only when they are confident that the explanations are valid (Weary & Edwards, 1996; Petty et al., 2002). Accordingly, we assessed participants' confidence in the author's reasons in Study 2 and examined whether confidence mediated our predicted effects on post–message attitudes.

Lastly, we included the BDI (Beck, 1967) in Study 2 so that we could examine whether our predicted effects were due to depression, a construct that one of our pilot studies revealed is associated with high levels of both CU and CI. However, we thought that specific beliefs about one's causal reasoning abilities (CU) and the importance of causal understanding (CI), rather than depression, would affect participants' attention to causal arguments.

PILOT STUDY

A pilot study was conducted to ensure that the strong and weak explanations were noticeably different from each other. Fourteen male and 16 female participants were randomly assigned to receive either strong or weak causal supporting evidence. The data from two participants were excluded because they had extensive prior experience with gambling.

As in the argument pilot for Study 1, participants were told that the study was part of a research program that examines people's perceptions of issues in the social world, and that they would read and evaluate a short editorial piece. Participants were told to think carefully about and evaluate the arguments that the author was making and how well he was explaining the reasons behind what he was saying.

Participants next read either the strong or weak causal essay, presented on the computer screen one sentence at a time. After they had finished reading the essay, participants rated on 7–point scales how desirable the consequences of gambling described in the essay were (extremely undesirable to extremely desirable) and how well the author explained why the consequences might occur (not at all well to extremely well).

One–way ANOVAs with explanation quality as a between–subjects factor were conducted on consequence desirability and explanation quality ratings. A signifi-

cant explanation quality effect emerged on perceived explanation quality, $F(1, 26) = 12.34$, $p < .01$. As expected, the strong explanations ($M = 5.00$) were rated as better explaining why the consequences might occur than the weak explanations ($M = 2.86$). However, as we had intended, the consequences were seen as equally negative in the strong ($M = 1.86$) and weak ($M = 2.21$) explanation quality conditions, $F(1, 26) = 0.61$, $p = .44$.

METHOD

Prescreening Data

In a mass prescreening session at the beginning of the quarter, 43 gender–unspecified, 372 male, and 373 female participants completed a questionnaire packet containing the BDI (Beck, 1967), the CU and CI scales, and the initial attitude items used in Study 1. An attitude index was created by reverse scoring and then averaging the five attitude items together ($\alpha = .94$). Higher numbers, then, indicated less favorable attitudes toward gambling. Only participants who were at or below the median on the prescreening attitude index ($Mdn = 3.40$), were invited by email to participate in Study 2.

The BDI (Beck, 1967) presents participants with 21 items that describe various thoughts, feelings, and behaviors associated with depression (i.e., feeling sad, guilty, disappointed in self, tired; decreased appetite, weight loss, difficulty sleeping, thoughts of suicide). Participants rated each item on a scale of 0 to 3 based on how they had been feeling during the past two weeks. For the participants who completed the main study, responses were summed to create an index of depression ($\alpha = .81$), where higher numbers indicated higher levels of depression ($M = 6.39$, $SD = 5.18$). Although the BDI cannot be used to diagnose depression, it is a well–validated measure of depressive symptomatology (Beck, Steer, & Garbin, 1988).

Participants

The 40 male and 43 female participants recruited based on their favorable attitudes towards gambling were randomly assigned to either the strong or weak causal explanation condition.

Procedure

The procedure for Study 2 was identical to that used in Study 1 with the following exceptions. First, the consequences of gambling always were very undesirable and causal explanations always were presented. However, the quality of the explanations was either strong or weak, depending upon condition. Second, after reading the essay and completing the five attitude items, we asked participants to rate on seven–point scales how confident they were in the reasons the author gave for why each of the four specific consequences would occur (not at all confident to very confident). Participants' ratings were averaged ($\alpha = .76$) to form a confidence index.

RESULTS

CU and CI Scores

We summed participants' responses to the 14 CU items ($\alpha = .89$) and averaged their

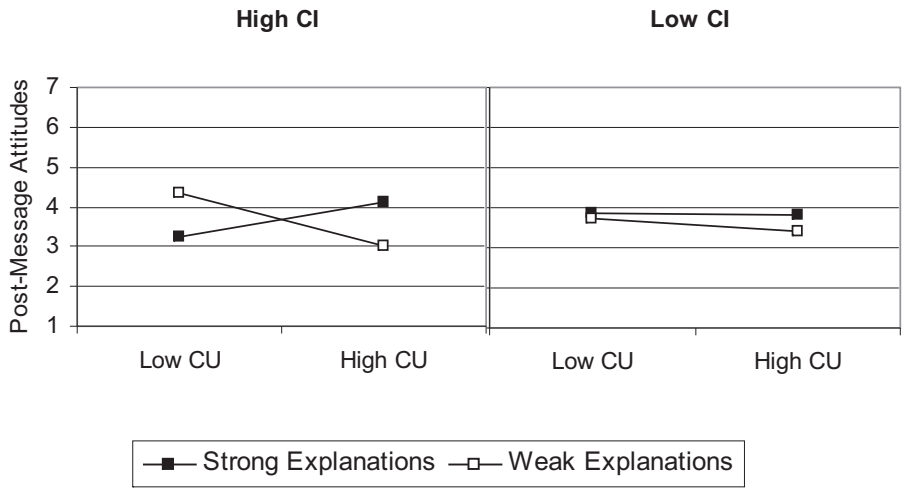

FIGURE 2. Persuasion among participants in Study 2 as a function of CU, CI, and explanation quality. Note: Higher numbers indicate greater persuasion.

responses to the six CI items ($\alpha = .81$) to form indices of CU ($M = 31.47$, $SD = 10.72$) and CI ($M = 4.38$, $SD = 0.96$). One–way ANOVAs revealed that random assignment to conditions was effective and that CU and CI scores did not differ as a function of explanation quality condition, ps > .73.

Attitudes

Responses to the five items were reverse–scored, and then averaged to form a post–message attitude index ($\alpha = .94$). We regressed post–message attitudes on explanation quality, CU, CI, and all interactions. CU and CI were standardized and explanation quality condition was effects–coded (+1 = strong, –1 = weak). This analysis yielded significant CU × Explanation Quality, $\beta = 0.27$, $t(75) = 2.48$, $p < .05$, and CU × CI × Explanation Quality, $\beta = 0.21$, $t(75) = 2.07$, $p < .05$, interactions.

To examine the nature of the CU × CI × Explanation Quality interaction, we conducted simple slope tests to examine the effects of explanation quality on post–message attitudes at high (+1 SD) and low (–1 SD) levels of CU and CI. Simple slope tests revealed a significant effect of explanation quality among two groups. As expected, high CU/high CI participants were significantly more persuaded by the strong compared to weak causal explanations, $\beta = 0.48$, $t(75) = 2.22$, $p < .05$. Low CU/high CI participants, on the other hand, were significantly less persuaded by the strong compared to weak causal explanations, $\beta = –0.49$, $t(75) = –2.25$, $p < .05$. (see Figure 2).

Confidence

Next, we examined participants' confidence in the author's reasons for why the consequences would occur. We regressed the confidence index on CU, CI, explanation quality, and all interactions. This analysis yielded only a significant CU × CI × Explanation Quality interaction, $\beta = 0.21$, $t(75) = 2.07$, $p < .05$.

We conducted simple slope tests to examine the effects of explanation quality on post–message attitudes within level of CU (+1 SD, –1 SD) and CI (+1 SD, –1 SD).

These analyses revealed a significant explanation quality effect only among high CU/high CI participants, $\beta = 0.57$, $t(75) = 2.61$, $p < .05$. These participants were more confident in the author's reasons when his explanations were strong compared to weak (see Figure 3).

Mediational Analyses

Because we had obtained comparable effects on confidence in the author's reasons and post–message attitudes for high CU/high CI participants, we next examined whether the effect on attitudes was mediated by confidence. We first examined whether confidence mediated the three–way interaction on attitudes. Specifically, we tested whether we had a case of mediated moderation (Muller, Judd, & Yzerbyt, 2005). If we did, we would have expected to see that (1) the CU × CI × Explanation Quality interaction predicted the criterion (attitudes); (2) the CU × CI × Explanation Quality interaction predicted the mediator (confidence in reasons); (3) the mediator predicted the criterion when the effects of the other variables were controlled; and (4) the inclusion of the mediator renders the CU × CI × Explanation Quality interaction on post–message attitudes nonsignificant.

We have already presented analyses relevant to steps one and two. The CU × CI × Explanation Quality interaction significantly predicted post–message attitudes, $\beta = 0.21$, $t(75) = 2.07$, $p < .05$, and confidence in reasons, $\beta = 0.21$, $t(75) = 2.07$, $p < .05$. We next examined whether our mediator (confidence) interacted with CU, CI, or explanation quality to predict post–message attitudes. None of the interaction terms involving confidence were significant: βs ranged from –.14 to .09, ts ranged from –1.11 to 0.81, ps > .26. Next, to provide evidence for the third and fourth steps, we regressed the criterion (post–message attitudes) on the mediator (confidence in reasons), while controlling for the other predictors: CU, CI, explanation quality, and all interactions. This analysis revealed that confidence predicted post–message attitudes, $\beta = 0.43$, $t(74) = 4.11$, $p < .001$, satisfying step 3. It also revealed that the CU × CI × Explanation Quality interaction no longer predicted attitudes when the mediator was included in the model, $\beta = 0.12$, $t(74) = 1.26$, $p = .21$, satisfying step 4. A Sobel test (Preacher & Leonardelli, 2001; Sobel, 1982) revealed that the drop in significance of the 3–way interaction was marginally significant, $Z = 1.86$, $p = .06$.

Next, we examined mediation for the particular group of interest. Recall that simple slope tests had revealed that among high CU/high CI participants, strong compared to weak causal explanations led to significantly more persuasion, $\beta = 0.48$, $t(75) = 2.22$, $p < .05$, and higher confidence, $\beta = 0.57$, $t(75) = 2.61$, $p < .05$. Subsequently, we entered confidence as a predictor of attitudes, along with the terms representing high CU (i.e., transformed CU scores where one SD above the CU mean is equal to zero), high CI (i.e., transformed CI scores where one SD above the CI mean is equal to zero), explanation quality, and all interactions. When we controlled for confidence, the explanation quality effect on post–message attitudes among high CU/high CI participants became nonsignificant, $\beta = 0.23$, $t(74) = 1.15$, $p = .25$. An additional Sobel test based on the simple slopes analyses revealed that the effect of explanation quality for high CU/high CI participants was significantly reduced, $Z = 2.21$, $p < .05$, when we controlled for the main effect of confidence on attitudes.

Depression

Lastly, to examine whether the effects associated with CU and CI might be due to

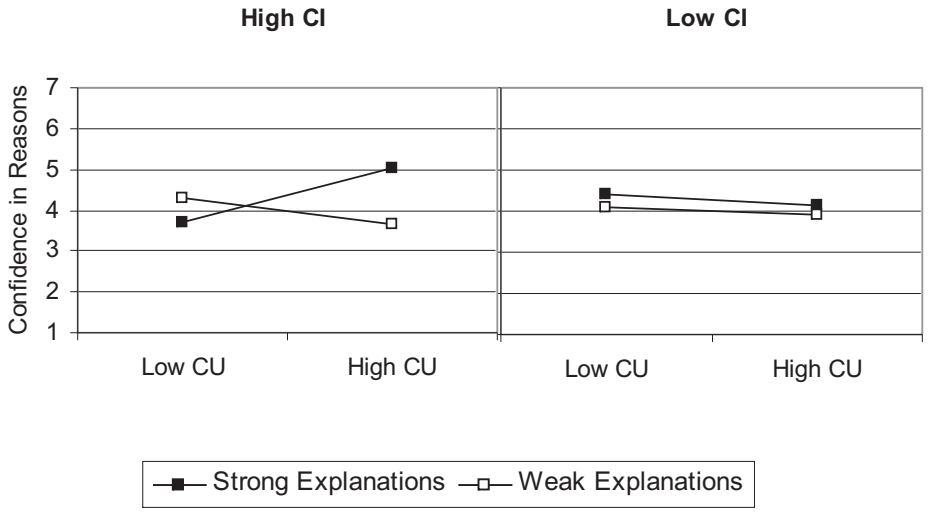

FIGURE 3. Confidence in the author's reasons among participants in Study 2 as a function of CU, CI, and explanation quality.

depression, we regressed post–message attitudes on BDI, explanation quality, and the two way interaction. This analysis yielded no significant effects, *p*s > .12.

In order to examine whether BDI might interact with CU or CI to predict responses to message arguments, we regressed post-message attitudes on BDI, CU, CI, explanation quality, and all interactions. Controlling for BDI, our predicted CU × CI × Explanation Quality interaction remained significant, $\beta = 0.25$, $t(67) = 2.14$, $p < .05$. Interestingly, the BDI × CU × CI × Explanation Quality interaction also was significant, $\beta = -0.34$, $t(67) = -2.27$, $p < .05$.

Next, we transformed BDI scores so that we could examine our predicted 3–way interaction among participants one SD above and below the BDI mean ($M = 6.39$, $SD = 5.18$). These analyses revealed that our predicted 3–way interaction emerged primarily among nondepressed participants, $\beta = 0.58$, $t(67) = 2.74$, $p < .01$. However, the direction of the explanation quality effects for high CU/high CI and low CU/high CI participants were the same for participants high and low in depression. High CU/high CI participants were more persuaded by strong compared to weak causal arguments, $\beta = 1.04$, $t(67) = 2.03$, $p < .05$ (nondepressed) and $\beta = 0.35$, $t(67) = 1.43$, $p = .16$ (depressed). Low CU/low CI participants were less persuaded by strong compared to weak causal arguments, $\beta = -1.01$, $t(67) = -3.31$, $p < .01$ (nondepressed) and $\beta = -0.10$, $t(67) = -0.31$, $p = .76$ (depressed).

DISCUSSION

A number of important findings emerged from Study 2. First, we replicated our effects when the individual difference predictors (CU and CI) were assessed prior to the experimental session. This helps rule out the possibility that CU and CI scores in Study 1 were a reflection of, rather than contributors to, attitude change. Second, we were able to show that depression, a construct that is positively associated with CU

and CI, was not responsible for the observed effects. Rather, it was uncertainty about why events happen in conjunction with high CI that increased the persuasiveness of strong causal arguments. Depression did moderate, however, the observed effects of CU, CI, and explanation quality. Our effects were observed primarily among nondepressed participants. Although unanticipated, this effect is consistent with the idea that high levels of depression (and negative expectancies for goal attainment) can lead high CU individuals to disengage from efforts to improve their causal understanding (Weary & Edwards, 1996).

Of greater theoretical interest, we found that individuals high in CU and CI scrutinized the quality of the causal explanations. High CU/high CI participants were more confident in the strong compared to weak causal explanations, and were more persuaded by them, as a result. Mediational analyses provided support for this process. These results are consistent with recent metacognitive models of persuasion which posit that confidence plays a critical role in persuasion among individuals who are thinking carefully (Petty et al., 2002).

Unexpectedly, we found that low CU/high CI participants were more persuaded by the weak compared to strong causal arguments. When presented with a potentially serious negative consequence of gambling and a specious explanation, it is possible that these participants spontaneously generated their own explanations. High levels of confidence in their own causal explanations (due to low CU levels) could have rendered these explanations more compelling than the author's strong causal explanations. This possibility is consistent with past findings in the areas of self–persuasion (Janis & King, 1954; King & Janis, 1956) and spontaneous inferences in persuasion (Kardes, 1988; Stayman & Kardes, 1992).[3]

GENERAL DISCUSSION

Extensions to the CU Model

The findings of the current set of studies have implications for the CU model (Weary & Edwards, 1996). Findings are consistent with the idea that high CU individuals use other people's causal explanations to help reduce their CU feelings and gain a sense of understanding, at least when high CU individuals are also high in CI. Importantly, high CU individuals' chronic lack of confidence in their own explanations does not appear to compromise their ability to detect specious causal explanations offered by others. They feel confident in and accept other people's explanations only when the explanations are plausible.

An important issue highlighted by the current research is the moderating role that CI plays in CU–reduction efforts. Only one previous study has examined the influence of CU and CI on social judgments (Weary et al., 2001, Study 2). Using a single–item measure of CI, that study found that when participants with a high level of CU, CI, or experimentally–induced accuracy motivation were asked to judge an ambiguous case of academic misconduct, they were not influenced by an available stereotype. In contrast to Weary et al. (2001), we found that different combinations of CU and CI affected judgments in different ways. In comparing the re-

3. Our confidence measure referred specifically to confidence in the author's reasons, so it would not have been sensitive to confidence in one's own explanations. This is probably why we did not observe an explanation quality effect on confidence among low CU/high CI participants.

sults of the different studies, it is important to note that lack of stereotype use in Weary et al.'s (2001) study does not necessarily indicate higher levels of elaboration. Indeed, recent research suggests that automatic vigilance to social information among high CU participants can dilute the judgmental impact of a stereotype even when individuals are unable to engage in effortful processing (Tobin, Weary, Brunner, Han, & Gonzalez, 2007).

With a clearer indication of elaboration in the current studies (i.e., sensitivity to argument quality), we found the effects of CU and CI to be more circumscribed. We found evidence of increased elaboration of causal arguments among high CU/high CI participants who received a counterattitudinal message (Studies 1 and 2) and low CU/high CI participants who received a proattitudinal message (Study 1). In our studies, then, high CI was necessary but not sufficient for increased processing of causally–relevant information. In addition, we posited that low CU/high CI participants may have spontaneously generated their own causal explanations when they received a counterattitudinal message containing weak causal explanations (Study 2). Future research will have to examine the processes underlying these unexpected CI effects among low CU participants.

Extensions to the Persuasion Literature

Researchers have found that uncertainty stemming from specific emotions (Tiedens & Linton, 2001) can increase the amount of thought individuals devote to a persuasive message, leading them to change their attitudes more in response to strong compared to weak arguments. Similarly, researchers have also found that inconsistencies between old and new attitudes (Petty, Tormala, Briñol, & Jarvis, 2006) or implicit and explicit self–conceptions (Briñol, Petty, & Wheeler, 2006) can increase individuals' processing of relevant information. These findings suggest that individuals will process persuasive messages carefully if the message potentially could help perceivers reduce their uncertainty. Our own findings extend this general principle to the causal domain. We found that high CU individuals thought carefully about our counterattitudinal message only when it contained causal arguments and only when they were high in CI.

We should acknowledge that one limitation of the current research is that we only presented participants with arguments against gambling. Would we have found parallel effects if we had used arguments in favor of gambling? Based on a review of the attribution literature, Weiner (1985) argued that spontaneous causal thinking is greatest in response to negative and unexpected events. However, more recent research has revealed that unexpected events lead to more spontaneous attributional activity than do expected events, regardless of event valence (Kanazawa, 1992). Event valence seems to affect only nonspontaneous attributional activity. Specifically, Kanazawa (1992) found that participants generated more causal attributions when they were asked why negative events occurred, compared to why positive events occurred.

It is likely that our causal persuasive messages elicited both spontaneous and nonspontaneous attributional activity, so valence and expectancies both should have played a role. In general, then, we would expect that CU and CI would have the strongest effect on message processing when the arguments address the causes of unexpected negative events, as they did in the current set of studies. Unexpected negative events can be very costly, so it would be reasonable for high CU/high CI individuals to focus their efforts on such events.

Overall, our findings support the utility of causal arguments for changing people's attitudes and beliefs (Slusher & Anderson, 1996). However, we found that such arguments received the most attention when individuals were highly motivated to understand the causes of events (high CI) and highly doubtful (high CU/counterattitudinal message). We also found some evidence to suggest that high CI increased attention to causal arguments when individuals were highly confident (low CU/proattitudinal message). Importantly, for these groups of individuals, we saw that causal arguments had their effect on persuasion through the central route. According to the Elaboration Likelihood Model (Petty & Cacioppo, 1986) and the Heuristic Systematic Model (Chaiken, 1987), such persuasion is likely to be long lasting rather than transitory. It would be worthwhile, then, for future research to examine strategies for temporarily altering perceivers' levels of CU and CI before presenting them with causal arguments.

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