The Mere Perception of Elaboration Creates Attitude Certainty: Exploring the Thoughtfulness Heuristic

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Attitude theory has long proposed a mechanism through which antecedents of message elaboration produce attitude strength consequences. However, little direct evidence exists for the intervening process. The proposed *thoughtfulness heuristic* holds that perceiving that more thought has taken place leads to greater attitude certainty. Two roles were established for this heuristic: first as a mediator of the impact of antecedents of elaboration on attitude certainty and second as a way to influence attitude certainty independent of actual elaboration. In Studies 1 and 2, antecedents of elaboration (need for cognition, distraction) impacted attitude certainty because they impacted the actual amount of processing, which in turn affected perceptions of the amount of processing. In Studies 3 and 4, a manipulation of perceived thought impacted certainty independent of actual thought (i.e., after thinking had already occurred). Furthermore, the thoughtfulness heuristic was shown to influence behavioral intentions, establishing perceived amount of processing as both a mediator and an independent cause of attitude strength consequences.

Keywords: heuristics, elaboration, attitude strength, certainty, persuasion

Social psychologists have for a long time been interested in the role of thought processes in attitudes and persuasion (Festinger, 1957; Hovland, Janis, & Kelly, 1953; Tesser, 1978). Of these, no aspect of thought has captured the interest of persuasion researchers as much as the *amount* of thought (elaboration) about an attitude object (see Petty & Wegener, 1998, for a review). Contemporary models of persuasion such as the heuristic–systematic model (Chaiken, 1987), the elaboration likelihood model (Petty & Cacioppo, 1986), and the unimodel (Kruglanski & Thompson, 1999) hold that the amount of thought that occurs in response to a persuasive message is an important determinant not only of the extent of persuasion but also of the strength of the attitude that results (Petty & Krosnick, 1995). That is, according to each of these models, attitudes based on high amounts of thought are proposed to be more persistent over time, resistant to attack, and predictive of behavior than attitudes formed or changed with little thought (see Petty, Haugtvedt, & Smith, 1995, for a review). Thus, understanding the role of elaboration in attitude strength is clearly of critical importance for anyone trying to develop persuasive communications with consequences, whether for product advertising, health promotions, election campaigns, or simply a discussion around the dinner table.

Given the conceptual importance of elaboration as a determinant of attitude strength, it is perhaps not surprising that a number of studies have investigated this linkage empirically. For example, research has demonstrated that various causes of elaboration, including personal relevance (Haugtvedt & Strathman, 1990; Petty, Haugtvedt, Heesacker, & Cacioppo, 1995, Study 1, as cited in Petty, Haugtvedt, & Smith, 1995), the expectation of having to communicate or discuss the message with another person (Chaiken, 1980; Zajonc, 1960), and high need for cognition (Haugtvedt & Petty, 1992), are associated with attitudes that persist across time. Similarly antecedents of elaboration including personal relevance (Haugtvedt & Petty, 1992; Petty et al., 1995, as cited in Petty, Haugtvedt, & Smith, 1995) and high need for cognition (Cacioppo, Petty, Kao, & Rodriguez, 1986) are associated with attitudes that are resistant to change. Finally, multiple investigations have shown message processing in high as opposed to low personal relevance conditions leads to greater attitude–behavior correspondence (Leippe & Elkin, 1987; Petty, Cacioppo, & Schumann, 1983; Sivacek & Crano, 1982). Thus, there is convergent evidence that various antecedents of elaboration impact attitude strength consequences.

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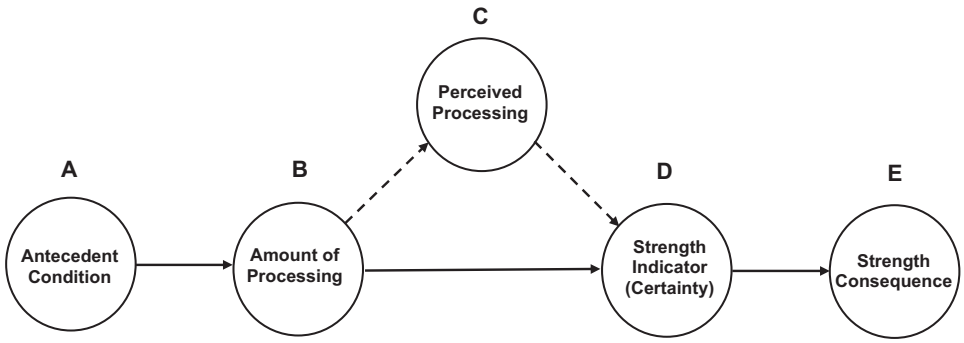

Figure 1. Proposed overall model of causal relationships between antecedents of the amount of processing and attitude strength consequences.

Although the overall relationship between antecedents of elaboration (e.g., personal relevance of message) and attitude strength consequences (e.g., resistance to persuasion) is well established empirically, it is not entirely clear why this relationship exists. To date, no study has established a mediator of the relationship between elaboration and strength consequences. From a theoretical standpoint, Petty, Haugtvedt, and Smith (1995) proposed the following generic framework to account for this relationship: antecedent conditions (A) → amount of processing (B) → strength mediator (D) → strength consequence (E) (see Figure 1). Notably, several candidate strength mediators were suggested through which elaboration might impact strength consequences, including structural consistency, attitude accessibility, attitude-relevant knowledge, and certainty.

In the current research, we focus on attitude certainty as a strength mediator and further examine why certainty would be affected by the extent of elaboration. Attitude certainty refers to the conviction with which individuals hold their attitudes, or how correct they believe their attitudes to be (Abelson, 1988; Gross, Holtz, & Miller, 1995). Certainty is perhaps the most studied indicator of attitude strength and has been shown to be associated with attitudes that are more consequential in terms of persistence (Abelson, 1988; Bassili, 1996; Haugtvedt & Petty, 1992; Pomerantz, Chaiken, & Tordesillas, 1995), resistance (Bassili, 1996; Haugtvedt & Petty, 1992; Tormala & Petty, 2002; Visser & Mirabile, 2004), and their ability to predict behavior (Fazio & Zanna, 1978; Franc, 1999; Rucker & Petty, 2004; Sample & Warland, 1973; Tormala & Petty, 2002; Warland & Sample, 1973; see Petty, Briñol, Tormala, & Wegener, 2007, for a review).

Although certainty is clearly established as an indicator or predictor of attitude strength consequences, surprisingly little is known about the relationship between antecedents of elaboration or elaboration itself and certainty. Studies measuring numerous strength indicators have found that, much like the relationship between other indicators, there appears to be a moderate relationship between self-reported elaboration and certainty (Krosnick, Boninger, Chuang, Berent, & Carnot, 1993; Prislin, 1996). However, the reliability of this relationship is unclear, as it varies from substantial to statistically nonsignificant, even within the same study (see Krosnick et al., 1993, Study 1).

Only two studies have included manipulations of potential antecedents of elaboration and are thus better able to address the direction of causality. Fazio and Zanna (1978) found that having behavioral experience with an attitude object resulted in greater attitude certainty; however, the role of elaboration is unclear because it was not assessed. In the most relevant research, S. M. Smith, Fabrigar, MacDougall, and Wiesenthal (2008) manipulated distraction and found effects on self-reported elaboration and certainty. However, the role of perceived elaboration was unclear, because one study showed evidence of partial mediation, whereas the other study showed no evidence of mediation. Furthermore, neither study reported measures of actual thought or strength consequences. So there was no way to establish whether distraction had the intended effect on thinking or whether certainty deriving from an antecedent of elaboration had any strength consequences. Taken together, there is surprisingly little direct evidence of the impact of antecedents of elaboration on certainty, and even more critically, the underlying process and consequences of that relationship have yet to be established.

The current research first focused on the relationship between antecedents of elaboration and certainty. Of particular interest is the question of *why* the extent of actual thought would impact certainty. We suggest that people are often cognizant of the amount of thought they have given to an issue and infer certainty from this assessment. To test this idea, in the current research we vary an antecedent of thinking and then measure actual thinking, perceptions of thinking, and certainty. Common experiences provide a variety of cues that draw attention to the amount of thought that has taken place, such as the amount of time spent in thought, the ease with which thoughts come to mind, and self-perceptions of the number of thoughts expressed in conversation. These cues suggest that perceptions of the amount of processing could reflect the actual amount of processing that takes place, at least under typical circumstances. Indeed, antecedents of elaboration have been shown to impact perceptions of the amount of thought (Petty, Harkins, Williams, & Latane, 1977), as well as measures of actual thought such as thought listings (Petty & Cacioppo, 1977). Even though actual thought measures and measures of perceived thought have not typically been reported within the same study, there has been an assumption that perceptions of the amount of thought generally reflect the actual amount of thought that has taken place (e.g., Wegener, Downing, Krosnick, & Petty, 1995). Accordingly, although it has not been examined empirically before, it is proposed that individuals form perceptions of the amount of thought that has taken place and that these perceptions can reflect the actual amount of thought that has taken place (see Figure 1, B–C).

More important, the current research also explores the potential consequences of perceiving that more as opposed to less thought has gone into reaching a particular attitude. In general, people believe that better judgments result when substantial thought has gone into making a decision as opposed to very little thought (Cacioppo & Petty, 1982; Tordesillas & Chaiken, 1999). Conversational conventions reflect an association between more thought and feelings of certitude and correctness in the resulting judgment. For example, authority figures such as parents or judges often preface their decisions with statements such as "Having given the matter a lot of thought" in order to lend an additional sense of certainty to their decisions. One common approach to undermining a judgment is to call into question the amount of thought that went into it, with statements such as "Did you ever stop to think before you decided to do that?" Personal experiences with mistakes that result from hasty decisions could also contribute to this association. Over time, these learning experiences result in what we call the *thoughtfulness heuristic*—if more thought is seen as going into a judgment, then that judgment is believed to be more correct. Thus, when one perceives that one has done much thinking regarding one's attitude, certainty is likely to follow.

Like other heuristics in persuasion, this is a simple rule, derived from past experience, that links a perceptual cue with a judgmental outcome (Chaiken, 1987). Heuristics are typically invoked to ease the effort involved in decision making (see Shah & Oppenheimer, 2008). Unlike other persuasion heuristics that typically influence the valence of one's attitude, the thoughtfulness heuristic affects the certainty with which the attitude is held. In typical circumstances, the amount of thought that is perceived to go into a judgment is likely to reflect the actual amount of processing that has taken place. In this case, the thoughtfulness heuristic provides a mechanism for translating the actual elaboration that takes place into attitude certainty: actual amount of processing → perceived amount of processing → attitude certainty. Demonstrating this mediational role would provide evidence of a mechanism by which multiple antecedents of elaboration could impact attitude certainty and additional downstream consequences such as attitude–behavior consistency. Thus, one goal of the current investigation is to provide evidence of a comprehensive process from antecedents of elaboration to strength consequences, as depicted in Figure 1 (A → B → C → D → E).

Perhaps the least well understood component of this comprehensive process is the role played by the actual amount of processing and the perception of the amount of processing. In prior research (Cacioppo, Petty, & Morris, 1983; Petty, Harkins, & Williams, 1980), either perceptions of the amount of processing or actual processing was measured within a given study, and these were seen as interchangeable. However, recent research has highlighted the importance of separating out operative indicators of a concept from perception measures (e.g., objective vs. perceived ambivalence; e.g., Bassili, 1996; Priester & Petty, 1996; Thompson & Zanna, 1995; Tormala & Petty, 2004). In this tradition, another goal of the current investigation is to show that perceived amount of processing is a construct distinct from actual amount of processing. When perceived amount of processing reflects actual amount of processing, actual amount of processing can be understood as a mediator of the relationship between antecedents of elaboration and perceived amount of processing (ABC). With the addition of the thoughtfulness heuristic, this provides the most comprehensive process to date to explain the relationship between antecedents of elaboration and attitude certainty.

Finally, distinguishing between these two variables raises the question of what might occur when perceptions of the amount of processing are influenced by something other than the actual amount of processing. On the basis of the thoughtfulness heuristic, we argue that any variable that influences perceptions of the amount of thought could change attitude certainty. This would provide a new route to strength consequences completely independent of variation in actual processing.

Study 1

The purpose of Study 1 was to provide an initial demonstration of the role of the thoughtfulness heuristic in explaining the relationship between an antecedent of elaboration, in this case the need for cognition (NC; Cacioppo & Petty, 1982), and attitude certainty. NC is a stable individual difference reflecting the tendency to engage in and enjoy effortful thought. Those high in NC have been shown to engage in greater elaboration of persuasive messages than those low in NC (see Cacioppo et al., 1986, for a review). The persuasive message used in Study 1 contained components that should appeal to participants who take either a thoughtful (central/systematic) or a nonthoughtful (peripheral/heuristic) route to persuasion. For those who are low in NC, who tend to engage in less elaborative processing, the communication contained positive cues such as a large number of arguments and a highly credible source (see Petty & Cacioppo, 1986). To appeal to those who are high in NC, who are more likely to engage in elaborative processing, the message was composed of strong arguments. Thus, it was predicted that attitudes and attitude extremity following the message would not differ on the basis of NC.

According to the proposed mechanism, those who like to think (high NC) should engage in more actual processing of the persuasive message. Under typical persuasion circumstances such as this, the perception of the amount of processing is expected to reflect the actual processing that has taken place. According to the thoughtfulness heuristic, perceiving more processing should lead to greater certainty in the attitude resulting from that processing. This overall mechanism suggests a model in which NC predicts actual amount of processing, which predicts perceived amount of processing, which predicts attitude certainty (Figure 1, ABCD).

Method

Participants

Eighty-one undergraduates in introductory psychology classes at Ohio State University voluntarily participated in fulfillment of a course requirement. Consistent with the student population, the sample self-identified as predominantly White (62 White, 10 African American, 5 Asian, and 4 other).

Procedure

Participants entered the experimental room and sat themselves at one of eight computer stations separated by partitions. Instructions on the computer indicated that a university committee was considering whether senior comprehensive exams should be adopted in 6 years' time, and that student feedback was being

solicited in response to this proposal. Instructions were designed to establish a moderate level of personal relevance, which should have allowed for variation in the extent of message processing due to NC. Participants were then presented with nine strong arguments in favor of instituting senior comprehensive exams (Petty & Cacioppo, 1986). The source of the message was a committee at Ohio State University charged with giving feedback to the Board of Regents. Persuasive arguments addressed the following points: improved university reputation and teaching, elimination of finals, as well as increased salaries of graduates, admissions to graduate schools, alumni donations, academic excellence, job preparation, and grades. After exposure to the message, participants completed items in the following order: a thought listing, attitude items, perceived thought items, attitude certainty items, perception of how carefully they had read the arguments, a memory listing for the arguments presented, and the NC scale. After this, participants were thanked and debriefed.

Independent Variable: NC

At the end of the experiment, participants completed the 18-item version of the NC scale (Cacioppo, Petty, & Kao, 1984). Scale items included "The notion of thinking abstractly is appealing to me" and "I only think as hard as I have to" (reverse coded). Participants were told to rate how characteristic each statement was of them on a 5-point scale from *extremely uncharacteristic* to *extremely characteristic*. The scale was highly reliable ($\alpha = .87$), so items were averaged to form an overall index (*Mdn* = 60; range 34–85).

Dependent Variables

Actual amount of processing. A thought listing and a memory listing were taken as two separate indicators of the actual amount of processing of the persuasive message. Previous research has supported the utility of measuring the number of message-relevant cognitive responses (Burnkrant & Howard, 1984; Petty & Wegener, 1998) and recall of arguments (Craik & Lockhart, 1972), as indicators of the depth of processing.

The instructions for the thought listing measure were as follows:

> Below is the first of several boxes you can use to record your thoughts regarding the senior comprehensive exams issue. Simply write down the thoughts that come to mind without worrying about spelling or grammar. Please list all of the thoughts you have. (Petty & Cacioppo, 1977)

Up to 18 boxes were provided for thoughts along with a key to press once they had no more thoughts.

For the memory listing, participants received the following instructions:

> Below is the first of a number of boxes in which we would like you to recall each of the pieces of evidence that you read in support of the senior comprehensive exam policy.

Otherwise, the memory items were handled in an identical way to the thought listing.

Before analysis, judges who were blind to the level of NC coded thought and memory items according to whether they were relevant to the senior comprehensive exams issue. The numbers of message-relevant thoughts and memory items were reliable ($\alpha = .56$), so they were averaged to form a single index of the actual amount of processing. Thoughts and memory items were standardized before being averaged, because they had somewhat different variances.

Attitudes. All ratings in the current research were assessed using items with scale points of 1 to 5, 1 to 7, or 1 to 9. Attitudes toward senior comprehensive exams were assessed using two 7-point semantic differential items: *good–bad* and *like–dislike*. Responses to these items were highly reliable ($\alpha = .91$), so they were averaged to form an overall attitude index. Attitude extremity was calculated by taking the attitude index, subtracting the center point of the scale from the index, and using the absolute value of the result to determine the distance from the neutral point.

Perceived amount of processing. Five items were used to assess this variable. In two items, participants were asked "To what extent did you think a lot about [pay attention to] the information about Senior Comprehensive Exams?" Responses were provided on a 9-point scale ranging from *a little* to *a lot*. In three items, participants were asked "To what extent did you take the time you needed to carefully read the first three [middle three, last three] arguments in favor of Senior Comprehensive Exams?" Responses here were provided on a 7-point scale from *not at all* to *definitely*. Items were based on those used to measure perceived amount of thought in previous research (Wegener et al., 1995). Because the two sets of items were on different scales, each item was standardized prior to creating a single index, which was highly reliable ($\alpha = .90$).

Attitude certainty. Three items measured certainty using 9-point scales from *not at all* to *very*: "How certain [confident, sure] are you of your opinion about Senior Comprehensive Exams?" This is consistent with typical measures of attitude certainty (Wegener et al., 1995). Responses were highly reliable ($\alpha = .91$), so they were averaged to form an overall index.

Results

Regression Analysis

NC was investigated as a continuous predictor. Consistent with the proposed mechanism, NC predicted actual amount of processing, $\beta = .34$, $t(79) = 3.29$, $p < .01$ ($M = 0.00$, $SD = 0.83$); perceived amount of processing, $\beta = .36$, $t(79) = 3.46$, $p < .01$ ($M = 0.00$, $SD = 0.85$); and attitude certainty, $\beta = .31$, $t(79) = 2.87$, $p < .01$ ($M = 5.84$, $SD = 1.65$).

Those low in NC were expected to have the same attitudes as those high in NC owing to the presence of cues (numerous arguments and source credibility). Consistent with this prediction, NC failed to predict attitudes, $\beta = .17$, $t(79) = 1.49$, $p = .14$ ($M = 4.58$, $SD = 1.56$), or attitude extremity, $\beta = .08$, $t(79) = 0.72$, $p = .48$ ($M = 1.44$, $SD = 0.83$). Thus, differential attitudes or extremity do not provide an alternative explanation for the impact of NC on attitude certainty.

Finally, regression analyses were conducted to investigate whether the impact of NC was due to a relationship with the nature

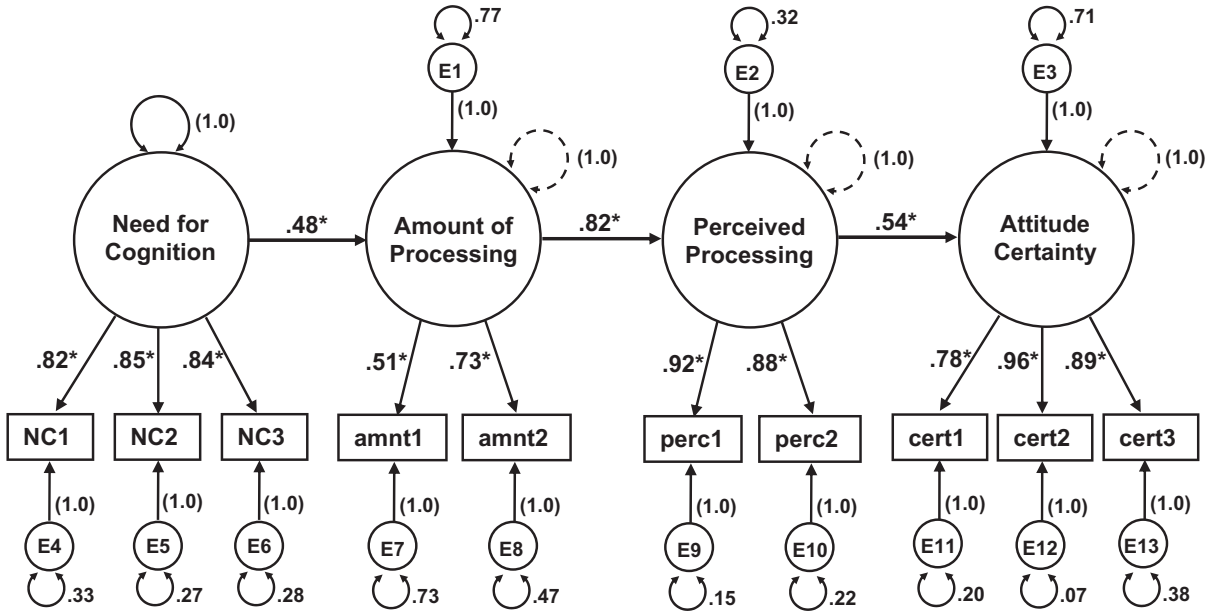

Figure 2. Structural equation modeling results, Study 1. Manifest variables are represented by rectangles and latent variables are represented by circles. E indicates an error term. Solid double arrows are variances within the model that are set to 1, whereas dashed double arrows are variances that are constrained to be 1.0 as the model is fit. $^{*}p < 05$.

of thoughts generated rather than the proposed amount of thought. Analyses found no evidence that NC was related to either the valence of the thoughts or whether thoughts were mixed as opposed to being on just one side of the issue.[1]

Structural Equation Modeling Analysis

RAMONA (Browne & Mels, 1998) was used to test how well the entire model based on the proposed mechanism (ABCD in Figure 1) fit the observed data, as indicated by fit indices. Good model fit is indicated by nonnormed fit index (NNFI) values greater than .95. Root-mean-square error of approximation (RMSEA) values below .05 are considered close fit, values between .05 and .08 indicate fair fit, and values greater than .10 indicate poor fit (Browne & Cudeck, 1993). The Akaike information criterion (AIC) was used to compare competing models. The model with a lower AIC is the preferred model (Akaike, 1987). The chi-square test is reported because it is common to do so; however, the chi-square fails to give preference for simpler over more complex models and has a bias to reject models with acceptable fit as sample size increases (Marsh, Balla, & McDonald, 1988). Finally, the χ^2/df, which adds a preference for simple models over complex models, is reported. Acceptable fit is indicated by χ^2/df values of 2.0 or less (Carmines & McIver, 1981).

Proposed model. Within the models examined, latent variables have standardized variance. For latent variables that do not receive a unidirectional arrow, the variance is a variable in the model, which is set to 1.0 (solid circular double arrows; see Figure 2). RAMONA also allows latent variables that receive at least one unidirectional arrow to be standardized (Browne & Mels, 1998). In this case, the variance is constrained to be 1.0 as the model is fit (dashed circular double arrows). Because these variances are constrained, they are not variables within the model. Latent variables allow for the removal of measurement error, leading to more accurate estimates (Coffman & MacCallum, 2005). Parcels (i.e., separate indicators of the same construct) were designated to be as equivalent as possible so that differences between parcels represent measurement error (e.g., Cunningham, Preacher, & Banaji, 2001). NC was separated into three parcels, each with one third of

[1] The thoughts generated in Study 1 were coded by a judge according to whether they were for, against, or neutral toward the senior comprehensive exam policy. The number of positive thoughts ($M = 2.39$, $SD = 2.30$) was similar to the number of negative thoughts ($M = 1.79$, $SD = 2.28$), and these were not significantly different from each other $F(1, 80) = 3.11$, $p = .12$. Although thoughts were mixed overall, it could be that this was true only for those who were low in NC, which would provide an alternative account for the lower attitude certainty among low NCs. To investigate the possibility that NC was systematically related to the valence of thoughts, we calculated an index of thought positivity: thought index = (positive thoughts – negative thoughts) / (positive thoughts + negative thoughts) (Cacioppo & Petty, 1981). No effect was observed when the thought index was regressed on NC, $\beta = -.14$, $t(79) = -1.23$, $p = .22$ ($M = 0.24$, $SD = 0.75$). It could also be that NC was systematically related to thought ambivalence, or the extent to which thoughts were of mixed as opposed to being in one direction, so an index of thought ambivalence was calculated: thought ambivalence = 3 * conflicting thoughts – dominant thoughts (Thompson & Zanna, 1995). *Dominant thoughts* refers to the number of thoughts in the dominant valence for that participant, whereas *conflicting thoughts* refers to the number of thoughts in the nondominant valence (Priester & Petty, 1996). No effect was observed when the thought ambivalence index was regressed on NC, $\beta = -.10$, $t(79) = -0.93$, $p = .36$ ($M = -1.17$, $SD = 3.58$). So, whereas NC was related to the amount of issue-relevant thought, it was not systematically related to the valence of thought or thought ambivalence.

the items. The perceived amount of processing items were divided into two parcels. For the other factors, each item was taken as a separate indicator. Table 1 shows the resulting correlation matrix.

The proposed model, indicated in Figure 2, evinced good fit according to all indices, $\chi^2(32, N = 81) = 25.86$, *ns*; $\chi^2/df = 0.81$; NNFI = 1.00; RMSEA = .00 (.00, .06); AIC = 48.85. In addition, all estimated parameters were significant and consistent with predictions. Thus the model was a good fit for the data.

Alternative partial mediation model. A second model was tested to evaluate whether the mediation indicated in the overall model was full mediation. Partial mediation would mean that there is a significant effect of the predictor to the criterion that is not explained by the mediator. To test this possibility, we added two additional paths to the model, a path from NC to perceived processing and a path from amount of processing to attitude certainty. This alternative model evinced good fit according to all indices, $\chi^2(30, N = 81) = 25.14$, *ns*; $\chi^2/df = 0.84$; NNFI = 1.00; RMSEA = .00 (.00, .06); AIC = 50.13. Critically, neither of the additional direct paths was statistically reliable: NC to perceived amount of processing, .12 (–.09, .34); amount of processing to attitude certainty, –.19 (–.64, .26). That is, the 90% confidence intervals of both paths included zero. With no variance falling outside of the hypothesized mediational path, this result is consistent with full mediation.

Discussion

Study 1 provided clear support for the proposed mechanism for why elaboration affects attitude certainty. Individuals who were high in NC processed the persuasive message to a greater extent, perceived that they processed it more extensively, and felt more certain in their attitudes. A test of the proposed model provided support for the entire mechanism for why elaboration relates to attitude certainty (Figure 1, ABCD). This study clearly identifies perceived amount of processing as a proximal mediator of the impact of elaboration on attitude certainty and provides an explanation for how variation in the actual extent of elaboration can impact a conscious judgment such as attitude certainty.

Study 2

As an individual difference, NC could have been confounded with some other variable responsible for the observed results. Accordingly, Study 2 incorporated a direct manipulation of elaboration using a distraction procedure. While listening to an audio presentation of the persuasive arguments, some participants had a secondary task to complete (Harkins & Petty, 1981; Petty, Wells, & Brock, 1976). As distraction increases, ability to think and thus attitude certainty should decrease. If direct manipulation of distraction impacts attitude certainty via the proposed mechanism, this would provide more compelling evidence that determinants of elaboration impact certainty via the proposed mechanism. To establish generality, Study 2 used a new message topic: wireless-fidelity (Wi-Fi) networks. As in Study 1, the message incorporated elements to produce the same attitudes for participants who take either the central (strong arguments) or the peripheral (source credibility) route to persuasion.

The second goal of Study 2 was to establish that attitude certainty derived from the thoughtfulness heuristic is capable of producing strength consequences (i.e., attitude-consistent behavioral intentions). Previously, antecedents of elaboration, such as personal relevance (Haugtvedt & Wegener, 1994; Petty et al., 1983) and NC (Haugtvedt & Petty, 1992), have produced enhanced attitude–behavior correspondence, and attitude certainty has been associated with all four of the strength consequences (see Petty et al., 2007, for a review). Accordingly, Study 2 included a measure of behavioral intentions to establish that certainty deriving from the thoughtfulness heuristic is capable of producing strength consequences. Given that Wi-Fi technology is popular on college campuses and the message presented both strong arguments and a positive cue, positive attitudes were expected under both high- and low-elaboration conditions. If attitudes are uniformly positive following message exposure, then greater certainty in those positive attitudes should result in more positive behavioral intentions.

Table 1
Study 1: Correlation Matrix of Measured Variables

Variable	1	2	3	4	5	6	7	8	9	10
1. NC1	(0.42)									
2. NC2	.71**	(0.54)								
3. NC3	.68**	.73**	(0.45)							
4. Number thoughts	.27*	.29**	.26*	(1.00)						
5. Number recall	.24*	.21	.29**	.39**	(1.00)					
6. Perceived1	.37**	.25*	.37**	.39**	.57**	(0.77)				
7. Perceived2	.33**	.22	.33**	.30**	.54**	.81**	(0.81)			
8. Certainty1 (certain)	.28*	.25*	.21	.16	.25*	.38**	.47**	(3.06)		
9. Certainty2 (confident)	.36**	.29**	.27*	.20	.27*	.48**	.50**	.86**	(3.20)	
10. Certainty3 (sure)	.25*	.21	.18	.06	.09	.34**	.38**	.72**	.75**	(3.42)
M	3.29	3.52	3.34	0.00	0.00	0.00	0.00	5.79	5.91	5.83

Note. Numbers on the main diagonal denote variances. $N = 81$. NC = need for cognition; Perceived = perceived amount of processing. Variables with a mean of zero are composed of one or more standardized variables.
* $p < .05$. ** $p < .01$.

Method

Participants

Two hundred fourteen undergraduates in introductory psychology classes at Ohio State University voluntarily participated in fulfillment of a course requirement.[2]

Procedure

Overall, Study 2 followed the following sequence. First, all participants practiced the distraction task. Then, they listened to the persuasive message accompanied by the distraction task or not. This was followed by the dependent measures. Upon entering the experimental room, participants were randomly assigned to either the distraction or the control condition. They were then told to follow the instructions on the computer screen throughout the experiment. All aspects of this multimedia experiment were presented using MediaLab 2004 (Jarvis, 2004). As with the previous study, the instructions indicated that a university committee was interested in the students' views, in this case regarding Wi-Fi networks. Then participants were told that they would also be completing a visual response task. Participants in both conditions practiced this task, which would later provide a manipulation of distraction.

The distraction task and instructions used were taken directly from previous research with minor adaptations (Petty et al., 1976). All participants completed practice trials of the distraction task before starting the message. Instructions for both conditions indicated that participants should pay close attention to the audio message to give feedback to the committee. In the distraction condition, participants were also told that they should perform as well as they could on the visual task that would occur while they listened to the audio message. Participants in the control condition were told that for now they would not need to complete the visual task.

The audio message participants heard over their headphones consisted of three strong arguments in favor of Wi-Fi networks.[3] The three arguments promoted Wi-Fi networks on the basis of cost savings resulting in decreased university tuition, security features superior to other networking solutions, and improved quality of teaching. Following the audio message, participants completed the dependent measures in the following order: attitudes, perceived thought, attitude certainty, behavioral intentions, perception of how closely they had listened, and then thought and memory listings.

Independent Variable: Distraction

After all participants had practiced the visual responding task, those in the control condition were told that they would not complete the visual task at this time. Those in the distraction condition completed 22 distractor trials during each 50-s passage of the persuasive message. In each trial, a square divided into four quadrants was presented with an *X* in one of the four quadrants at random. In the 2 s before the next trial, participants were to type the two letters corresponding to the quadrant in which the *X* appeared (e.g., *UL* for upper left).

Dependent Variables

Actual amount of processing. Message-relevant thoughts and memory items were measured and coded in the same manner as in Study 1. Message-relevant thoughts and memory items were reliable ($\alpha = .52$), so they were first standardized and then averaged to form a single index of the actual amount of processing as they were in Study 1.

Perceived processing. The items that made up this index were modified slightly because the message was presented in audio form. The thought and attention items read, "To what extent were you able to think about [pay attention to] the audio information about Wi-Fi Networks?" The other three items in the index read, "To what extent were you able to listen closely to the first [second, third] passage about Wi-Fi Networks?" The endpoints used in this study were the same as in Study 1, except that all responses were provided on 7-point scales. Individual items were again standardized, and because they exhibited good reliability ($\alpha = .95$), they were again averaged to form an index of perceived amount of processing.

Attitudes. Attitudes were measured as they were in the previous study. Good reliability was again observed ($\alpha = .95$), so the items were averaged to form a single index. Attitude extremity was calculated in the same manner as in the previous study.

Attitude certainty. Attitude certainty was measured as in the previous study except that items were assessed on 7-point scales to be consistent with the other measures. Good reliability was again observed for certainty ($\alpha = .96$), so the items were averaged to form a single index.

Behavioral intentions. Three items were used to assess behavioral intentions. The first item read, "If you were voting for or against the proposed Wi-Fi Network policy, how would you vote?" Responses to this item were provided on a 7-point scale ranging from *definitely vote against* to *definitely vote for*. The second item read, "How willing would you be to sign a petition in favor of Wi-Fi Networks?" The third item read, "How willing would you be to let us add your name to the list of students in favor of Wi-Fi Networks?" Responses to these last two items were provided on a

[2] The study was composed of two samples drawn from the same population of students at different times. The first sample ($n = 93$) was combined with the second sample ($n = 121$) to make up the overall sample ($N = 214$). The manipulations, measures, and procedures used for the two samples were similar except that a neutral 4-min filler task was provided to the second sample between their listening to the persuasive message and responding to the dependent variables. Because the procedures were very similar and the manipulation had an impact on all the same dependent variables in the same direction as with the first sample, the two samples were combined to maximize statistical power.

[3] A pretest sample ($N = 57$) was taken from the same population used in the current studies. Participants were randomly assigned to either a no-message control condition, in which they read only a single paragraph describing what Wi-Fi networks are, or a message condition, in which they were also presented with seven of the Wi-Fi arguments. Study 3 used all seven arguments, and study 2 used three. Following the message, participants completed two 7-point semantic differential items measuring attitudes (i.e., *good–bad* and *like–dislike*). Participants who read the message reported more positive attitudes ($M = 5.67$, $SD = 0.91$) than those who did not read the message ($M = 4.90$, $SD = 1.04$), $F(1, 55) = 8.42$, $p < .01$, illustrating that this message produced persuasion.

7-point scale ranging from *not at all willing* to *completely willing*. These three items exhibited good reliability ($\alpha = .88$), so they were averaged to form an index of behavioral intentions.

Results

Analysis of Variance (ANOVA)

Actual amount of processing. A one-way between-participants ANOVA was conducted to compare the undistracted and distracted conditions on all dependent variables (see Table 2). Means and standard deviations are presented in their unstandardized form to make them easier to interpret. The actual amount of processing index indicated that the distraction task led to fewer thoughts and memories being recalled ($M = 1.41$, $SD = 1.42$) compared with the undistracted condition ($M = 2.27$, $SD = 1.44$), $F(1, 212) = 19.26$, $p < .001$.

Perceived processing. Perceived amount of processing was also impacted by the distraction manipulation. Participants believed that they had processed the message less thoroughly when they were distracted ($M = 2.86$, $SD = 1.33$) as compared with when they were listening to the audio message by itself ($M = 4.65$, $SD = 1.35$), $F(1, 212) = 95.03$, $p < .001$.

Attitudes. Attitudes were equivalent in the distracted ($M = 5.90$, $SD = 1.17$) and undistracted conditions ($M = 6.02$, $SD = 1.08$), $F(1, 212) = 0.67$, $p = .41$. The distracted ($M = 1.90$, $SD = 1.16$) and undistracted conditions ($M = 2.06$, $SD = 1.00$) also showed equal extremity, $F(1, 212) = 1.20$, $p = .27$.

Attitude certainty. Even though attitudes were not affected, distraction impacted attitude certainty. As predicted, participants who were distracted felt less certain in their attitudes ($M = 4.14$, $SD = 1.88$) than those who were not ($M = 5.23$, $SD = 1.51$), $F(1, 212) = 21.73$, $p < .001$.

Behavioral intentions. Finally, if distraction has an impact on attitude certainty, then it could also have an impact on behavioral intentions even if attitudes were unaffected. As noted above, participants had uniformly positive attitudes toward Wi-Fi networks regardless of distraction condition. Furthermore, those who were distracted as they listened to the message felt less certain in these positive attitudes. On the basis of this finding, it was predicted that participants who were not distracted would be more willing to act on their positive attitudes than participants who were distracted. This was confirmed ($M_{\text{distracted}} = 5.12$, $SD = 1.44$; $M_{\text{undistracted}} = 5.73$, $SD = 1.29$), $F(1, 212) = 10.64$, $p < .01$.

Table 2
Dependent Variables as a Function of Distraction Condition in Study 2

	Distraction condition	
Dependent measure	No distraction ($n = 107$)	Distraction ($n = 107$)
Actual processing		
M	2.27_a	1.41_b
SD	1.44	1.42
Perceived processing		
M	4.65_a	2.86_b
SD	1.35	1.33
Certainty		
M	5.23_a	4.14_b
SD	1.51	1.88
Behavior intentions		
M	5.73_a	5.12_b
SD	1.29	1.44
Attitude extremity		
M	1.90_a	2.06_a
SD	1.16	1.00

Note. Within each row, means with different subscripts differ from each other significantly.

Structural Equation Modeling Analysis

Proposed model. RAMONA (Browne & Mels, 1998) was used to test the fit of our entire proposed model (see Figure 3) to the results of Study 2 (see Table 3). According to the proposed viewpoint, distraction should predict actual processing, which predicts perceived amount of processing, which predicts attitude certainty, which predicts behavioral intentions. For this model, two parcels were again created for perceived processing. The number of relevant thoughts and memory items, each attitude certainty item, and each behavioral intention item was taken as an indicator of their respective constructs. This model showed good to fair fit to the data according to the indicators, $\chi^2(41, N = 214) = 62.28$, $p < .05$; $\chi^2/df = 1.52$; NNFI = .98; RMSEA = .05 (.02, .07); AIC = 90.28. In addition, all of the estimated parameters were significant and consistent with predictions. Thus, taken together, these findings show that the data were consistent with the causal sequence outlined in the proposed model (ABCDE).

Alternative partial mediation model. As in Study 1, a second model was tested in order to evaluate whether the mediation indicated in the overall model was full mediation. To test the possibility of partial as opposed to full mediation, we added three additional paths to the model, a path from distraction to perceived processing, a path from amount of processing to attitude certainty, and a path from perceived processing to behavioral intentions. The alternative model with the addition of three direct paths showed good fit on all indices, $\chi^2(31, N = 214) = 45.93$, *ns*; $\chi^2/df = 1.21$; NNFI = .99; RMSEA = .03 (.00, .06); AIC = 79.93. Of the three additional direct paths added to the model, the path from distraction to perceived amount of processing was reliable –.36 (–.47, –.24), whereas the path from amount of processing to attitude certainty .01 (–.14, .17) and the path from perceived amount of processing to behavioral intentions –.07 (–.20, .06) were not reliable, as indicated by the 90% confidence intervals including zero. This indicates that actual amount of processing is a partial mediator of the relationship between distraction and perceived amount of processing. Because the other two direct paths were not reliable, this indicates that there is no variance left unexplained outside of the last two paths in the proposed model (Figure 1, CD and DE).

Discussion

Antecedents of elaboration and strength consequences have been linked often enough that antecedents of elaboration are perhaps the most established predictors of attitude strength (see Petty, Haugtvedt, & Smith, 1995, for a review). Yet, as we noted earlier, surprisingly little is known about mechanisms underlying this relationship. Study 2 provides the most complete evidence for a mechanism from a manipulated antecedent of elaboration to

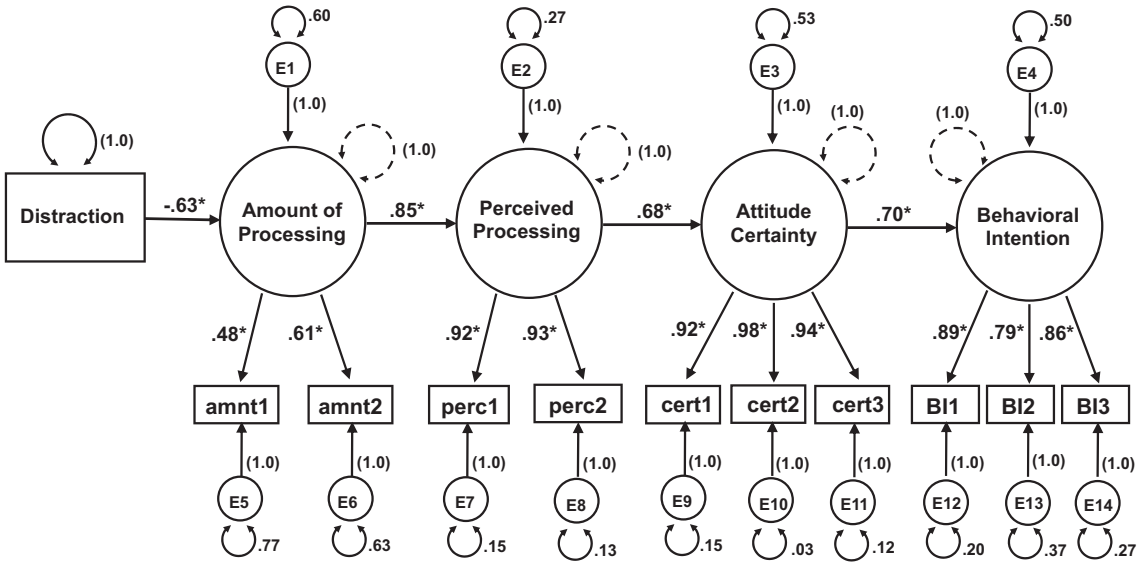

Figure 3. Structural equation modeling results, Study 2. $^{*}p < 05$.

strength consequences to date. In Study 2, participants who were distracted as opposed to not distracted while listening to a persuasive message engaged in less actual processing, perceived that less processing was taking place, felt less certain in their attitudes on the topic, and were less likely to behave in line with their positive attitudes. Furthermore, an analysis testing all of these relationships simultaneously indicated that the proposed sequence fit the data (see Figure 3). Thus, Studies 1 and 2 provide comprehensive evidence for a mechanism to explain why antecedents of elaboration such as distraction and presumably others (e.g., personal relevance) impact attitude certainty, a key strength indicator. Furthermore, Study 2 shows that certainty deriving from this mechanism has strength consequences.

Studies 1 and 2 establish the role of the thoughtfulness heuristic under conditions where perceived thought reflects the actual amount of thought. Prior theory (Petty, Haugtvedt, & Smith, 1995) emphasized the impact of the actual amount of processing on strength mediators, but this was seen as a direct relationship (Figure 1, BD). By adding the perception of the amount of processing (C) as a key predictor of attitude certainty, the thoughtfulness heuristic provides a more complete mechanism through which actual processing can influence attitude certainty and strength consequences (ABCDE).

One intriguing aspect of Study 2 was that in addition to the path mediated by the actual amount of processing, distraction had an unmediated (direct) impact on perceived processing. This direct path is consistent with the view that heuristics, such as the thoughtfulness heuristic, are responsive to simple cues in the environment that might reflect processing (e.g., the mere presence of distraction) as well as to indicators of actual processing (e.g., the amount of thoughts generated). Unlike the measurement of NC in Study 1, which was administered at the end of the experiment, the distraction manipulation provided a more salient cue to directly influence the perceptions of the amount of thinking. It is perhaps for this

Table 3
Study 2: Correlation Matrix of Manipulated and Measured Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Distraction	(0.25)										
2. Number thoughts	−.20**	(1.00)									
3. Number recall	−.35**	.45**	(1.00)								
4. Perceived1	−.54**	.37**	.45**	(0.92)							
5. Perceived2	−.54**	.34**	.46**	.86**	(0.86)						
6. Certainty1 (certain)	−.30**	.32**	.32**	.62**	.62**	(3.62)					
7. Certainty2 (confident)	−.30**	.29**	.32**	.61**	.63*	.91**	(3.39)				
8. Certainty3 (sure)	−.29**	.31**	.30**	.56**	.58**	.86**	.92**	(3.36)			
9. Behavior1 (signature)	−.17*	.19**	.25**	.36**	.36**	.60**	.58**	.59**	(2.47)		
10. Behavior2 (endorse)	−.20**	.16**	.22*	.32**	.32**	.56**	.57**	.57**	.71**	(3.15)	
11. Behavior3 (vote)	−.23**	.21**	.24**	.35**	.36**	.56**	.60**	.59**	.77**	.66**	(1.74)
M	0.50	0.00	0.00	0.00	0.00	4.64	4.77	4.66	5.39	5.14	5.74

Note. Numbers on the main diagonal denote variances. $N = 214$. Perceived = perceived amount of processing. Variables with a mean of zero are composed of one or more standardized variables.
$^{*}p < .05$. $^{**}p < .01$.

reason that distraction had a dual impact, not only by an indirect path via actual processing but also directly on the perception of the amount of processing. The observation that distraction had an impact through a direct path in addition to the indirect path raises the possibility that other variables might influence perceptions of the amount of processing completely independent of variation in the actual amount of processing. This possibility is explored in Studies 3 and 4.

Model Comparison

To this point, our analytical strategy has been to focus on establishing findings that were confirmatory to the proposed model. This model predicts a mediational path in which perceived processing serves as a critical mediator of attitude certainty (Figure 1, ABCD). We now take a different approach by evaluating alternative accounts for the observed relationships. The first alternative account is that perceived and actual amount of processing are dual independent mediators, and the second alternative account is that the certainty precedes the perception of the amount of processing, reversing the order of these variables.

According to the first alternative account, actual amount of processing and perceived amount of processing might serve as dual independent mediators of the relationship between antecedents of elaboration (NC and distraction) and attitude certainty (see Figure 4). To test this possibility, we used the results of Studies 1 and 2 to compare this divergent path model with the proposed single path model: antecedent of elaboration → amount of processing → perceived amount of processing → attitude certainty (Figure 1, ABCD).

For Study 1, recall that the single path model evinced good fit according to all indices, $\chi^2(32, N = 81) = 25.86$, *ns*; $\chi^2/df = 0.81$; NNFI = 1.00; RMSEA = .00 (.00, .05); AIC = 48.85. In addition, all estimated parameters were significant and consistent with predictions. By comparison, the divergent path model had fair to poor fit, as indicated by a significant chi-square, $\chi^2(31, N = 81) = 50.73$, $p < .05$; $\chi^2/df = 1.64$; an RMSEA of .09 (.04, .13), suggesting fair to poor fit; and an NNFI of .94, which falls short of the criterion for good fit; AIC = 74.74. Furthermore, the path from actual amount of processing to attitude certainty was not reliable according to the 90% confidence interval, .03 (–.19, .25).

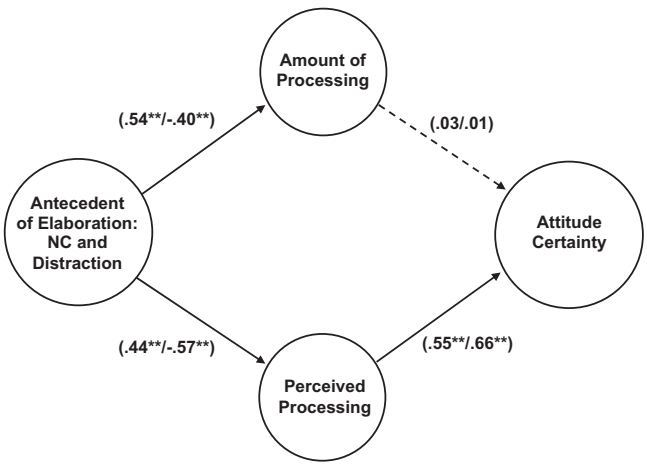

Figure 4. The divergent path model used as an alternative for model comparison in Studies 1 and 2. The numbers in parentheses correspond to the point estimates of the indicated paths (Study 1/Study 2). NC = need for cognition. $^{*}p < .05$. $^{**}p < .01$.

For Study 2, the behavior intention factor was removed in order to allow more direct model comparison. Otherwise the single path model was identical to that used in Study 2 (see Figure 3). This single path model evinced fair fit, $\chi^2(18, N = 214) = 35.96$, $p < .01$; $\chi^2/df = 1.99$; NNFI = .98; RMSEA = .06 (.03, .10); AIC = 55.96. In addition, all estimated parameters were significant and consistent with predictions. By comparison, the divergent path model fit the data poorly, $\chi^2(17, N = 214) = 56.96$, $p < .001$; $\chi^2/df = 3.35$; NNFI = .95; RMSEA = .10 (.07, .13); AIC = 78.96. As in Study 1, the path from amount of processing to attitude certainty was not reliable according to the 90% confidence interval, .01 (–.08, .12).

In both studies, overall model fit statistics suggested acceptable fit for the proposed single path model (ABCD) and unacceptable fit for the alternative divergent path model (Figure 4). In addition, the lower AIC for the single path model indicated that it was preferred over the divergent path model in both studies. Furthermore, both studies failed to find support for the path from actual amount of processing to attitude certainty, a critical component of the divergent path model. That is, when perceived amount of processing and actual amount of processing are put in as competing mediators, actual amount of processing fails to mediate attitude certainty effects deriving from either chronic differences in NC or a contextual manipulation of distraction. This failure supports the notion that perceived amount of processing is a critical mediator of the effects of an elaboration variable on certainty within these studies.

According to the second alternative account, the perception of the amount of elaboration derives from a feeling of certainty rather than the reverse, which implies the following model: antecedent of elaboration (NC/distraction) → actual amount of processing → attitude certainty → perceived amount of processing. This alternative was compared with the proposed model, which was identical except that perceived amount of processing preceded attitude certainty (Figure 1, ABCD).

For Study 1, recall that the proposed model evinced good fit on the basis of all indices, $\chi^2(32, N = 81) = 25.86$, *ns*; $\chi^2/df = 0.81$; NNFI = 1.00; RMSEA = .00 (.00, .05); AIC = 48.85. By comparison, the reversed order model had fair to poor fit, $\chi^2(32, N = 81) = 53.35$, $p < .05$; $\chi^2/df = 1.67$; NNFI = .93; RMSEA = .09 (.05, .13); AIC = 76.35. All paths in both models were significant and consistent with predictions.

For Study 2, recall that the proposed model evinced fair fit, $\chi^2(18, N = 214) = 35.96$, $p < .01$; $\chi^2/df = 1.99$; NNFI = .98; RMSEA = .06 (.03, .10); AIC = 55.96. By comparison, the reversed order model had poor fit, $\chi^2(18, N = 214) = 97.88$, $p < .001$; $\chi^2/df = 5.43$; NNFI = .90; RMSEA = .14 (.11, .17); AIC = 117.88. All paths in both models were significant and consistent with predictions.

In both studies, overall model fit statistics suggested acceptable fit for the proposed model (ABCD) and unacceptable fit for the reversed order model, where certainty preceded the perception of the amount of processing. Model comparison (AIC) showed that the proposed model was preferred to the reversed order model in both studies. Because this change in order was the only difference between these two models, the decrease in fit is consistent with the notion that certainty derives from the perception that more processing has taken

place rather than the reverse. This is consistent with a causal role for the thoughtfulness heuristic in influencing attitude certainty.

Study 3

Studies 1 and 2 explored the thoughtfulness heuristic under typical circumstances where the perceived amount of processing reflected the actual amount of processing. However, much of the fascination with heuristics derives from their ability to produce shifts away from the judgment that would occur on the basis of normative rational processes (Gilovich & Griffin, 2002). Such shifts have often served as the critical piece of evidence in establishing a heuristic (Tversky & Kahneman, 1983). To explore this, Study 3 included a manipulation of perceived processing that occurred after participants had the opportunity to process the persuasive message. Participants were given an attention quiz rigged for either success or failure, which should have influenced perceived processing (i.e., "If I did so well [poorly] on the attention quiz, I must have done a lot of [little] thinking about the message"). Thus, the purpose of Study 3 was to show that the mere perception of the amount of processing can impact certainty judgments with strength consequences, independent of the actual amount of processing.

Method

Participants

One hundred twelve undergraduates in introductory psychology classes at Ohio State University voluntarily participated in fulfillment of a course requirement.

Procedure

Upon entering the experimental room, participants were randomly assigned to read persuasive arguments that were either relevant or not to items on an attention quiz. As with the previous study, the instructions indicated that a university committee was interested in student views on Wi-Fi networks. Participants in the quiz-relevant information condition were shown Arguments 1–4 on the screen, whereas participants in the quiz-irrelevant information condition were shown Arguments 4–7. This served as a manipulation of performance on the attention quiz, because the eight multiple-choice questions that made up the quiz were taken from content covered in Arguments 1–4. Participants then completed the attention quiz on their clipboards. The instructions indicated that the quiz was only an assessment of how well they had thought about or paid attention to the message. After the quiz, the computer provided the correct answers, and participants were instructed to score their own quizzes and then to enter the number correct into the computer. This was intended to emphasize how well or poorly they had performed.

Next, participants completed the other dependent variables in the following order: attitudes, perceived thought and attention, attitude certainty, behavioral intentions, perceived care and attention taken in reading the message, perceived knowledge, and a thought listing.

Independent Variable: Perceived Processing

Participants were randomly assigned to read persuasive arguments that were either directly relevant (Arguments 1–4) or not directly relevant (Arguments 4–7) to items on the attention quiz they would complete. Pretest data taken from the same population ($N = 56$) indicated that by themselves, these two sets of arguments produced equivalent reading times, perceived amount of processing, perceived knowledge, attitudes, attitude certainty, and behavioral intentions (all Fs < 1.4).

Dependent Variables

Actual amount of processing. Message-relevant thoughts were measured and coded in the same manner as in Studies 1 and 2.

Quiz performance. Performance was taken as the number of correct answers out of eight.

Attitude. Attitudes were measured using the same items as in Study 2. Good reliability was again observed ($\alpha = .90$), so the items were averaged to form an attitude index. Attitude extremity was calculated in the same manner as in the previous studies.

Perceived processing. Perceived amount of processing was measured in the same manner as in Study 2. The items exhibited good reliability ($\alpha = .91$), so they were again averaged to form the index of perceived amount of processing.

Attitude certainty. Attitude certainty was measured using the same items as in Study 2. Good reliability was again observed for the certainty items ($\alpha = .90$), so the items were averaged to form an index.

Behavioral intentions. The three items used were identical to those in the previous study. These three items exhibited good reliability ($\alpha = .89$), so they were averaged to form an index of behavioral intentions.

Perceived knowledge. Perceived amount of knowledge or information about the topic provides a possible alternative metacognitive mediator to perceived amount of processing. Two items from prior research (Wegener et al., 1995) were used to assess the participant's perceived amount of knowledge about Wi-Fi networks: "How much knowledge [information] do you have about Wi-Fi Networks?" Responses were provided on a 7-point scale from *very little* to *a lot*. The two items were highly reliable ($\alpha = .96$), so they were averaged into a single index.

Results

ANOVA

Actual amount of processing. A one-way, between-participants ANOVA was conducted for all dependent variables based on experimental condition (see Table 4). As expected, the actual number of message-relevant thoughts was no different whether participants received quiz-relevant ($M = 2.89$, $SD = 2.15$) or quiz-irrelevant information ($M = 2.55$, $SD = 1.99$), $F(1, 110) = 0.79$, $p = .37$.

Quiz performance. The rigging of quiz performance was successful, because participants in the relevant information condition performed much better on the quiz ($M = 5.91$, $SD = 1.44$) than those in the irrelevant information condition ($M = 3.98$, $SD = 1.28$), $F(1, 110) = 55.82$, $p < .001$.

Perceived processing. Participants in the quiz-relevant information condition also perceived that they had processed the message more extensively ($M = 4.65$, $SD = 1.26$) than those in the irrelevant information condition ($M = 3.48$, $SD = 1.03$), $F(1, 110) = 29.08$, $p < .001$.

Table 4
Dependent Variables as a Function of Quiz Condition in Study 3

Dependent measure	Quiz condition	
	Success (n = 57)	Failure (n = 55)
Quiz score		
M	5.91_a	3.98_b
SD	1.44	1.28
Perceived processing		
M	4.65_a	3.48_b
SD	1.28	1.03
Certainty		
M	5.13_a	4.38_b
SD	1.33	1.53
Behavior intention		
M	5.69_a	5.03_b
SD	1.33	1.37
Perceived knowledge		
M	3.61_a	3.30_a
SD	1.55	1.69
Attitude extremity		
M	1.94_a	1.63_a
SD	0.94	0.97
Relevant thought		
M	2.89_a	2.54_a
SD	2.15	1.99

Note. Within each row, means with different subscripts differ from each other significantly.

Attitudes. Of note, no differences were observed between participants in the quiz-relevant (M = 1.94, SD = 0.94) and quiz-irrelevant conditions (M = 1.63, SD = 0.97), $F(1, 110) = 2.95$, $p = .09$, on attitude extremity. The results for attitudes were similar, because no participants responded below the midpoint of the scale. That is, no difference was found between quiz-relevant (M = 5.94, SD = 0.94) and quiz-irrelevant conditions (M = 5.63, SD = 0.97), $F(1, 110) = 2.95$, $p = .09$.

Attitude certainty. Those receiving quiz-relevant information felt more certain in their attitudes (M = 5.13, SD = 1.33) than those who received information that was less relevant (M = 4.38, SD = 1.53), $F(1, 110) = 7.72$, $p < .001$.

Because the impact of condition on attitudes and attitude extremity approached significance (ps $< .09$), an analysis of covariance (ANCOVA) was conducted to verify that the experimental manipulation continued to impact attitude certainty when attitudes and attitude extremity were controlled for. This effect remained significant when attitudes were included as a covariate in the analysis, $F(1, 110) = 4.61$, $p < .05$, and when attitude extremity was included as a covariate in the analysis, $F(1, 110) = 4.61$, $p < .05$.

Behavioral intentions. Finally, there is the question of whether an extraneous factor, such as the attention quiz, could also have strength consequences. As in Study 2, attitudes were uniformly positive in the two conditions. Given a positive attitude, any variable increasing certainty is likely to also enhance positive behavioral intentions. Consistent with this prediction, the quiz-relevant information condition resulted in more positive behavioral intentions (M = 5.69, SD = 1.33) than the quiz-irrelevant information condition (M = 5.03, SD = 1.37), $F(1, 110) = 6.59$, $p < .05$. The effect of condition on behavioral intentions remained significant when either attitudes, $F(1, 110) = 3.71$, $p = .05$, or attitude extremity, $F(1, 110) = 3.71$, $p = .05$, was included as a covariate in the analysis. Thus, the information relevance manipulation impacted perceived amount of processing, attitude certainty, and behavioral intentions.

Perceived knowledge. The quiz was framed as an attention quiz so that rigged results would specifically impact perceived thought and attention. Consistent with this specificity, the manipulation of information relevance had no impact on perceived knowledge ($M_{relevant}$ = 3.61, SD = 1.55; $M_{irrelevant}$ = 3.30, SD = 1.69), $F(1, 110) = 1.04$, $p = .31$. So, perceived knowledge failed as an alternative mediator of the effect of the manipulation on attitude certainty.

Structural Equation Modeling Analysis

RAMONA (Browne & Mels, 1998) was again used to test our proposed model. If extraneous factors can impact perceived amount of processing in the absence of actual processing differences with the same consequences, this suggests the following model: The quiz information condition predicts quiz score, which predicts perceived amount of processing, which predicts attitude certainty, which predicts behavioral intentions (see Figure 5). The manipulation and quiz score were included as manifest variables, and the parcels for perceived amount of processing and indicators of attitude certainty and behavioral intentions were handled as they were in the previous studies (see Table 5). The proposed model provided a good fit to the data, $\chi^2(33, N = 112) = 46.62$, *ns*; $\chi^2/df = 1.41$; NNFI = .98; RMSEA = .06 (.00, .10); AIC = 70.62. In addition, all estimated parameters were significant and consistent with predictions.

As in Studies 1 and 2, the proposed model was compared with a model where the order of perceived processing and certainty was reversed, and evidence showed that the reversed order model was a poor fit to the data and a comparatively worse fit than the proposed model.[4]

[4] Model comparison was conducted on the results of Studies 3 and 4 to test an alternative account that the perception of the amount of elaboration derives from a feeling of certainty rather than the reverse. The proposed model was compared with a model that was identical except that the order of perceived amount of processing and attitude certainty was reversed. For Study 3, recall that the proposed model evinced good fit according to all indices, $\chi^2(33, N = 112) = 46.62$, *ns*; $\chi^2/df = 1.41$; NNFI = .98; RMSEA = .06 (.00, .10); AIC = 70.62. By comparison, the reversed order model—quiz condition → quiz score → attitude certainty → perceived processing → behavioral intention—had poor fit, $\chi^2(33, N = 112) = 119.49$, $p < .001$; $\chi^2/df = 3.62$; NNFI = .84; RMSEA = .15 (.12, .18); AIC = 141.50. All paths in both models were significant and consistent with predictions. For Study 4, the proposed model was a good fit to the data, $\chi^2(8, N = 109) = 6.19$, *ns*; $\chi^2/df = 0.77$; NNFI = 1.00; RMSEA = .00 (.00, .09); AIC = 20.20. The alternative reversed order model was also fit: thought feedback condition → attitude certainty → perceived processing. By comparison, the reversed order model had poor fit, $\chi^2(8, N = 109) = 24.18$, $p < .01$; $\chi^2/df = 3.02$; NNFI = .92, RMSEA = .13 (.08, .20), AIC = 38.17. All paths in both models were significant and consistent with predictions. In Studies 3 and 4, overall model fit statistics suggested acceptable fit for the proposed model and unacceptable fit for the reversed order model, where certainty preceded the perception of the amount of processing. Comparative model fit (AIC) indicated that the proposed model was preferred over the reversed order model in both studies. This change in order was the only difference between these two models, so the decrease in fit is consistent with the notion that certainty derives from the perception that more processing has taken place rather than the reverse. This is in support of the causal direction of the thoughtfulness heuristic.

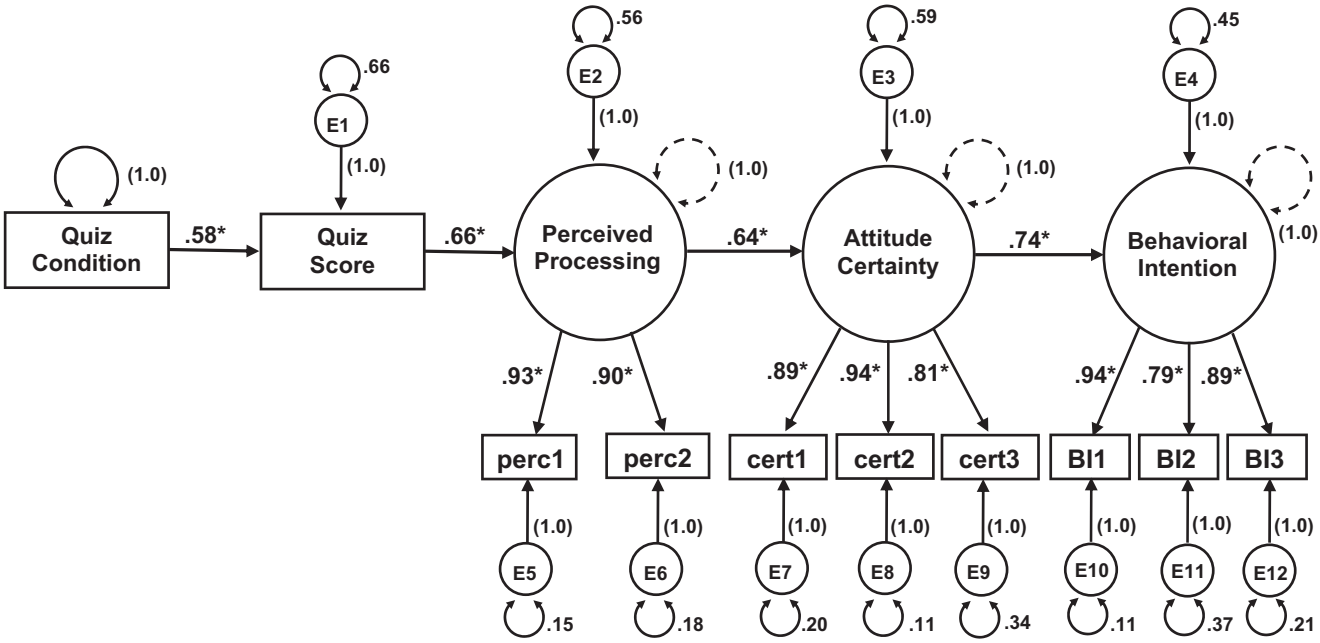

Figure 5. Structural equation modeling results, Study 3. $^{*}p < .05$.

Alternative Partial Mediation Model

A second model was tested to evaluate whether the mediation indicated in the overall model was full mediation as suggested by the fit of the proposed model. To test the possibility of partial mediation, we added two additional paths to the model, a path from quiz condition to attitude certainty and a path from perceived processing to behavioral intentions. This alternative model evinced good to fair fit according to the fit indices, $\chi^2(31, N = 112) = 46.23$, $p < .05$; $\chi^2/df = 1.49$; NNFI = .97; RMSEA = .06 (.01, .10); AIC = 74.23. However, neither of the two additional direct paths was statistically reliable, as indicated by their 90% confidence intervals: quiz condition to attitude certainty, –.04 (–.18, .09); perceived processing to behavioral intentions, .04 (–.12, .20). So, no evidence was found that additional variance remains unexplained outside of the hypothesized mediational path.

Discussion

In Study 3, perceived amount of processing was manipulated independent of actual amount of processing by rigging the results of an attention quiz. Manipulated success on the quiz resulted in greater perceived amount of thought, more attitude certainty, and behavioral intentions that were more consistent with the positive attitudes that resulted. Because the quiz followed the presentation of the message, these results were independent of differences in the actual processing of the message. This shows that the thoughtfulness heuristic can shift judgments of certainty away from their

Table 5
Study 3: Correlation Matrix of Manipulated and Measured Variables

Variable	1	2	3	4	5	6	7	8	9	10
1. Quiz condition	(0.25)									
2. Quiz score	.58**	(2.79)								
3. Perceived1	.47**	.63**	(0.84)							
4. Perceived2	.40**	.58**	.84**	(0.87)						
5. Certainty1 (certain)	.26**	.39**	.50**	.53**	(2.36)					
6. Certainty2 (confident)	.22*	.41**	.55**	.58**	.85**	(2.22)				
7. Certainty3 (sure)	.23*	.31**	.46**	.43**	.74**	.75**	(3.14)			
8. Behavior1 (signature)	.22*	.31**	.43**	.43**	.54**	.65**	.64**	(2.23)		
9. Behavior2 (endorse)	.19*	.24*	.24**	.22*	.47**	.51**	.47**	.77**	(3.06)	
10. Behavior3 (vote)	.24*	.33**	.45**	.45**	.60**	.67**	.70**	.83**	.68**	(1.64)
M	0.51	4.96	0.00	0.00	4.96	4.94	4.39	5.36	5.07	5.68

Note. Numbers on the main diagonal denote variances. $N = 112$. Perceived = perceived amount of processing. Variables with a mean of zero reflect indexes composed of standardized items.
$^{*}p < .05$. $^{**}p < .01$.

typical normative basis in the actual amount of processing. In short, convincing people that they have thought a lot about a topic can instill attitudes with the same strength consequence that comes from actually thinking a lot.

Manipulating perceived amount of processing independent of actual processing helps rule out a number of variables that could have been confounded with perceived processing in earlier studies. For example, attitude accessibility or actual knowledge differences resulting from idiosyncratic variation in actual processing during the message cannot explain the results of Study 3. Similarly, the manipulation was independent of any feeling of ease that occurred during the message. Of course, ease feelings during the message must be differentiated from the ease of recall that likely resulted from the quiz itself on the basis of the manipulation. If anything, a feeling of ease during the quiz should contribute to the strength of the manipulation, with greater ease resulting in the perception that more thought has taken place. Thus, although perceived amount of processing typically covaries with a host of variables that fall outside of the proposed process, the results of Study 3 were generally inconsistent with their influence in this case.

Because the quiz manipulation occurred following the message, this controlled for online processing during the presentation of the message. However, there is still the issue of whether the manipulation induced differential memory-based processing after the message. This alternative seems unlikely for a couple of reasons. First, all participants were told at the outset that they would be sharing their views, which should have encouraged online processing during the message rather than memory-based processing at the point of judgment (Hastie & Park, 1986). Second, any impact of the manipulation on actual processing following the message is likely to be in the direction opposite of the observed results. That is, struggling with and performing poorly on an attention quiz is likely to result in more, not less, memory-based processing, particularly in a sample of college students. Thus, it seems unlikely that the manipulation induced differential memory-based processing in a way that explains the observed results.

Study 4

Study 3 showed that a manipulation that impacts perceived amount of processing can influence attitude certainty and behavioral intentions independent of the actual amount of processing. However, it could be that failure or success on the attention quiz also had an impact on other critical persuasion variables that were not measured, such as mood or metalevel perceptions (e.g., perceived importance of topic), and these could serve as alternative mediators of certainty. To address this, Study 4 used a more precise manipulation of perceived amount of processing and included more measures of potential alternative mediators, as discussed below.

Study 4 also tested the generality of the thoughtfulness heuristic by presenting participants with a persuasive message with arguments on two sides of the same issue, rather than just one side. One possible limitation of the thoughtfulness heuristic is that perceiving greater thought about a two-sided message could produce less rather than more certainty because presenting both sides could induce ambivalence. On the other hand, even if people are less certain in attitudes following a two-sided rather than a one-sided message, it might still be that greater perceived thought about a two-sided message would increase certainty. Indeed, prior research indicates that thinking more about a two-sided communication leads people to perceive that their attitudes have polarized (Lord, Ross, & Lepper, 1979; Miller, McHoskey, Bane, & Dowd, 1993). If perceived polarization relates to attitude certainty, the thoughtfulness heuristic could operate for two-sided messages much as it does for one-sided messages.

Study 4 explored mood as a potential mediator of certainty, because negative mood is associated with feelings of uncertainty (C. A. Smith & Ellsworth, 1985) and negative mood leads to decreased confidence in accessible mental contents (e.g., Briñol, Petty, & Barden, 2007). Thus, mood provides a potential alternative mediator of certainty in Study 3, whether failing at the quiz led to a decreased feeling of confidence in general or a lack of confidence in judgments. To assess this potential alternative, Study 4 included items from the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988).

Perceived ambivalence and perceived issue or attitude importance were also measured as potential mediators of certainty. Perceived ambivalence is often closely related to structural ambivalence (Priester & Petty, 1996), which has been linked to key antecedents of elaboration, such as high NC (Thompson & Zanna, 1995). In the current study, the two-sided message could enhance ambivalence for all participants. However, it is unclear how perceiving that more thought has taken place, independent of actual thought, would impact perceived ambivalence. Perceived importance can be associated with perceived amount of processing and attitude certainty as well (Bassili, 1996; Krosnick et al., 1993), but this relationship has been shown only when these variables could reflect differences in actual processing. In any case, to assess these alternative mediators, Study 4 included commonly used measures of perceived importance (Krosnick et al., 1993) and perceived ambivalence (Priester & Petty, 1996), as well as perceived knowledge. All potential mediators, including perceived processing, were assessed in a counterbalanced order to provide a fair test of alternatives.

Method

Participants

One hundred nineteen undergraduates in introductory psychology classes at Howard University voluntarily participated in order to receive extra credit. In order for the feedback condition to be believable, participants had to report generating between three and nine thoughts in response to the persuasive message. In all, 7 participants reported generating fewer than three thoughts, and 3 participants reported generating more than nine thoughts, so these participants were excluded from further analysis. This left 109 participants for formal analysis. Consistent with the student population at Howard University, the majority of the participants in this sample self-identified as African American (90 African American, 12 Caribbean, 4 African, and 3 other), which gave us an opportunity to generalize our findings across ethnically diverse samples.

Procedure

Upon entering the experimental room, participants were randomly assigned to either the many thoughts (high-processing)

feedback condition or the few thoughts (low-processing) feedback condition. As with the previous study, the instructions indicated that a university committee was interested in student views on the topic of Wi-Fi networks. All participants then read the same persuasive message containing two arguments against Wi-Fi networks and two arguments for Wi-Fi networks. The first argument against Wi-Fi networks summarized security issues, including increased danger of theft of the more numerous laptops around campus and credit card information, and a second argument highlighted the unreliability of Wi-Fi, how disruptive and time consuming it is to install, and how installation is costly, which would lead to tuition increases for students. The first argument for Wi-Fi networks indicated that they lead to decreased study time for students with greater access to the Internet and professors who are more responsive to students, and the second argument highlighted increased salaries for graduates, who are seen by top executives as being more technologically skilled. Participants were then given 2 min to list thoughts in response to the message on a paper-and-pencil thought listing with a total of 11 spaces. Participants were then told to count the number of thoughts they had listed over one word long and to enter that number into the computer.

As a manipulation of perceived amount of thought, independent of actual thought, participants were given feedback supposedly generated from prior data collected from their peers in this same study. Participants were led to believe that they had generated either fewer or more thoughts on the topic than their fellow students. Participants then completed the measure of attitudes, followed by the potential mediators in counterbalanced order: perceived thought and attention and perceived care and attention taken in reading the message, the PANAS, perceived knowledge, perceived importance, and perceived ambivalence. After this, participants reported attitude certainty and completed the final, computer thought listing.

The computer thought listing was conducted to measure all of the thoughts participants had generated on the issue by the end of the study. Participants were told to enter into the computer all of the thoughts that they had written on the sheet of paper as well as any additional thoughts that they might have had on the issue. Space was provided for 15 thoughts to allow for any additional thoughts they might have generated. Otherwise the thought listing was handled as in earlier studies.

Independent Variable: Perceived Processing

Participants were randomly assigned to receive feedback that they had generated either fewer thoughts or more thoughts than their peers who had completed the study previously. To ensure that the feedback was believable, we adjusted it idiosyncratically according to each participant's number of thoughts. That is, in the few thoughts (many thoughts) condition, participants were told that the average number of thoughts of their peers was two fewer (two more) than the number of thoughts the participant indicated having generated. Thus, a participant who indicted having generated six thoughts was told that his or her peers had generated eight (four) on average. On the same screen the computer instructed participants that "past research has shown that this is simply an indication of how well you paid attention to or thought carefully about the topic relative to others." On a second screen they were told that 80% of their peers entered more (fewer) thoughts than they did according to past results from this study. Finally, to solidify the manipulation, participants were asked to "indicate why you think that you had fewer [more] thoughts and paid less [more] attention than others did to the passage on Wi-Fi Networks." They were given a space to type in their response. These three screens constituted the manipulation of the perceived amount of thought.

Dependent Variables

Actual amount of processing. Message-relevant thoughts entered during the computer thought listing were measured and coded in the same manner as in the prior studies.

Attitude. Attitudes were measured using the same items as in Study 3. Good reliability was again observed ($\alpha = .90$), so the items were averaged to form an attitude index. Attitude extremity was calculated in the same manner as in previous studies.

Perceived processing. Perceived amount of processing was measured in the same manner as in Study 3, and these items exhibited good reliability ($\alpha = .89$). Thus, they were again averaged to form an index.

Attitude certainty. Attitude certainty was measured using the same items as in Study 3. Good reliability was again observed ($\alpha = .90$), so the items were averaged to form an index.

Mood. Momentary affective state was measured using eight items from the PANAS (Watson et al., 1988). Items such as "Indicate to what extent you feel this way right now: Enthusiastic" were rated on a 5-point scale from *very slightly or not at all* to *very much*. Two valence indexes were created: a positive index, including four items that load on the Positive Affect factor (*determined*, *excited*, *inspired*, and *enthusiastic*), and a negative index, based on four items that load on the Negative Affect factor (*distressed*, *upset*, *scared*, and *afraid*). The positive items had good reliability ($\alpha = .81$), but the negative items were somewhat less reliable ($\alpha = .45$). When the negative items were reverse coded to form an index of overall mood, the two scales were reliable ($\alpha = .60$).

Perceived importance. Perceived issue importance was measured using four items used in prior research (Boninger, Krosnick, Berent, & Fabrigar, 1995; Krosnick et al., 1993; see Wegener et al., 1995, for a review). The following items were used: "How important is the issue of Wi-Fi Networks to you personally?," "How much do you personally care about the issue of Wi-Fi Networks?," "How much does the issue of Wi-Fi Networks mean to you?," and "How important is the issue of Wi-Fi Networks compared to other issues?" Items were rated on 9-point scales from *not at all* to *very much*. The four items had good reliability ($\alpha = .95$), so they were averaged to form an index.

Perceived ambivalence. Perceived ambivalence was measured using three items used in prior research (Priester & Petty, 2001): "To what extent do you feel conflicted in your reactions to Wi-Fi Networks?" (*no conflict* to *maximum conflict*), "To what extent do you feel indecision in your reactions to Wi-Fi Networks?" (*no indecision* to *maximum indecision*), and "To what extent do you feel one-sided or mixed reactions to Wi-Fi Networks?" (*completely one sided reactions* to *completely mixed reactions*). Items were rated on 9-point scales. The three items had good reliability ($\alpha = .84$), so they were averaged to form an index.

Perceived knowledge. Perceived amount of knowledge or information about the topic was measured with two items used in Study 3 as well as three additional items. As a change from Study

3, all items were rated on a 9-point scale. The new items were: "How well informed are you about Wi-Fi Networks?" (*completely uninformed* to *very informed*), "Estimate the number of behaviors you have performed in relation to Wi-Fi Networks?" (*no behaviors* to *many behaviors*), and "How many memories do you have relating to Wi-Fi Networks?" (*no memories* to *a lot of memories*). These additional items have been used to measure perceived amount of knowledge in prior research (Krosnick et al., 1993; see Wegener et al., 1995, for a review). The five items had good reliability ($\alpha = .82$), so they were averaged to form an index.

Results

ANOVA

Actual amount of processing. A one-way, between-participants ANOVA was conducted on the basis of feedback condition (see Table 6). As expected, the manipulation had no impact on the actual numbers of message-relevant thoughts generated, which were similar in the many thoughts and few thoughts feedback conditions ($M_{many} = 4.78$, $SD = 1.52$; $M_{few} = 4.96$, $SD = 1.74$), $F(1, 107) = 0.30$, $p = .58$.

Table 6
Dependent Variables as a Function of Thought Feedback Condition in Study 4

	Thought feedback	
Dependent measure	Many thoughts ($n = 57$)	Few thoughts ($n = 52$)
Perceived processing		
M	6.02_a	4.85_b
SD	1.07	1.26
Certainty		
M	6.58_a	5.74_b
SD	1.51	1.79
Perceived knowledge		
M	5.04_a	4.86_a
SD	1.62	1.46
Overall mood		
M	3.49_a	3.37_a
SD	0.50	0.47
Positive mood		
M	2.29_a	2.12_a
SD	0.93	0.94
Negative mood		
M	4.68_a	4.63_a
SD	0.38	0.44
Perceived importance		
M	4.35_a	4.66_a
SD	2.06	2.43
Perceived ambivalence		
M	4.12_a	4.24_a
SD	2.02	1.86
Attitude extremity		
M	1.08_a	1.20_a
SD	0.85	0.92
Relevant thought		
M	4.78_a	4.96_a
SD	1.52	1.74

Note. Within each row, means with different subscripts differ from each other significantly.

Perceived processing. Participants in the many thoughts feedback condition perceived that they had processed the message more extensively than those in the few thoughts feedback condition ($M_{many} = 6.02$, $SD = 1.07$; $M_{few} = 4.85$, $SD = 1.26$), $F(1, 107) = 27.49$, $p < .001$.

Attitudes. The thought feedback condition had no effect on either attitude extremity ($M_{many} = 1.08$, $SD = 0.85$; $M_{few} = 1.20$, $SD = 0.92$), $F(1, 107) = 0.47$, $p = .49$, or attitudes ($M_{many} = 4.82$, $SD = 1.11$; $M_{few} = 4.64$, $SD = 1.39$), $F(1, 107) = 0.54$, $p = .46$.

Attitude certainty. Critically, the many thoughts feedback condition resulted in greater attitude certainty than the few thoughts feedback condition ($M_{many} = 6.58$, $SD = 1.51$; $M_{few} = 5.74$, $SD = 1.79$), $F(1, 107) = 6.92$, $p < .05$.

Mood. The thought feedback condition had no impact on indicators of mood, including overall mood ($M_{many} = 3.49$, $SD = 0.50$; $M_{few} = 3.37$, $SD = 0.47$), $F(1, 107) = 1.52$, $p = .22$; positive mood ($M_{many} = 2.29$, $SD = 0.93$; $M_{few} = 2.12$, $SD = 0.94$), $F(1, 107) = 0.97$, $p = .32$; and negative mood ($M_{many} = 4.68$, $SD = 0.38$; $M_{few} = 4.63$, $SD = 0.44$), $F(1, 107) = 0.46$, $p = .49$. Given the lower reliability observed among the negative mood items, each individual item was analyzed. The *distressed*, *upset*, and *jittery* items of negative affect showed no effects (all Fs < 1), and the effect on the *scared* item was also unreliable, $F(1, 107) = 2.39$, $p = .12$.

Perceived importance, ambivalence, and knowledge. The perceived amount of thought manipulation had no impact on perceived importance ($M_{many} = 4.35$, $SD = 2.06$; $M_{few} = 4.66$, $SD = 2.43$), $F < 1$; perceived ambivalence ($M_{many} = 4.12$, $SD = 2.02$; $M_{few} = 4.24$, $SD = 1.86$), $F < 1$; or perceived knowledge and information ($M_{many} = 5.04$, $SD = 1.62$; $M_{few} = 4.86$, $SD = 1.46$), $F < 1$.

Structural Equation Modeling Analysis

RAMONA (Browne & Mels, 1998) was again used to test our proposed model. If perceived amount of processing is a critical factor capable of independently influencing attitude certainty, then the manipulation should have an impact on perceived amount of processing and attitude certainty even though the manipulation is independent of the actual amount of thought. Accordingly, the following model was fit to the data: Feedback condition predicts perceived amount of processing, which predicts attitude certainty (see Figure 6).

The manipulation was included as a manifest variable, and the parcels for perceived amount of processing and attitude certainty were handled as they were in the previous studies (see Table 7). The feedback manipulation was dummy coded (0 = few thoughts feedback, 1 = many thoughts feedback) for the structural equation modeling analyses. The proposed model was a good fit to the data, $\chi^2(8, N = 109) = 6.19$, *ns*; $\chi^2/df = 0.77$; NNFI = 1.00; RMSEA = 0.00 (0.00, 0.09); AIC = 20.20. In addition, all estimated parameters were significant and consistent with predictions.

As in Studies 1–3, the proposed model was compared with a model where the order of perceived processing and certainty was reversed, and evidence showed that the reversed order model was a poor fit to the data and a comparatively worse fit than the proposed model (see Footnote 4).

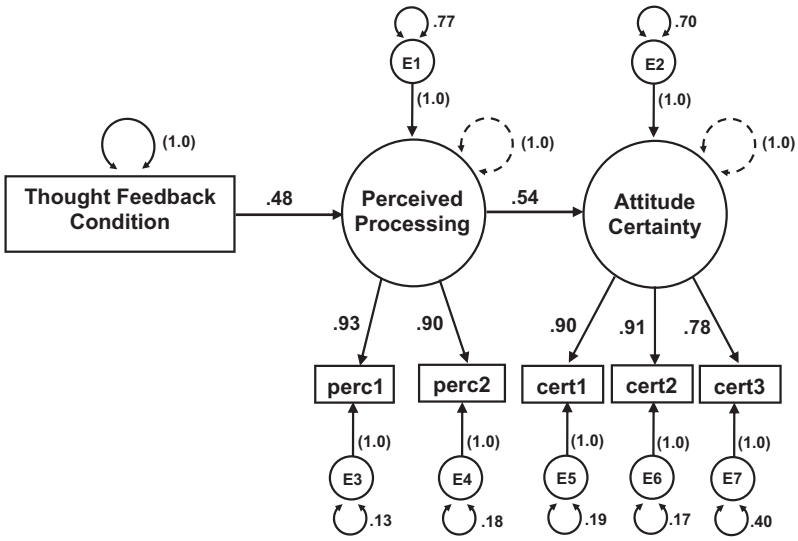

Figure 6. Structural equation modeling results, Study 4. $^{*}p < .05$.

Alternative Partial Mediation Model

As in Studies 1–3, an alternative model was tested to evaluate whether the mediation indicated in the overall model was full mediation as suggested by the fit of the proposed model. To test for partial mediation, we added an additional path from feedback condition to attitude certainty. This alternative model evinced good fit, $\chi^2(7, N = 109) = 6.17$, *ns*; $\chi^2/df = 0.88$; NNFI = 1.0; RMSEA = 0.00 (0.00, 0.11); AIC = 22.17. However, the additional path was not statistically reliable on the basis of the 90% confidence interval, –.01 (–.18, .15), so no evidence was found that additional variance is unexplained outside the hypothesized mediational path.

Discussion

Study 4 investigated the role of the thoughtfulness heuristic under circumstances of a message including arguments on both sides of an issue. Results showed that individuals who were led to believe that they had thought a lot about a two-sided message felt more certain about the resulting attitude than people who were led to believe that they had thought only a little about the same message. This finding supports the generality of the thoughtfulness heuristic to circumstances where people are faced with information on both sides of an issue.

In addition to perceived amount of processing, Study 4 investigated a number of alternative mediators of attitude certainty. The proposed and alternative mediators were all assessed using previously validated, multi-item scales, and they were each presented in counterbalanced order to provide an equal playing field. The false feedback condition had an impact on attitude certainty and the proposed mediator, perceived amount of processing, but had no impact on any of the alternative mediators, including mood, perceived importance, perceived knowledge, and perceived ambivalence. Consistent with the thoughtfulness heuristic, perceived amount of processing fully mediated the impact of feedback condition on attitude certainty. So, although these alternative variables have been associated with attitude certainty in previous research, they do not provide an alternative explanation for the results of Study 4. This study also provides additional evidence that the thoughtfulness heuristic can impact certainty independent of variation in actual thought and independent of these alternative variables.

Table 7
Study 4: Correlation Matrix of Manipulated and Measured Variables

Variable	1	2	3	4	5	6
1. Thought feedback condition	(0.25)					
2. Perceived1	.45**	(0.68)				
3. Perceived2	.43**	.85**	(0.64)			
4. Certainty1 (certain)	.20*	.50**	.48**	(3.54)		
5. Certainty2 (confident)	.21*	.42**	.42**	.82**	(3.48)	
6. Certainty3 (sure)	.26**	.39**	.37**	.69**	.72**	(3.44)
M	0.52	0.00	0.00	6.11	6.43	6.00

Note. Numbers on the main diagonal denote variances. $N = 109$. Perceived = perceived amount of processing. Variables with a mean of zero reflect indexes composed of standardized items.
$^{*}p < .05$. $^{**}p < .01$.

General Discussion

Contemporary models of persuasion have long postulated that antecedents of elaboration produce strength consequences through strength mediators such as attitude certainty (Petty & Cacioppo, 1986; Petty, Haugtvedt, & Smith, 1995). However, no study has provided clear evidence of *why* elaboration leads to certainty. The current investigation set out to provide clear evidence of one route through which antecedents of elaboration can produce attitude certainty, a key indicator of attitude strength. The first step in this process was to show that antecedents of elaboration (i.e., NC, distraction) have an impact on perceptions of the amount of thought because these perceptions reflect variation in the actual amount of processing that has taken place. The next step comprised the central component of the proposed model, the thoughtfulness heuristic, which holds that the perception that more thought has gone into a judgment leads to greater certainty in that judgment. Finally, it was important to show that attitude certainty resulting from the thoughtfulness heuristic produced strength consequences (i.e., behavioral intentions). Under circumstances where the perceived amount of processing reflected the actual amount of processing, this provided a comprehensive causal sequence from antecedents of elaboration to strength mediators and consequences (Figure 1, ABCDE).

Across four studies, structural equation models based on the proposed causal sequence from antecedents of elaboration to strength consequences fit the data. Furthermore, each of the four postulated causal relationships was supported in at least two separate studies. Both chronic differences in NC (Study 1) and a manipulation of distraction (Study 2) influenced the number of issue-relevant thoughts and memory items participants listed. The numbers of issue-relevant thoughts and memories were each reflected in the perception of the amount of processing (Studies 1 and 2). Whether it reflected the amount of actual processing (Studies 1 and 2) or an extraneous factor independent of actual processing (Studies 3 and 4), the perceived amount of processing influenced attitude certainty, supporting the thoughtfulness heuristic. Finally, certainty resulting from this mechanism was consequential, leading to behavioral intentions that were more in line with the positive attitudes that participants held (Studies 2 and 3). Thus, the current investigation provides evidence of a comprehensive process from antecedents of elaboration to strength consequences.

The remaining goal of this research was to show that perceived amount of processing is a construct distinct from actual amount of processing and thus is capable of influencing strength indicators (i.e., attitude certainty) and strength consequences (i.e., behavior intentions) on its own. In prior research, self-reported measures of perceived processing and measures of the actual number of thoughts (e.g., thought listings) have been used interchangeably as indicators of elaboration (see Wegener et al., 1995, for a review). To separate these variables, Studies 3 and 4 included manipulations of perceived processing that occurred after participants had the opportunity to engage in the actual processing of the persuasive message. In Study 3, perceived amount of processing was manipulated using an attention quiz that was rigged so that it resulted in either success or failure. Study 4 employed a false feedback manipulation, where participants were told that their peers had generated either two more or two fewer thoughts than they themselves had reported generating. Both manipulations had an impact on both perceived amount of processing and attitude certainty. Consistent with the thoughtfulness heuristic, model fit indicated that perceived processing mediated the impact of these manipulations on attitude certainty. Furthermore, Study 3 showed that perceptions of the amount of processing can produce strength consequences (i.e., behavioral intentions) independent of actual processing. Critically, the manipulations in Studies 3 and 4 influenced perceived amount of thought but not the actual number of thoughts. So these results show that perceived amount of processing is a construct distinct from the actual amount of processing, capable of influencing strength mediators and consequences on its own.

Alternative Accounts

According to the current account, under circumstances where perceived amount of processing reflects actual processing, the thoughtfulness heuristic provides a mechanism through which antecedents of elaboration can influence attitude certainty. The current evidence supports this view and also fails to support alternative accounts for these findings. In Study 4, mood and a number of alternative meta-level variables (i.e., perceived importance, perceived ambivalence, and perceived knowledge) failed to show effects even though the false feedback manipulation had an impact on perceived processing and attitude certainty. So although these variables have each been associated with certainty in the past, Study 4 shows that the thoughtfulness heuristic can influence attitude certainty independent of these variables.

Attitude Extremity

Attitude extremity and attitude certainty have often been confounded in past research, because attitude extremity leads to certainty (Gross et al., 1995). The current investigation was focused on the impact of amount of processing on attitude certainty, so it was critical that the amount of processing not also impact extremity. Thus, each study included both positive persuasion cues and strong arguments, in order to produce similar attitudes regardless of the extent of elaboration (Petty & Wegener, 1999). This approach was successful in that across all four studies, the same variables that influenced attitude certainty failed to influence attitudes or attitude extremity. High and comparable reliability was observed for the attitude and certainty items, which is inconsistent with differential measurement reliability. Similarly, a ceiling effect on attitudes cannot account for these null results, because they were also obtained when the topic was senior comprehensive exams (Study 1) and when a two-sided message was used (Study 4), both of which elicited less extreme attitudes.

There is an additional question of why the certainty effects that were observed failed to produce extremity as a consequence. Prior research indicates that although extremity leads to certainty, certainty does not necessarily lead to extremity (Gross et al., 1995). For example, it is possible to feel certain about a neutral (e.g., chair) or ambivalent (e.g., exercise) attitude. Thus, to the extent that it is possible to argue on the basis of null results, the current results fail to support the notion that attitude extremity was responsible for the observed effects on attitude certainty.

Attitude Accessibility

Accessibility is another attitude strength indicator that might provide an alternative account for the current findings. Past research suggests that elaboration produces more accessible attitudes (e.g., Bizer & Krosnick, 2001), and attitude accessibility has been associated with both attitude certainty and increased attitude–behavior correspondence (see Fazio, 1995). However, there are reasons to believe that attitude accessibility does not provide an alternative account for the current results. In Studies 1 and 2 participants were told prior to the message that they would be providing their opinions on the message topic. This type of instruction promotes online evaluation of the topic (Hastie & Park, 1986), which would make attitudes temporarily accessible for all participants just before attitudes were measured (e.g., Tormala & Petty, 2001). Thus, it seems unlikely that accessibility was responsible for the observed effects on attitude certainty.

The methods and results of Studies 3 and 4 are more definite in ruling out attitude accessibility as an alternative. The manipulations in Studies 3 and 4 followed the presentation of the message, so the manipulation was independent of any idiosyncratic differences in the amount of actual processing during the presentation of the message that might have produced differential attitude accessibility or other structural changes. These manipulations nevertheless had an impact on perceived thinking, certainty, and behavioral intentions, so attitude accessibility resulting from differential elaboration of the message cannot explain these results.

Limitations and Future Directions

Given that perceived amount of thought served as a mediator of attitude certainty effects, this raises the question of whether these are truly independent constructs. Model comparison in each of the four studies showed that when the order was changed so that certainty preceded perceived processing, the models fit poorly and worse than the models in the proposed order. Thus, far from being interchangeable, perceived processing and attitude certainty have distinct roles in the proposed process and are thus distinct constructs. Outside of the current studies, perceived processing and certainty will not necessarily co-occur. For example, certainty can be based on variables other than perceived processing, such as attitude extremity (Gross et al., 1995) and perceived success in resistance (Tormala & Petty, 2002). In addition, there are specific circumstances where increased thought is not likely to be associated with greater certainty. Depression, which is often associated with extensive ruminative thought, is also characterized by chronic feelings of uncertainty (Segerstrom, Stanton, Alden, & Shortridge, 2003). So although perceived processing and certainty often co-occur, there are various circumstances where this might not be the case. Indeed, we suspect that in some circumstances (e.g., highly repetitive thought) or for some individuals (e.g., those high in chronic self-doubt), perceptions of enhanced thinking might even be associated with less certainty.

A second question is whether the thoughtfulness heuristic depends on the nature of the thoughts generated. In particular, when thoughts are of mixed valence, does increased perceived processing still lead to greater certainty? A reanalysis of the thoughts from Study 1 indicated that the senior comprehensive exams topic elicited thoughts of mixed valence, which is typical for this topic (see footnote 1). Thus, the thoughtfulness heuristic can have an impact regardless of whether the valence of thoughts is primarily in one direction or of mixed valence. Of course, people may become more certain as their thinking becomes more univalent (less ambivalent). However, the current results suggest that at any one level of valence of thinking, perceiving that one's attitude is based on more thought leads to more certainty. That is, people can be certain even in their ambivalent attitudes.

A third question is whether the thoughtfulness heuristic applies under circumstances where the message contains information on both sides of an issue. To address this, Study 4 presented a message composed of two arguments against and two arguments for the same issue. Results showed that perceiving more processing had taken place, even in response to a two-sided message, led to increased certainty. This supports the generality of the thoughtfulness heuristic to persuasion circumstances involving both one-sided and two-sided messages. Of course, how one-sided and two-sided messages compare on attitude certainty is a separate issue. Some research has shown that when actual information is held constant, merely perceiving that information is two-sided produces greater certainty than perceiving that information is one-sided (Rucker, Petty, & Briñol, 2008). These results, combined with the current Study 4, support the notion that two-sided messages are capable of producing attitudes held with certainty when accompanied by the perception of high thought. On the other hand, a recent meta-analysis found that studies using actual one-sided messages produced greater attitude certainty than studies with actual two-sided messages (Glasman & Albarracin, 2006). However, because attitude extremity was not controlled for, it is unclear whether in these effects certainty was a proxy for extremity. Future research should directly compare actual one-sided and two-sided messages on certainty and strength consequences and then investigate elaboration as a moderator.

One final open question is whether the thoughtfulness heuristic can produce other strength consequences such as persistence and resistance. Previous research has linked attitude certainty to both persistence (Abelson, 1988; Bassili, 1996) and resistance (Bassili, 1996; Haugtvedt & Petty, 1992; Visser & Mirabile, 2004); however, in each case either the methods or the evidence suggested that certainty likely covaried with the actual amount of processing. So, it is unclear whether certainty based on perceived processing that is extraneous to actual processing would produce increased persistence and resistance. On the one hand, certainty that does not correspond to actual processing could still motivate people to defend their attitudes. On the other hand, if certainty is not accompanied by the corresponding beliefs supporting the attitude, individuals may be less well equipped to defend their attitudes. Thus, this remains an open question for future research.

Perhaps the most exciting finding of the current investigation is that the mere perception of processing was sufficient to produce changes in behavioral intentions, by affecting attitude certainty completely independent of the actual amount of processing. These results offer an intriguing avenue for creating behavior change. According to contemporary models of persuasion, attitude change that is consequential requires extensive elaborative processing. The current results suggest a second possibility. Namely, leading individuals to perceive that they have elaborated extensively could also produce behavior change in the direction of the attitude. This provides a novel, low-effort process to create behavior change.

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