

A COMPREHENSIVE PROCESS FROM ANTECEDENTS
OF ELABORATION TO STRENGTH CONSEQUENCES:
MEDIATION BY THE PERCEPTION OF THE EXTENT OF ELABORATION

DISSERTATION

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ABSTRACT

There is convergent evidence that the extent of elaboration on an attitude object enhances its overall strength in terms of outcomes such as attitude-behavior correspondence (Petty, Haugtvedt, & Smith, 1995). However, little is known about how this occurs. The current research suggests that individuals develop perceptions of the extent of elaboration, and these can impact the certainty with which they hold their attitudes, resulting in strength outcomes. Although prior research on meta-cognition has shown that perceptions of ease of thinking (Haddock et al., 1999) and resistance (Tormala & Petty, 2002) can affect attitude certainty, perceptions of the extent of thinking have not yet been shown to affect certainty. In a Pilot Study and Studies 1 and 2, perceived processing reflected actual processing resulting from message exposure time, need for cognition, and distraction. Perceived elaboration consistently mediated the impact of actual thoughts on certainty. In Study 2, manipulated distraction led to fewer thoughts, decreased perceived processing, decreased certainty and less attitude consistent behaviors. In Study 3, perceived elaboration was manipulated by rigging an Attention Quiz for success or failure. The quiz followed the persuasive message, so perceived elaboration was independent of actual thought. Quiz success resulted in greater perceived elaboration, more attitude certainty, and more attitude consistent behaviors.

This is the first investigation to provide comprehensive support for a process from antecedents of elaboration to strength consequences, and the first to show that perceived processing can impact certainty whether it derives from actual thought or a source extraneous to thought.

Dedicated to:
my mother for reading and writing,
my father for arithmetic.

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PUBLICATIONS

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TABLE OF CONTENTS

	Page
Abstract.....	ii
Dedication.....	iv
Acknowledgments.....	v
Vita.....	vi
List of Tables.....	ix
List of Figures.....	x
Chapters:	
1. Introduction.....	1
Links in the Elaboration to Certainty Sequence.....	4
Meta-cognition and Attitude Strength.....	13
Amount of Processing and Attitude Certainty.....	17
Overview of Present Research.....	22
2. Pilot Study.....	23
Method.....	26
Results.....	29
Discussion.....	32
3. Study 1.....	35
Method.....	37
Results.....	41
Discussion.....	46
4. Study 2.....	49
Method.....	50
Results.....	55
Discussion.....	61

5.	Study 3.....	63
	Method.....	66
	Results.....	69
	Discussion.....	73
6.	General Discussion.....	77
	Alternative Accounts.....	81
	Understanding Meta-Cognitive Contributions to Attitude Strength.....	85
	Limitations and Future Directions.....	86
	Conclusion.....	92
	Endnotes.....	93
	Appendix A Tables.....	96
	Appendix B Figures.....	103
	Appendix C Wireless-Fidelity Arguments.....	111
	Bibliography.....	116

LIST OF TABLES

Table	Page
1 Pilot Study: Correlation matrix of measured variables.....	97
2 Study 1: Correlation matrix of measured variables.....	98
3 Dependent variables as a function of distraction condition in Study 2.....	99
4 Study 2: Correlation matrix of manipulated and measured variables.....	100
5 Dependent variables as a function of quiz condition in Study 3.....	101
6 Study 3: Correlation matrix of manipulated and measured variables.....	102

LIST OF FIGURES

Figure	Page
1 Operative view of causal relationships between antecedents of the amount of processing and attitude strength.....	104
2 Structural equation modeling results, Pilot Study, *p < 05.....	105
3 Structural equation modeling results, Study 1, Model 1, *p < 05.....	106
4 Structural equation modeling results, Study 1, Model 2, *p < 05.....	107
5 Structural equation modeling results, Study 1, Model 3, *p < 05.....	108
5 Structural equation modeling results, Study 2, *p < 05.....	109
6 Structural equation modeling results, Study 3, *p < 05.....	110

CHAPTER 1

INTRODUCTION

The first week of college brings a lot of questions to mind. One of the most common is bound to be: “How can I be sure I made the right decision to come here?” One way to seek reassurance is to reflect on the process that led to the decision, such as discussions with your friends and parents, the list of pros and cons you made, or the time you spent imagining what life would be like. If a lot of thought has gone into the decision, then becoming aware of this is likely to lead to a greater sense of certainty. If not, then the perception that little thought went into the decision is likely to make an entering student feel even more unsure. The current investigation focuses on this notion that perceptions of the amount of thought that an attitude is based on have important consequences for how certain we feel about that attitude.

Allport (1935) asserted that the attitude construct was the most indispensable concept in contemporary social psychology. However, this viewpoint has not been universally held. In particular, the history of attitudes research has been characterized by an ongoing controversy about whether attitudes should be viewed as consequential or not. In line with Allport’s perspective, the Yale School in the 1940’s and 1950’s viewed attitudes as stable, consequential and difficult to change (Hovland, 1959). Most

importantly, attitudes were shown to predict critical behaviors, such as voting for political candidates (Schuman & Johnson, 1976). Theories have been developed on the basis of the notion that attitudes are a critical determinant of behavior (Ajzen & Fishbein, 1980; Fazio & Towles-Schwen, 1999). Others have been more skeptical about the utility of the attitudes construct and have questioned the notion that attitudes are consequential. LaPiere (1934) famously demonstrated that while restaurant and hotel employees surveyed might express negative attitudes toward potential Chinese patrons, this did not correspond to the more positive behavioral responses that were received in person (see Wicker, 1969, for a review). Accordingly, some have argued that people often hold attitudes that are so flexible, that they are better described as “nonattitudes” (Converse, 1964), or that attitudes are constructed in the moment (Schwarz & Bohner, 2001).

More recently, this controversy has developed into what is perhaps a more useful question, namely what determines whether an attitude is likely to be consequential or not. Fishbein and Ajzen (1977) focused on measurement issues and found that attitudes predicted behaviors as long as there was correspondence between the attitude measure and the behavior. Others have shown that attitudes with certain attributes tend to be more consequential, such as when an attitude comes to mind quickly (Fazio, Chen, McDonel, & Sherman, 1982), or when an attitude is based on more thoughtful processing (Petty & Cacioppo, 1986). Growing evidence based on a variety of these attributes has led to the more general notion of attitude strength. Strong attitudes can be defined by their

consequences, so an attitude is strong when it is relatively persistent over time, resistant to persuasive attempts, when it influences information processing, and predicts behavior (Krosnick & Petty, 1995). At this point, many social psychologists have settled on the idea of attitude strength as solving the problem of whether attitudes are consequential or not. Attitude strength can be viewed as a continuum going from non-attitudes to highly consequential attitudes.

Developing an understanding of the processes underlying attitude strength is clearly of critical importance for anyone trying to develop persuasive communications with consequences, whether for product advertising, health promotions, social issues or simply a discussion at the dinner table. Social psychologists have proposed many causes of attitude strength, and these are viewed as indicators of which attitudes are likely to be consequential (see Krosnick & Petty, 1995, for a review). Krosnick, Boninger, Chuang, Berent, and Carnot (1993) identified a total of 10 different dimensions of strength: extremity, intensity, certainty, importance, interest, knowledge, accessibility, direct experience, latitudes of rejection, and affective-cognitive consistency, and other research has identified additional attributes, such as ambivalence and issue relevant thought (see Krosnick & Petty, 1995, for a review). These attributes are viewed as features of the attitude that lead to the consequences that characterize strong attitudes. In terms of understanding attitude strength, however, tracing strength consequences to strength attributes begs the question of what leads to these strength attributes. Despite the clear

utility in understanding what distinguishes attitudes that are strong from those that are weak, there is relatively little empirical evidence regarding the processes underlying strength attributes and consequences (Petty, Haugtvedt, & Smith, 1995).

Attitude certainty is a strength indicator that 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). Understanding certainty is critical, because attitudes held with greater certainty 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). Surprisingly little is known about the antecedents and processes underlying attitude certainty (see Gross et al., 1995, for a review).

Links in the Elaboration to Certainty Sequence

The current investigation will focus on why the amount of processing or elaboration of a persuasive communication leads to attitude certainty. Contemporary models of persuasion (Chen & Chaiken, 1999; Kruglanski & Thompson, 1999; Petty & Wegener, 1999), hold that the amount of operative processing of a persuasive communication is a critical mediator of persuasion processes as well as persuasion outcomes such as attitude strength. For example, the Elaboration Likelihood Model

(ELM), holds that the amount of issue-relevant thought that takes place has critical consequences for attitude strength (Petty & Cacioppo, 1986; Petty & Krosnick, 1995). In particular, Petty, Hautvedt and Smith (1995) postulated that attitude strength is derived through the following process: antecedent conditions→amount of processing→strength indicator→strength consequence (see Figure 1). Support for the causal links between each of these variables will be reviewed in sequence.

Link A-B: Antecedent Conditions and Amount of Processing

The relationship between antecedents of elaboration and the actual amount of thought has received broad support in the literature (Petty & Wegener, 1998). A number of situational variables, such as personal relevance (Petty, Cacioppo, & Goldman, 1981), and individual differences, such the need for cognition (Cacioppo & Petty), or the extent to which an individual enjoys thinking, influence how motivated an individual is to engage in issue-relevant processing. Similarly, the ability to engage in issue-relevant processing is influenced by situational variables such as distraction (Petty, Wells, & Brock, 1976), and individual variables, such as knowledge of the topic (Wood, Rhodes, & Beik, 1995). Thus, there is general support for the notion that motivation and ability impact the amount of issue relevant thought that occurs regarding an issue (see Petty & Wegener, 1998, for a review).

A number of methods are used to determine the extent of processing of a persuasive message, including argument strength manipulations (Petty & Cacioppo, 1979), thought listings (Burnkrant & Howard, 1984), thought-attitude correlations (Petty & Cacioppo, 1979), and the amount of time spent processing (Vonk & van Knippenberg, 1995). For example, greater elaboration is associated with greater scrutiny of issue relevant information, so the level of elaboration in a group can be inferred from the extent to which strong and compelling reasons for an advocacy are more effective in persuading people to support an advocacy than are weak and specious reasons (Petty et al., 1976). Thought listings provide participants the opportunity to write down any thoughts they have in response to a persuasive communication. Extent of processing is indexed by the number of issue-relevant thoughts generated (Burnkrant & Howard, 1984). Thoughts can also be categorized as for or against the position advocated in the persuasive communication. Stronger correlations between the favorability of thoughts and attitudes indicates that the attitude reflects greater issue-relevant thinking (Petty & Cacioppo, 1979). When an individual chooses to spend more time with a given piece of information, this has also been used as a measure of the extent of processing (Stern, Marrs, Millar, & Cole, 1984; Vonk & van Knippenberg, 1995). For example, Stern et al. (1984) showed participants a single attitude statement attributed to a target followed by a number of target behaviors. Behaviors included some that were consistent and others that were inconsistent with the initial statement. Overall, participants took more time with the

inconsistent behaviors and had greater recall for them. Furthermore, when time was controlled for, the effect of consistency on recall was eliminated. Thus, time spent with target-relevant information is one of a number of indexes of the extent of processing.

Link B-C: Amount of Processing and Attitude Certainty

There is very little direct support for the relationship between the extent of elaboration and attitude certainty (see Haugtvedt & Petty, 1992, below for an exception). A few findings are consistent with a relationship between antecedents of elaboration and certainty, however. Research has shown that having behavioral experience with an object (Fazio & Zanna, 1978), and making more judgments regarding the object before certainty is measured (Miller, Gross, & Holtz, 1991), both lead to greater certainty. However, in each case the role of the amount of thinking cannot be verified, because it was not measured.

There is more general support that elaboration is an important antecedent of other strength indicators, such as attitude accessibility. For example, Bizer and Krosnick (2001) found that greater personal importance of an issue leads to more accessible attitudes three months later. Critically, selective attention to issue-relevant information provided the mechanism for this relationship. Other studies have shown that need for cognition (Ahlering & Parker, 1989) and personal relevance (Petty, Haugtvedt, & Rennie, 1995) result in more accessible attitudes as well. Consistent with these findings, Fazio et al. (1982) have suggested that the consolidation of thoughts is the critical process

leading to more accessible attitudes. In sum, there is evidence that elaboration impacts other strength indicators, however there is little direct evidence in the case of attitude certainty.

Link A-D: Antecedent Conditions and Strength Consequences

There is convergent evidence that antecedents of elaboration impact strength consequences, including persistence, resistance and attitude-behavior correspondence (Petty, Haugtvedt, & Smith, 1995). Various antecedents associated with greater elaboration result in more persistent attitudes, 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 the message to another person (Boninger, Brock, Cook, & Gruder, 1990; Chaiken, 1980; Zajonc, 1960), and greater NC (Haugtvedt & Petty, 1992). Similarly, antecedents of elaboration also result in attitudes that are more resistant, including personal relevance (Haugtvedt & Wegener, 1994; Petty et al., 1995, Study 2 as cited in Petty, Haugtvedt, & Smith, 1995), and greater need for cognition (Haugtvedt & Petty, 1992). Finally, these same antecedents also result in attitudes that are more likely to predict behaviors. For example, attitudes toward presidential candidates are more likely to predict voting among those who are high in need for cognition (Cacioppo, Petty, Kao, & Rodriguez, 1986). Multiple investigations have also demonstrated that processing a message under conditions of greater personal relevance leads to increased attitude-behavior correspondence (Leippe &

Elkin, 1987; Petty, Cacioppo, & Schumann, 1983; Shavitt & Brock, 1986; Sivacek & Crano, 1982). Thus there is general support for the notion that antecedents that are known to produce more elaborative processing lead to strength consequences.

Link C-D: Certainty and Strength Consequences

Finally, certainty has been linked to each of the strength consequences, including persistence (Abelson, 1988; Bassili, 1996; Haugtvedt & Petty, 1992; Pomerantz et al., 1995), resistance (Bassili, 1996; Haugtvedt & Petty, 1992; Tormala & Petty, 2002; Visser & Mirabile, 2004), and attitudes that are predictive of behavior (Fazio & Zanna, 1978; Franc, 1999; Rucker & Petty, 2004; Sample & Warland, 1973; Tormala & Petty, 2002; Warland & Sample, 1973). For example, Bassili (1996) used telephone survey techniques to investigate attitude certainty along with a number of other strength indicators. On a variety of issues, Bassili (1996) found that the more certain respondents were about their attitudes, the more stable their attitudes were over two weeks, and the less likely their attitudes were to change in response to new information. Critically, the effects of certainty were observed when other strength indicators, such as attitude accessibility, were controlled for statistically. Thus, certainty is an important strength indicator associated with all of the consequences of strong attitudes.

Multiple Links

Very few investigations have reported evidence of more than two components of the process outlined in Figure 1. Thus the evidence for the overall process is largely piecemeal at this point. Two investigations have included three of these components. In two studies, Fazio and Zanna (1978) found evidence that direct behavioral experience impacted certainty and certainty led to attitude-behavior consistency, incorporating components A, C, and D. In Study 1, which is most relevant here, participants in the direct experience condition were told to work out examples of the five types of puzzle that served as attitude objects, whereas the no experience condition was shown the same examples with the answer provided. The direct experience condition reported being more certain in their attitudes towards the puzzles. Given this manipulation of direct experience, the extent of elaboration provides one candidate mechanism. However, mediators of certainty were not measured, so the role of elaboration or other potential mechanisms cannot be established.

Haugtvedt and Wegener, (1994) investigated how the extent of thought given to one passage contributes to resistance of a subsequent passage espousing the opposite viewpoint, incorporating components A, B, and D. When the first message was framed as personally relevant to the participant, a condition which increases the likelihood of elaboration (Petty et al., 1981), this resulted in more counterarguments against the second message and attitudes that were more resistant to the second message. This study showed

that antecedents of elaboration produce resistance with elaboration as the mechanism, however the role of certainty is unclear, because it was not measured. Thus, these two investigations are consistent with the overall process, however neither directly established the critical link between the amount of thought and attitude certainty.

Only one investigation the authors is aware of provides direct evidence of the link between the extent of elaboration and attitude certainty. Haugtvedt and Petty (1992, Study 2) investigated whether attitude certainty might be more or less likely to reflect the extent of elaboration depending on an individual's chronic need for cognition (NC). In general, the attitudes of those high in NC tend to reflect thoughtful consideration of message arguments, whereas attitudes of those low in NC reflect less thoughtful processing including peripheral cues, such as the expertise of the source (Cacioppo, Petty, Feinstein, & Jarvis, 1996). In this study, participants read a persuasive message comprised of arguments against a food additive, which was attributed to a credible source, Dr. Dobbs. After the message, those high and low in NC reported identical attitudes and attitude certainty. However, for those high in NC, certainty was related to the actual number of arguments they recalled, whereas for those low in NC, certainty was related to perceptions of the source's credibility. Those high in NC also recalled more message arguments. Finally, participants read a second message, which was in favor of the food additive. Consistent with their thought-based attitudes, those high as opposed to low in NC generated more counterarguments to the second message, and their attitudes

were more resistant to change. Although not tested directly in this research, this result suggests that attitude certainty based on elaboration is more consequential than certainty based on source credibility. In any case, this is the only investigation to include all four components of the overall process.

Having reviewed support for each step in the operative process as it applies to attitude certainty, the evidence is compelling in some cases and quite sparse in others. There is convergent evidence supporting a number of the pair-wise links: A-B, C-D, and A-D. On the other hand, there appear to be two gaps in the support for this framework (1) Only one study provides direct evidence of a relationship between the extent of elaboration and attitude certainty (Haugtvedt & Petty, 1992). This leaves a couple of important questions: How does certainty based on more thought differ from certainty based on less thought? How do operative aspects of processing, such as thoughts, come to impact certainty, which is viewed as a meta-attitudinal indicator? (2) No study provides comprehensive support for the overall process that has been postulated. Haugtvedt and Petty (1992) provided an important advance, with evidence of pair-wise relationships between many of the components of the process. However, no mediational evidence was provided. So this does not provide strong support for the overall process, which specifies multiple causal paths with the intervening variables serving as mediators. These are some of the issues that will be addressed in the current investigation.

Meta-cognition and Attitude Strength

Recently, there has been a growing appreciation for the role of meta-cognitive processes as they apply to a variety of domains including social judgment, memory, and person perception (Jost, Kruglanski, & Nelson, 1998; Yzerbyt, Lories, & Dardenne, 1998). Metacognitions relevant to persuasion include perceptions of a variety of variables such as the ease or difficulty in processing, the confidence, direction or amount of thought, or the amount of knowledge (see Petty, Brinol, Tormala, & Wegener, in press, for a review). In one classic demonstration of the relationship between meta-cognition and social judgment, Schwarz et al. (1991) examined the possibility that the experience of ease or difficulty in retrieving information could impact judgments about the self. In this study, participants were asked to rate themselves on assertiveness after recalling either 6 or 12 examples of their own assertive behaviors. The results showed that participants who retrieved 12 examples actually reported that they were less assertive than those who retrieved 6 examples. According to Schwarz et al. (1991), participants who had to retrieve 12 examples had more difficulty doing this, and so inferred that they actually had fewer examples in memory than those who had an easy time, because they only had to retrieve 6 examples (see Tormala, Petty & Brinol, 2002, for an account based on certainty). This study is particularly striking, because if participants had used the actual number of examples retrieved, they would have reached the exact opposite

conclusion. Findings such as these, suggest that metacognitions can explain social judgments over and above what purely operative processes might predict.

Despite the growing evidence of meta-cognitive processes in the area of social judgment, it is only very recently that researchers have begun to explore the role of meta-cognitive processing in persuasion (Petty et al., in press). One example of the promise of this new area is research on the self-validation hypothesis, which focuses on the confidence or doubt with which thoughts are held. According to this hypothesis, thoughts held with high confidence are more likely to result in persuasion in the direction of their valence (i.e., positive or negative), than thoughts held with doubt (Petty, Brinol, & Tormala, 2002). Self-validation has provided a mechanism behind a variety of phenomena that were originally postulated to be based on different processes, including head nodding (Brinol & Petty, 2003), and ease of retrieval (Tormala et al., 2002).

One area that has received particular attention of late is the role of meta-cognition in attitude strength (Haddock, Rothman, Reber, & Schwarz, 1999; Rucker & Petty, 2004; Tormala & Petty, 2002, 2004a, 2004c). For example, Haddock et al. (1999) investigated the impact ease of retrieval on attitude certainty, intensity and importance. In this research, participants retrieved either a small (easy) or large (hard) number of arguments regarding doctor-assisted suicide. According to the classic account, the experience of ease of recall is presumed to lead to the conclusion that there is a greater amount of similar information available in memory. Consistent with this, results showed that

participants reported the highest attitude strength when they had to retrieve an easy number of arguments for their opinion, and the lowest attitude strength when they had to retrieve an easy number of arguments against their opinion.

Researchers have also found that that meta-cognitive perceptions surrounding resistance to persuasion impact attitude certainty (Rucker & Petty, 2004; Tormala & Petty, 2002, 2004a, 2004c). This research has focused on circumstances where participants are expected to counterargue a persuasive message. Results from these studies indicate that, holding the operative aspects of resistance constant, perceptions of the success in resisting, perceptions of the strength of the message, perceptions of the credibility of the source, and perceptions of the number of available counterarguments all impact attitude certainty. For example, Tormala and Petty (2002) instructed participants to counterargue a persuasive message. Participants who believed they successfully resisted a strong as opposed to a weak message perceived that they were more successful in resisting and as a consequence became more certain in their initial attitudes. Taken together, evidence supports the utility of exploring meta-cognitive processes in the area of persuasion, particularly in the case of attitude strength variables such as attitude certainty.

In order to illustrate the role of meta-cognitive processes, meta-cognition has often been placed in opposition to operative processes. This has led some to the view meta-cognition as a source of contextual bias that interferes with more accurate operative

processes. In the case of attitude strength, Bassili (1996) has argued that meta-attitudinal strength indicators, such as attitude certainty, derive from different processes than operative indicators of attitude strength. According to this view, operative indicators, such as accessibility, extremity and ambivalence, are direct consequences of the information processing that produces the attitude judgment. By contrast, meta-attitudinal indicators, such as certainty, and perceived amount of thought and knowledge, are subjective impressions an individual has about their attitudes when they reflect on them. Based on this distinction, Bassili (1996) argued that: “The thesis presented here is that most self-report measures of properties of attitude strength tap information that...requires insights into processes that are not open to conscious scrutiny”(pp. 640). Without this accurate insight, meta-attitudinal indicators merely reflect extraneous factors, such as self-presentational concerns or a desire to provide a plausible answer. This viewpoint predicts that indicators based on self-report measures, such as attitude certainty, should not accurately reflect such operative processes as the amount of issue relevant processing, nor should they be consequential in predicting various important consequences such as attitude-behavior consistency. At least, they should not be as good as more operative indicators. Yet this conceptual viewpoint is at odds with the findings reviewed earlier relating attitude certainty to elaboration and strength consequences. Indeed, Bassili’s (1996) own results showed that among operative and meta-attitudinal indicators, attitude

certainty was the strongest predictor of the attitude-behavior correspondence! So, a revised version of this viewpoint might hold that meta-attitudinal indicators, such as certainty, predict only when they are a proxy for some operative indicator.

All together, attitude certainty presents an apparent contradiction, although it is a meta-attitudinal indicator, it nevertheless responds to operative processing and is associated with strength consequences. So, this raises some interesting issues about how this is possible. In particular, how does the actual amount of processing come to impact attitude certainty. The operative viewpoint would suggest that the attitude certainty following elaboration derives from structural changes, such as a more coherent cognitive structure related to the object (Petty & Cacioppo, 1986), or a stronger object-attitude link leading to greater attitude accessibility (Fazio & Towles-Schwen, 1999). An alternative meta-cognitive account would suggest that attitude certainty is inferred from some perception of the operative processing that has taken place.

Amount of Processing and Attitude Certainty

According to current models of persuasion, the amount of issue-relevant processing that takes place is a critical mediator of persuasion processes and consequences (Chen & Chaiken, 1999; Kruglanski & Thompson, 1999; Petty & Wegener, 1999). In particular, the ELM provides a clear set of predictions regarding how antecedents of elaboration eventually result in strength consequences (Petty, Haugtvedt, & Smith, 1995). As it applies to certainty, this viewpoint leads to the following

predictions: antecedents of elaboration that increase the amount of issue-relevant processing should produce greater attitude certainty, resulting in greater strength consequences. Despite the clear utility of understanding the process that determines which attitudes are likely to be consequential and which are not, critical gaps remain in the support for this process. Accordingly, the current investigation aims to provide comprehensive support for the entire causal sequence outlined above, something that no previous investigation has accomplished.

In addition, the current investigation will focus on the aspect of the process that is least understood. As reviewed above, only a single investigation has shown the relationship between the amount of issue-relevant processing and attitude certainty. Furthermore, almost nothing is known about the mechanism through which the amount of processing comes to impact attitude strength. There is also the question of how operative aspects of processing can produce changes in a meta-attitudinal variable. Assuming that support can be found for the relationship between amount of processing and attitude certainty, there are a number of candidate mechanisms to explain how this occurs. These can be separated into two general categories, operative processes which only involve primary thought and meta-cognitive processes which add in an additional role for secondary thought. Primary thought refers to an initial association of an object with an

attribute or judgment. By contrast, secondary thought refers to people's awareness of their own cognition—in other words their thoughts about their thoughts or thought processes (Petty, Brinol, Tormala, & Wegener, in press).

According to an account mediated solely by primary thought, a sense of certainty rises directly from operative cognition. For example, a sense of certainty could rise from a more extensive, or coherent schema of beliefs surrounding the attitude object (Petty & Cacioppo, 1986), or the enhancement of the object-attitude link in memory (Fazio et al., 1982), or simply more extreme attitudes (Gross et al., 1995). These changes in the attitude itself and its structure are postulated to result from more extensive amounts of processing (Petty & Cacioppo, 1986). For example, increased behavioral experience, which is likely to result in more extensive processing, results in greater attitude accessibility (Fazio et al., 1982; Fazio, Powell, & Herr, 1983), attitude certainty (Fazio & Zanna, 1978) and attitude-behavior consistency (Fazio & Zanna, 1978). This emphasis on operative cognition mediating critical persuasion processes and outcomes is a common attribute of current models of attitudes and persuasion (Chen & Chaiken, 1999; Fazio & Towles-Schwen, 1999; Kruglanski & Thompson, 1999; Petty & Krosnick, 1995).

According to an account mediated by secondary thought, meta-cognitive perceptions can account for the relationship between the amount of operative thought and attitude certainty. That is, meta-cognitive perceptions provide an explanation for how operative thought rises to awareness to impact attitude certainty and the subsequent strength consequences.

In particular, it is proposed that the meta-cognitive perception of the amount of processing that has taken place mediates the impact of the amount of actual processing on attitude certainty. When individuals form impressions of the amount of processing they have engaged in, this can reflect the actual amount of processing that has taken place (Batra & Ray, 1986; Fukada, 1986; Petty, Harkins, Williams, & Latane, 1977).

Generally, people believe that more extensive processing will lead to a greater sense of certainty (Tordesillas & Chaiken, 1999). The perceived amount of processing should reflect salient aspects of operative processing such as the number of thoughts and memories that are available or the amount of time spent thinking about a particular issue. Haugtvedt and Petty (1992) found that self-reported elaboration was correlated with attitude certainty. After inserting this meta-cognitive perception, the proposed viewpoint makes the following predictions: antecedents of elaboration→actual amount of processing→perceived amount of processing→attitude certainty→strength consequences. The focus of the current investigation will be to test the causal predictions that come from this meta-cognitive hypothesis.

However, perceived amount of processing is far from the only meta-cognitive variable capable of mediating the impact of actual amount of processing on attitude certainty. One clear alternative is an individual's perception of how much knowledge or information they have about the issue (Cacioppo & Petty, 1980; Davidson, Yantis, Norwood, & Montano, 1985). According to this view, increased processing of issue relevant information could be reflected in the perception that more knowledge is held about the topic. Evidence suggests that perceptions about knowledge often accurately reflect actual knowledge, but they also can derive from the accessibility of knowledge (Koriat, 1993). In either case, perceived knowledge offers a potential proximal subjective belief capable of impacting certainty. In fact, perceived knowledge has been shown to relate to strength consequences, such as attitude-behavior consistency (Davidson et al., 1985).

A second alternative is that an increased amount of processing could result in changes in the structure of the attitude, which would result in greater ease in retrieving object relevant information. This feeling of ease could derive from sources such as greater accessibility of the attitude itself or beliefs associated with the attitude. Previous evidence shows that ease can have an impact on attitude certainty (Haddock et al., 1999), so this provides a second alternative meta-cognitive mechanism.

Overview of the Present Research

An initial Pilot Study and three full studies explore the role of perceived amount of processing as a meta-cognitive mechanism underlying attitude certainty, whether it derives from the actual amount of processing or an extraneous source. In the Pilot Study and Studies 1 and 2, participants will engage in varying amounts of actual processing of a persuasive message, and the impact of this on attitude certainty and perceived amount of processing will be measured. An initial Pilot Study will explore this proposed mechanism in the context of naturalistic variation in the amount of processing of a persuasive message. Studies 1 and 2 will investigate whether the proposed mechanism can explain the impact of NC and distraction on attitude certainty. Study 3 will explore whether factors extraneous to the actual amount of processing that impact perceived amount of processing also impact attitude certainty. Studies 2 and 3 will also investigate the implications of the proposed mechanism for behavioral intentions.

CHAPTER 2

PILOT STUDY

The goal of the Pilot Study was exploratory and was aimed at providing an initial naturalistic demonstration of the proposed meta-cognitive mechanism responsible for attitude certainty. On a daily basis, people are faced with numerous persuasive communications. Some receive only a fleeting moment's attention whereas other communications grab attention for a longer period of time. All other things being equal, the longer individuals choose to expose themselves to a persuasive communication, the more extensively they are likely to have processed that message. Thus, the Pilot Study used the participant's self-controlled exposure time as a surreptitious measure of actual amount of processing of a persuasive message. Unlike some measures of the amount of processing, such as a thought listing, self-paced exposure time can be measured outside of the participant's awareness. So, this study provides an opportunity to test whether perceived amount of processing can reflect actual amount of processing under naturalistic conditions.

In this study, participants were presented with a persuasive message in favor of setting up Wireless-Fidelity Networks on college campuses (see Appendix C).

Participants were allowed to control the pace of exposure to the persuasive message, so

exposure time would provide a measure of the actual amount of processing. Exposure time has been used as a measure of amount of processing of attitude relevant information (Vonk & van Knippenberg, 1995), and information related to impression formation (Stern et al., 1984). For example, participants take longer to study target information when the target makes inconsistent attitude statements as opposed to consistent attitude statements (Vonk & van Knippenberg, 1995), and this has been taken as evidence of enhanced information processing. A pre-test was conducted to validate the relationship between exposure time and amount of processing of a persuasive message. A sample ($N = 57$) was taken from the same population used in the Pilot Study. Self-paced exposure time to the Wi-Fi message was correlated with the number of message relevant thoughts generated in response to the message, $r(57) = .45, p < .01$. Relevant thoughts are a well-established measure of the actual amount of processing of a persuasive message (Burnkrant & Howard, 1984; see Petty & Wegener, 1998, for a review). Thus, assuming that processing efficiency is constant, individuals choosing to spend more time with the persuasive message are likely to be processing the message more extensively (Vonk & van Knippenberg, 1995).

According to the proposed meta-cognitive mechanism, more extensive processing will be associated with greater attitude certainty. Furthermore, the perception of the

amount of processing should reflect the time spent with the persuasive message. Finally, this meta-cognition should explain the relationship between actual time spent with the passage and attitude certainty.

Attitude extremity and attitude certainty have often been confounded in the past, 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 attitude extremity. Thus, this Pilot Study was designed to produce the same attitudes regardless of whether the participant took the central or peripheral route to persuasion. Accordingly, two positive cues were presented, a credible source and a large number of arguments, to induce positive attitudes under low elaboration conditions (Petty & Cacioppo, 1984; Petty et al., 1981). In order to produce positive attitudes under high elaboration conditions, the message was comprised of strong arguments in favor of Wi-Fi Networks. Data from a second pre-test sample (N = 57) verified that a message comprised of a large number of strong arguments produced persuasion compared to a no message control condition.¹ Since the message contained two positive peripheral cues as well as strong arguments, it was predicted that those who took more time with the persuasive message and those who took less time should nevertheless evaluate Wi-Fi Networks similarly.

Method

Participants

Seventy-three undergraduates in introductory psychology classes at Ohio State University voluntarily participated in fulfillment of a course requirement.

Procedure

For all of the studies in this investigation, experimental sessions were conducted on computers using MediaLab 2004 (Jarvis, 2004). Participants were escorted into the experimental room and sat themselves at one of 8 computer stations separated by partitions. They were instructed to follow the directions on the computer screens to complete the experiment. The instructions indicated that participants would be reading about a college campus issue and then sharing their views. For the Pilot Study, participants were told that a university committee was considering whether Wi-Fi Networks should be set up in 6 years time, and that student feedback was being solicited in response to this proposal. These instructions were designed to establish a moderate level of personal relevance, which should allow for variation in the extent of message relevant processing. After reading these instructions, participants were presented with seven strong arguments in favor of setting up Wi-Fi Networks on college campuses (see Appendix C). These arguments addressed the following points: the convenience of Wi-Fi technology, the potential for free internet telephony, increased technological preparation of graduates, decreased overhead costs for the university of providing a network

connection, the highly secure connection, easier learning for students, and increased faculty responsiveness to students. After being presented with the message, participants completed a variety of items in the following order: attitude items, perceived thought and attention items, attitude certainty items, and perceived care in reading the arguments. After this, participants were thanked and debriefed.

Independent Variable

Actual amount of processing. Each of the seven arguments were presented on a single computer screen, and the computer recorded the time the participants took before moving on to the next argument. Exposure times were recorded according to the number of seconds individuals spent with argument. Exposure times for individual arguments were reliable ($\alpha = .93$), so they were averaged together to form a single index of actual amount of processing.

Dependent Variables

Attitudes. Attitudes toward Wi-Fi Networks were assessed using two 7-point semantic differential items with the following anchors: *good-bad, like-dislike*. Responses to these items were highly reliable ($\alpha = .80$), 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 taking the absolute value of this to determine the distance of the attitude from the neutral point.

Perceived amount of processing. Five items were used to assess the participant's perception of how much they had processed the persuasive message. In two items, participants were asked "To what extent did you think a lot about [pay attention to] the information about Wi-Fi Networks?" Responses to these items were provided on a 9-point scale ranging from *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 two [middle three, last two] arguments in favor of Wi-Fi Networks?" Responses to these items were provided on a 7-point scale from *not at all* to *definitely*. These items were based on those used to measure perceived amount of thought in previous research (Wegener, Downing, Krosnick, & Petty, 1995). Because the two sets of items were measured on different scales, each item was standardized prior to creating an index. The five standardized items were highly reliable ($\alpha = .91$), so they were averaged to form a single index of perceived amount of processing.

Attitude certainty. Attitude certainty was measured using three separate items "How certain [confident, sure] are you of your opinion about Wi-Fi Networks?" Responses were provided on a 9-point scale from *not at all* to *very*. These items are consistent with the typical manner of measuring attitude certainty (Abelson, 1988; Wegener et al., 1995). Responses to these items were highly reliable ($\alpha = .94$), so they were averaged to form an overall index of attitude certainty.

Results

Regression Analysis

The relationships between the amount of actual processing and the dependent variables were initially investigated using total exposure time as a continuous predictor of each dependent variable. Consistent with the proposed mechanism, total exposure time predicted perceived amount of processing, $\beta = .428$, $t(1,71) = 3.99$, $p < .01$, ($M = 181.89$, $SD = 73.29$), and attitude certainty, $\beta = .253$, $t(1,71) = 2.20$, $p < .05$, ($M = 6.10$, $SD = 1.75$). As noted earlier, due to the presence of positive cues in the message, such as numerous arguments and high source credibility, it was expected that those taking those taking less time with the message would have the same favorable attitudes as those who take more time. Consistent with this prediction, exposure time was not a significant predictor of attitudes, $\beta = .066$, $t(1,71) = .559$, $p = .578$, ($M = 5.81$, $SD = 0.95$), or attitude extremity, $\beta = .081$, $t(1,71) = .688$, $p = .493$, ($M = 1.84$, $SD = 0.90$).

Thus, these results offer an opportunity to test the proposed meta-cognitive mechanism. Accordingly, structural equation modeling was used to investigate whether the perception of the amount of processing that had taken place explained the relationship between actual amount of processing and attitude certainty.

Structural Equation Modeling Analysis.

RAMONA (Browne & Mels, 1998) was used to test how well a model based on the proposed mechanism fit the observed data. RAMONA provides several indices of model fit, including a chi-square goodness-of-fit index, the non-normed fit index (NNFI) (Bentler & Bonett, 1980), and the root mean square error of approximation (RMSEA) (Browne & Cudeck, 1993). The chi-square fit index provides a test of statistical significance whereby significant values indicate poor fit and non-significant values indicate better fit. The NNFI compares the specified model to a null model with no interrelationships between the variables. Good fit is indicated by NNFI values greater than .95. For the RMSEA, lower values indicate better fit, but unlike the chi-square fit index, these values take into account the number of parameters in the model, giving preference to simpler models when all else is equal. In general, when evaluating the point estimate of the RMSEA, values below 0.05 are considered close fit, values between 0.05 and 0.08 indicate fair fit, and values greater than 0.10 indicate poor or unacceptable fit (Browne & Cudeck, 1993). The RMSEA confidence interval provides a range of plausible values of the fit in the population. This confidence interval allows for comparison of different competing models based on whether the point estimate of one model is included in the confidence interval of the other model.

The models in the current studies were evaluated using a structural equation modeling (SEM) approach. All of the models are based on confirmatory factor analysis using latent variables. Within the models, 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 (indicated by a solid circular double arrow). 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, so is not a variable within the model (indicated by a dashed circular double arrows). The use of latent variables allows for the removal of measurement error, leading to more accurate estimations of the relationships between critical latent constructs (Little, Cunningham, Shahar, & Widaman, 2002). In particular, multiple indicators will be placed into separate parcels. These parcels are designated in such a way that they are as equivalent as possible so that differences between parcels represent measurement error rather than systematic error (e.g., Cunningham, Preacher, & Banaji, 2001). Accordingly, exposure times were separated into three parcels and each parcel was comprised of an average of multiple items (parcel 1 contained times for arguments 1, 4, and 7, parcel 2 contained arguments 2 and 6, and parcel 3 contained arguments 3 and 5). Perceived amount of processing items were also averaged into two parcels. Parcel 1 contained the first two reading care items and the perceived attention item. Parcel 2 contained the third reading care item and the perceived thought item. Each of the three attitude certainty

items was taken as a separate indicator of attitude certainty. The correlation matrix of all of the parcels and indicators used in the model in this study is included in Table 1.

The model we fit provided an initial test of the proposed causal sequence (see Figure 2). According to this model, actual amount of processing predicts perceived amount of processing, which predicts attitude certainty. This model had good fit as indicated by a non-significant chi-square, $\chi^2(18, N = 73) = 16.30, ns$, a large NNFI = 1.00, and a low RMSEA = 0.00 (0.00, 0.09). In addition, all estimated parameters were significant and consistent with predictions. This indicates that the proposed model had good fit.

A set of parallel analyses based on regression was conducted to test for mediation. This analysis made use of the averaged indexes for each construct, as in the earlier regression analyses. The set of mediational analyses indicated that perceived amount of processing fully mediated the impact of actual processing on attitude certainty.² Thus the regression results were consistent with the SEM results.

Discussion

The Pilot Study was successful in providing initial support for the proposed meta-cognitive account of the relationship between actual amount of processing and attitude certainty. Participants who chose to take more time with the persuasive message reported feeling more certain in the attitudes that resulted. Furthermore, this relationship was fully mediated by the meta-cognitive perception of the amount of processing that had taken

place. That is, participants formed perceptions of the extent of their processing, which reflected actual processing, and used this information to determine how certain to feel in their attitudes. By including positive persuasive cues, such as numerous arguments and a credible source, along with arguments that were cogent, positive attitudes were expected regardless of the extent of elaboration. Indeed, the actual amount of processing had no impact on attitudes or attitude extremity, suggesting that differences in persuasion were not responsible for the effects of processing on certainty.

The Pilot Study took advantage of observed variation in the actual amount of processing, and measured this processing surreptitiously. Thus, perceptions of the amount of processing reflected actual processing under naturalistic conditions. These findings are inconsistent with the viewpoint that self-report indicators of attitude strength, such as attitude certainty and perceptions of processing, are trying to tap information about internal processes that necessarily fall outside of awareness (Bassili, 1996).

The Pilot Study provided an initial validation of the proposed mechanism. However, since observed variation in exposure time served as the predictor variable for this study, the results are open to alternative explanations. For example, the three measured variables could all be caused by prior knowledge of Wireless-Fidelity Networks. That is, greater prior knowledge could cause increased actual processing of the message, perceived amount of processing could reflect prior knowledge as much as

processing of the presented message, and finally, knowledge could lead to greater certainty. Study 1 sought to replicate these initial findings, and to extend the breadth of the investigation to include a known antecedent of elaboration.

CHAPTER 3

STUDY 1

The goal of Study 1 was to broaden the support for the proposed meta-cognitive mechanism. To establish the generality of the findings of the Pilot Study, Study 1 used a different attitude object and persuasive message, and a different measure of actual amount of processing. Study 1 was also designed to expand the exploration of the proposed mechanism to include an antecedent of elaboration. Need for cognition (NC) is a stable individual difference measuring the tendency to engage in and enjoy effortful thought (Cacioppo & Petty, 1982). Across a variety of studies, those high in NC have been shown to engage in greater elaboration of persuasive messages than those low in NC (see Cacioppo et al., 1996, and Brinol & Petty, 2005, for reviews).

In Study 1, the actual amount of processing will be measured using a thought listing and an argument memory listing rather than message exposure time. Because they are more practiced engaging in cognitively demanding tasks (Cacioppo et al., 1996), those high in NC may make more efficient use of their processing time. For this reason, reading time may not be an accurate indicator of actual amount of processing as it varies across NC. Indeed, previous research has shown that those high in NC find cognitive tasks that they are familiar with, such as solving anagrams (Baugh & Mason, 1986), and

performing mental arithmetic (Dornic, Ekehammar, & Laaksonen, 1991), to be easier than those low in NC. Meta-analytic results indicate that those who are high in NC are more likely to seek out information, such as persuasive messages, making this a familiar task for them (Cacioppo et al., 1996). Thus it was judged that a thought and memory listing would more accurately reflect the actual amount of processing without any confound with processing efficiency.

As in the Pilot Study, the persuasive message used in Study 1 was designed so that it contained components that should appeal to participants who take either the central or peripheral routes 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. For those who are high in NC, who are more likely to engage in elaborative processing, the message was comprised of strong arguments in favor of senior comprehensive exams (Petty & Cacioppo, 1986). Thus, it was predicted that attitudes and attitude extremity following the message will not differ based on NC.

According to the proposed mechanism, antecedents of elaboration, such as NC, impact attitude certainty through a meta-cognitive route. Those high in NC tend to process persuasive messages more extensively, producing greater actual processing. The level of actual processing is reflected in meta-cognitive perceptions of the amount of

processing. Finally, this perception of processing should lead to greater certainty. This mechanism suggests a model where NC predicts actual amount of processing, which predicts perceived amount of processing, which predicts attitude certainty.

Study 1 will be used to compare the proposed viewpoint to an alternative dual process viewpoint. Both views predict that antecedents of elaboration can impact both actual and perceived amount of processing. However, the alternative viewpoint proposes that antecedents of elaboration, such as NC, impact the actual amount of processing and perception of processing through two independent paths. First, those high in NC engage in a greater amount of actual processing, and derive a sense of certainty directly from this purely operative mechanism. Second, those high in NC perceive that they processed more extensively, but this perception is based on an awareness of their own chronic tendencies, rather than reflecting any actual amount processing on the particular topic. Thus, according to this alternative explanation, NC should predict actual amount of processing and perceived amount of processing through separate paths. Study 1 will investigate the relative merits of the proposed and alternative viewpoints.

Method

Participants

Eighty-one undergraduates in introductory psychology classes at Ohio State University voluntarily participated in fulfillment of a course requirement.

Procedure

All experimental sessions were conducted on computers. Participants were escorted into the experimental room and sat themselves at one of 8 computer stations separated by partitions. They were instructed to follow the directions on the computer screens to complete the experiment. The instructions indicated that participants would be reading about a college campus issue and then sharing their views. Participants were told 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. As in the Pilot Study, these instructions were designed to establish a moderate level of personal relevance, which should allow for variation in the extent of message relevant processing according to participant's NC. After reading these instructions, participants were presented with nine strong arguments in favor of implementing the senior comprehensive exam policy (Petty & Cacioppo, 1986). These arguments addressed the following points: the exams boost the university's reputation, eliminate finals for seniors, increase interest of graduate schools, increase salaries of graduates, increase financial aid through increased alumni donations, improved undergraduate teaching, increase academic excellence at prestigious universities, increase preparation for real world jobs, and increase grade point averages. After exposure to the message, participants completed a variety of items in the following order: a thought

listing, attitude items, perceived thought and attention, attitude certainty items, perceived care in exposure to the arguments, a memory for arguments listing, and the NC scale.

After this, participants were thanked and debriefed.

Independent Variable

Need for cognition. At the end of the experiment, participants completed the 18-item version of the NC scale (Cacioppo, Petty, & Kao, 1984). This scale contains items such as: “The notion of thinking abstractly is appealing to me.” and “I only think as hard as I have to.” (reverse coded). Instructions indicate that participants are to indicate how characteristic each statement is of them on a 5-point scale from *extremely uncharacteristic* to *extremely characteristic*. Since items on this scale were highly reliable ($\alpha = .87$), they were averaged to form an overall index.

Dependent Variables

Actual amount of processing. A thought listing and a memory listing were taken as two separate indicators of actual amount of processing of the persuasive message. Previous research has shown the utility of measuring message relevant cognitive responses as an index of the extent of elaborative processing (Burnkrant & Howard, 1984; Petty & Wegener, 1998). For the thought listing, participants received the following instruction: Below is the first of several boxes you can use to record your thoughts regarding the senior comprehensive exams issue about which you just read. 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). Participants were provided with up to 18 boxes for thoughts along with instructions to press a key to exit the thought listing when they had no more thoughts. For the memory listing, participants received the following instruction: 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 for the senior comprehensive exam policy. Otherwise, the memory items were handled in an identical way as the thought listing.

After the experimental session, each thought and memory item was coded according to whether it was relevant to the Senior Comprehensive Exams issue or not. Coding was conducted by a judge who was blind to the level of NC. The measures 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. Because the variances of the thoughts and memory items were somewhat different, they were standardized separately before they were averaged into an index.

Attitudes. Attitudes toward senior comprehensive exams were assessed in the same manner as the Pilot Study. The items were again highly reliable ($\alpha = .91$), so they were averaged to form an overall attitude index. Attitude extremity was calculated in the same way as the Pilot Study.

Perceived amount of processing. Perceived amount of processing was assessed in the same manner as the Pilot Study. The items were again standardized prior to creating an index. The items were highly reliable ($\alpha = .90$), so they were averaged to form a single index.

Attitude certainty. Attitude certainty was measured in the same way as the Pilot Study. Responses to these items were highly reliable ($\alpha = .91$), so they were averaged to form an overall index of attitude certainty.

Results

Regression Analysis.

The relationship between NC and the dependent variables was initially investigated using NC as a continuous predictor of each dependent variable. According to our proposed mechanism, NC should predict actual amount of processing, perceived amount of processing and attitude certainty. In line with predictions, NC predicted actual amount of processing $\beta = .347, t(1,79) = 3.29, p < .01, (M = 0.00, SD = 0.83)$, perceived amount of processing, $\beta = .363, t(1,79) = 3.46, p < .01, (M = 0.00, SD = 0.85)$, and attitude certainty, $\beta = .307, t(1,79) = 2.87, p < .01, (M = 5.75, SD = 1.76)$.

Regression analyses were conducted to investigate the possible role of attitude extremity in determining attitude certainty. Due to the presence of cues, such as numerous arguments and source credibility, it was expected that those low in NC would have the same attitudes as those high in NC. Consistent with this prediction, NC failed to

predict attitude extremity, $\beta = .08$, $t(1,79) = 0.72$, $p = .48$, ($M = 1.44$, $SD = 0.83$), or attitudes, $\beta = .166$, $t(1,79) = 1.49$, $p = .14$, ($M = 4.58$, $SD = 1.56$). Thus, attitudes failed to provide an alternative explanation for the impact of NC on attitude certainty.

These results suggest that this study offers an opportunity to investigate the process behind the impact of NC. In particular, there are two alternative explanations for why NC was associated with both actual processing and perceived processing. A series of structural equation models were fit to the data in order to investigate the relative merits of the two alternatives.

Structural Equation Modeling Analysis.

RAMONA (Browne & Mels, 1998) was used to test the proposed model and the alternative model. The model used in Study 1 was expanded to include NC as the antecedent of the actual amount of processing. The other change was that the number of message relevant thoughts and memory items served as indicators of the actual amount of processing for Study 1. The correlation matrix to which all of the models were fit for Study 1 is included in Table 2. Note that the first and second models were fit to a subset of this overall matrix of correlations.

The first two models that we fit tested two possible explanations for the source of the perceived amount of processing. The first model, based on the proposed mechanism, holds that individuals who like to think perceive that they have processed extensively, because they have actually engaged in a greater amount of processing. According to this

viewpoint, NC should predict actual amount of processing, and actual amount of processing should predict perceived amount of processing (see Figure 3). This model evinced good fit based on all indices, $\chi^2 (12, N = 81) = 7.91, ns$, NNFI = 1.00, RMSEA = 0.00 (0.00, 0.07). In addition, all estimated parameters were significant and consistent with predictions.

The second model that we fit provided an alternative to the proposed viewpoint. According to this alternative, individuals who like to think tend to perceive that they have processed a lot regardless of the actual amount of processing that has taken place. That is, this meta-cognition derives directly from a chronic view of themselves. Based on this viewpoint, NC should predict actual amount of processing and perceived amount of processing independently (see Figure 4). This model fit the data poorly, as indicated by a significant chi-square, $\chi^2 (12, N = 81) = 34.26, p < .001$, a large RMSEA = 0.15 (0.09, 0.21), and a low NNFI = .85.

In terms of relative fit, the RMSEA confidence interval for the second model did not include the point estimate of the first model, and vice versa, indicating that the first model based on the proposed mechanism fit significantly better than the second model based on the alternative mechanism. A set of parallel analyses based on regression also indicated that actual amount of processing fully mediated the impact of NC on the

perceived amount of processing.³ Thus, these analyses support the proposed view that NC had an impact on perceived processing, because it reflected the impact of NC on actual processing.

The third model that we fit tested the broader prediction of the proposed mechanism. According to the proposed mechanism, perceived amount of processing provides a proximal determinant of attitude certainty. Thus, according to this view, a model that is identical to the first model above, with the addition of perceived amount of processing predicting attitude certainty, should also fit the data well.

The third model that we fit was the full model of the proposed meta-cognitive mechanism (see Figure 5). According to this model, NC predicts actual amount of processing, which predicts perceived amount of processing, which predicts attitude certainty. This model evinced good fit according to all indices, $\chi^2(32, N = 81) = 25.86$, *ns*, NNFI = 1.00, RMSEA = 0.00 (0.00, 0.05). In addition, all estimated parameters were significant and consistent with predictions. These findings indicated that this model was a good fit for the data, providing the first comprehensive support for the proposed mechanism underlying attitude certainty.

Mediational Analysis

In order to decompose the full model above, two additional sets of mediational analyses were conducted (Baron & Kenny, 1986). The first analysis tested the notion that NC impacted certainty because of perceived amount of processing. Previous research

suggested that actual amount of processing was a plausible mediator of the relationship between NC and certainty (Haugtvedt & Petty, 1992). Thus, it is important to establish that the proposed meta-cognitive variable is most directly responsible in the current study. Accordingly, the first set of analyses investigated whether the impact of NC on certainty was mediated by the perceived amount of processing. First, the perceived amount of processing index was regressed on NC. The NC was found to be a significant predictor of perceived processing ($b = 0.36, p < .01$). Second, the certainty index was regressed on NC. NC was found to be a significant predictor of certainty ($b = 0.31, p < .01$). Third, certainty was regressed on perceived processing and NC. Perceived processing significantly predicted certainty ($b = 0.42, p < .001$). In addition, NC was no longer a significant predictor of certainty, ($b = 0.16, p = .15$). The Sobel (1982) test was conducted and results established that the reduction in the path from NC to attitude certainty was significant when perceived processing was included in the regression equation ($z = 2.62, p < .01$). This suggests that perceived amount of processing fully mediates the relationship between NC and certainty (Baron & Kenny, 1986), which is consistent with the fit of the full model above.

The second analysis tested the notion that actual amount of processing impacted certainty because of the perception of the amount of processing. This second analysis was conducted to provide a direct replication of the Pilot Study and to directly test the meta-cognitive component of the proposed mechanism. First, the perceived amount of

processing index was regressed on actual processing. Actual processing was found to be a significant predictor of perceived processing ($b = 0.57, p < .001$). Second, the certainty index was regressed on actual processing. Actual processing was found to be a significant predictor of certainty ($b = 0.22, p < .05$). Third, certainty was regressed on perceived processing and actual processing. Perceived processing significantly predicted certainty, ($b = 0.52, p < .001$). In addition, actual processing was no longer a significant predictor of certainty, ($b = -0.08, p = .51$). The Sobel (1982) test was conducted and results established that the reduction in the path from actual processing to certainty was significant when perceived processing was included in the regression equation ($z = 3.54, p < .001$). This suggests that perceived amount of processing fully mediates the relationship between actual processing and certainty (Baron & Kenny, 1986), which directly replicates the results of the Pilot Study and supports the specific meta-cognitive component of the proposed mechanism.

Discussion

Study 1 was successful in broadening support for the proposed meta-cognitive mechanism responsible for attitude certainty. Individuals who were high in need for cognition, tended to process a persuasive message to a greater extent, to perceive that they processed more extensively, and to feel more certain in their attitudes. Thus, the study expanded on the findings of the Pilot Study by adding the NC, a well-established antecedent of elaboration. The expanded model fit the observed data, providing the first

comprehensive support for the entire proposed mechanism behind certainty: antecedent of elaboration→actual amount of processing→perceived amount of processing→attitude certainty. In addition, Study 1 replicated the findings from the Pilot Study using a new attitude object and a new measure of actual amount of processing. Critically, the proposed perceived amount of processing again mediated attitude certainty and reflected actual processing. Thus, the results supported the generality of the proposed mechanism.

Study 1 also tested support for an alternative viewpoint based on the notion that operative and meta-cognitive processes provide independent sources of attitude certainty. Based on this view, any impact of NC on perceived amount of processing should be independent of actual processing. However, the model based on this viewpoint failed to fit the observed data. Furthermore, it fit the data significantly worse than the model based on the proposed mechanism. So, Study 1 provided additional support for the notion that meta-cognition is not necessarily divorced from operative thought processes. Rather, meta-cognition is clearly capable of reflecting operative thought processes.

This study suggests that what was previously viewed as a purely operative process, can be metacognitively mediated. Study 1 also clearly identifies perceived amount of processing as a proximal mediator of attitude certainty. As such, this provides an explanation for how it is that variation in operative processing can impact meta-attitudinal indicators, such as attitude certainty. Finally, these findings are quite inconsistent with the notion of a strict separation of meta-attitudinal strength indicators

and operative processes. One limitation of Study 1 is that NC is a measured as opposed to a manipulated variable. Thus, this makes it difficult to make strong causal claims based on these data. Accordingly, Study 2 provided a direct manipulation of elaboration using a distraction manipulation.

CHAPTER 4

STUDY 2

The Pilot Study and Study 1 provide convergent evidence that our proposed meta-cognitive mechanism is responsible for a relationship between message relevant elaboration and attitude certainty. However, since NC is an individual difference measure, it is possible that it was confounded in Study 1 with some other variable that is actually responsible for the observed results. Study 2 will address this issue by directly manipulating the actual amount of processing while holding exposure time constant. Exposure time will be controlled for by presenting the persuasive communication as a fixed length audio message. Elaboration will be manipulated using a distraction manipulation (Harkins & Petty, 1981; Petty et al., 1976). If distraction impacts attitude certainty via the proposed meta-cognitive mechanism, this would show evidence that distinct determinants of elaboration impact certainty via the proposed mechanism.

The second purpose of Study 2 was to extend the investigation to include strength consequences. Previous research supports the viewpoint that antecedents of elaboration, such as personal relevance (Haugtvedt & Wegener, 1994; Petty et al., 1983) and the need for cognition (Haugtvedt & Petty, 1992) produce strength consequences such as persistence, resistance, and attitude-behavior correspondence. Nevertheless, it is

important to establish that the proposed meta-cognitive mechanism is capable of producing strength consequences as well. Recent evidence indicates that certainty derived from meta-cognitive processes leads to greater correspondence between attitudes and behavioral intentions (Rucker & Petty, 2004; Tormala & Petty, 2002, 2004a, 2004c). Accordingly, Study 2 included a measure of behavioral intentions, which have been shown to correlate very highly with actual behavior (Ajzen & Fishbein, 1980). In the Pilot Study, all but one participant reported an attitude that was at or above the neutral point on the scale, so the same is expected for Study 2, which also uses the Wi-Fi message topic. Given positively valenced attitudes, greater certainty in those positive attitudes should result in more positive behavioral intentions. By including strength consequences, Study 2 provides the first comprehensive investigation of every step in the process from antecedents of elaboration to strength consequences.

Method

Participants

Ninety-three undergraduates in introductory psychology classes at Ohio State University voluntarily participated in fulfillment of a course requirement.

Procedure

Overall, Study 2 followed the following sequence: participants practiced the distraction task, and then they listened to the persuasive message, during which time participants in the distraction condition also had to complete the distraction task. This was followed by the dependent measures.

Upon entering the experimental room, participants were randomly assigned to either distraction or control conditions. They were then told to follow the instructions on the computer screen throughout the experiment. All aspects of this multi-media experiment were presented using Medialab 2004 (Jarvis, 2004). As with previous studies, the instructions indicated that a university committee was interested in student views on Wi-Fi networks. Then participants were told that they would be completing an additional visual response task. Participants in both conditions practiced this task, which served as a means by which distraction was manipulated.

The distraction task and instructions used were taken directly from previous research with minor adaptations (Petty et al., 1976). In each trial of the distraction task, a square divided into four equal quadrants appeared in the lower part of the screen. For each trial, an X would appear in one of the four quadrants of the square, determined at random. The task for participants was to type two letters corresponding to the quadrant in which the X appeared (i.e., “UL” for upper-left or “LR” for lower-right). Two blank spaces were provided on the screen in order for participants to type in their responses.

For the first two practice trials, participants were allowed unlimited time to respond. After this, participants were warned that there would be a time limit, and participants were only allowed 2 seconds to respond to the second two practice trials. After each practice trial, the correct answer was provided to clarify the task.

After completing the practice, instructions for those in the distraction condition indicated that, “Now that you have practiced the visual responding task, you will be asked to complete it while listening to the audio message.” The instructions also indicated that they should pay close attention to the audio message so they could give feedback to the committee, but at the same time, they should perform as well as they could on the audio visual task. Instructions for the control condition indicated that, “For now, you will not need to complete the visual responding task.” They were also reminded that the committee was interested in your feedback, so they should pay close attention to the audio message. All participants were then instructed to put on their headphones and to listen to the message. The audio message contained three strong arguments in favor of Wi-Fi Networks, and each argument was 50 seconds in length. The distraction condition was presented with 22 distractor trials during each separate argument, which corresponded to roughly one trial every 2 seconds. This number of trials was designed to be challenging enough to disrupt processing of an audio message without harming comprehension of the position advocated. The control condition listened to the audio message with no distractor trials.

Following the audio message, participants completed the dependent measures in the following order: attitudes, perceived thought and attention, attitude certainty, behavioral intentions, perception of how closely they listened, thought and memory listings.

Independent Variable

Distraction. Participants were randomly assigned to either the distraction or control condition. Both conditions practiced the distraction task. Participants in the control condition were told that they would not have to complete the visual responding task at this time. Participants in the distraction condition completed 22 distractor trials during each 50-second passage from the persuasive message.

Dependent Variables

Perceived amount of processing. The items that made up this meta-cognitive index were modified slightly to correspond to the audio presentation of the message. The thought and attention items read: “To what extent were you able to pay attention to [think about] 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 previous studies, and responses were provided on a 7-point scale. The items exhibited good reliability ($\alpha = .96$), so they were again averaged to form the index of perceived amount of processing.

Behavioral intention. Three items were used to assess behavioral intentions. The first item read: “Hypothetically, 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: “Hypothetically, how willing would you be to sign a petition in favor of Wi-Fi Networks?” The third item read: “Hypothetically, 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 7-point scale ranging from *not at all willing* to *completely willing*. These three items exhibited good reliability ($\alpha = .90$), so they were averaged to form an index of behavioral intentions.

Actual amount of processing. Message relevant thoughts and memory items were measured and coded in the same manner as Study 1. Message relevant thoughts and memory items were reliable ($\alpha = .60$), so they were averaged to form a single index of the actual amount of processing.

Attitudes. Attitudes were measured as they were in the previous studies. 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 the previous studies.

Attitude certainty. Attitude certainty was measured as it was in the previous studies. The only change was that attitude certainty items were assessed using 7-point scales to be more consistent with the other measures. Good reliability was again observed for certainty ($\alpha = .97$), so the items were averaged to form a single index.

Distractor task. For participants in the distraction condition, the computer recorded responses to the distractor task items. Responses were coded as correct if both letters were correct and in the correct order (e.g., “UL” was typed when the X appeared in the upper-left quadrant), otherwise the item was coded as incorrect.

Results

ANOVA analyses.

A one-way between-participants ANOVA was conducted to compare the undistracted and distraction conditions on all dependent variables (see Table 3). Memory items indicated that the distraction led to fewer passages being recalled ($M = .52$, $SD = 0.77$) compared to the undistracted condition ($M = 1.95$, $SD = 0.95$), $F(1, 91) = 64.08$, $p < .001$. The number of message relevant thoughts also indicated that fewer thoughts were generated in the distraction condition ($M = 1.72$, $SD = 2.18$) compared to the undistracted condition ($M = 3.28$, $SD = 2.09$), $F(1, 91) = 12.33$, $p < .01$.

Distraction also impacted attitude certainty. As predicted, being distracted led participants to feel less certain in their attitudes ($M = 3.87$, $SD = 1.90$) than those who were not distracted ($M = 5.37$, $SD = 1.20$), $F(1, 91) = 20.06$, $p < .001$.

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 ($M = 2.90, SD = 1.40$) as compared to when they were listening to the audio message by itself ($M = 5.29, SD = 0.95$), $F(1, 91) = 91.19, p < .001$.

As with the previous studies, the effects of distraction on certainty could simply reflect attitude extremity. However, distracted ($M = 1.66, SD = 1.15$) and undistracted conditions ($M = 1.77, SD = 1.14$) showed equal extremity, $F(1, 91) = 0.25, p = .62$. Attitudes were also equal in the distracted ($M = 5.66, SD = 1.15$) and undistracted conditions ($M = 5.68, SD = 1.14$), $F(1, 91) = 0.01, p = .96$.

Finally, if distraction has an impact on attitude certainty, then it could also have an impact on behavioral intentions. 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. Based on this, it was predicted that participants who were not distracted would be more willing to act on their positive attitudes than participants who were distracted. Consistent with this view, those who were not distracted were more willing to act in line with their positive attitudes ($M = 5.45, SD = 1.44$) than were those who were distracted ($M = 4.83, SD = 1.39$), $F(1, 91) = 4.42, p = .038$.

Taken together, the ANOVA analyses indicate that distraction, a manipulated variable, had the same impact on the critical dependent variables as NC did in Study 1. Furthermore, distraction had an impact on behavioral intentions that was in line with the impact on attitude certainty, setting up the possibility that the impact on behavioral intentions might be due to attitude certainty. There is also an opportunity to establish that the proposed meta-cognitive mechanism could be responsible for critical strength consequences such as behavioral intentions. These possibilities were investigated simultaneously using structural equation modeling.

Structural Equation Modeling Analysis

RAMONA (Browne & Mels, 1998) was used to test the fit of our proposed model (see Figure 6) to the results of Study 2 (see Table 4). 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, the parcels for perceived processing were handled in the same manner as in the earlier studies. The number of message relevant thoughts and memory items were taken as two indicators of actual amount of processing, and the three attitude certainty items and behavioral intention items were taken as indicators of their respective constructs. This model had acceptable fit to the data based on all indicators,

χ^2 (41, N = 93) = 56.28, *ns*, NNFI = 0.98, RMSEA = 0.06 (0.00, 0.10). In addition, all of the estimated parameters were significant and consistent with predictions. Thus, taken together, these findings support the proposed model.

Mediational Analyses

In order to decompose the full model above, three mediational analyses were conducted. The first analysis tested the notion that distraction impacted perceived amount of processing because of actual amount of processing. If so, this would indicate that perceived amount of processing again reflected actual differences in the amount of processing rather than deriving solely from sources extraneous to actual thought. Analyses were conducted based on a series of regressions analyses to examine mediation as suggested by Baron and Kenny (1986).

First, the actual amount of processing index was regressed on distraction. Distraction was found to be a significant predictor of actual processing ($b = -0.58, p < .001$). Second, the perceived amount of processing index was regressed on distraction. Distraction was found to be a significant predictor of perceived processing ($b = -0.70, p < .001$). Third, perceived processing was regressed on actual processing and distraction. Actual processing significantly predicted perceived processing ($b = 0.35, p < .001$). However, distraction continued to be a significant predictor of perceived processing as well, ($b = -0.50, p < .001$). The Sobel (1982) test was conducted and results established that the reduction in the path from the distraction to perceived amount of processing was

significant when actual processing was included in the regression equation ($z = 3.55, p < .001$). This suggests that actual amount of processing partially mediates the relationship between distraction and perceived amount of processing (Baron & Kenny, 1986), corroborating the findings based on SEM analysis. That this was not complete mediation suggests that a portion of the participants' perceptions of their processing came directly from the presence or absence of the distraction task itself, beyond the impact of that on their actual ability to process. This likely occurred due to the overt nature of the distraction manipulation in this case. This may explain why this same analysis exhibited full mediation when the antecedent was the NC, which was not at all overt, since it was measured last.

The second analysis tested the notion that actual amount of processing impacted certainty because of perceived amount of processing. This second analysis was conducted to provide a direct replication of the previous studies and to directly test the meta-cognitive component of the proposed mechanism. First, the perceived amount of processing index was regressed on actual processing. Actual processing was found to be a significant predictor of perceived processing ($b = 0.64, p < .001$). Second, the certainty index was regressed on actual processing. Actual processing was found to be a significant predictor of certainty ($b = 0.46, p < .001$). Third, certainty was regressed on perceived processing and actual processing. Perceived processing significantly predicted certainty ($b = 0.72, p < .001$). In addition, actual processing was no longer a significant

predictor of certainty, ($b = 0.05, p = .96$). The Sobel (1982) test was conducted and results established that the reduction in the path from the actual processing to attitude certainty was significant when perceived processing was included in the regression equation ($z = 8.01, p < .001$). This suggests that perceived amount of processing fully mediates the relationship between actual processing and certainty (Baron & Kenny, 1986), which directly replicates the results of the Pilot Study and Study 1 and supports the specific meta-cognitive step of the proposed mechanism.

The third analysis tested the notion that the impact of distraction on behavioral intentions was mediated by attitude certainty. This analysis provided a test of whether certainty could explain the strength consequences of the distraction manipulation. For this analysis, distraction was dummy coded (i.e., control = 0, distraction = 1). First, the attitude certainty index was regressed on distraction. Distraction was found to be a significant predictor of certainty ($b = -0.43, p < .001$). Second, the behavioral intention index was regressed on distraction. Distraction was found to be a significant predictor of behavioral intention ($b = -0.22, p < .05$). Third, behavioral intention was regressed on certainty and distraction. Certainty significantly predicted behavior, ($b = 0.69, p < .001$). In addition, distraction was no longer a significant predictor of behavior, ($b = 0.08, p = .36$). The Sobel (1982) test was conducted and results established that the reduction in the path from distraction to behavioral intentions was significant when certainty was included in the regression equation ($z = 3.90, p < .001$). This suggests that attitude

certainty fully mediates the relationship between distraction and behavioral intentions (Baron & Kenny, 1986). Of course, this analysis does not rule out the possibility that some strength indicator closely related to certainty was in fact directly responsible for behavioral intentions. On the other hand, the null effect of distraction on attitude extremity and attitudes is inconsistent with the most likely alternative.

Discussion

Study 2 is the first to provide comprehensive evidence of a process from the antecedents of elaboration to the strength consequences including actual amount of processing and a strength indicator. The predictions for a purely operative process of this nature have been postulated for nearly 20 years (Petty & Cacioppo, 1986), without comprehensive empirical support from any single investigation. In addition to supporting past predictions, the current findings go beyond this viewpoint by adding clear evidence of a meta-cognitive mediator. The perceived amount of processing provides an explanation for how variation in the amount of operative processing can impact a meta-attitudinal indicator of strength.

By using a manipulated antecedent of elaboration, this study clearly establishes causality within these findings. That is, distraction caused a decrease in message relevant processing, a decrease in perceived processing, a decrease in attitude certainty, resulting in a decreased tendency to behave consistent with held attitudes. Furthermore, these studies together establish the general role of the perception of the amount of processing.

If perceived processing mediates the impact of distraction, need for cognition, and exposure time, then it is able to reflect a wide variety of different antecedents of elaboration. Furthermore, regardless of the source, this meta-cognition has the same consequences for attitude certainty. Thus, perceived amount of processing clearly plays a pivotal role in relation to attitude certainty.

Past research investigating the impact of antecedents of elaboration on attitude strength has utilized variables associated with the motivation to engage in elaborative processing, including NC (Haugtvedt & Petty, 1992) and personal relevance (Haugtvedt & Wegener, 1994; Petty et al., 1983). Study 2 is the first to demonstrate that an ability variable, in this case distraction, can impact strength indicators and consequences as well. Finding parallel results with motivation and ability variables is consistent with the ELM notion that these two categories of antecedents have the same impact on the extent of elaboration.

By directly manipulating an antecedent in Study 2, the observed results are not amenable to alternatives based on confounds with the key predictor variable, as was the case in the Pilot Study and Study 1. However, this does not rule out the possibility that some unmeasured variable downstream from the manipulation played a role in influencing attitude strength. Accordingly, Study 3 is designed to more firmly establish the causal role of the perceived amount of processing.

CHAPTER 5

STUDY 3

Up to this point, perceived processing has been investigated under circumstances where it reflected actual elaboration. As a consequence, some other variable that is confounded with either actual or perceived processing could be responsible for the observed results. Variables such as attitude accessibility, feelings of ease, knowledge, or perceived knowledge, are likely to be influenced by the extent of elaboration. These variables are either strength indicators themselves, or closely related to them, so each could potentially have influenced perceived processing, certainty or strength consequences in the findings to this point. Critically, this raises the possibility that perceived amount of processing is simply a byproduct, while these other variables play the true causal role. In order to address these concerns and firmly establish perceived processing as a cause of attitude strength on its own, Study 3 includes a direct manipulation of the perceived amount of processing. This manipulation will follow the exposure to the persuasive message, thereby controlling for differences in operative processing during the message.

Given that perceived processing and certainty have been measured variables up to this point, it has not been possible to clearly establish the direction of causality between them. That is, perceiving that more processing has taken place is likely to make an individual feel more certain, based on the naïve theory that more extensive thought leads to more accurate judgments (Tordesillas & Chaiken, 1999). However, it is also possible that individuals who feel certain about their views could reason that they have considered their views more thoroughly. In this way, feelings of certainty could provide a source of self-perceptions about the amount of processing that has taken place, such as: "I feel certain about my views, so I must have thought a lot about them." (BEM, 1967). This alternative is somewhat less likely for the current studies, particularly since self-perception tends to occur when there is no basis for judgment, and in each of the studies to this point, actual processing had occurred quite recently. Nevertheless, this alternative would make perceived processing a byproduct of certainty, so it is important to rule it out. In line with the proposed viewpoint, it is expected that manipulating perceived processing will impact attitude certainty.

As noted earlier, the meta-cognition of perceived amount of knowledge provides a plausible alternative to perceived processing. Given the likelihood that actual processing and actual knowledge were confounded in these studies, operative and meta-knowledge provide a parallel alternative account. Indeed, perceived knowledge often reflects actual knowledge (Koriat, 1993), and knowledge has been associated with strength outcomes

such as resistance (Cacioppo & Petty, 1980) and attitude-behavior consistency (Davidson et al., 1985). Accordingly, the manipulation used in Study 3 was designed to be as unrelated as possible to perceived knowledge. However, it is difficult to imagine a manipulation of perceived amount of processing which, one could be assured, a priori, would not to impact perceived knowledge. So perceived knowledge was also measured to assess whether it provided a plausible alternative for this study.

The manipulation of perceived processing also offers an opportunity to investigate how a factor extraneous to the actual amount of processing can impact perceived processing. This manipulation consisted of rigging performance of participants on an Attention Quiz. Participants in the relevant information condition received all of the information that is needed for the quiz, whereas participants in the irrelevant information condition read an equivalent message with information on the topic of the quiz, but which was insufficient to answer the particular questions on the quiz. In this way the persuasive messages that participants received set up success or failure on the Attention Quiz. Those performing well on the Attention Quiz should infer that they processed the message carefully, whereas those who do poorly should infer that they did not independent of their actual processing. It is predicted that perceived processing would have the same consequences regardless of the source. Thus, greater perceived processing resulting from performing well on the Attention Quiz is expected to increase attitude certainty and positive behavioral intentions.

Method

Participants

One hundred and 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 directly relevant or not to items on an Attention Quiz they would complete. As with the previous studies, 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 questions on the quiz were taken from content covered in arguments 1-4. Participants were then told to complete the Attention Quiz on their clipboards, and the title of the quiz was reiterated on the quiz itself. Participants were told that the quiz was only an assessment of how well they had thought about or paid attention to the message. The quiz consisted of eight multiple-choice questions directly related to details contained in arguments 1-4. The quiz questions were designed to contain content that was related

to the content of either set of arguments. After the Quiz, the computer provided participants with the correct answers to the quiz. Participants were instructed to score their own quizzes, to write the number correct over the total questions at the bottom of the quiz, and then to enter the number correct into the computer. This was intended to emphasize how well or poorly they performed on the quiz.

Following the quiz, participants completed the other dependent variables in the following order: attitudes, perceived thought and attention, attitude certainty, behavioral intention, and finally perceived care and attention taken in reading the message and perceived amount of knowledge and information about the topic.

Independent Variable

Quiz performance condition. 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. Pre-test data taken from the same population ($N = 56$) indicated that, by themselves, these two sets of arguments produced equivalent attitudes, attitude certainty, and perceived amount of processing and behavioral intentions, all $F_s < 1.0$.

Dependent Variables

Quiz performance. The number correct out of eight provided a measure of quiz performance.

Attitude. Attitudes were measured using the same items as 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 previous studies.

Perceived amount of processing. Perceived amount of processing was measured in the same manner as in Study 1, except that responses to all five items were provided on a 7-point scale. The items exhibited good reliability ($\alpha = .91$), so they were again averaged to form the index of perceived amount of processing.

Perceived amount of knowledge and information. Perceived amount of knowledge or information about the topic provides a possible alternative meta-cognition to perceived amount of processing. Two items were used to assess the participant's perception of the amount of knowledge and information they had on the topic of Wi-Fi Networks: "How much knowledge [information] do you have about Wi-Fi Networks?" These items were based on those used to measure perceived amount of knowledge in previous research (Wegener et al., 1995). 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 to form a single index.

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

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

Results

ANOVA analyses. A one-way, between-participants ANOVA was conducted to compare participants who received quiz relevant information and those who received quiz irrelevant information for all dependent variables (see Table 5). The rigging of quiz performance was successful, because the relevant information condition performed much better on the quiz ($M = 5.91, SD = 1.44$) than the irrelevant information condition ($M = 3.98, SD = 1.28$), $F(1, 110) = 55.82, p < .001$.

The quiz relevant information condition also reported perceiving that they had processed the message more extensively ($M = 4.65, SD = 1.26$) compared to the irrelevant information condition ($M = 3.48, SD = 1.03$), $F(1, 110) = 29.08, p < .001$. In addition, 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 ($M = 4.38, SD = 1.53$), $F(1, 110) = 7.72, p < .001$. Importantly, there were no differences between quiz relevant ($M = 1.94, SD = 0.94$) and quiz irrelevant conditions, ($M = 1.63, SD = 0.97$), $F(1, 110) = 2.95, p = .09$ in terms of their attitude extremity regarding Wi-Fi Networks. The results for attitudes were identical, 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, ($M = 5.63$, $SD = 0.97$), $F(1, 110) = 2.95$, $p = .09$. Since the impact of condition on attitude extremity approached significance, an analysis of covariance (ANCOVA) analysis was conducted to verify that the condition continued to impact attitude certainty when controlling for attitude extremity. This effect remained significant when attitude extremity was included as a covariate in the analysis, $F(1, 110) = 4.61$, $p < .05$.

Perceived amount of knowledge and information, which serves as an alternative meta-cognitive variable, was not affected by the quiz information manipulation. Perceived knowledge and information were the same whether participants were in the quiz relevant ($M = 3.61$, $SD = 1.55$) or quiz irrelevant conditions ($M = 3.30$, $SD = 1.69$), $F(1, 110) = 1.04$, $p = .310$. This indicated that perceived knowledge and information did not provide an alternative mediator for the effect of the manipulation on attitude certainty.

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 relevant information condition indicated more positive behavioral intentions overall, ($M = 5.69$, $SD = 1.33$), than those the irrelevant information condition ($M = 5.03$, $SD = 1.37$), $F(1, 110) = 6.59$, $p < .05$. An ANCOVA was again

conducted to investigate whether the impact of the condition on behavioral intentions remained when attitude extremity was included as a covariate. The effect of condition on behavioral intentions remained significant even when the covariate was included, $F(1, 110) = 3.71, p = .05$. Thus, the information relevance manipulation impacted perceived amount of processing, attitude certainty and behavioral intentions.

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, with the consequences observed in the previous studies, then 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 7). The manipulation and quiz score were included as manifest variables and the parcels for perceived amount of processing and items for attitude certainty were handled as they were in Study 1 (see Table 6). The quiz manipulation was dummy coded (0 = quiz irrelevant information, 1 = quiz relevant information) for both the SEM and mediational analyses. Behavioral intentions were handled as they were in Study 2. The proposed model was a good fit to the data, $\chi^2(33, N = 112) = 45.65, ns$, NNFI = 0.98, RMSEA = 0.06 (0.00, 0.09). In addition, all estimated parameters were significant and consistent with predictions.

Mediational Analyses

In order to decompose the full model above, two mediational analyses were conducted. The first analysis explored the notion that the quiz manipulation impacted attitude certainty because of perceived amount of processing. If so, this would indicate that the impact on an extraneous factor on certainty can also be explained by the meta-cognitive perceived amount of processing. First, certainty was regressed on the quiz manipulation. The quiz manipulation significantly predicted certainty ($b = 0.26, p < .01$). Second, the perceived amount of processing index was regressed on the quiz manipulation. The quiz manipulation was a significant predictor of perceived processing ($b = 0.46, p < .001$). Third, certainty was regressed on perceived processing and the quiz manipulation. Perceived processing significantly predicted certainty ($b = 0.57, p < .001$). However, the quiz manipulation was no longer a significant predictor of certainty, ($b = -0.01, p = .95$). The Sobel (1982) test was conducted and results established that the reduction in the path from the quiz manipulation to attitude certainty when perceived processing was included in the regression equation ($z = 4.14, p < .001$). These findings indicate that perceived processing mediates the impact of the extraneous quiz manipulation on attitude certainty (Baron & Kenny, 1986).

The second analysis explored the notion that the impact of the quiz manipulation on behavioral intentions was mediated by attitude certainty. This analysis provided a test of whether certainty could explain the strength consequences of the quiz manipulation.

First, the attitude certainty index was regressed on the quiz manipulation. The quiz manipulation was found to be a significant predictor of certainty ($b = 0.25, p < .01$). Second, the behavioral intention index was regressed on the quiz manipulation. The quiz manipulation was found to be a significant predictor of behavioral intention ($b = 0.23, p < .05$). Third, behavioral intention was regressed on certainty and the quiz manipulation. Certainty significantly predicted behavior, ($b = 0.66, p < .001$). In addition, the quiz manipulation was no longer a significant predictor of behavior, ($b = 0.06, p = .34$). The Sobel (1982) test was conducted and results established that the reduction in the path from the quiz manipulation to behavioral intentions was significant when certainty was included in the regression equation ($z = 2.65, p < .01$). This suggests that attitude certainty fully mediates the relationship between the quiz manipulation and behavioral intention (Baron & Kenny, 1986). These findings indicate that attitude certainty was responsible for the strength consequences that resulted from the quiz manipulation. And, the previous mediation indicated that the quiz manipulation affected certainty, because of its impact on the perceived amount of processing.

Discussion

Study 3 established that merely perceiving that more processing has occurred has consequences for attitude certainty and even behavioral intentions. As psychologists have often noted, the perception of reality is often more important than reality itself. In the prior studies, perceived processing and certainty were measured variables, so it was

not possible to assess the direction of causality. In this study, perceived processing was manipulated by rigging performance on a quiz that was explicitly referred to as an Attention Quiz. Participants who were set up to perform well on the Attention Quiz reported feeling more certain in their resulting attitudes. Thus, a manipulation of perceived processing caused differences in attitude certainty. The impact of the manipulation on behavioral intentions shows that perceived processing also produces strength consequences. Since this quiz followed the presentation of the message itself, the impact of perceived processing on certainty and behavioral intentions was independent of differences in actual processing. Thus, this study establishes that perceived processing can impact certainty independent of actual processing, and have consequences for behavioral intentions.

Manipulating perceived amount of processing using quiz performance also helps to rule out a number of variables that could have been confounded with perceived processing in previous studies. For example, attitude accessibility or actual knowledge differences resulting from idiosyncratic variation in actual processing during the message cannot explain these results. 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 as a function of the quiz manipulation. If anything, feelings of ease during the quiz should contribute to the strength of the manipulation and its impact on perceived amount of

processing. Finally, the current results are consistent with the notion that the Attention Quiz manipulation was successful in influencing the perception of the amount of processing without any impact on perceived knowledge. The similarity of the thought and attention items to the knowledge and memory items makes poor measurement sensitivity an unlikely explanation for the null effect on perceived knowledge. Thus, while perceived amount of processing typically covaries with a variety of operative and meta-cognitive variables that fall outside of the proposed process, the results of Study 3 were generally inconsistent with their influence in this case.

Since 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, participants were told that they would be sharing their views on Wi-Fi Networks after reading the message. This should encourage 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 of message

information. This is particularly true given that the participants were college students. Thus, it seems unlikely that the manipulation induced differential memory-based processing in a way that explains the observed results.

CHAPTER 6

GENERAL DISCUSSION

Contemporary models of persuasion have long postulated a process from antecedents of elaboration to strength consequences, which was mediated by the extent of elaboration and strength indicators (Petty & Cacioppo, 1986; Petty, Haugtvedt, & Smith, 1995). Although this process determines which attitudes are likely to be consequential, a review of the literature revealed two critical gaps in the support for this view. First, few investigations provide comprehensive support for this view, including each step in the framework. Second, little is known about *how* the extent of elaboration influences attitude strength. Accordingly, the current investigation provides the following advances: (a) it is one of the first investigation to encompass the entire process surrounding an attitude strength indicator from the antecedents to the strength consequences, (b) it introduces a novel meta-cognitive mechanism to explain how operative differences in actual amount of processing are reflected in meta-attitudinal certainty by way of the perception of the amount of processing, (c) it shows that perceived amount of processing is a proximal and independent determinant of attitude certainty, which mediates certainty regardless of whether it derives from observed variation in processing time, need for cognition, distraction, or factors extraneous to elaboration, (d) it reinforces the idea that

change in behavior can result from the impact of extraneous factors on meta-cognition, independent of operative cognition.

The purpose of the current investigation was to provide evidence for the proposed meta-cognitive hypothesis, which specified a set of causal relationships as follows: antecedents of elaboration→actual amount of processing→perceived amount of processing→attitude certainty→strength consequences. Across four studies, each of the postulated causal relationships was supported in at least two separate studies. Both chronic differences in the need for cognition (Study 1), and a manipulation of distraction (Study 2) influenced the number of issue relevant thoughts and memory items participants were able to list. The amount of time spent with a persuasive message (Pilot Study), and the number of issue-relevant thoughts and memories (Studies 1 and 2) were each reflected in the meta-cognitive perception of the amount of processing. Whether it reflected the amount of actual processing (Pilot Study, Studies 1 and 2), or an extraneous factor independent of actual processing (Study 3), the perceived amount of processing influenced attitude certainty. Finally, certainty deriving from this meta-cognitive process, had consequences, leading behavioral intentions to be more in line with predominantly positive attitudes following the message (Studies 2 and 3). This was true whether perceived processing reflected the amount of actual processing or a factor extraneous to actual processing.

Very few investigations have attempted to provide comprehensive evidence for the relationship between elaboration and attitude strength. For example, Haugtvedt and Petty (1992) is the only study we are aware of to report specific evidence for all four components of the operative account for attitude strength. Like most previous studies, all of the reported evidence was based on pairwise relationships between variables, rather than testing all of the relationships simultaneously or even testing for mediation. The current investigation improved on this approach by using Structural Equation Modeling to simultaneously test all of the postulated causal relationships. In all four studies, models based on the proposed meta-cognitive hypothesis fit the observed data. Furthermore, in each case, all of the predicted causal paths were significant. These analyses were further supported by more traditional mediational analyses using regression techniques.

Overall, the least understood aspect of the process from elaboration to attitude strength has been the relationship between the amount of elaboration and indicators of strength. The case of attitude certainty raises the particularly intriguing issue of how operative variation in the amount of elaboration comes to impact a meta-attitudinal indicator of strength. According to the meta-cognitive hypothesis, actual processing can influence attitude certainty, because it is possible to perceive the amount of processing that has taken place. When perceived processing reflects operative processing, then it can mediate the impact of operative processing on attitude certainty. Consistent with this

view, perceived amount of processing reflected the actual amount of processing across three studies (Pilot Study, Studies 1 and 2), whether operative processing was measured based on time spent with the message or the number of cognitive responses generated. It is not clear from these findings exactly what aspect of the amount of processing this perception is sensitive to, because various aspects of thought, such as the amount of time and the number of thoughts are confounded. However, the current results are sufficient to establish that the perception of amount of processing can reflect the actual amount of processing. Critically, perceived amount of processing fully mediated the impact of elaboration on certainty, in all three studies. These findings are consistent with previous research, which has viewed perceived processing as reflecting, at least in part, actual processing (Batra & Ray, 1986; Fukada, 1986; Petty et al., 1977). Thus the current investigation establishes a clear mechanism for how the extent of elaboration can impact a meta-attitudinal strength indicator, such as attitude certainty.

Perhaps the most exciting finding of the current investigation is that in Study 3 mere perception of processing was sufficient to produce behavioral change, completely independent of actual processing. These results offer an intriguing avenue for creating behavioral change. According to contemporary models of persuasion, attitude change that is consequential requires extensive elaborative processing. The current results provide a second option. Namely, leading an individual to perceive that they have elaborated extensively also produces behavioral change in the direction of the attitude.

This provides a novel, low effort process to create behavior change. It suggests such advertising taglines as, “You’ve thought a lot about buying a car...” have the potential to increase certainty. One interesting question for future research is how persistent metacognitively based behavioral change is likely to be.

Finally, the current findings are consistent with recent research showing that the perceptions surrounding attempts to resist persuasive can impact certainty and behavioral intentions (Rucker & Petty, 2004; Tormala & Petty, 2002, 2004a, 2004b, 2004c). For example, Tormala and Petty (2002) found that participants who were led to believe they had resisted strong arguments were more likely to behave in line with their attitudes than those who believed they had resisted weak arguments. Furthermore, this relationship was explained by the impact of perceived argument strength on attitude certainty (i.e., people who believed they resisted strong arguments became more certain of their attitudes than people who believed they resisted weak arguments). Thus, the current findings along with recent results in the area of resistance support a new set of meta-cognitive processes that influence behavior independent of operative cognition.

Alternative Accounts

According to the meta-cognitive hypothesis, perceived amount of processing is a mediator of the relationship between elaboration and certainty. As such, it provides the first clear account of how the operative amount of thought can impact a meta-attitudinal strength indicator. Although the current evidence supports this hypothesis, it is also

important to consider alternative accounts for these findings. Thus the current results will be reviewed in relation to alternative accounts based on certainty being a proxy for extremity or accessibility. In each case, the current evidence is inconsistent with these alternatives. Of course, these alternative variables likely play a role under other circumstances.

Attitude extremity. Attitude extremity and attitude certainty have often been confounded in the past, 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 for those engaged in low and high elaboration processes respectively. This approach was successful in that across all four studies, the same variables, which influenced attitude certainty, failed to have a significant impact on attitudes. 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, which elicited more neutral 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 attitude (e.g., rice, coffee mugs). Thus, to the extent that it is possible to argue based on null results, the current results failed to support the notion that attitude extremity was responsible for the observed effects on attitude certainty.

Attitude accessibility. Accessibility provides a second attitude strength indicator that could provide an alternative account for the current findings. Past research suggests that elaboration produces more accessible attitudes, and attitude accessibility has been associated with both attitude certainty and increased attitude-behavior correspondence (see Fazio, 1995). Indeed, it is plausible that participants who engaged in more extensive elaboration of the messages in the current studies had more accessible attitudes as a result, at least well after the experiments were over. However, there are reasons to believe that attitude accessibility does not provide an alternative account for the current results. First, the methods used in the Pilot Study and Studies 1 and 2 were likely to make the attitudes very accessible for all participants just before attitudes were measured. That is, participants were told that they would be sharing their views on the issue after the message, so they were likely to engage in online evaluation of the issue (Hastie & Park, 1986). In addition, the measure of attitudes directly followed either the passage itself, or the thought listing, insuring that responses to the issue were salient in the minds of participants. So, attitudes were likely to be highly accessible to participants in general, whether their attitude was based on less thoughtful processing of peripheral cues, such as

source credibility and the number of arguments, or more thoughtful processing of the merits of the arguments. Of course, attitude accessibility would be more likely to provide an account for attitude certainty effects if attitudes had been measured following a time delay if it led to decay. On the other hand, if a memory formed of certainty or the perceived amount of thought associated with an attitude (see, Bassili, 1996), this could lead to strength consequences into the future. Second, the methods used in Study 3 make it difficult to explain based on an attitude accessibility account. In this study perceived amount of processing was manipulated using an Attention Quiz that was rigged for success or failure. Critically, the quiz followed the presentation of the message, so the manipulation was independent of any idiosyncratic differences in the amount of actual processing which might produce differential attitude accessibility. The manipulation nevertheless had an impact on certainty and behavioral intentions, so attitude accessibility resulting from differential elaboration of the message cannot explain these results. Taken together, attitude accessibility does not provide a plausible alternative for the findings across the current studies. Without covering each alternative variable separately, Study 3 is inconsistent with a number of alternative accounts, based on the same logic above. Any account based on differential effects in response to the message itself cannot explain the results of Study 3, including knowledge, a purely operative thought-based account, or ease of recall of the arguments.

Understanding Meta-Cognitive Contributions to Attitude Strength

Finally, the current results have ramifications for our understanding of the role of meta-attitudinal indicators of strength. According to critics, meta-attitudinal indicators serve as proxies for the actual mechanism behind attitude strength, which is purely operative (Bassili, 1996). This notion leads to a number of predictions for the role of attitude certainty, which were not supported in the current investigation. If meta-attitudinal indicators only work through their covariation with operative indicators of strength, then they should only be loosely related to operative thought antecedents and strength consequences. The current results were inconsistent with this viewpoint, because attitude certainty reflected variation in the actual amount of processing and it mediated the impact of elaboration antecedents on behavioral intentions. This is consistent with evidence relating elaboration with attitude certainty (Haugtvedt & Petty, 1992), and certainty with strength consequences (see Gross et al., 1995, for a review). The current results also showed that a meta-level perception mediated the relationship between operative thought and attitude certainty. This is inconsistent with the notion that the real mechanism is purely operative, with meta-attitudinal indicators having a single link to operative indicators. Finally, if meta-attitudinal indicators only serve as proxies, then they should not lead to strength consequences in the absence of variation in operative variables. However, manipulating perceived processing independent of actual processing produced an impact on attitude certainty with consequences for behavioral

intentions. Recent research has shown that perceptions of resistance processes can also influence certainty with consequences for attitude-behavior correspondence, independent of actual processing differences (Rucker & Petty, 2004; Tormala & Petty, 2002, 2004b), which is consistent with evidence that meta-cognitive variables can play an independent role in persuasion processes in general (see Petty et al., in press, for a review). Thus, it appears that far from a mere proxy, attitude certainty can reflect operative processing and play a mediating role in strength consequences.

With growing evidence that meta-level variables can play a central role in attitude strength, this raises a new set of questions, such as when they are likely to play a role, how they come to reflect operative processes, and what determines when they are likely to reflect operative processes. The current investigation provides some initial insights into these questions discussed in the next section.

Limitations and Future Directions

A number of factors provide potential moderators of the impact of perceived processing on attitude certainty and strength consequences. For instance, does actual amount of thought have to be particularly salient in order to be perceived? If cognitive responses to an object are ambivalent, does increased thought still lead to certainty? How might boundary conditions of secondary thought in general affect perceived amount of processing? Is the current process likely to apply to all strength consequences? These types of questions suggest directions for future research.

The current investigation focused on circumstances of a recent persuasion attempt. In this context, the amount of actual processing that has taken place is particularly salient, so this raises the possibility that the observed impact of perceived amount of processing might be limited to these circumstances. However, the results from the Pilot Study and Study 3 suggest that it is not necessary for the amount of thought to be particularly salient for perceived amount of processing to have consequences. In the Pilot Study, the amount of processing was measured surreptitiously using the amount of time participants chose to expose themselves to the message. Nevertheless, in both cases, perceived processing reflected this indicator of actual amount of processing. Study 3 illustrated that perceived amount of processing can be consequential completely independent of any variation in the actual amount of processing. This suggests that both actual processing and factors extraneous to actual processing can lead to perceived processing and its consequences.

Other potential extraneous factors include contextual variables such as social comparison information, and internal variables such as feeling worried, both of which relate to certainty (Gross et al., 1995; Tiedens & Linton, 2001). Taken together, there are a large number of variables that could lead to perceptions of elaboration, including actual thoughts that are recently generated or recalled, internal and external extraneous factors, and stored perceptions of the amount of processing. Thus, the salience of recent thought is unlikely to be a boundary condition for the impact of perceived amount of thought.

However, it could be that perceived processing has an impact only when some variable makes the notion of the quantity of thought salient. Future research is needed to investigate which of the factors known to impact certainty does so via the perceived amount of processing. Of course, some circumstances are likely to make certainty less responsive to perceived processing, such as when certainty derives from attitude extremity.

Another critical question is whether the current results depend on the nature of thoughts themselves. In particular, if thoughts are mixed towards the message, will more thoughts still lead to greater certainty? Based on the current results, increased elaboration results in certainty whether the topic elicits primarily positive thoughts (i.e., Wi-Fi Networks) or mixed thoughts (i.e., Senior Comprehensive Exams).⁴ Of course, it should be expected that having mixed thoughts will result in less certainty than having thoughts of one valence, consistent with extremity causing certainty (Gross et al., 1995). On the other hand, among those who have mixed thoughts, having more mixed thoughts could still result in greater certainty than having fewer mixed thoughts. One exception could be topics that elicit feelings of ambivalence, because this negative affect could itself undermine certainty. Previous research has also shown that the typical polarizing effect of thought on attitudes disappears in when a topic is selected to provide a value conflict for an individual (e.g., “Should public park lands be opened to mining and exploration to promote economic growth and prosperity?”) (Liberian & Chaiken, 1991). In sum, more

extensive elaboration produces greater certainty whether thoughts are mixed or primarily of one valence, however, it could be that this does not apply when ambivalence produces negative affect or when an issue is associated with a personal value conflict.

In general, since secondary thought is made up of thoughts about thoughts and internal processes, then primary thought is viewed as necessary in order for secondary thought to operate (Petty et al., in press). In line with this view, processes based on secondary thought tend to operate when elaboration likelihood is either moderate or high. Evidence suggests that circumstances that elicit low elaboration tend to attenuate the role of secondary thought processes including self-validation effects (Petty et al., 2002), ease of retrieval (Tormala et al., 2002), and perceptions of resistance (Tormala & Petty, 2004a). By making the topics at least moderately personally relevant in the current studies, it was expected that the majority of participants would have sufficient elaboration to engage in secondary thought. Under circumstances where perceived amount of processing reflects actual thought, then clearly some variation in the extent of elaboration is required to observe the current findings. On the other hand, it is unclear whether perceptions of the amount of thought are likely to be formed under low elaboration conditions. In some cases, it could be that perceptions of the amount of thought are the only cognitions an individual has regarding an issue, reflected in sentiments such as the following, “I don’t really care, so I haven’t given it a lot of thought.”

One issue that remains is whether perceived processing can be viewed as merely a proxy for attitude certainty. After all, perceived processing and certainty were closely related throughout the current investigation. On the other hand, the current findings were based on circumstances where recent elaboration raised the awareness of extent of thought. Under other circumstances, it seems more likely that perceived processing and certainty will diverge. One case would be an affectively based attitude that is extreme and therefore likely to be held with certainty. For example, when food poisoning sets in, attitudes toward the offending food are likely to be extremely negative and held with certainty. Here certainty is unlikely to be based on any perception of the extent of processing about the food because behavioral direct experience leads to the certainty. However, for most attitudes, not based on direct experience, the perception of thinking is likely to be more important.

There are also circumstances where increased thought is not associated with greater certainty. For example, depression, which is associated with chronic feelings of uncertainty, is often accompanied by ruminative thought (Segerstrom, Stanton, Alden, & Shortridge, 2003). In addition, increased thought on topics when a value conflict is present, fails to produce more extreme attitudes (Liberian & Chaiken, 1991). These circumstances, where certainty is unlikely to reflect the extent of processing, suggest that perceived amount of processing and certainty are not interchangeable.

The current investigation has established that perceived processing provides a mediating variable for attitude certainty with consequences for behavioral intentions. However, it is unclear whether this same meta-cognitive mechanism can also produce 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 presented in the study suggest that certainty covaried with operative processing variables. So, it is an open question whether certainty based on perceived processing that is extraneous to actual processing would produce increased persistence and resistance. Extraneous perceived processing should lead to persistence and resistance particularly when the level of certainty itself is sufficient to produce these consequences. For example, Tormala and Petty (2002, Study 3) showed that when an argument is resisted, the mere perception that the argument was strong as opposed to weak led to greater certainty and greater future resistance. However, it is unclear whether purely extraneous perceived processing enhances persistence and resistance when these consequences require aspects of the attitude that derive from operative processing (e.g., number of thoughts, accessibility). For example, Haugtvedt and Petty (1992) found that certainty led to counter-arguing and resistance when it was based on actual elaboration, but not when it was based on less thoughtful source expertise. Even when certainty is not based on actual elaboration, it is possible that certainty could motivate greater counter-

arguing, increasing resistance, and greater willingness to maintain extreme attitudes, increasing persistence. Thus, it seems likely that certainty deriving from extraneous perceived processing could produce other strength consequences, however the conditions under which this takes place await future research.

Conclusion

Now, imagine yourself as a college freshman again, doubting your choice of schools. If you could call up memories of long conversations on the topic or other indications of extensive actual thought, this should make you feel more certain about your choice. But what if you put little actual thought into your decision? The current research suggests that the perception of the extent of thought can influence certainty independent of actual thought. Thus, anything that increases the mere perception of thought could resolve this sense of doubt. For example, you could seek out a fellow student who put much less thought into the decision than you did. For this purpose, anyone who flipped a coin or played “pin the tail on the college” should do. Armed with the perception of engaging in more extensive thought than your fellow student, you should be feeling more certain in no time. And even though your perception does not reflect actual thought, it can lead to behaviors such as wearing school colors or buying season tickets.

ENDNOTES

¹A second pre-test sample ($N = 57$) was taken from the same population used in this Pilot Study. Participants were randomly assigned to 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 all seven of the Wi-Fi arguments. Following the message, participants completed two 7-point semantic differential items measuring attitudes (i.e., *good-bad*, *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.

² Parallel analyses were conducted using more common regression techniques to test for mediational relationships, in order to corroborate the findings based on SEM analyses in the Pilot Study. These analyses investigated whether the impact of exposure time on attitude certainty was mediated by the perceived amount of processing. Analyses were conducted based on a series of regressions analyses to examine mediation as suggested by Baron and Kenny (1986). First, the attitude certainty index was regressed on the index of exposure time. The exposure time was found to be a significant predictor of certainty ($b = 0.25$, $p < .05$). Second, the perceived amount of processing index was regressed on exposure time. Exposure time was found to be a significant predictor of

perceived processing ($b = 0.43, p < .001$). Third, certainty was regressed on exposure time and perceived processing. Perceived processing significantly predicted certainty ($b = 0.56, p < .001$). In addition, exposure time no longer a significant predictor of certainty, ($b = 0.01, p = .92$). The Sobel (1982) test was conducted and results established that the reduction in the path from the exposure manipulation to certainty was significant when perceived processing was included in the regression equation ($z = 3.16, p < .01$). These analyses suggest that perceived amount of processing fully mediates the relationship between exposure time and attitude certainty (Baron & Kenny, 1986), corroborating the findings based on SEM analysis.

³ Parallel analyses were conducted using more common regression techniques to test for mediational relationships (Baron & Kenny, 1986). These analyses investigated whether the impact of NC on perceived amount of processing was mediated by the actual amount of processing. First, the actual amount of processing index was regressed on NC. The NC was found to be a significant predictor of actual processing ($b = 0.35, p < .01$). Second, the perceived amount of processing index was regressed on NC. NC was found to be a significant predictor of perceived processing ($b = 0.36, p < .01$). Third, perceived processing was regressed on actual processing and NC. Actual processing significantly predicted perceived processing ($b = 0.51, p < .001$). In addition, NC was no longer a significant predictor of perceived processing, ($b = 0.18, p = .06$). The Sobel (1982) test was conducted and results established that the reduction in the path from NC to actual

processing was significant when perceived processing was included in the regression equation ($z = 2.78, p < .01$). These analyses suggests that actual amount of processing fully mediates the relationship between NC and perceived amount of processing (Baron & Kenny, 1986), corroborating the findings based on SEM analysis.

⁴The 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 $F(1, 80) = 3.11, p = .12$.

APPENDIX A

TABLES

Table 1
Pilot study: Correlation matrix of measured variables

Variable	1	2	3	4	5	6	7	8
1. Time1	(113.36)							
2. Time2	.87**	(119.02)						
3. Time3	.84**	.91**	(129.87)					
4. Perc1	.32**	.36**	.32**	(0.78)				
5. Perc2	.40**	.45**	.46**	.82**	(0.84)			
6. Cert1	.27*	.31**	.25**	.51**	.53**	(3.35)		
7. Cert2	.24*	.25*	.21	.57**	.56**	.92**	(3.15)	
8. Cert3	.16	.19*	.14	.50**	.47**	.81**	.84**	(3.74)
Mean	27.61	24.51	25.16	0.00	0.00	6.15	6.30	5.85

Note. Time = exposure time, Perc = perceived processing, Cert = attitude certainty. Numbers following the variable labels denote the separate parcels for each construct. Numbers on the main diagonal denote variances. $N = 73$.
 * $p < .05$, ** $p < .01$.

Table 2
Study 1: Correlation matrix of measured variables

Variable	1	2	3	4	5	6	7	8	9	10
1. NC1	(123.83)									
2. NC2	.71**	(.54)								
3. NC3	.68**	.73**	(.45)							
4. Amnt1	.27*	.29**	.26*	(1.00)						
5. Amnt2	.24*	.21	.29**	.39**	(1.00)					
6. Perc1	.37**	.25*	.37**	.39**	.57**	(0.77)				
7. Perc2	.33**	.22	.33**	.30**	.54**	.81**	(0.81)			
8. Cert1	.28*	.25*	.21	.16	.25*	.38**	.47**	(3.06)		
9. Cert2	.36**	.29**	.27*	.20	.27*	.48**	.50**	.86**	(3.20)	
10. Cert3	.25*	.21	.18	.06	.09	.34**	.38**	.72**	.75**	(3.42)
Mean	61.01	3.52	3.34	0.00	0.00	0.00	0.00	5.79	5.91	5.83

Note. NC = need for cognition, Amnt = amount of processing, Perc = perceived processing, Cert = attitude certainty. Numbers following the variable labels denote the separate parcels for each construct. Numbers on the main diagonal denote variances. $N = 81$.

* $p < .05$, ** $p < .01$.

Table 3
Dependent Variables as a Function of Distraction Condition in Study 2

Dependent Measure	Distraction Condition	
	No Distraction (<i>n</i> = 45)	Distraction (<i>n</i> = 48)
Relevant Thought		
<i>M</i>	3.28 _a	1.72 _b
<i>SD</i>	2.09	2.18
Relevant Memory		
<i>M</i>	1.95 _a	0.52 _b
<i>SD</i>	0.95	0.77
Perceived Processing		
<i>M</i>	5.29 _a	2.90 _b
<i>SD</i>	0.95	1.40
Certainty		
<i>M</i>	3.87 _a	5.37 _b
<i>SD</i>	1.90	1.20
Behavior Intentions		
<i>M</i>	5.45 _a	4.85 _b
<i>SD</i>	1.44	1.39
Attitude Extremity		
<i>M</i>	1.77 _a	1.66 _a
<i>SD</i>	1.14	1.15

Note. Subscripts should be interpreted in rows only. Means with different subscripts differ from each other.

Table 4
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. Amnt1 (1.26)	-.35**										
3. Amnt2 (5.14)	-.64**	.43**									
4. Perc1 (0.83)	-.74**	.44**	.64**								
5. Perc2 (0.91)	-.63**	.44**	.61**	.92**							
6. Cert1 (3.64)	-.44**	.38**	.42**	.70**	.85**						
7. Cert2 (3.18)	-.39**	.32**	.39**	.68**	.74**	.95**					
8. Cert3 (3.20)	-.40**	.38**	.40**	.65**	.54**	.88**	.89**				
9. BI1 (2.38)	-.18	.15	.26*	.35**	.47**	.63**	.64**	.66**			
10. BI2 (3.24)	-.21*	.13	.24*	.32**	.60**	.54**	.53**	.53**	.79**		
11. BI3 (1.82)	-.20*	.20*	.27**	.33**	.60**	.60**	.61**	.61**	.85**	.70**	
Mean	0.51	1.22	2.48	0.00	0.00	4.59	4.61	4.59	5.16	4.78	4.45

Note. Amnt = amount of processing, Perc = perceived processing, Cert = attitude certainty, BI = behavioral intention. Numbers following the variable labels denote the separate parcels for each construct. Numbers on the main diagonal denote variances. $N = 93$.

* $p < .05$, ** $p < .01$.

Table 5
Dependent Variables as a Function of Quiz Condition in Study 3

Dependent Measure	Quiz Condition	
	Success (<i>n</i> = 57)	Failure (<i>n</i> = 55)
Quiz Score		
<i>M</i>	5.91 _a	3.98 _b
<i>SD</i>	1.44	1.28
Perceived Processing		
<i>M</i>	4.65 _a	3.48 _b
<i>SD</i>	1.28	1.03
Certainty		
<i>M</i>	5.13 _a	4.38 _b
<i>SD</i>	1.33	1.53
Behavior Intention		
<i>M</i>	5.69 _a	5.03 _b
<i>SD</i>	1.33	1.37
Perceived Knowledge		
<i>M</i>	3.61 _a	3.30 _a
<i>SD</i>	1.55	1.69
Attitude Extremity		
<i>M</i>	1.94 _a	1.63 _a
<i>SD</i>	0.94	0.97

Note. Subscripts should be interpreted in rows only. Means with different subscripts differ from each other.

Table 6
 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. Perc1	.47**	.63**	(1.00)							
4. Perc2	.40**	.58**	.84**	(1.00)						
5. Cert1	.26**	.39**	.50**	.53**	(2.36)					
6. Cert2	.22*	.41**	.55**	.58**	.85**	(2.22)				
7. Cert3	.23*	.31**	.46**	.43**	.74**	.75**	(3.14)			
8. BI1	.22*	.31**	.43**	.43**	.54**	.65**	.64**	(2.23)		
9. BI2	.19*	.24*	.24**	.22*	.47**	.51**	.47**	.77**	(3.06)	
10. BI3	.24*	.33**	.45**	.45**	.60**	.67**	.70**	.83**	.68**	(1.64)
Mean	0.51	4.96	0.00	0.00	4.96	4.94	4.39	5.36	5.07	5.68

Note. Perc = perceived processing, Cert = attitude certainty, BI = behavioral intention. Numbers following the variable labels denote the separate parcels for each construct. Numbers on the main diagonal denote variances. $N = 112$.
 * $p < .05$, ** $p < .01$.

APPENDIX B

FIGURES

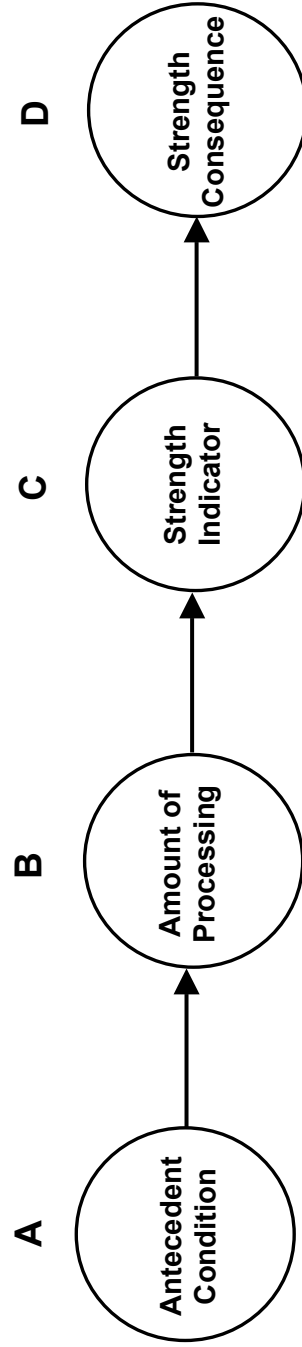


Figure 1: Operative view of causal relationships between antecedents of the amount of processing and attitude strength.

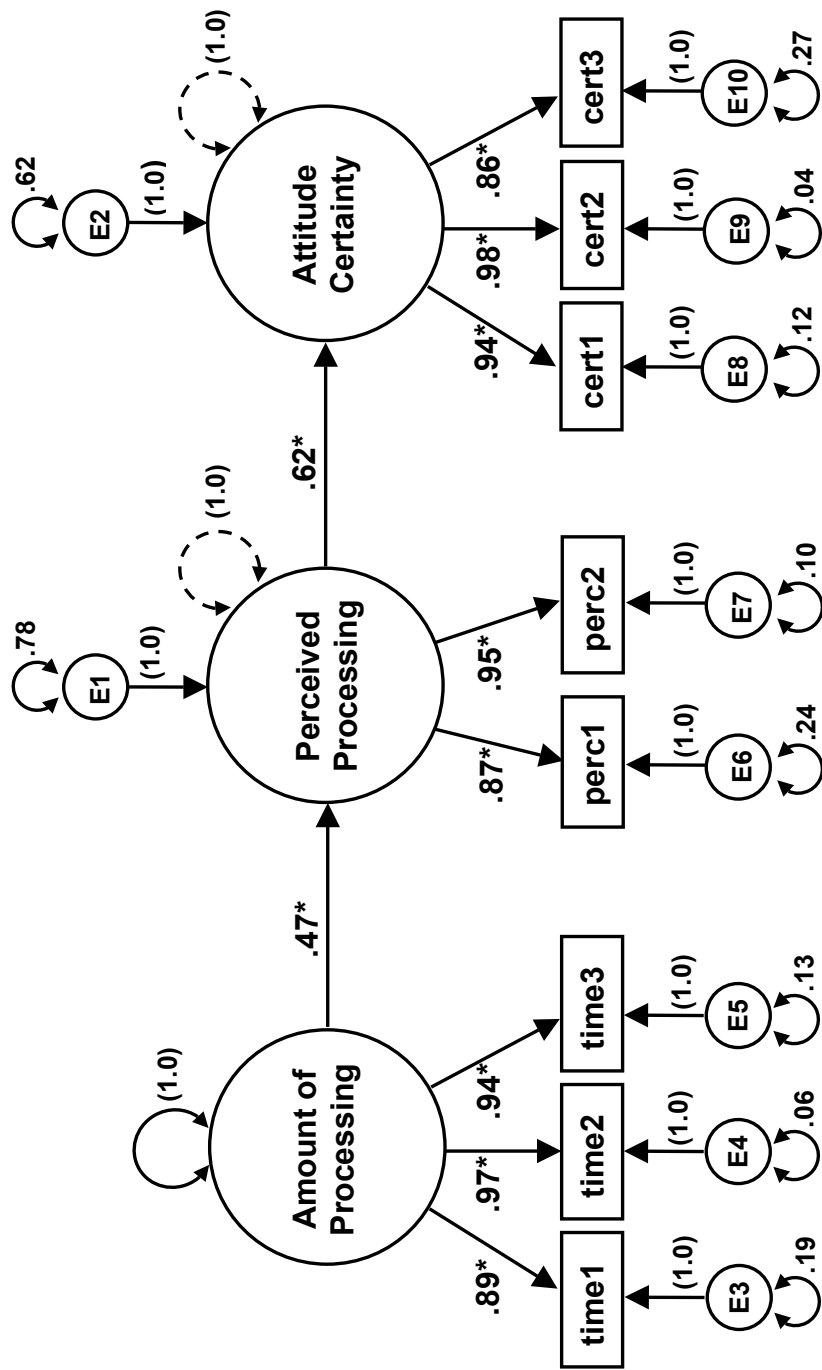


Figure 2: Structural equation modeling results, Pilot Study. *p < .05.

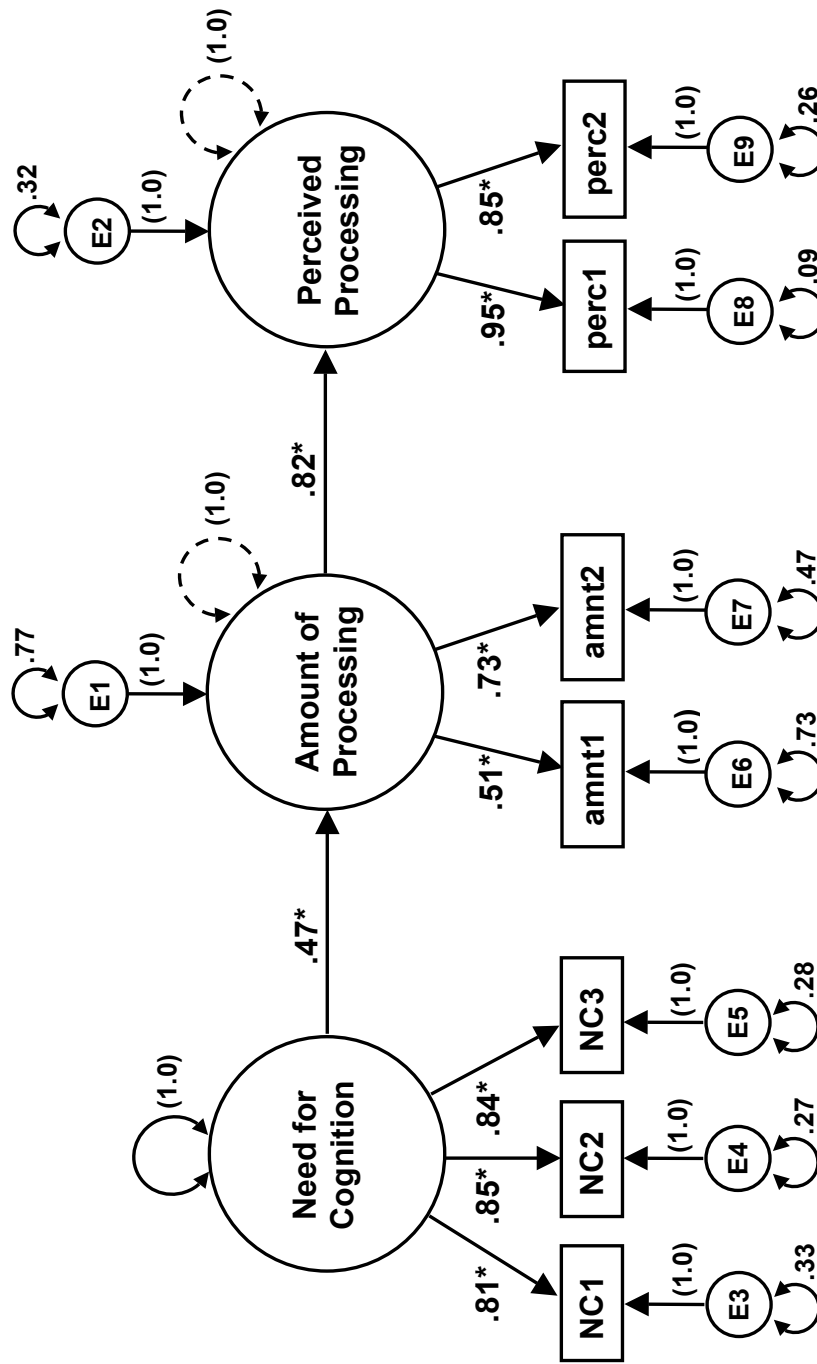


Figure 3: Structural equation modeling results, Study 1, Model 1. * $p < .05$.

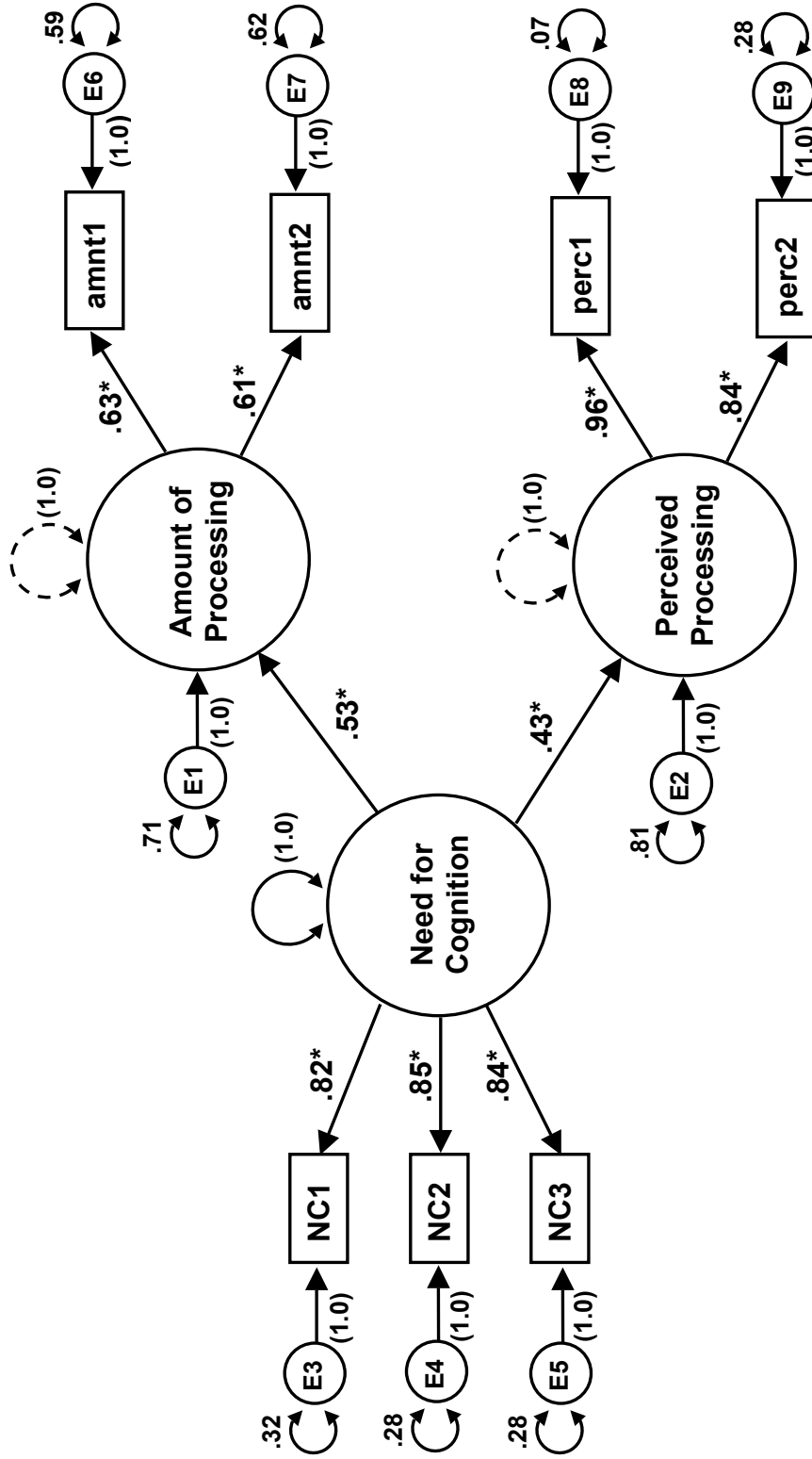


Figure 4: Structural equation modeling results, Study 1, Model 2. *p < .05.

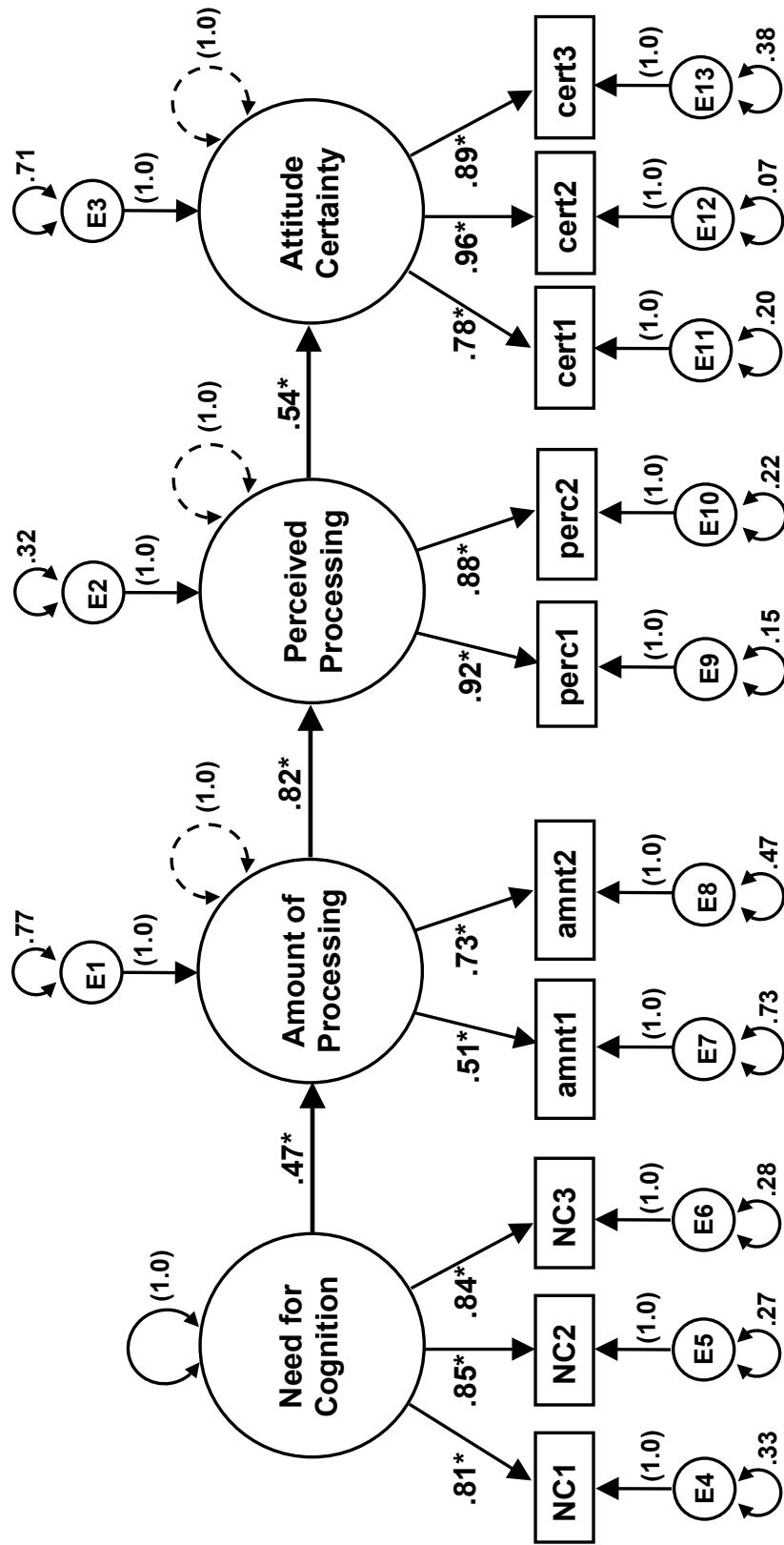


Figure 5: Structural equation modeling results, Study 1, Model 3. * $p < .05$.

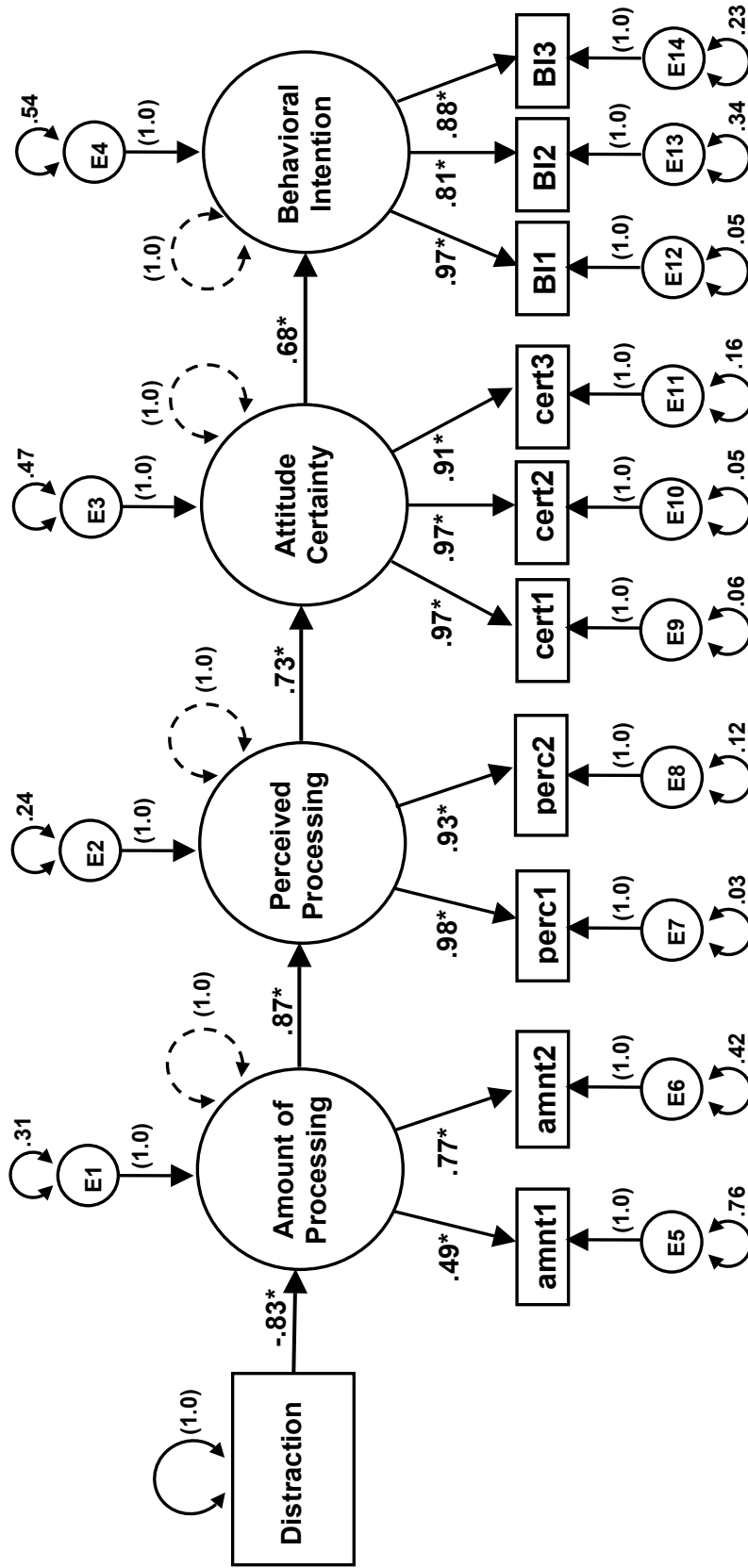


Figure 6: Structural equation modeling results, Study 2. *p < .05.

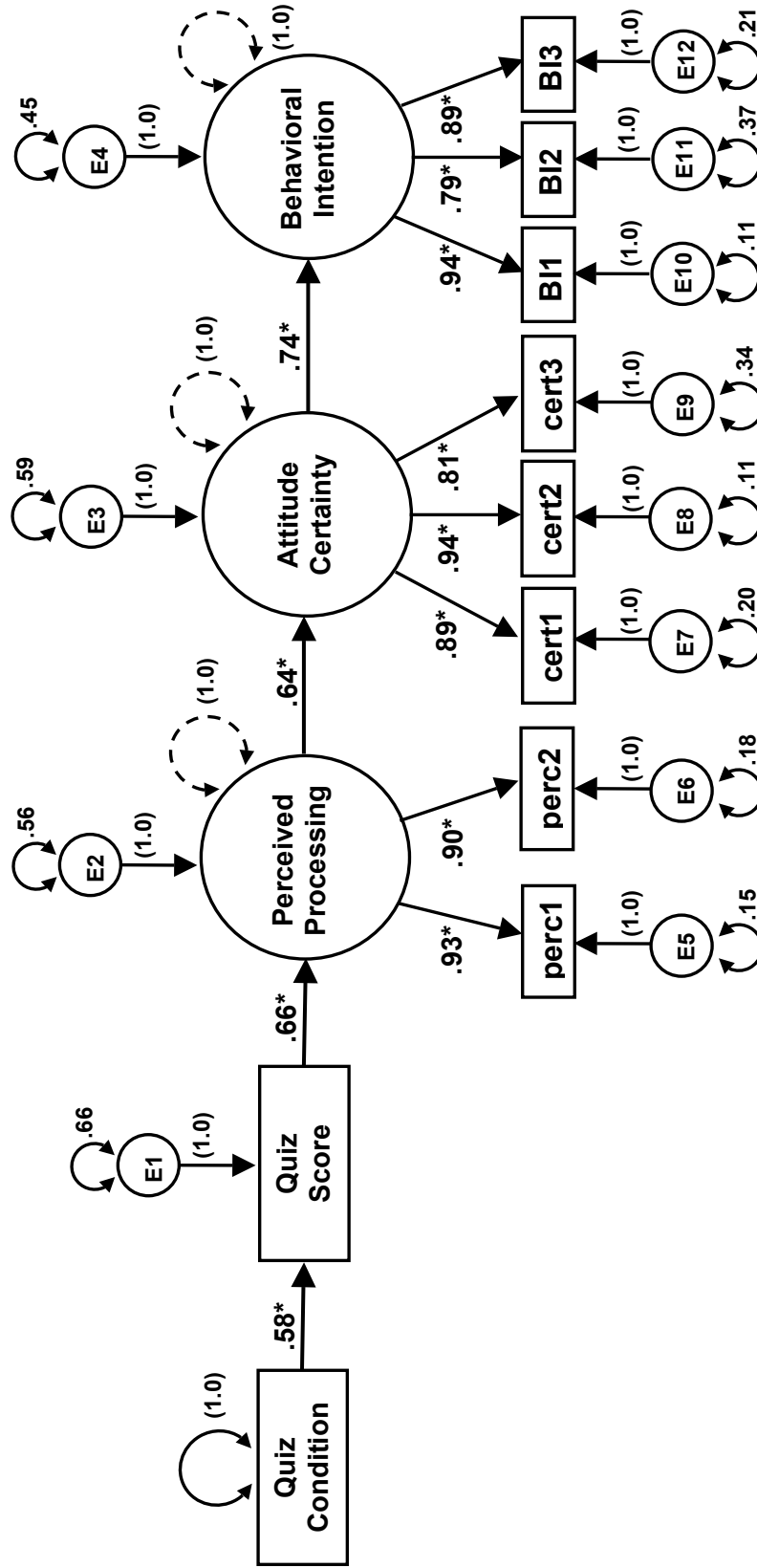


Figure 7: Structural equation modeling results, Study 3. * $p < .05$.

APPENDIX C
WIRELESS-FIDELITY ARGUMENTS

The Princeton Review conducted a 5-year survey of students at Arizona State including time before and after a Wireless-Fidelity network was installed. After the network was installed, student reports of faculty responsiveness to student needs increased 45%, whereas no increase was observed at comparable institutions without the network. In particular, since PDA's were issued to students, faculty were able to receive quick feedback, so they could review any material that was confusing and help students maximize their points on exams. In addition, students reported enjoying class more, because the faculty encouraged them to interact with pertinent web sites during class. In this interactive learning environment, undergraduate GPA's increased by 31%.

Another great advantage of Wireless-Fidelity technology is that it is extremely convenient. Colleges that adopt broadband wireless connectivity typically provide service from anywhere on campus or within one mile of campus. As a result, students can connect to the internet and check their e-mail from outside on the lawn, a coffee shop, or at home in their bed. Wi-Fi connectivity is also a lot more convenient, because it does not require confusing instructions or messy cords. In addition, setting up access is easy. After plugging in the Wi-Fi card, it installs itself and finds any local Wi-Fi networks on its own. Thus Wi-Fi technology will clearly make college life easier and more flexible.

An additional advantage of Wireless-Fidelity networks is that they come with voice-over-IP capabilities that allow free internet phone calls. Calls can be originated from PDA's laptops or desktops anywhere within the range of the Wi-Fi network. The sound quality is comparable to a music CD with none of the delays or dropped calls of earlier internet phones. Furthermore, because it uses free university bandwidth, students at schools with Wi-Fi networks get to make free local and long distance phone calls from anywhere on campus. Wi-Fi networks save the average student around \$108 a year for telephony costs.

In the two-year period after the University of Florida adopted a Wi-Fi network, the average starting salary of graduates increased by over \$2000. At comparable universities without such a network, salaries increased by only \$300 over the same period. Saul Siegel, a vice president at IBM, told Business Week: "We tend to offer the largest salaries and executive positions to applicants who have more day to day engagement with dynamic technologies such as advanced networks and the internet. Individuals from institutions with Wi-Fi networks tend to think more like modern executives must in order to be successful." So students attending schools with Wi-Fi networks are more attractive candidates for higher paying jobs.

According to a recent assessment by the Army Corps of Engineers, campuses that adopt a Wireless network will be able to avoid costly and time-consuming upgrades which are associated with increasing the capacity of land-line networks. This savings

could comprise up to 40% of the overhead cost of providing computer services to students and employees. Because Wi-Fi networks are upgradeable without rewiring within and between buildings, adopting this technology greatly decreases tunneling and construction work that inconveniences people trying to walk or drive around. Taken together, the report cited Wi-Fi networking technology as one way to lower costs, which would result in a savings of up to \$180 a year per student in tuition and fees.

One important feature of Wireless-Fidelity networks is that they are completely secure, unlike many other networking solutions. This is because Wi-Fi networks make use of high frequency 2.4 GHz bandwidth and a 128-bit encryption. This means that your private information from e-commerce to personal communications is guaranteed to be safe. Wi-Fi networks are a newer technology, so the architecture provides a more effective firewall, making your computer invisible to the internet. Thus, a Wi-Fi connection is much safer than using Ethernet, cable modem, DSL or dial-up connections. All together, using a Wi-Fi connection protects your personal information and your computer by providing a secure connection.

The National Scholarship Achievement Board recently released a report where they compared learning opportunities at 30 universities. Students rated the quality of teaching 25% higher at institutions with Wireless-Fidelity networks. In addition, faculty reported that faster and convenient internet access meant that they updated their course content every year rather than every 3-5 years, making it more relevant for students.

Students in turn reported that they could get away with studying 3 hours less a week and still get the same grades, because the network allowed them to master the material with a lot less effort. Thus, the Wi-Fi network makes class time more interesting and learning easier for students.

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