Investigating Multiple Roles of Vocal Confidence in Persuasion

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Abstract

Although persuasion often occurs via oral communication, it remains a comparatively understudied area. This research tested the hypothesis that changes in three properties of voice influence perceptions of speaker confidence, which in turn differentially affects attitudes according to different underlying psychological processes that the Elaboration Likelihood Model (ELM, Petty & Cacioppo, 1984), suggests should emerge under different levels of thought. Experiment 1 was a 2 (Elaboration: high vs. low) x 2 (Vocal speed: increased speed vs. decreased speed) x 2 (Vocal intonation: falling intonation vs. rising intonation) between participants factorial design. Vocal speed and vocal intonation influenced perceptions of speaker confidence as predicted. In line with the ELM, under high elaboration, confidence biased thought favorability, which in turn influenced attitudes. Under low elaboration, confidence did not bias thoughts but rather directly influenced attitudes as a peripheral cue. Experiment 2 used a similar design as Experiment 1 but focused on vocal pitch. Results confirmed pitch influenced perceptions of confidence as predicted. Importantly, we also replicated the bias and cue processes found in Experiment 1. Experiment 3 investigated the process by which a broader spectrum of speech rate influenced persuasion under moderate elaboration. In a 2 (Argument quality: strong vs. weak) x 4 (Vocal speed: extremely slow vs. moderately slow vs. moderately fast vs. extremely fast) between participants factorial design, results confirmed the hypothesized non-linear relationship between speech rate and perceptions of confidence. In line with the ELM, speech rate influenced persuasion based on the amount of processing. Experiment 4 investigated the effects of a broader spectrum of vocal intonation on persuasion under moderate elaboration and used a similar design as Experiment 3. Results indicated a partial success of our vocal intonation manipulation. No evidence was found to support the hypothesized mechanism. These studies show that changes in several different properties of voice can influence the extent to which others perceive them as confident. Importantly, evidence suggests different vocal properties influence persuasion by the same bias and cue processes under high and low thought. Evidence also suggests that under moderate thought, speech rate influences persuasion based on the amount of processing.

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Table of Contents

List of Figures

Experiment 1

Experiment 2

Experiment 3

Experiment 4

Chapter 1 Introduction

Attitude change has long been a central topic in social psychology. Indeed, for the better part of a century, researchers have investigated those variables thought to either facilitate or inhibit attitude change; and more recently, the underlying processes by which these changes take place. Early research into the nature of persuasive communication was organized around the question, "Who says what to whom with what effect?" (Smith, Lasswell, & Casey, 1946). This approach to studying persuasion, developed in the 1940's and 1950's by Carl Hovland and his colleagues at Yale University, postulated that attitude change relied heavily on the extent to which the recipient adequately learned the message (Hovland, Janis, & Kelly, 1953; Kelman, 1958; Kelman & Hovland, 1953). This general theoretical framework was based on the premise that a person must progress through a series of four successive stages following exposure to a message. Of primary interest to these researchers were the ways in which different variables influenced a person's attention, comprehension, acceptance, and retention of the arguments contained in a persuasive message. While a variety of theoretical frameworks have been proposed over the years to better understand the nature of persuasion, the basic categories of variables proposed by Hovland and his colleagues (1953) have remained largely the same. Of these categories, those characteristics related to the source (e.g., attractiveness, expertise, race, gender), have received a considerable amount of attention. Indeed, contemporary researchers in social psychology have generated an extensive body of literature investigating how source characteristics influence the persuasion process (see, Briñol & Petty, 2011; Eagley & Chaiken, 1993, Petty, Cacioppo, Strathman, & Priester, 1994; Petty & Wegener, 1998, for reviews). Interestingly, despite the breadth of this research, one aspect of the source that has received comparatively little coverage is the potential role played by different qualities of a speaker's

voice. This is somewhat surprising considering that so much of communication, and by extension persuasion, occurs orally.

Literature Review

While a great deal of research has shown that the content of what we say matters (see, Petty & Cacioppo, 1981; Eagley & Chaiken, 1993; Petty & Wegener, 1998, for reviews), a number of studies have also suggested that how we say something may be important. Indeed, researchers have demonstrated that one important feature of oral communication is that our voice allows us to convey a rich variety of information beyond the content of our message (Johnson, Ernde, Scherer, & Klinnert, 1986; Pell, Monetta, Paulmann, & Kotz, 2009). Thus, how we say something should also play a role in how successful we are at persuading others.

Although there are certainly many characteristics of voice that may influence the persuasion process, a growing body of research suggests one characteristic that should play an important role is the extent to which a speaker sounds confident (e.g., Brennan & Williams, 1995; Brown, Giles, & Thakerar, 1985; Jiang & Pell, 2014; Kimble & Seidel, 1991; London, 1973; Scherer, London, & Wolf, 1973; Smith & Clark, 1993). Therefore, the focus of the present thesis was to investigate how changes in several properties of voice influenced a listener's perceptions of speaker confidence. This construct was particularly appealing given the large body of research on attitude confidence that indicates people often rely on self-evaluations of confidence as a basis for making decisions (see, Tormala & Rucker, 2007, for a review). If one considers that confidence is an important dimension we use to evaluate ourselves when making decisions, then it makes sense that confidence may also be an important dimension we use to evaluate others when making decisions. From a theoretical perspective, confidence was also an appealing starting point because it may serve as a general heuristic when making inferences

about a person's standing on a variety of conceptually related attributes, such as intelligence, expertise, credibility, and so forth. For example, when people speak with confidence we may infer they are an expert on a topic and believe in the validity of what they are saying. Thus, to the extent that confidence is used as a heuristic when making global judgements of others on a variety of attributes, it should also be an important determinant when evaluating the likelihood that a persuasive appeal will be successful. Indeed, if we think about our interactions with others, it is often relatively easy to determine whether they are confident simply by listening to how they talk. Thus, perhaps varying degrees of confidence can be expressed through specific features of a speaker's voice. But what is it exactly about our voice that communicates confidence?

Vocal Qualities and Speaker Confidence

Although the study of vocal confidence has received limited attention within the persuasion literature, a fair amount of research within the domain of communications has documented which characteristics of voice vary according to whether a speaker is confident. Typically, this research has been conducted in several different ways. For instance, researchers have instructed participants to speak in a confident versus unconfident manner and then observed which characteristics of voice change as a result (e.g., Scherer et al., 1973). Another method commonly used observes people in more naturalistic settings in which self-reports of confidence are typically either high or low (e.g., authority figure giving instructions to others versus public speaking) or situations where material is provided that impacts one's confidence level in order to observe how voice changes as a result of more naturally occurring confidence (e.g., Kimble & Seidel, 1991). These methodologies have produced converging evidence to suggest that specific variations in certain characteristics of voice systematically covary based on the extent to which a speaker is confident.

For example, several experiments have demonstrated that confident speakers typically communicate at a louder volume relative to unconfident speakers (Kimble & Seidel, 1991; Scherer et al., 1973). Scherer et al., (1973) illustrated the relationship between vocal loudness and perceived confidence by having a speaker create two versions of the same message: a linguistically confident version and a linguistically doubtful version. To create these messages, a speaker was instructed to insert words or phrases that typically reflect confidence (e.g. "I believe") or doubt (e.g. "I'm not positive") into predetermined locations throughout a message. Participants exposed to these messages were informed that the purpose of the experiment was ostensibly to "examine the ability of law students". The results indicated that participants perceived speakers who were instructed to use confident language as speaking louder relative to speakers who used language that reflected uncertainty.

Vocal intonation has also been shown to influence perceptions of speaker confidence. An experiment by Brennan and Williams (1995) revealed that when participants used falling intonation in their responses to multiple choice trivia questions, they were perceived as significantly more confident than when using rising intonation. Moreover, their results demonstrated that rising intonation was used by participants twice as frequently as falling intonation when providing incorrect responses. Research by Smith and Clark (1993) suggests rising intonation may signal uncertainty and thus reflect increased strain on behalf of the respondent to produce the correct response. Consequently, the speaker may be perceived as lacking credibility, which in turn may lead the recipient to conclude the information is inaccurate and the speaker unreliable.

Another vocal quality found to influence perceptions of speaker confidence is rate of speech (Brown et al., 1985; Jiang & Pell, 2014; London, 1973; Scherer et al., 1973). Research indicates that speakers actually increased their rate of speech when *asked* to speak in a confident

manner (Jiang & Pell; 2014; Scherer et al., 1973). For example, Scherer et al., (1973) had an experienced drama student record a passage while speaking in either a confident or doubtful manner. The audio recordings were then presented to participants who were told to imagine that they were jury members asked to evaluate the facts presented in the audio recording. Confirming the author's hypothesis, the results indicated that participants rated the speaker who spoke in a confident manner as communicating significantly faster as well as with greater fluency relative to the version in which the speaker spoke in a doubtful manner.

As the prior example illustrates, research on the features of vocal confidence has focused on not only what listeners perceive as confident, but also on the specific changes in a speaker's voice that are produced when they are confident. For instance, research by Kimble and Seidel (1991) presented participants with 10 multiple choice trivia questions delivered via computer and then recorded the amount of time between presenting the question and the start of each participant's verbal response. Following their response to each question, participants rated the extent to which they were confident in their response on a 1 to 7 scale. The results indicated that participants responded significantly faster to questions when they were more confident in the accuracy of their response. Taken together, research suggests that specific qualities of voice not only influence the recipient's perception of speaker confidence, but also the speaker's subjective assessment of their own level of confidence.

Vocal Qualities and Persuasion

While current evidence presents a relatively clear picture of the relationship between vocal qualities and perceptions of speaker confidence, research investigating how vocal qualities affect persuasion is somewhat inconclusive. To date, the majority of this research has focused on rate of speech (e.g., Hausknecht & Moore, 1986; Mehrabian & Williams, 1969; Miller,

Maruyama, Beaber, & Valone, 1976; Moore, Hausknecht, & Thamodaran, 1986; Nickell & Pinto, 1984; Smith & Shaffer, 1991; 1995). Unfortunately, the results have been somewhat mixed; with some studies indicating faster speakers are more persuasive (e.g., Hausknecht & Moore, 1986; Mehrabian & Williams, 1969; Miller et al., 1976; Moore et al., 1986; Nickell & Pinto, 1984; Smith & Shaffer, 1991; 1995), whereas others have found that fast speakers are no more persuasive than those speaking at a normal rate of speed (e.g., Gunderson & Hopper, 1976; Wheeless, 1971; Woodall & Burgoon, 1983).

For example, Mehrabian & Williams (1969) observed that communicators naturally increased their rate of speech – and were perceived as correspondingly more persuasive – when instructed to convey a message in a neutral, modestly persuasive, or highly persuasive manner, respectively. Across two experiments, Miller et al., (1976) demonstrated that a message spoken at a rapid rate of speech significantly enhanced persuasion compared with a slower version of the same message. In both studies, different rates of speech were created by instructing the speaker to practice delivering the messages several times while attempting to maintain an equal degree of enthusiasm and involvement. In the first study, participants listened to an audio recording in which the dangers of drinking coffee were described either by a highly credible (biochemist) or less credible (locksmith) source. Speech rate was manipulated such that the speaker either communicated at a very slow (102 WPM) or very fast (195 WPM) rate of speech. In line with expectations, rapid rate of speech generated significantly more persuasion relative to a slower version of the same message. Likewise, the data revealed persuasion was significantly greater for those participants assigned to the high credibility speaker compared with participants assigned to the low credibility speaker. No interaction between rate of speech and credibility was found.

In the second study, participants listened to an audio recording in which the speaker described the dangers of hydroponically grown vegetables at either a slow (111 WPM), moderate (140 WPM) or fast (191 WPM) rate of speech. In addition, the complexity of the message was varied by using either simple sentences or compound versions of the same sentences. Although no effects of message complexity emerged, once again rapid rate of speech led to significantly more persuasion compared with a slower version of the same message. In describing their findings, Miller et al., (1976) suggested that because a fast speaker may be perceived as more intelligent and knowledgeable, and a higher standing on these attributes reflect greater credibility, rapid speech may have enhanced perceptions of credibility thereby leading to more persuasion. Taken together, these data suggest that at least under some conditions, rate of speech and credibility may work together to influence persuasion in an additive fashion.

Later research by Moore et al., (1986) provided a more nuanced interpretation by demonstrating an interaction between speech rate and argument quality, as well as a three-way interaction between speech rate, argument quality, and source credibility. Participants listened to an audio recording comprised of either strong or weak arguments in which a new product was described either by a highly credible (Princeton University professor) or less credible (student) source. Speech rate was manipulated such that the speaker communicated at either a comparatively slow (145 WPM), intermediate (189 WPM) or rapid (232 WPM) rate of speech. The intermediate and rapid speech recordings were created by first compressing the original recording (145 WPM) to a shorter duration and then re-recording the compressed audio track at the desired speed.

A two-way interaction between speech rate and argument quality revealed that when the speaker communicated at a comparatively slow rate of speech, strong arguments produced

significantly more persuasion than weak arguments. However, as speech rate increased, the relative difference in persuasion between strong and weak arguments decreased. This suggests that as rate of speech increased, participant's ability to process the arguments was reduced, which in turn decreased the persuasiveness of strong arguments and increased the persuasiveness of weak arguments.

More interesting is the three-way interaction between speech rate, argument quality, and source credibility. When speaking at a comparatively slow rate of speech, the data revealed main effects for both argument quality and source credibility. More specifically, strong arguments led to significantly more persuasion than weak arguments. Likewise, a highly credible source led to significantly more persuasion than a less credible source. No interaction was found. At a moderate rate of speech, an interaction emerged such that strong arguments were significantly more persuasive when delivered by a highly credible relative to less credible source. However, no difference in persuasion emerged when weak arguments were delivered by either a highly credible or less credible source. Finally, at a rapid rate of speech, both strong and weak arguments were significantly more persuasive when delivered by a highly credible relative to less credible source. No main effect of argument quality or interaction with source credibly was found. This suggests that at rapid rates of speech, participants appeared to disregard the quality of the arguments and instead relied on the credibility of the speaker when forming their attitudes.

A similar study by Smith and Shaffer (1991) also revealed a two-way interaction between speech rate and message type. Participants listened either to a pro-attitudinal or counter-attitudinal message delivered at either a slow (144 WPM), intermediate (182 WPM) or rapid (214 WPM) rate of speech that discussed a recently implemented law requiring individuals to be at least 21 years of age to purchase or consume alcohol. Audio versions for both intermediate

and rapid rate of speech conditions were created using similar techniques as in prior research (e.g., Moore et al., 1986).

In line with expectations, a two-way interaction between speech rate and message type revealed that when the speaker communicated at a slow rate of speech, pro-attitudinal arguments produced significantly more favorable attitudes than counter-attitudinal arguments. However, as rate of speech increased, the relative difference in attitudes elicited by pro – and counter attitudinal messages decreased. In other words, as rate of speech increased, this reduced participant's ability to favorably evaluate pro-attitudinal arguments, thus diminishing their persuasive impact. Similarly, because participant's ability to refute counter-attitudinal arguments was reduced as rate of speech increased, this lessened their negative impact, thus enhancing persuasion. This pattern fits well with the proposition that rapid rate of speech can both enhance and reduce persuasion by affecting processing ability. These results as well as those of Moore et al., (1986) are particularly interesting because they present clear evidence indicating that increased rate of speech affects persuasion by reducing the recipient's ability to process the message content.

Finally, in a later study by Smith and Shaffer (1995), participants listened to either a moderate (180 WPM) or rapid (220 WPM) version of the classic senior comprehensive exams passage (Petty & Cacioppo, 1979), that also manipulated argument quality (strong vs. weak) and message relevance (high vs. moderate). The rapid rate of speech condition was created in a similar manner as in prior research (e.g., Moore et al. 1986).

Replicating the pattern that emerged in Moore et al., (1986) and more generally, Smith and Shaffer (1991), a two-way interaction was found such that at moderate rates of speech, strong arguments produced significantly more persuasion than weak arguments. However, when

spoken rapidly, the relative difference in persuasion elicited by strong and weak arguments decreased. This provides a third demonstration that rapidly spoken speech impairs processing ability, thus eroding the effect of argument quality on persuasion. Additionally, a marginally significant two-way interaction between speech rate and message relevance emerged such that rapid speech generated significantly more persuasion than moderately paced speech for messages perceived as moderately relevant. However, no effect of speech rate emerged when the message content was perceived as highly relevant. Smith and Shaffer (1995) interpret this pattern of results by suggesting that because moderately relevant messages are processed to a lesser extent, rapid speech may have enhanced persuasion because participants perceived a fast-talking speaker as highly credible.

Although certainly plausible, there are several reasons this interpretation may not be correct. First, the authors conducted only a single study examining this phenomenon and no attempts have been made at replication. Second, recall that the two-way interaction between speech rate and message relevance was only marginally significant ($p = .09$). Given the relatively small sample size ($N = 94$; < 12 participants per cell), one possibility suggests these results may be spurious due to an underpowered sample. Finally, in order to support the claim that rapid speech enhanced persuasion by affecting perceptions of speaker credibility, a two-way interaction between argument quality and message relevance should have emerged. What we would expect is that in the case of a message perceived as highly relevant, strong arguments should elicit significantly more persuasion than weak arguments. However, based on the author's logic that moderately relevant messages are processed to a lesser extent, here we would expect strong and weak arguments to produce a relatively equal amount of persuasion. Given the fact that this two-way interaction failed to emerge, there is no evidence to suggest the relevance of

the message affected processing. Indeed, a comparison of the coefficients reflecting the direct effect of thoughts on attitudes under high – and moderate relevance indicate that although the effect fell in the appropriate direction, it was comparatively weak ($z = 1.18$). Finally, given that the coefficients reflecting the direct effect of speaker credibility on attitudes ($z = .01$) were no different as a function of message relevance suggests that rapid speech could not have enhanced persuasion because perceptions of speaker credibility functioned as a simple peripheral cue, as proposed by Smith and Shaffer (1995).

Critique of Methodology in Prior Research

Empirical research has shown that at least three qualities of voice can reliably predict speaker confidence. However, what is less clear is how those qualities of voice affect persuasion. Of those vocal qualities shown to influence perceptions of speaker confidence, researchers have only investigated how rate of speech influences persuasion. Thus, we know very little about how other hallmarks of confidence beyond rate of speech may affect persuasion.

Importantly, within the literature investigating rate of speech, possible confounds may have arisen due to a variety of methodological issues, thus leading to difficulties when interpreting the data. For example, some studies have asked a speaker to alter their rate of speech to be fast or slow (e.g., Brown et al., 1986; Miller et al., 1976), or to speak in a confident or doubtful manner (e.g., Jiang & Pell, 2014; Scherer et al., 1973). Other studies have combined audio and visual modalities when presenting experimental stimuli (e.g., Gunderson & Hopper, 1976; Woodall & Burgoon, 1983), or forcibly altered speech rate by compressing an analog audio file into a shorter duration through re-recording the original track (e.g., Hausknecht & Moore, 1986; Moore et al., 1986; Smith & Shaffer, 1991; 1995). These methodologies are problematic for several reasons.

First, when instructed to speak either fast or slow (e.g., Brown et al., 1985; Miller et al., 1976), or in a confident or unconfident manner (e.g., Jiang & Pell, 2014; Scherer et al., 1973), it is unclear to what extent a speaker may have inadvertently changed other properties of their voice (e.g., volume, intensity, pitch) and thus confounded the manipulation. For example, when asked to speak either in a confident or unconfident manner, it is possible that a speaker imparted their own stylized interpretations of how a confident voice should sound. Consequently, perhaps a speaker in one condition (e.g., confident-speaker) communicated either or both faster and louder than did a speaker in the other condition (e.g., unconfident-speaker). In such a case, it would be impossible to determine whether perceptions of confidence were driven by rate of speech, volume, or a combination of both. Indeed, research has shown that vocal properties such as rate of speech, volume, and pitch typically covary in natural communication (Black, 1961). For example, rapid speech is often judged as louder and higher pitched relative to normal rates of communication (Bond & Feldstein, 1982; Bond, Feldstein, & Simpson, 1988; Feldstein & Bond, 1981). Thus, it is entirely plausible that participants in these studies were responding to cues related to pitch and/or loudness as well as to those reflecting rate of speech. Consequently, unless pretesting is done to evaluate each dimension of the speaker's voice prior to using the audio materials in the actual study, there is no way to adequately compare the relative standing on each vocal dimension between speakers asked to communicate in a confident or a doubtful manner.

Second, presenting stimuli that combines both audio and visual channels (e.g., Gunderson & Hopper, 1976; Woodall & Burgoon, 1983), leaves open the possibility that any effect voice may have on persuasion could be distorted by any one of a number of visual features related to the speaker. For example, perhaps the speaker was leaning to one side or standing with shoulders curled forward, thus conveying a lack of confidence through other non-verbal features of

communication such as body language (Mehrabian & Williams, 1969; Maslow, Yoselson, & London, 1971). Alternatively, perhaps the speaker's facial expression reflected emotions such as anxiety, stress, or boredom and thus eroded any effect voice may have on persuasion because the mismatch in non-verbal signals elicited confusion in the recipient.

Finally, it is not clear whether forcibly compressing an audio file (e.g., Hausknecht & Moore, 1986; Moore et al., 1986; Smith & Shaffer, 1991; 1995), altered certain parameters of voice that may have affected the extent to which the listener perceived it as sounding natural. Given that measures were not included to evaluate whether compressing an audio file in some way influenced the extent to which the speaker sounded natural, the possibility exists that the effects of voice on persuasion observed in these studies may in part have been caused by an unnatural-sounding speaker.

Beyond issues related to how experimental stimuli have been created, prior research has also been inconsistent in selecting which attributes to include when testing the relationship between rate of speech and persuasion. For example, some studies have focused on perceptions of speaker knowledge or intelligence (e.g., Miller et al., 1976; Moore et al., 1986; Nickell & Pinto, 1984), whereas others have measured speaker credibility (e.g., Hausknecht & Moore, 1986; Moore et al., 1986; Nickell & Pinto, 1984; Smith & Shaffer, 1991, 1995). Still others have examined perceptions of speaker expertise (Smith & Shaffer, 1995). Although conceptually these attributes are related to one another, to the extent that they are somewhat different makes direct comparisons regarding the strength of their relationship with rate of speech more difficult. Most importantly, only one study (i.e., Smith & Shaffer, 1995) has attempted to test whether any of these attributes serve in a mediating role and thus can account for the underlying psychological processes responsible for the effects of rate of speech on persuasion.

In thinking about how prior research has examined rate of speech, an additional concern is its focus on a relatively narrow range of this vocal quality. For example, researchers typically have employed a maximum of only three levels (i.e., slow, intermediate, and fast). This is problematic because it is not clear that we would necessarily expect speech rate to exert the same effects on persuasion across the entire spectrum of this variable. For example, at the upper end of the speed continuum, one possibility is that speech rate may have complementary effects on processing (i.e., ability and motivation decrease). Indeed, research has demonstrated that rapid speech reduces the listener's ability to elaborate on the message in order to generate counterarguments (Moore et al., 1986; Smith & Shaffer, 1991).[1] In turn, this can either enhance persuasion if the message is counter-attitudinal or reduce persuasion if the message is pro-attitudinal. Consistent with this finding, research has shown that relative to normal rates of speech, rapid speech can lead to a reduction in message recall as well as attention to the message content (Chattopadhyay, Dahl, Ritchie, & Shahin, 2003; Hausknecht & Moore, 1986; Moore et al., 1986; Schlinger, Alwitt, McCarthy, & Green, 1983). Another possibility is that rapid speech may have contradictory effects on processing (i.e., ability decreases, motivation increases). Supporting this, some research has found that faster rates of speech enhanced attention to the message (LaBarbera & MacLachlan, 1979; MacLachlan & Siegel, 1980). Thus, while it appears that rapid speech typically has a negative impact on processing ability, how it affects motivation is somewhat less clear.

At the lower end of the speed continuum, extremely slow speech may also have complementary effects of processing (i.e., ability and motivation decrease). For example, extremely slow speech may have a negative impact on a person's ability to process the content

[1] When ability is referred to in the Elaboration Likelihood Model, it denotes both the intrinsic capabilities of the person processing a message as well as the demands inherent in a task that may either increase or decrease a person's ability to process information.

because it requires sustained attention for a much longer amount of time and thus may elicit fatigue in the listener. Likewise, a decrease in motivation may arise because the slow pacing elicits boredom while also suggesting the speaker lacks confidence. Indeed, recall that research by Jiang and Pell (2014) as well as Scherer et al., (1973) revealed that speakers who lack confidence are perceived as speaking significantly slower than confident speakers. Moreover, unconfident speakers may also be perceived as providing information of lesser value and accuracy than confident speakers (Smith & Clark, 1993). Given that accuracy-related goals influence motivation and in turn enhance systematic processing (Chaiken et al., 1989; Petty & Cacioppo. 1979; Petty & Wegener, 1999), this suggests that a slow rate of speech may reduce motivation and thus decrease processing of the message because the speaker is perceived as lacking confidence. Taken together, this suggests that persuasion may occur by different processes based on how one's amount of processing is influenced as rate of speech moves from extremely slow to extremely fast.

Given that prior research has focused solely on rate of speech, this leads us to consider the possibility that not all hallmarks of vocal confidence exert their effects on persuasion in the same way. For example, other variables such as intonation may influence persuasion in a relatively straightforward manner. Recall that research by Smith and Clark (1993) suggests that because rising intonation signals the speaker is posing a question, which reflects a degree of uncertainty, this may reduce perceptions of credibility and thus lead the recipient to conclude the information is inaccurate and the speaker unreliable. Consequently, the recipient may infer the information is less valuable, which in turn could reduce their motivation to attend to the content. Reduced motivation should lead to decreased processing of the message, which then lessens the impact of the content on persuasion. By comparison, because falling intonation suggests the speaker is making a statement of fact, this may be interpreted as reflecting a high degree of confidence. In this case, the recipient may

reason that the speaker is sharing valuable information. This may enhance motivation to attend to the content and thus increase processing, which in turn may lead to a greater impact on persuasion. Importantly, unlike rate of speech, there is no clear reason why variability in intonation should necessarily affect one's ability to process a message. Thus, different vocal qualities may affect persuasion by different processes; with some (i.e., rate of speech) affecting the recipient's ability and motivation whereas others perhaps only affecting motivation.

Interestingly, because research has yet to examine how qualities of voice affect perceptions of confidence or persuasion when combined with one another, it is unknown whether different vocal qualities work together in a purely additive fashion or if they have interactive effects. One possibility is that they combine to influence persuasion in an additive fashion. This suggests that as the number of dimensions in a speaker's voice that reflect confidence increases, a corresponding increase should be observed in the extent to which the speaker is perceived as confident. Thus, communicating both rapidly *and* at a loud volume should enhance perceptions of confidence relative to communicating either rapidly *or* at a loud volume. Another possibility is that vocal qualities may influence persuasion in an interactive fashion. If this is the case, then focusing on only one vocal quality at a time may be somewhat misleading – particularly if one considers that research has shown that different properties of voice typically covary in natural communication (Black, 1961). For example, perhaps when communicating slowly, a loud speaker is perceived as more confident than one who speaks softly. However, when communicating rapidly, volume has little impact on perceptions of speaker confidence. Another possibility is that when vocal qualities are combined they only affect perceptions of confidence when both features of voice are synchronized. For example, when a speaker communicates softly *and* at a slow rate of speed, or loudly *and* a rapid pace. If either vocal quality is out of sync with

the other, then no effect is found. In other words, both vocal qualities must reflect either high confidence or low confidence for an effect to emerge. Thus, one important question that has been overlooked is whether qualities of voice affect confidence and persuasion by working together in an additive or interactive fashion and further, the specific form these patterns may take.

Vocal Confidence and Persuasion: A Theoretical Framework

Although a number of studies have shown that changes in specific parameters of voice reliably influence perceptions of speaker confidence, comparatively little research has investigated the underlying mechanisms by which specific hallmarks of vocal confidence affect persuasive communication. Inconsistent results across studies have led some researchers to conclude that qualities of voice may enhance persuasion by affecting perceptions of speaker credibility (e.g., Miller et al., 1976; Smith & Shaffer, 1995), whereas others propose its effects are likely driven by affecting the amount of processing (e.g., Hausknecht & Moore, 1986; Moore et al., 1986; Smith & Shaffer, 1991). While these inconsistencies may in part be attributed to methodological issues, a major problem facing this emerging literature is the absence of a general theoretical framework that can aid researchers by guiding their predictions regarding when (i.e., under what conditions) and why (i.e., by what processes) vocal hallmarks of confidence affect persuasion.

Many of the inconsistent findings can be resolved by drawing upon a theoretical framework known as the Elaboration Likelihood Model (ELM; Petty & Cacioppo, 1981; Petty & Cacioppo, 1986; Petty, Rucker, Bizer, & Cacioppo, 2004; Petty & Wegener, 1999). Broadly speaking, the ELM is a general theoretical framework that describes the psychological processes underlying changes in attitudes, the variables that elicit these processes, and the strength of the attitudes/evaluative judgements resulting from these processes. Importantly, the ELM postulates

that a variety of different processes can guide attitude change and that the emergence of these processes are a function of where an individual falls on the elaboration continuum. More fundamentally, an individual's ability and motivation to effortfully process information determines where they fall along this continuum. When both ability and motivation are high, attitude change is conceptualized as occurring by the central route. In contrast, when ability and motivation are low, attitude change is conceptualized as occurring by the peripheral route. Thus, central and peripheral refers to the amount of elaboration or cognitive processing that occurs when attitudes are formed and/or changed. Conceptually, central and peripheral also refer to anchoring points at either end of the elaboration continuum. As an individual moves across the elaboration continuum the contribution of both central and peripheral routes change.

Attitude change arising via the central route is based on information already contained within an individual's store of knowledge, or information that can be thoughtfully generated about the content of a message. As an individual's ability and motivation to carefully evaluate the central merits of an issue increase, this results in more cognitive elaboration of the message in relation to existing information about the issue. Thus, attitude change via the central route occurs through the careful encoding and evaluation of an argument's merits, consequently producing a well-formed position on an issue. Attitude change arising via the peripheral route emphasizes the non-thoughtful nature by which individuals form and change their attitudes. This can occur either through a low-effort evaluation of the merits of an argument (e.g., examining less information or the same amount but less carefully), or through less resource demanding processes that include either the use of information processing shortcuts, known as heuristics (Chaiken, 1987), classical conditioning (Staats & Staats, 1958), or self-perception (Bem, 1972). Attitude change via the peripheral route is most likely to occur either when an individual's

ability or motivation (or both) to scrutinize a message are low, and a peripheral cue exists that may elicit a favorable or unfavorable response to the message (Petty & Wegner, 1998). Importantly, the ELM states that whether attitudes are changed by either central or peripheral process has important downstream implications for the strength, durability, and resistance of the attitude. For example, attitude change occurring via the central route is typically more persistent, resistant, and predictive of behavior compared with attitude change occurring via the peripheral route (Haugtvedt & Petty, 1992; Haugtvedt & Strathman, 1990; Petty, Haugtvedt, Heesacker, & Cacioppo, 1995; Petty, Haugtvedt, & Smith, 1995).

Understanding where an individual falls on the elaboration continuum is critical to determining the relevant processes by which attitude change may occur. According to the ELM, a variable can influence attitudes by different processes at different points along the elaboration continuum. For example, at the high end of the elaboration continuum, a variable can either serve as an argument for or against the message, bias the direction of processing to be more or less favorable, or determine whether an individual relies on the thoughts generated in response to a message. At the low end of the elaboration continuum, a variable can serve as a simple peripheral cue, whereby evaluative judgements may arise by way of heuristics, classical conditioning, or self-perception. In the middle of the elaboration continuum, when processing is not constrained to be either high or low, a variable can affect the amount of processing that occurs. Importantly, the theory suggests that even when the same effect does occur for a variable under different levels of elaboration, the underlying psychological process responsible for this effect is different.

Applying this to vocal confidence, when a person is able and motivated to carefully consider the merits of an issue (i.e., high elaboration), the ELM suggests they are more likely to

consider both the relevance and quality of all information that comes to mind as it relates to the persuasive communication. Under these conditions, one process by which vocal confidence can exert its' effects on persuasion is by serving either as an argument for or against an attitude object. In other words, a listener can evaluate a speaker's vocal confidence as evidence that provides diagnostic information regarding the merits of a particular advocacy.

For example, consider an advertisement promoting a program designed to improve public speaking. A confident sounding speaker might be viewed as an inherently relevant argument in favor of the program because the listener may reason that the program taught the speaker how to communicate with confidence. Likewise, a listener may evaluate an unconfident speaker as providing evidence that suggests the program is ineffective at teaching people how to communicate with confidence. Importantly, the extent to which a speaker sounds confident when delivering a message can only serve as an argument when the speaker's confidence is directly relevant to the advocacy. This would hold true in the case of a message advocating a program designed to improve public speaking, but not in the case of a message advocating the merits of using nuclear power – in which case the confidence of the speaker is unrelated to the advantages or disadvantages of using nuclear power.

However, even when a variable is not directly relevant to an advocacy, it can still affect a person's attitude by biasing the direction of their topic-relevant thoughts to be more or less favorable. In other words, even though a listener is able and motivated to process the message and thus carefully evaluating the merits of the advocacy, they may not do so in an entirely objective way. Take, for example the topic of nuclear power. The confidence with which the speaker delivers the message in no way informs the listener whether nuclear power is safe, economical, environmentally friendly, and so forth. Nonetheless, how the speaker communicates

the arguments contained within the message could influence the listener to process those arguments in either a more or less favorable manner. This is the essence of what the ELM refers to as a biasing factor.

For example, the listener may infer that a confident speaker is exceptionally knowledgeable or passionate and thus reason the speaker may be sharing valuable information. Perceiving the speaker as sounding confident may cause the listener to focus on the strengths of the argument and thus approach the message in a very confirmatory way. This may positively bias thoughts towards the message, which the listener then uses as a guide when forming their attitude. However, if the speaker sounds unconfident, the listener may recognize this and reason that the speaker may not be providing very accurate information. In this case, the listener may either focus on the weaknesses in the arguments or generate counter-arguments, which in turn negatively biases their thoughts towards the message. Research suggests the biasing effects of a variable should be most effective when a message is composed of moderate arguments (Chaiken & Maheswaran, 1994). Importantly, no research has explored the possibility that any hallmark of vocal confidence may serve in this role.

An additional process by which a variable can affect a person's attitude when engaged in effortful processing is by influencing the extent to which they rely on their thoughts when evaluating the merits of an issue. The idea here is that people reflect on the thoughts generated in response to a message and then consider their validity, which either enhances or reduces subjective perceptions of confidence in their thoughts (Briñol & Petty, 2009; Petty, Briñol & Tormala, 2002). In turn, thoughts affect subsequent evaluations and behaviors to the extent that people believe their thoughts are correct or hold positive evaluations of them. Conversely, thoughts perceived as incorrect or viewed unfavorably are mentally discarded and thus have

comparatively little influence on subsequent evaluations and behavior. Importantly, variables (e.g., source characteristics) that serve in a validation role by either enhancing or reducing confidence in one's thoughts often have the greatest impact when they are introduced to the recipient *after* the message has been received. Thus, given that the confidence with which a speaker delivers a message is inherently part of the listener's initial receipt of the message, it is comparatively unlikely that vocal confidence can affect persuasion by influencing the extent to which the listener relies on or has confidence in their topic-relevant thoughts.

In contrast, when a person is unable and/or unmotivated to think carefully (i.e., low elaboration), the ELM suggests they are more likely to attend to very simple cues in the environment to guide them in reacting to the message. That is, in the absence of careful thought, a person may use their evaluation of a speaker's vocal confidence as a simple peripheral cue to directly infer how favorable or unfavorable they are towards the message. As this applies to vocal confidence, a listener might infer that an argument does or does not have merit based predominantly on the manner in which the speaker conveys the information. Thus, if a speaker sounds confident, the listener may be more likely to adopt the position advocated by the speaker, whereas if a speaker sounds unconfident, the listener may be more likely to move in the other direction.

When a person's ability and motivation are unconstrained (i.e., moderate elaboration) the ELM suggests that attitudes are influenced by a different process than those that occur when a person is engaged in effortful processing of a message (i.e., high elaboration) or when processing ability is constrained (i.e., low elaboration). That is, under moderate elaboration, persuasion is determined primarily by the amount of processing that takes place. Applying this to vocal confidence, a listener may reason that a confident speaker must be particularly knowledgeable,

accurate, or possess a high level of topic-relevant expertise, and thus may be sharing valuable information. In turn, this may enhance the listener's motivation to attend to the content and thus increase the amount of thought devoted to processing the message. Conversely, because an unconfident speaker may be perceived as lacking knowledge, accuracy and/or expertise, a listener may conclude that the speaker must not be providing valuable and/or accurate information. In turn, this may reduce the listener's motivation to attend to the content and thus decrease the amount of thought devoted to processing the message.

Current Objectives

At a broad level, the goal of this research was to investigate the underlying processes by which vocal confidence affects persuasion based on the extent to which a person engages in effortful processing of a message. Drawing on the Elaboration Likelihood Model as our theoretical framework, the basic premise is that although we would expect vocal confidence to influence persuasion across the entire range of the elaboration continuum, how it exerts its effects under each level of elaboration is not necessarily the same. Indeed, as previously noted, a number of inconsistent findings have emerged in prior research thus leading to some debate regarding the processes responsible for the effects of rate of speech on persuasion.

In addition to testing the mechanisms underlying the effects of vocal confidence on persuasion, we sought to address a number of methodological issues stemming from the various ways in which prior research has manipulated qualities of voice. Using advances in technology, we employed a digital recording and editing process that provided a far more precise way of manipulating specific properties of voice than those techniques used in prior research – importantly, without affecting other vocal properties that were not of interest. More generally, a further goal was to investigate other hallmarks of vocal confidence beyond rate of speech, such

as vocal intonation and vocal pitch. In this case, several ideas guided our thinking. One idea was to combine the manipulations of two hallmarks of vocal confidence within the same audio file so that they either worked in conjunction with one another (i.e., both vocal qualities either simultaneously reflected confidence or did not) or contradicted one another. Testing this was an important step because it allowed us to determine whether combining multiple hallmarks of vocal confidence affects persuasion in an additive or an interactive fashion. A second goal was to investigate how vocal confidence affects persuasion across a broader spectrum of each variable and further, whether these effects exert themselves in different ways across different variables. We tested these ideas across a series of four experiments.

In Experiments 1 and 2, we explored the mechanisms by which vocal confidence may exert it effects on persuasion when people are pushed to the end points of the elaboration continuum and are processing a message either with a high or low degree of elaboration. Based on the ELM, we proposed that the underlying psychological processes that occur under these conditions are not necessarily the same as when processing is not constrained to be either high or low. We tested this in Experiment 1 by introducing manipulations that either reduced participant's ability and motivation to process a message or increased both ability and motivation. Participants listened to an audio file containing a message comprised of moderately strong arguments delivered by a speaker whose rate of speech and vocal intonation were manipulated such that all possible combinations of these variables were produced. Experiment 2 employed a similar design and also used a message comprised of moderately strong arguments, but manipulated only the speaker's vocal pitch.

In Experiments 3 and 4, our focus shifted to investigate the processes by which vocal confidence affects persuasion in the middle of the elaboration continuum. In this case, what the

ELM suggests is that the primary effect vocal confidence should have under moderate elaboration is to influence the amount of processing that takes place. Here the basic idea is that various factors affecting perceptions of speaker confidence should influence a recipient's motivation to attend to the message because vocal confidence may be used as a determinant of the extent to which a speaker is providing valuable/accurate information. Importantly, Experiments 3 and 4 also sought to test the extent to which various hallmarks of vocal confidence can affect a recipient's ability to process a message by investigating a wider spectrum of both rate of speech and vocal intonation.

Chapter 2

The Effects of Vocal Speed and Vocal Intonation on Persuasion in the Context of Moderate Arguments

Experiment 1 investigated how rate of speech and vocal intonation influenced the success of a persuasive appeal using a message comprised of moderately strong arguments. Specifically, Experiment 1 sought to determine the process by which these hallmarks of vocal confidence exert their effects on persuasion based on the predictions made by the Elaboration Likelihood Model. Ratings of speaker confidence and cognitive responses were tested as mediators of this process under high – and low elaboration.

2.1 Method

Participants

Participants (N = 394) were obtained on a volunteer basis from the introductory psychology research pool at Queen's University. This study formed part of a session in which participants completed several studies that together took no longer than one hour to complete.

All studies were completed in a laboratory environment under semi-private conditions on a computer provided by the researchers. Course credit was provided in exchange for participation.

Design and Procedure

We employed a 2 (Elaboration: high vs. low) x 2 (Vocal speed: increased speed vs. decreased speed) x 2 (Vocal intonation: falling intonation vs. rising intonation) between participants factorial design. Assignment to all conditions was random. After being seated at a computer, participants were given headphones and told that they would be listening to an audio passage. The passage described a policy under consideration for some provinces that would provide students with the opportunity to reduce their tuition in exchange for working as part-time university staff members. The passage was modelled after pro-attitudinal arguments on the same topic that prior research (Clark, Wegener, & Fabrigar, 2008; see also Baker & Petty, 1986) had demonstrated were perceived as comparatively strong. We modified the passage to contain arguments of moderate strength in accordance with prior research that suggests the biasing effects of a variable (e.g., vocal confidence) should be most effective when a message is composed of moderate arguments (Chaiken & Maheswaran, 1994). For example, our moderate arguments version informed participants that this policy would allow a greater portion of the university budget to be invested in nicer offices for faculty, more money to fund their travel, and more vacation time. Thus, it is possible that a greater number of the faculty currently employed in the university system will be more satisfied with their work environment. By comparison, in the strong arguments version (Clark et al., 2008), participants were told that this policy would allow a greater portion of the university budget to be invested in monetary incentives for research and teaching, which would leave funding available to recruit additional outstanding professors, researchers, and Nobel prize-winning laureates.

Prior to receiving the audio passage, participants were randomly assigned to either a high or low elaboration condition. According to the Elaboration Likelihood Model (ELM; Petty & Cacioppo, 1986), a person's ability and motivation are the primary determinants of the extent to which an individual will thoughtfully evaluate the content of a message. Because one goal of Experiment 1 was to investigate how vocal hallmarks of confidence affect persuasion when people are pushed to the end points of the elaboration continuum, we combined manipulations of both ability and motivation when creating our high and low elaboration conditions. Thus, when creating our high elaboration condition, we had two goals in mind. First, we sought to maximize participant's ability to process the arguments contained within the message by creating an optimal environment conducive to high elaboration. Specifically, participants completed the experiment on a computer provided by the researchers under semi-private conditions, thus minimizing audio and visual distractions to the greatest extent possible. Importantly, unlike participants assigned to our low elaboration condition, no distraction task was used.

Second, we wanted to ensure that participants were highly motivated to process the message. This was accomplished by framing the message as having a high degree of personal relevance in order to increase participant's involvement in the topic and thus enhance processing of the arguments. For example, participants were informed that Queen's University was considering implementing a program the following year that would require all students to enroll in the plan in order to pursue and/or continue their degree at Queen's University. Moreover, this plan would require students to work for the university in exchange for a reduction in tuition. Prior research (e.g., Petty & Cacioppo, 1979; Petty & Cacioppo, 1984), has demonstrated that personal relevance can affect the extent to which individuals are motivated to thoughtfully consider the merits of an argument.

According to the ELM, effortful processing is at its lowest when people are both unable and unmotivated to carefully evaluate the content of a message. Thus, when creating our low elaboration condition, one goal was to reduce participant's ability to process the message. This was accomplished by providing participants with an 8-digit number, instructing them to memorize it, and informing them that they would need to provide it to the researchers at the end of the experiment. Research had shown that this type of distraction task reduces people's ability to carefully process information (e.g., Gilbert & Osborne, 1989).

To reduce motivation, the message was framed as having a low degree of personal relevance in order to decrease participant's involvement in the topic and thus erode processing of the arguments. Specifically, participants were told that several universities in the United States had adopted a tuition reduction program but that Queen's was not considering implementing a similar program. At this point, participants in all conditions listened to the audio passage.

The audio passage was delivered by a female speaker recruited from the drama program at Queen's University. A professional digital recording and editing program (PRAAT©) was used to create the audio passage. This allowed us to target only the two dimensions of interest (i.e., rate of speech and vocal intonation) without affecting other vocal characteristics that were not of interest. When recording the passage, the speaker was asked to talk at their normal rate of speech and to deliver the content in as natural a fashion as possible.

In order to manipulate rate of speech, we increased how fast the speaker was talking by 10% and decreased how fast the speaker was talking by 15% relative to their baseline in the original audio recording. This produced an average of 191 WPM in the increased rate of speech condition and an average of 149 WPM in the decreased rate of speech condition. In order to manipulate vocal intonation, we selected 10 target sentences throughout the passage and either

raised or lowered the intonation in the speaker's voice on the last word in each sentence. These manipulations were employed based on the success of similar manipulations used in research previously conducted in our lab (Creighton, Kredenster, Fabrigar, & Munhall, 2010). Because our manipulations of speech rate and vocal intonation were fully crossed, this produced four audio recordings in which the speaker spoke either fast with rising or falling intonation, or slow, with rising or falling intonation.

Following the audio passage, participants assigned to the low elaboration condition were asked to enter the number they were provided. Next, all participants answered three filler questions that required them to evaluate the speaker's stylistic delivery of the message. After this, ratings were provided on two attributes of the speaker and on two qualities of the speaker's voice. Participants then indicated their attitude towards the proposed tuition-reduction plan. As a final step, participants completed a thought-listing task that asked them to list up to twelve thoughts that came to mind while listening to the audio passage and then rate the favorability of those thoughts as either positive, negative, or neutral as they applied to the topic. Once the study had concluded, debriefing forms were provided and 1 course credit was awarded in exchange for participation.

Measures

Stylistic Qualities Questionnaire.

Three questions assessed the stylistic qualities of the speaker and were included in order to mask the true intent of the study. Questions were presented in a random order. Participants evaluated the clarity with which the speaker presented their ideas on a scale ranging from 1 = *Very unclear*, to 7 = *Very clear*. The complexity of the vocabulary used by the speaker was evaluated on a scale ranging from 1 = *Very basic*, to 7 = *Very complex*. The organization of the speaker's points were evaluated on a scale ranging from 1 = *Very poorly* to 7 = *Very organized*.

Speaker Attributes and Vocal Qualities Questionnaire.

Four questions were presented, of which two (i.e., vocal confidence, rate of speech) were of interest. The remaining two items (i.e., intelligence, loudness) were included in order to disguise the two variables of interest. All questions were presented in a random order. Beginning with a description of our two variables of interest, participants were asked to rate the extent to which the speaker sounded confident using a scale ranging from 1 = *Very unconfident*, to 7 = *Very confident*. The speaker's rate of speech was evaluated using a scale ranging from 1 = *Very slow*, to 7 = *Very fast*. Concerning our two filler questions, participants were asked to indicate how loud the speaker was talking using a scale ranging from 1 = *Very quiet*, to 7 = *Very loud*. Participants were also asked to rate the intelligence of the speaker using a scale ranging from 1 = *Very unintelligent*, to 7 = *Very intelligent*.

Attitude Scale.

Attitudes were measured using an 8-item scale consisting of different words reflecting general and undifferentiated positive or negative evaluation. Half of the words implied positive evaluations (e.g., good, positive), whereas the other half implied negative evaluations (e.g., dislike, undesirable). Participants were instructed to work rapidly and rate the extent to which their evaluation of the university service plan matched each word on a scale ranging from 1 = *Not at all*, to 7 = *Definitely*. Higher numbers reflect a more favorable attitude whereas lower numbers reflect a less favourable attitude. Final attitude scores were created by reverse coding the negative items, then averaging the scores across all scale items. This scale was previously developed and validated by Crites, Fabrigar, & Petty (1994), and has been used in many published studies. Cronbach's α for the attitude scale was .93.

Thought Listing and Rating Task.

A thought listing and rating task was employed (e.g., Cialdini, Levy, Herman, Kozlowski, & Petty, 1976; Cacioppo & Petty, 1981) in which participants were asked to list up to twelve thoughts that came to mind while listening to the audio passage. Participants were told that each response should contain only one thought; that they could list as many or as few thoughts as desired and that neither grammar nor punctuation was important. When they had finished listing as many thoughts as desired, participants were instructed to type the word "none" in each remaining box. Once the thought-listing task was complete, participants were shown each of the thoughts they had previously entered and instructed to rate the favorability of each thought as it applied to the university service plan. Response options included *Positive* (+), *Negative* (-), *Neutral* (0), or *No thought* (N).

Although participants self-rated their thoughts for favorability, two independent raters also coded their thoughts on two dimensions while blind to condition and without observing the coding assigned by participants. The use of codes assigned by independent raters is a well-established practice when employing thought listing and ratings measures (e.g., Cacioppo & Petty, 1979; Petty & Cacioppo, 1984). First, the independent raters evaluated the *favorability* of each thought as it applied to the university service plan and then coded each thought using the same response options used by participants. The second dimension evaluated by the independent raters involved the *relevance* of the thought to the topic. In cases where thoughts were clearly irrelevant to the university service plan, the independent raters coded the thought as irrelevant. Examples of irrelevant thoughts include: "I'm going to Tim Hortons when this study is finished", or "I wonder what my boyfriend is doing right now." Analyses indicated a high degree of interrater agreement both on thought favorability (92%) and thought relevance (88%). In line

with prior research, we calculated the final values for thought favorability and thought relevance by averaging the scores for both independent raters on each dimension (e.g., Petty, Cacioppo, & Heesacker, 1981).

Based on the coding assigned by the independent raters, an index of thought favorability was computed using the following formula (Petty & Cacioppo, 1986): *Thought Favorability* = (Number of positive relevant thoughts – Number of negative relevant thoughts) / Total number of thoughts. The possible range of values for this measure was -1 to 1. Participants received a score of -1 if all thoughts were both relevant and negative and a score of 1 if all thoughts were both relevant and positive.

Using scores derived from the thought-rating task, two additional indices were created whose purpose was to evaluate the success of our elaboration manipulation. The first index examined the total *number* of topic-relevant thoughts. Thus, any thoughts categorized as irrelevant to the topic were excluded from this analysis. This measure was computed using the following formula: *Total number of relevant thoughts* = (Number of positive thoughts + Number of negative thoughts + Number of neutral thoughts). The possible range of values for this measure was 0 to 12, with zero indicating no topic-relevant thoughts were generated, and 12 indicating the maximum number of thoughts allowed were generated and all thoughts were relevant to the topic.

The second index evaluated the *proportion* of topic-relevant thoughts compared with all thoughts generated by the participant. This measure was computed using the following formula: *Proportion of relevant thoughts* = (Number of positive thoughts + Number of negative thoughts + Number of neutral thoughts) / (Total number of thoughts). The possible range of values for this

measure was 0 to 1, with 0 indicating no thoughts were relevant and 1 indicating all thoughts were relevant.

2.2 Results

Vocal Speed Manipulation Check

Our first goal was to evaluate the success of our vocal speed manipulation. This was tested by conducting an ANOVA in which vocal speed, vocal intonation, and elaboration were designated as our independent variables and ratings of the speaker's rate of speech served as the dependent variable.

Confirming expectations, the data revealed that participants perceived the speaker with an increased rate of speech (M = 4.74, SE = .08) as talking significantly faster than the speaker with a decreased rate of speech (M = 3.53, SE = .08), $F(1, 386) = 116.51$, $p < .001$, partial $\eta 2 = .23$. A marginally significant main effect of vocal intonation was also found, $F(1, 386) = 3.29$, $p = .07$, partial $\eta 2 = .01$, such that participants perceived an increase in rate of speech when presented with a speaker whose intonation raised (M = 4.24, SE = .08), rather than fell (M = 4.03, SE = .08), at the end of a sentence. Furthermore, the data revealed a significant main effect of elaboration, $F(1, 386) = 8.37$, $p < .01$, partial $\eta 2 = .02$, such that participants rated the speaker as talking significantly faster when processing was unconstrained (M = 4.30, SE = .08), than when constraints (M = 3.97, SE = .08), were placed on processing through a number recall task.

In addition, a significant two-way interaction emerged between elaboration and intonation, $F(1, 386) = 4.02$, $p = .046$, partial $\eta 2 = .01$, such that under high elaboration, participants rated the speaker as talking significantly faster when the speaker's intonation raised (M = 4.51, SE = .11), rather than fell (M = 4.08, SE = .11), at the end of a sentence, $p < .01$. However, under low elaboration, no difference in ratings of speech rate was found across levels

of intonation, $p = .89$. Finally, the data revealed a marginally significant two-way interaction between rate of speech and intonation, $F(1, 386) = 3.40$, $p = .07$, partial $\eta 2 = .01$. A closer examination revealed that participants assigned to the increased rate of speech condition rated the speaker as talking significantly faster when the speaker's intonation raised ($M = 4.95$, $SE = .11$), rather than fell ($M = 4.54$, $SE = .11$), $p = .01$, at the end of a sentence. No difference across levels of intonation emerged for participants who heard a speaker talking at a decreased rate of speech, $p = .98$. No interaction between vocal speed and elaboration was found, $F(1, 386) = .75$, $p = .39$, partial $\eta 2 = .00$. Likewise, a three-way interaction between vocal speed, vocal intonation, and elaboration did not emerge, $F(1, 386) = .50$, $p = .48$, partial $\eta 2 = .00$.

Taken together, although participants rated the speaker as talking significantly faster when processing was unconstrained (i.e., high elaboration) by a number recall task, importantly, the absence of a two-way interaction between speech rate and elaboration suggests that *constraining* (i.e., low elaboration) processing in no way impacted participant's ability to detect changes in the speaker's rate of speech. Thus, these data suggest that our rate of speech manipulation was successful.

Evaluation of Vocal Confidence Measure

Next, we sought to ensure that both vocal manipulations produced the expected effects on ratings of speaker confidence. This was tested by conducting an ANOVA in which vocal speed, vocal intonation, and elaboration were designated as the independent variables and ratings of speaker confidence served as the dependent variable.

Two critical effects were expected to emerge. First, a main effect of vocal speed was predicted. Confirming expectations, participants rated the speaker in the increased vocal speed condition ($M = 5.39$, $SE = .11$), as significantly more confident relative to the speaker in the

decreased vocal speed condition (M = 4.51, SE = .11), F(1, 394) = 34.26, p < .001, partial η2 = .08. The second effect we expected was a main effect of vocal intonation. As anticipated, participants rated the speaker with falling intonation (M = 5.51, SE = .11), as significantly more confident than the speaker with rising intonation (M = 4.39, SE = .11), F(1, 386) = 55.75, p < .001, partial η2 = .13. Also in line with expectations, no main effect of elaboration was found, F(1, 386) = 1.79, p = .18, partial η2 = .00. Importantly, the vocal speed main effect was not qualified by an interaction with elaboration, F(1, 386) = .12, p = .74, partial η2 = .00. Likewise, the vocal intonation main effect was not qualified by an interaction with elaboration, F(1, 386) = 1.96, p = .16, partial η2 = .01. This suggests that judgments of speaker confidence were not differentially influenced by the extent to which participants engaged in effortful processing of the message. Furthermore, no interaction between vocal speed and vocal intonation was found, F(1, 386) = .22, p = .64, partial η2 = .00, thus suggesting that the impact of these variables on perceptions of speaker confidence was additive as opposed to interactive. Finally, a three-way interaction between vocal speed, vocal intonation, and elaboration did not emerge, F(1, 386) = .18, p = .67, partial η2 = .00. Taken together, these data confirm that both vocal speed and vocal intonation influenced ratings of speaker confidence as predicted.

Elaboration Manipulation Check

In order to test whether elaboration was successfully manipulated, there are several analyses that can be performed. First, we examined whether our efforts to decrease processing resulted in fewer topic-relevant thoughts compared with our efforts to increase processing. This was tested by conducting an ANOVA in which elaboration, vocal speed, and vocal intonation were designated as the independent variables and the number of topic-relevant thoughts served as the dependent variable.

Confirming expectations, participants assigned to the high elaboration condition (M = 4.38, SE = .17), generated a significantly greater number of topic-relevant thoughts than participants assigned to the low elaboration condition, (M = 3.56, SE = .17), $F(1, 386) = 11.60$, $p < .01$, partial $\eta 2 = .03$. Additionally, the data revealed a main effect of intonation, $F(1, 386) = 5.95$, $p = .015$, partial $\eta 2 = .02$, such that participants generated significantly more topic-relevant thoughts when the speaker's intonation fell (M = 4.26, SE = .17), as opposed to raised (M = 3.67, SE = .17), at the end of a sentence. Finally, a marginally significant two-way interaction between vocal intonation and elaboration was found, $F(1, 386) = 3.31$, $p = .07$, partial $\eta 2 = .01$, such that under low elaboration, falling intonation (M = 4.07, SE = .25), led to significantly more topic-relevant thoughts compared with rising intonation, (M = 3.04, SE = .24), $p < .01$. However, under high elaboration, no difference in the number of topic-relevant thoughts emerged across levels of intonation, $p = .66$. As expected, no main effect of vocal speed was found, $F(1, 386) = .03$, $p = .86$, partial $\eta 2 = .00$. Likewise, the two-way interaction between vocal speed and elaboration did not reach significance, $F(1, 386) = .71$, $p = .40$, partial $\eta 2 = .00$. Similarly, the two-way interaction between vocal speed and vocal intonation was not significant, $F(1, 386) = .36$, $p = .55$, partial $\eta 2 = .00$. Finally, a three-way interaction between vocal speed, vocal intonation, and elaboration did not emerge, $F(1, 386) = .30$, $p = .59$, partial $\eta 2 = .00$.

A similar analyses using proportion of relevant thoughts as the dependent variable revealed that high elaboration participants (M = .82, SE = .02), generated a significantly greater proportion of topic-relevant thoughts compared with low elaboration participants (M = .75, SE = .02), $F(1, 380) = 7.88$, $p < .01$, partial $\eta 2 = .02$. Once again, a main effect of vocal intonation emerged, $F(1, 380) = 19.71$, $p < .001$, partial $\eta 2 = .05$, such that participants generated a significantly greater proportion of topic-relevant thoughts when the speaker's intonation fell

(*M* = .85, *SE* = .02), as opposed to raised (*M* = .72, *SE* = .02), at the end of a sentence. However, unlike the prior analyses which used the total number of relevant thoughts as the dependent variable, in this case the two-way interaction between vocal intonation and elaboration did not reach significance, $F(1, 380) = .07$, $p = .79$, partial $\eta 2 = .00$. As in the prior analyses, no interaction between vocal speed and vocal intonation was found, $F(1, 380) = .68$, $p = .41$, partial $\eta 2 = .00$. Once again, no main effect of vocal speed was found, $F(1, 380) = .54$, $p = .46$, partial $\eta 2 = .00$, nor did the two-way interaction between vocal speed and elaboration reach significance, $F(1, 380) = .06$, $p = .80$, partial $\eta 2 = .00$. Finally, the three-way interaction between vocal speed, vocal intonation, and elaboration was not significant, $F(1, 380) = .24$, $p = .63$, partial $\eta 2 = .00$.

Across both indices of elaboration, these data provide clear evidence of robust differences in processing, thus confirming the success of our elaboration manipulation. Interestingly, despite our efforts to manipulate processing, these data suggest that some variance in elaboration can be accounted for by the speaker's vocal intonation. These effects emerged when the speaker's intonation fell, which is precisely when we might expect processing to increase because a confident sounding speaker should engender more processing. However, it is important to note that these effects were comparatively weak and not entirely consistent across our two indices of elaboration. This suggests that despite our efforts to push people to both ends of the elaboration continuum, processing was still driven to a certain extent by the speaker's vocal intonation.

The Effects of Vocal Qualities and Elaboration on Thought Favorability

Having confirmed the success of our manipulations, we now turn our attention to investigating the effects of vocal qualities and elaboration on participant's cognitive responses

toward the university service plan. This was tested by conducting an ANOVA in which vocal speed, vocal intonation, and elaboration were designated as our independent variables and participant's cognitive responses (i.e., thought-favorability) served as the dependent variable.

Beginning with our main effects, we did not have a compelling basis for predicting a main effect of either vocal intonation or vocal speed. Confirming expectations, no main effect of either vocal intonation, $F(1, 363) = .01$, $p = .91$, partial $\eta 2 = .00$, or vocal speed, $F(1, 363) = 1.31$, $p = .25$, partial $\eta 2 = .00$, was found. Regarding a main effect of elaboration, to the extent that the arguments are sufficiently strong to produce generally positive responses, we might expect increased elaboration to be associated with more favorable thoughts. Indeed, the data revealed that high elaboration participants ($M = .08$, $SE = .05$), generated significantly more favorable thoughts than low elaboration participants, ($M = -.08$, $SE = .05$), $F(1, 363) = 5.26$, $p = .02$, partial $\eta 2 = .01$.

Based on the logic of the ELM, we anticipated a two-way interaction between vocal speed and elaboration as well as between vocal intonation and elaboration. First, recall that our model suggests perceptions of speaker confidence should be the most proximal consequence of vocal speed and vocal intonation. Following perceptions of speaker confidence come thoughts. Under high elaboration, vocal speed and vocal intonation affect perceptions of speaker confidence, which in turn biases the favorability of the recipient's thoughts. Although vocal speed and vocal intonation still affect perceptions of confidence under low elaboration, confidence no longer biases thoughts. Thus, any effect of vocal speed and vocal intonation on thoughts should be comparatively weak. For this reason, we anticipated a two-way interaction between vocal speed and elaboration such that increased processing should result in more favorable thoughts when the message was delivered by a fast relative to slow talking speaker. A

weaker effect of speech rate was expected when processing was decreased. Likewise, a two-way interaction between vocal intonation and elaboration was predicted such that increased processing should result in more favorable thoughts when the speaker used falling as opposed to rising intonation at the end of a sentence. A weaker effect of vocal intonation was expected when processing was decreased.

Interestingly, no interaction between vocal speed and elaboration, $F(1, 363) = .29$, $p = .59$, partial $\eta 2 = .00$, or vocal intonation and elaboration, $F(1, 363) = 1.09$, $p = .30$, partial $\eta 2 = .00$, was found. We had no basis for predicting an interaction between vocal speed and vocal intonation and none was found, $F(1, 363) = .80$, $p = .37$, partial $\eta 2 = .00$. Finally, a three-way interaction between vocal speed, vocal intonation, and elaboration was not predicted and did not emerge, $F(1, 363) = .05$, $p = .83$, partial $\eta 2 = .00$. Taken together, the fact that neither two-way interaction reached significance was somewhat curious. However, it is important to bear in mind that this analysis forms only one component of our larger theoretical model, which when fully developed could provide a greater understanding insofar as why this pattern of effects failed to emerge as anticipated.

The Effects of Vocal Qualities and Elaboration on Attitudes

Our next step was to investigate the effects of vocal qualities and elaboration on participant's attitudes toward the university service plan. This was tested by conducting an ANOVA in which vocal speed, vocal intonation, and elaboration were designated as our independent variables and a measure of participant's attitude served as the dependent variable. Although prior research suggests the possibility that several effects could emerge, it is important to consider that because attitudes assume the most distal position in our theoretical model, to the

extent that any effects of vocal qualities do emerge, these effects should be comparatively weak. Bearing this in mind, we begin with an examination of our two vocal qualities.

Turning first to vocal speed, we hypothesized the possibility that a comparatively fast-talking speaker might elicit more attitude change relative to a comparatively slow-talking speaker. Likewise, a speaker who used falling intonation at the end of a sentence might elicit more attitude change relative to a speaker who used rising intonation at the end of a sentence. The results indicated no main effect of vocal speed, $F(1, 386) = .07$, $p = .79$, partial $\eta 2 = .00$, or vocal intonation, $F(1, 386) = 1.34$, $p = .25$, partial $\eta 2 = .00$ was found.

Moving now to elaboration, because vocal qualities were hypothesized to have a similar effect on attitudes but through different processes moderated by elaboration, no main effect of elaboration or interaction between vocal qualities and elaboration was expected. As anticipated, no main effect of elaboration, $F(1, 386) = .35$, $p = .56$, partial $\eta 2 = .00$, or interaction between vocal speed and elaboration, $F(1, 386) = .00$, $p = .97$, partial $\eta 2 = .00$, or vocal intonation and elaboration, $F(1, 386) = .44$, $p = .51$, partial $\eta 2 = .00$, emerged. Finally, we allowed for the possibility of a two-way interaction between vocal speed and vocal intonation but had no compelling basis to make specific predictions regarding the form this interaction may take. Our data indicated the two-way interaction between vocal speed and vocal intonation, $F(1, 386) = .47$, $p = .49$, partial $\eta 2 = .00$, did not reach significance. Finally, a three-way interaction between vocal speed, vocal intonation, and elaboration was not predicted and did not emerge, $F(1, 386) = .17$, $p = .68$, partial $\eta 2 = .00$.

Given our theoretical model, these data are not altogether surprising. Importantly, our model explicitly predicts that vocal qualities should have similar effects on attitudes under high – and low elaboration, but through different mediating processes at each level of elaboration. Thus,

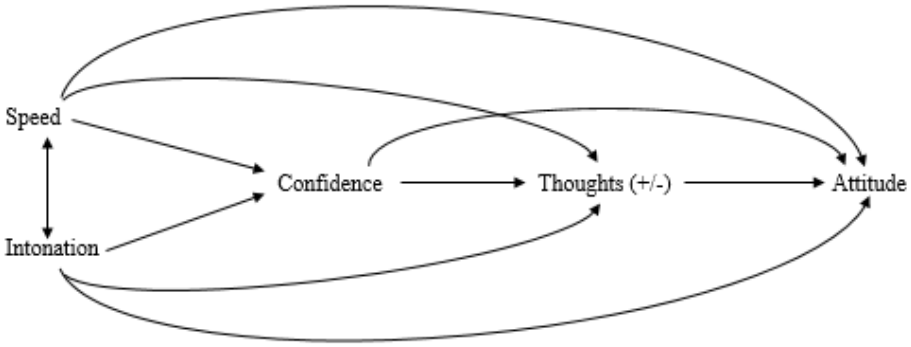
our theoretical framework would not expect any interaction between vocal qualities and elaboration, which is exactly what we found.

Vocal Confidence as a Biasing Factor and Peripheral Cue

The next step was to determine whether the process by which vocal speed and vocal intonation influenced persuasion differed under high – and low elaboration. This was tested by conducting a multi-sample structural equation model using Lisrel 9.20 (Joreskog & Sorbom, 2014).[2] First, participants were divided into their respective high and low elaboration condition. Next, the covariance matrix for each level of elaboration was computed using the measured variables designated as exogenous (i.e., vocal speed and vocal intonation) and endogenous (i.e., ratings of speaker confidence, cognitive responses, and attitude). We then fit the model depicted in Figure 1 to each of these groups. Importantly, because all variables are measured variables and do not have multiple indicators, this model was specified such that each variable was fixed with a factor loading of 1 on its underlying construct and the associated error for each variable was set to 0. In effect, this assumes that the measure is a perfect representation of its underlying construct. Bear in mind that this assumption is implicitly made in all ANOVA and regression-based analyses and thus is not unique to our statistical approach. Additionally, our model presumed that the residual variance in our endogenous variables were independent of one another.

[2] These relationships were also evaluated using a regression-based moderated mediation analysis. The data indicated highly comparable results to those produced through multi-sample structural equation modelling.

Figure 1.
Path Model Depicting Relationships between Variables under High – and Low Elaboration



When conducting our analyses, this model was fit simultaneously to both groups. Using Maximum Likelihood to estimate each parameter, we then tested whether various paths were significantly different from one another across levels of elaboration by placing equality constraints on specific coefficients of interest. A chi-square difference test was used to evaluate the fit of our constrained model against its unconstrained counterpart. If a significant chi-square statistic was found, that indicated the particular coefficients being compared were significantly different from one another. Finally, recall that the earlier ANOVA investigating the joint effects of vocal speed and vocal intonation on perceptions of confidence revealed that these variables influenced confidence in an additive rather than interactive fashion. Thus, these models assume additive effects of voice. The results for both path models are represented in Figure 2 and use unstandardized coefficients as an index of the value estimated for each path. Dotted lines indicate non-significant paths.

According to the Elaboration Likelihood Model, the process by which a variable influences persuasion differs based on the extent to which an individual carefully evaluates the merits of an argument. In thinking of how vocal speed and vocal intonation influence persuasion under high elaboration, recall that the ELM suggests a variable should bias the favorability of the recipient's thoughts, which in turn are used as a guide when forming subsequent attitudes. Thus,

our prediction was that vocal speed and vocal intonation would influence perceptions of speaker confidence, which would then bias the recipient's cognitive responses and in turn influence their attitude. Importantly, recall that the ELM suggests a different process should occur under low elaboration. In this case, although vocal speed and vocal intonation should still influence perceptions of speaker confidence, the difference here is that confidence no longer directly influences thought favorability but rather has a direct impact on the recipient's attitude.

Our first step was to investigate the pattern of effects that constitute the bias process our model suggests should emerge under high elaboration. This process refers to the causal chain that should unfold when confidence is functioning as a biasing factor. Once again, our expectation was that vocal speed and vocal intonation should affect perceptions of speaker confidence. Confidence should then bias thought favorability, which then directly influences post-message attitude (see Panel A in Figure 2, page 45).

Thus, using those four paths, we tested whether this causal chain was equivalent across high – and low elaboration. This was done by placing equality constraints across elaboration groups, specifically on each of the paths that formed the direct causal chain between vocal speed/intonation and attitude in our high elaboration path model, then simultaneously conducting a multi-sample structural equation model analyses on both high – and low elaboration groups. Our expectation was that the causal chain described above would emerge under high elaboration but not under low elaboration. As anticipated, the results indicated a significant difference in the overall mediation effect across levels of elaboration, thus providing initial support for our theoretical framework, $\chi^2 = 28.65$ ($df = 4$, $N = 371$, $p < .001$).

Our next step was to determine where these differences emerged. Similar to any omnibus test, this result indicates that a significant difference was found when comparing this causal chain

across both high – and low elaboration groups, but does not indicate where this difference emerged. Therefore, follow up tests were conducted to determine which paths differed across levels of elaboration. This was done by placing equality constraints on each of the direct causal paths in our high elaboration group, one path at a time, and then comparing whether or not each path was significantly different across levels of elaboration.

Beginning with high elaboration in panel A of Figure 2 (see page 45), our first goal was to test whether the paths reflecting the direct effect of both vocal speed and vocal intonation on ratings of speaker confidence differed across levels of elaboration. Our theory suggests that people should be equally adept at detecting changes in rate of speech and intonation regardless of how carefully they are processing a message. Thus, our expectation was that both variables should have similar effects on confidence across levels of elaboration.

The data revealed that under high elaboration, vocal speed, $b = .83$, $SE = .21$, $p < .001$, and vocal intonation, $b = .92$, $SE = .21$, $p < .001$, were significant predictors of speaker confidence. Moving to low elaboration in panel B of Figure 2, we also find that vocal speed, $b = .89$, $SE = .23$, $p < .001$, and vocal intonation, $b = 1.31$, $SE = .23$, $p < .001$, significantly predicted ratings of speaker confidence. Importantly, the data revealed that when testing these coefficients across levels of elaboration, the effects of vocal speed, $\chi^2 = .03$ ($df = 1$, $N = 371$, $p = .85$), and vocal intonation, $\chi^2 = 1.67$ ($df = 1$, $N = 371$, $p = .20$), were of comparable magnitude. This suggests that regardless of whether or not participants were carefully processing the message, the amount of effort exerted did not affect their ability to detect changes in the speaker's voice.

Next, recall that under high elaboration, our theory suggests that confidence should bias the favorability of a person's thoughts. In line with expectations, this is exactly what we found, $b = .15$, $SE = .03$, $p < .001$. Importantly, when a person lacks the ability and/or motivation to

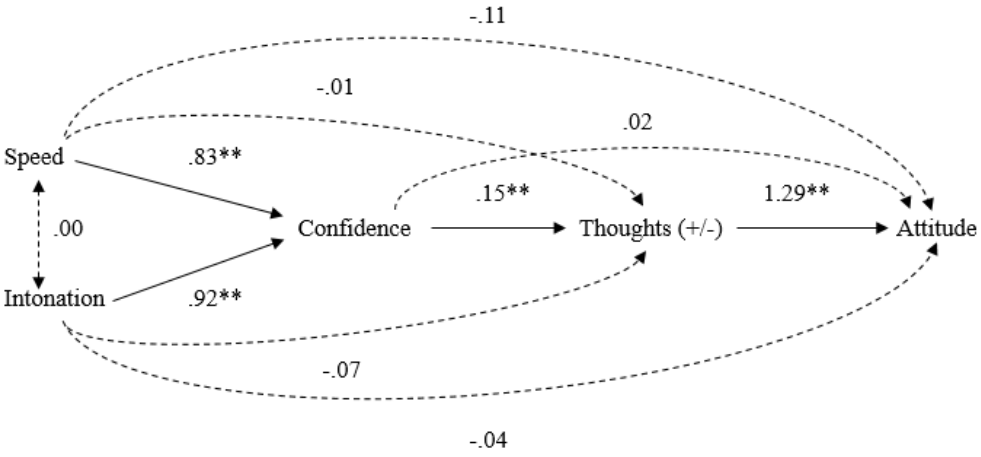
carefully process a message, our theory suggests that confidence should not bias the favorability of thoughts. Once again, this is precisely what the data suggest, b = -.03, SE = .03, p = .38. Follow-up tests were performed to compare the coefficients reflecting the direct effect of speaker confidence on thoughts across levels of elaboration. Supporting the theory, the data revealed that speaker confidence was a significantly greater predictor of thoughts under high – compared with low-elaboration, $\chi^2 = 15.85$ (df = 1, N = 371, $p < .001$).

Finally, under high elaboration, we expected the thought to attitude path to be especially robust, which the data supported, b = 1.29, SE = .11, $p < .001$. Under low elaboration, our theory predicts that thoughts should also be a significant predictor of attitude, which is exactly what we found, b = .79, SE = .10, $p < .001$. However, because under high elaboration this causal chain is presumed to be thought-driven, the effect of thoughts on post-message attitude should be significantly more powerful under high – relative to low elaboration. Indeed, a comparison of these coefficients across levels of elaboration revealed this was in fact the case, $\chi^2 = 11.10$ (df = 1, N = 371, $p < .001$).

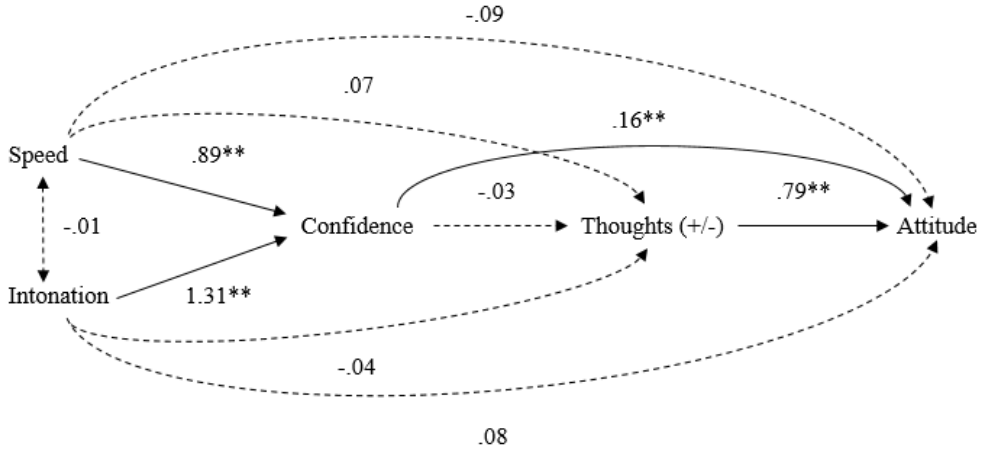
Taken together, these data provide compelling evidence to support the predictions of our theoretical framework. Specifically, that confidence should function in a biasing role under high but not low elaboration. Clear evidence of this pattern emerged when performing direct tests of the coefficients reflecting each path in the high elaboration causal chain across both groups. In line with expectations, our data revealed that confidence was a significantly greater predictor of thoughts under high compared with low elaboration. Likewise, thoughts were a significantly more powerful determinant of attitude under high relative to low elaboration. In contrast, our theory suggested the effects of both vocal speed and intonation on confidence should be of comparable magnitude across levels of elaboration. As anticipated, this is precisely what we found.

Figure 2.
Vocal confidence and cognitive responses as mediators of the relationship between vocal speed and vocal intonation and attitude.

Panel A) High Elaboration:



Panel B) Low Elaboration:



Turning now to low elaboration, recall that our theoretical framework predicts vocal confidence should exert its effects on attitudes via a different process than we observed under high elaboration. Notice that under low elaboration we have a simpler process and thus fewer paths in our causal chain than we do under high elaboration. In this case, our expectation was that confidence should now influence post-message attitudes by functioning as a peripheral cue. Although vocal speed and vocal intonation should still influence perceptions of speaker

confidence (paths 1 and 2), in this case our expectation was that confidence should now influence post-message attitudes by functioning as a peripheral cue (path 3) rather than through biasing thought favorability as we observed under high elaboration (see Panel B in Figure 2).

Our next step involved testing whether this causal chain was equivalent across high – and low elaboration. This was done using a similar process to that employed when testing our high elaboration causal chain. Our expectation was that the causal chain described above would emerge under low – but not under high elaboration. However, the data revealed a non-significant difference in the overall mediation effect across levels of elaboration, $\chi^2 = 6.15$ ($df = 3$, $N = 371$, $p = .10$).

When interpreting this result, recall that in accordance with our theory, both parameters reflecting the paths between vocal speed and confidence and vocal intonation and confidence were no different across levels of elaboration. In this case, our theory predicted only one parameter should differ across groups. Given the comparatively insensitive nature of an omnibus test, it is possible that significant differences exist when making pairwise comparisons yet the omnibus is not significant. This is particularly likely in the case of a model where two of the three paths were predicted – and emerged, as no different from one another.

Bearing this in mind, because our theory predicts that under low elaboration, confidence should function as a peripheral cue and have a direct effect on attitude, our next step involved testing this parameter. As expected, the data revealed a significant effect of confidence on attitudes, $b = .16$, $SE = .05$, $p < .01$. In contrast, recall that under high elaboration, our theory predicts the effects of vocal speed and vocal intonation should be thought driven. This suggests that confidence should not have a direct impact on attitudes. Indeed, the data confirmed this effect did not emerge, $b = .02$, $SE = .05$, $p = .73$. Importantly, when comparing the coefficients

reflecting the direct effect of confidence on attitudes across levels of elaboration, tests confirmed our expectation that this effect was significantly more powerful under low – compared with high-elaboration, $\chi^2 = 4.46$ ($df = 1$, $N = 371$, $p = .03$). Supporting our theoretical framework, these data provide good evidence that under low elaboration, confidence does not influence thought favorability but rather directly affects the recipient's attitude by functioning as a peripheral cue.

2.3 Discussion

To our knowledge, this experiment is the first to make use of electronic means to successfully manipulate previously identified hallmarks of vocal confidence, and further, to examine how these vocal properties influence persuasion. These data replicate past research (e.g., Brennan & Williams, 1995; Jiang & Pell, 2014; Scherer et al., 1973), by demonstrating that rate of speech and vocal intonation play an important role in evaluating the extent to which a speaker is perceived as confident. Beyond perceptions of confidence, these data advance our understanding of persuasion in several important ways. Our data provide the first evidence that, when combined, different hallmarks of vocal confidence may work together in an additive rather than interactive fashion to influence persuasion. Of greatest importance, our data supports the predictions made by the Elaboration Likelihood Model regarding the processes by which vocal confidence should affect persuasion. That is, when a person is engaged in effortful processing of a message, the extent to which they perceive the speaker as confident acts as a biasing factor that may either enhance or reduce the favorability of topic-relevant thoughts. However, when processing is reduced, perceptions of speaker confidence do not influence the favorability of the recipient's topic-relevant thoughts but rather directly affect their attitude by functioning as a peripheral cue.

Chapter 3

The Effects of Vocal Pitch on Persuasion in the Context of Moderate Arguments

Experiment 2 was developed with several goals in mind. First, given the multifaceted nature of voice, it seems plausible that additional qualities beyond rate of speech and intonation may play a role in affecting perceptions of speaker confidence. Indeed, research suggests vocal pitch may be one such quality. Similar to rate of speech and intonation, empirical evidence has demonstrated that listeners are readily able to identify changes in a speaker's vocal pitch (e.g., Bänziger, Patel, & Scherer, 2014). Likewise, research has found that these changes reliably influence listener's judgements of a speaker on various dimensions. For example, changes in vocal pitch have been shown to affect perceptions of speaker competence (Brown, Strong, & Rencher, 1973), honesty (Streeter, Krauss, Geller, Olson, & Apple, 1977), and anxiety (Apple, Streeter, & Krauss, 1979; Bond, Welkowitz, Goldschmidt, & Wattenberg, 1987), such that in each case a higher fundamental frequency (i.e., raised pitch) resulted in a more negative evaluation on each dimension.

Given that raised pitch is associated with more negative evaluations on both competence and anxiety, and anxiety and confidence are inversely related, it makes sense that listeners may associate increased competence as well as confidence with a lower fundamental frequency (i.e., lowered pitch). Of course, if vocal pitch is also a determinant of confidence, we would expect that when people are pushed to the end points of the elaboration continuum, any vocal quality affecting perceptions of confidence should influence persuasion in a similar manner as vocal speed and vocal intonation.

Thus, an important goal of Experiment 2 was to show that the same underlying psychological processes that emerged in Experiment 1 could be extended to other vocal qualities beyond those that have traditionally been investigated in the vocal confidence literature. Finally, although Experiment 1 provided one example of the multiple roles (i.e., bias, peripheral cue) by which confidence can affect persuasion under high and low elaboration, Experiment 2 sought to provide a second demonstration of these effects through a conceptual replication.

3.1 Method

Participants

Participants (N = 412) were obtained on a volunteer basis from the introductory psychology research pool at Queen's University. This study formed part of a session in which participants completed several studies that together took no longer than one hour to complete. All studies were completed in a laboratory environment under semi-private conditions on a computer provided by the researchers. Course credit was provided in exchange for participation.

Design and Procedure

We employed a 2(Elaboration: high vs. low) x 2(Vocal pitch: raised pitch vs. lowered pitch) between participants factorial design. Assignment to all conditions was random. After being seated at a computer, participants were given headphones and instructed to listen to an audio passage that discussed the benefits of using phosphate-based laundry detergent (Shavitt & Brock, 1986). Although prior research indicated the passage we used contained weak arguments, data collected in our lab provided some basis to suggest these arguments were perceived as sufficiently ambiguous. For example, participants were told that phosphate detergents have topped the charts in customer satisfaction a couple of times because they look better than other detergents, thus are frequently placed in locations that are more salient to shoppers. A further

reason phosphate detergents are so popular is because the packaging is more attractive than that of other kinds of detergents due to the colorful designs.

Similar to Experiment 1, participants were randomly assigned to either a high or low elaboration condition prior to receiving the audio passage. Once again, manipulations of ability and motivation were combined when creating each level of elaboration. Specifically, in our high elaboration condition, we sought to maximize participant's ability to process the arguments by creating an optimal environment conducive to thoughtful evaluation of the message. As in Experiment 1, participants completed the experiment on a computer provided by the researchers under semi-private conditions, thus minimizing audio and visual distractions to the greatest extent possible. In addition, unlike participants assigned to our low elaboration condition, no distraction task was used.

Second, to ensure that participants were highly motivated to process the message, we included a manipulation of personal responsibility. Research has shown that personal responsibility can enhance motivation to process issue-relevant arguments (e.g., Petty, Harkins, & Williams, 1980). For this reason, participants were informed that because very few students would be completing the survey, they may be one of the only students offering feedback. Thus, their feedback was especially important to the researchers.

In our low elaboration condition, we employed a distraction task to decrease processing ability by instructing participants to memorize an 8-digit number, and informing them that they would need to provide it to the researchers at the end of the experiment. We sought to reduce participant's motivation to carefully evaluate the message by informing them that because so many students would be completing this survey, it might be necessary to discard their survey

responses. Thus, any information they provide might not be read by the researchers. At this point, participants in all conditions listened to the audio passage.

The audio passage was delivered by a male speaker recruited from the psychology department at Queen's University. As in Experiment 1, a professional digital recording and editing program (PRAAT©) was used to create the audio passage. This allowed us to digitally manipulate the speaker's vocal pitch to produce two distinct levels of pitch without altering any other vocal characteristics that were not of interest. When recording the passage, the speaker was asked to talk at their normal rate of speed and to deliver the content in as natural a fashion as possible. Vocal pitch was manipulated by either raising the pitch in the speaker's voice by 120 hertz or lowering the pitch in the speaker's voice by 20 hertz relative to the speaker's natural baseline. Similar research conducted in our lab using the same speaker and manipulations of vocal pitch indicated these manipulations produced the expected effects on ratings of confidence (Guyer, Fabrigar, & Maracle, 2014).

Following the audio passage, participants assigned to the low elaboration condition were asked to enter the number they were given. Next, all participants provided a measure of their attitude towards the use of phosphate-based laundry detergents. Participants were then presented with a series of questions that asked them to evaluate different attributes of the speaker as well as the speaker's voice. Finally, participants completed a thought-listing task that asked them to list up to 10 thoughts that came to mind while listening to the audio passage and to then rate the favorability of those thoughts as either *positive, negative, neutral*, or *unrelated* (see Briñol, Petty, & Tormala, 2004), as they applied to the topic. Once the study had concluded, debriefing forms were provided and 1 course credit was awarded in exchange for participation.

Measures

Attitude Scale.

The attitude scale used in Experiment 2 was identical to that used in Experiment 1. Cronbach's α for the attitude scale was .92.

Speaker Attributes and Vocal Qualities Questionnaire.

Twelve questions were presented, of which three (i.e., vocal confidence, ratings of pitch, naturalness) were of primary theoretical interest. The remaining nine items (i.e., age, honesty, sincerity, intelligence, knowledgeable, competence, trustworthiness, credibility, and anxiety) were included for exploratory purposes as well as to disguise the three variables of interest. As our most important dependent variables, ratings of pitch, naturalness, and confidence were always presented first. All remaining questions were presented in random order. Beginning with a description of our three variables of interest, participants were asked to indicate the level of pitch in the speaker's voice using a scale ranging from -3 = *Very low*, to +3 = *Very high*. Next, participants were asked to rate the extent to which the speaker's voice sounded natural, using a scale ranging from 1 = *Not at all*, to 7 = *A great deal*. Using the identical scale, participants were also asked to rate the extent to which the speaker sounded confident. Identical scaling (i.e., 1 = *Not at all*, to 7 = *A great deal*) was used for all remaining questions with the exception of ratings of the speaker's age, which used an open-ended question format.

Thought Listing and Rating Task.

The thought-listing task used in Experiment 2 was identical to that used in Experiment 1, with the exception that a maximum of 10 rather than 12 thoughts could be listed. Likewise, the thought rating task used in Experiment 2 was identical to that used in Experiment 1, with the exception that the response options were expanded to include an *unrelated* option, represented by

a question mark (?). Experiment 2 used identical coding procedures as Experiment 1 for all indices. Thought favorability and thought relevance were evaluated using the same independent raters and identical procedures as those used in Experiment 1. Analyses indicated a high degree of interrater agreement both on thought favorability (89%) and thought relevance (87%). As in prior research, we calculated the final values for thought favorability and thought relevance by averaging the scores for both independent raters on each dimension (e.g., Petty et al., 1981).

3.2 Results

Vocal Pitch Manipulation Check

Our first goal was to evaluate the success of our vocal pitch manipulation. This was tested by conducting an ANOVA in which vocal pitch and elaboration were designated as our independent variables and ratings of the speaker's pitch served as the dependent variable. Confirming expectations, the data revealed that participants perceived the speaker with raised vocal pitch (M = 3.93, SE = .10) as having a significantly higher pitched voice than the speaker with lowered vocal pitch (M = 2.54, SE = .10), $F(1, 408) = 102.25$, $p < .001$, partial $\eta 2 = .20$. No main effect of elaboration, $F(1, 408) = .85$, $p = .36$, partial $\eta 2 = .00$, or interaction between vocal pitch and elaboration, $F(1, 408) = 2.46$, $p = .12$, partial $\eta 2 = .01$, was predicted and none emerged.

Evaluation of Vocal Confidence Measure

Next, we sought to determine whether our manipulation of vocal pitch produced the expected effects on ratings of speaker confidence. This was tested by conducting an ANOVA in which vocal pitch and elaboration were designated as the independent variables and ratings of speaker confidence served as the dependent variable.

Confirming expectations, participants rated the speaker with lowered vocal pitch (M = 4.63, SE = .10), as significantly more confident than the speaker with raised vocal pitch (M =

3.12, *SE* = .10), $F(1, 408) = 109.43$, $p < .001$, partial $\eta 2 = .21$. A significant main effect of elaboration was also found $F(1, 408) = 4.17$, $p = .04$, partial $\eta 2 = .01$, such that participants assigned to the low elaboration condition (*M* = 4.02, *SE* = .10), rated the speaker as significantly more confident than participants assigned to the high elaboration condition (*M* = 3.73, *SE* = .10). Importantly, the vocal pitch main effect was not qualified by an interaction with elaboration, $F(1, 408) = .001$, $p = .97$, partial $\eta 2 = .00$. This suggests that judgments of speaker confidence were not differentially influenced by the extent to which participants engaged in effortful processing of the message. Taken together, these data confirm that vocal pitch influenced ratings of speaker confidence as predicted.

Elaboration Manipulation Check

Similar tests were conducted as in Experiment 1 to evaluate the success of our elaboration manipulation. First, we examined whether our efforts to decrease processing resulted in fewer total topic-relevant thoughts compared with our efforts to increase processing. This was tested by conducting an ANOVA in which elaboration and vocal pitch were designated as the independent variables and the total number of topic-relevant thoughts served as the dependent variable.

Confirming expectations, the total number of topic-relevant thoughts generated by participants assigned to the high elaboration condition (*M* = 3.80, *SE* = .14), was significantly greater than for those participants assigned to the low elaboration condition (*M* = 2.49, *SE* = .14), $F(1, 408) = 43.02$, $p < .001$, partial $\eta 2 = .10$. Although no main effect of vocal pitch was predicted, the data revealed this effect did reach significance, $F(1, 408) = 4.39$, $p = .037$, partial $\eta 2 = .01$. Specifically, participants who heard the speaker with lowered vocal pitch (*M* = 3.35, *SE* = .14), generated a significantly greater number of topic-relevant thoughts compared with participants who heard the speaker with raised vocal pitch, (*M* = 2.93, *SE* = .14). A two-way

interaction between vocal pitch and elaboration was not predicted and did not emerge, $F(1, 408) = .07$, $p = .79$, partial $\eta 2 = .00$.

A similar analyses using proportion of topic-relevant thoughts as the dependent variable revealed that high elaboration participants ($M = .71$, $SE = .02$), generated a significantly greater proportion of topic-relevant thoughts compared with low elaboration participants ($M = .62$, $SE = .02$), $F(1, 401) = 7.83$, $p < .01$, partial $\eta 2 = .02$. Once again, the data revealed a significant main effect of vocal pitch, $F(1, 401) = 14.35$, $p < .001$, partial $\eta 2 = .04$, such that participants who heard a speaker with lowered pitch ($M = .73$, $SE = .02$), generated a significantly greater proportion of topic-relevant thoughts compared with participants who heard a speaker with raised pitch ($M = .61$, $SE = .02$). No interaction between vocal pitch and elaboration was predicted and none was found, $F(1, 401) = .38$, $p = .54$, partial $\eta 2 = .00$.

Across both indices of elaboration, these data provide clear evidence of robust differences in processing, thus confirming the success of our elaboration manipulation. Similar to Experiment 1, despite our efforts to manipulate processing, these data suggest that some variance in elaboration can be accounted for by the speaker's vocal pitch. These effects emerged when the vocal pitch in the speaker's voice was lowered, which is precisely when we might expect processing to increase because a confident sounding speaker should engender more processing. This suggests that despite our efforts to push people to both ends of the elaboration continuum, to a certain extent processing may have been driven by the speaker's vocal pitch.

The Effects of Vocal Pitch and Elaboration on Thought Favorability

Having confirmed the success of our manipulations, we now turn our attention to investigating the effects of vocal pitch and elaboration on participant's cognitive responses toward the use of phosphate laundry detergents. This was tested by conducting an ANOVA in

which vocal pitch and elaboration were designated as our independent variables and participant's cognitive responses (i.e., thought-favorability) served as the dependent variable.

Our predictions followed the same logic as in Experiment 1. Thus, no main effect of vocal pitch was predicted and none was found, $F(1, 354) = 2.12$, $p = .15$, partial $\eta 2 = .01$. Similar to Experiment 1, to the extent that the arguments are sufficiently strong to produce generally positive responses, we might expect increased elaboration to be associated with more favorable thoughts. Interestingly, contrary to what we found in Experiment 1, in this case the data revealed that low elaboration participants ($M = .17$, $SE = .05$), generated significantly more favorable thoughts than high elaboration participants, ($M = -.02$, $SE = .05$), $F(1, 354) = 6.40$, $p = .01$, partial $\eta 2 = .01$. Following the logic of Experiment 1, a two-way interaction between vocal pitch and elaboration was expected such that increased processing should result in more favorable thoughts when the message was delivered by a speaker with lowered versus raised vocal pitch. A weaker effect of speech rate was expected when processing was decreased. Against expectations, no interaction between pitch and elaboration emerged, $F(1, 354) = .03$, $p = .86$, partial $\eta 2 = .00$.

These data reveal a similar although not entirely consistent pattern as that found in Experiment 1. Interestingly, the pattern that emerged for the main effect of elaboration suggests that the arguments may have been somewhat weak. Whereas thought favorability was slightly negative for those participants carefully evaluating the message, a somewhat positive effect was found in those participants for whom message processing was low. This suggests that placing constraints on participant's ability and motivation to carefully evaluate the arguments may have masked their somewhat weaker quality, thus resulting in modestly favorable thoughts. Although the lack of a two-way interaction between vocal pitch and elaboration was somewhat surprising,

once again, it is important to bear in mind that this analysis forms only one component of our larger theoretical model.

The Effects of Vocal Pitch and Elaboration on Attitudes

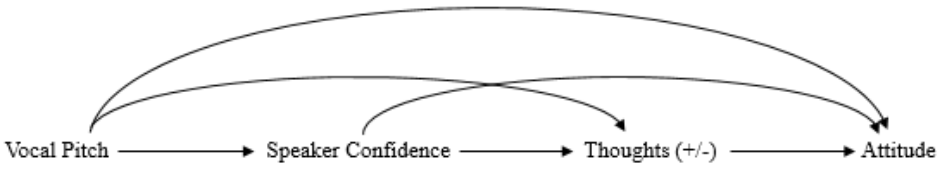
Our next step was to investigate the effects of vocal pitch and elaboration on participant's attitudes toward phosphate laundry detergent. This was tested by conducting an ANOVA in which vocal pitch and elaboration were designated as our independent variables and a measure of participant's attitude served as the dependent variable.

Similar to Experiment 1, given that attitudes assume the most distal position in our theoretical model, to the extent that any effects of vocal pitch do emerge, these effects should be comparatively weak. Turning first to vocal pitch, a main effect was hypothesized such that lowered pitch should elicit more attitude change relative to raised pitch. Confirming expectations, results indicated a main effect of vocal pitch, $F(1, 408) = 7.26$, $p < .01$, partial $\eta 2 = .02$, such that persuasion was significantly enhanced in response to a speaker with lowered ($M = 4.89$, $SE = .08$), compared with raised vocal pitch ($M = 4.60$, $SE = .08$). Because vocal pitch was hypothesized to have a similar effect on attitudes but through different processes moderated by elaboration, no main effect of elaboration or interaction between vocal pitch and elaboration was expected. Indeed, as anticipated, no main effect of elaboration was found, $F(1, 408) = 2.55$, $p = .11$, partial $\eta 2 = .01$. Likewise, the two-way interaction between vocal pitch and elaboration did not reach significance, $F(1, 408) = .43$, $p = .51$, partial $\eta 2 = .00$. Given our theoretical model, these data are not altogether surprising. As in Experiment 1, no main effect of elaboration nor an interaction between vocal pitch and elaboration was expected and these effects did not emerge.

Vocal Confidence as a Biasing Factor and Peripheral Cue

The next step was to determine whether the process by which vocal pitch influenced persuasion differed under high – and low-elaboration. As in Experiment 1, this was tested by conducting a multi-sample structural equation model using Lisrel 9.20 (Joreskog & Sorbom, 2014).[3] Similar procedures were employed to evaluate the predictions made by our theoretical framework. We then fit the model depicted in Figure 3 to both our high – and low elaboration groups. The results for both path models are represented in Figure 4 and use unstandardized coefficients as an index of the value estimated for each path. Dotted lines indicate non-significant paths.

Figure 3.
Path Model Depicting Relationships between Variables under High – and Low Elaboration



As in Experiment 1, our first step was to investigate the pattern of effects that constitute the bias process our model suggests should emerge under high elaboration. This process refers to the causal chain that should unfold when confidence is functioning as a biasing factor. Once again, our expectation was that vocal pitch should affect perceptions of speaker confidence. Confidence should then bias thought favorability, which in turn directly influences post-message attitude (see Panel A in Figure 4, page 60).

Thus, using these three paths, we tested whether this causal chain was equivalent across high – and low elaboration. This was done by placing equality constraints across elaboration

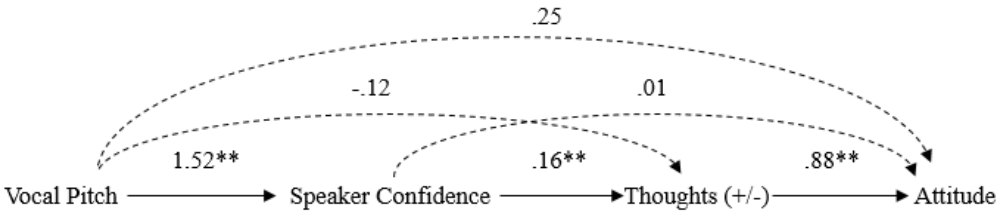
[3] These relationships were also evaluated using a regression-based moderated mediation analysis. The data indicated highly comparable results to those produced through multi-sample structural equation modelling.

groups, specifically on each of the paths that formed the direct causal chain between vocal pitch and attitude in our high elaboration path model, then simultaneously conducting a multi-sample structural equation model analyses on both high – and low elaboration groups. Our expectation was that the causal chain described above would emerge under high elaboration but not under low elaboration. As anticipated, the results indicated a significant difference in the overall mediation effect across levels of elaboration, thus providing initial support for our theoretical framework, $\chi^2 = 16.05$ ($df = 3$, $N = 258$, $p < .001$). Our next step was to determine where these differences emerged. Thus, follow up tests were conducted to determine which paths differed across levels of elaboration. This was done by placing equality constraints on each of the direct causal paths in our high elaboration group, one path at a time, and then comparing whether or not each path was significantly different across levels of elaboration.

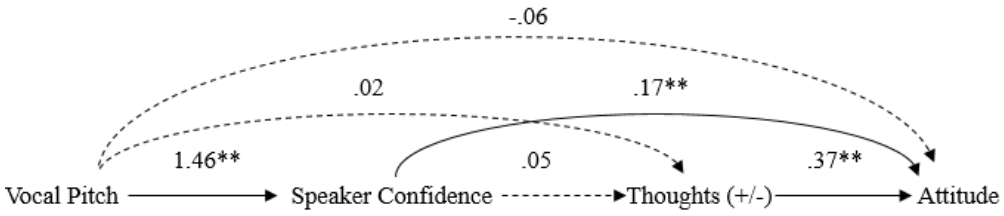
Beginning with high elaboration in panel A of Figure 4, our first goal was to test whether the paths reflecting the direct effect of vocal pitch on ratings of speaker confidence differed across levels of elaboration. Our theory suggests that people should be equally adept at detecting changes in pitch regardless of how carefully they are processing a message. Thus, our expectation was that similar effects on confidence should emerge across levels of elaboration.

Figure 4.
Vocal confidence and cognitive responses as mediators of the relationship between vocal pitch and attitude.

Panel A) High Elaboration:



Panel B) Low Elaboration:



The data revealed that under high elaboration, vocal pitch, $b = 1.52$, $SE = .22$, $p < .001$, was a significant predictor of speaker confidence. Moving to low elaboration in panel B of Figure 4, we also find that vocal pitch, $b = 1.46$, $SE = .21$, $p < .001$, significantly predicted ratings of speaker confidence. When testing these coefficients across levels of elaboration, the data revealed the effects of vocal pitch, $\chi^2 = .04$ ($df = 1$, $N = 258$, $p = .84$), were of comparable magnitude. This is important because what it suggests is that regardless of whether or not participants were thinking carefully when processing the message, the amount of effort exerted did not affect their ability to detect changes in the speaker's voice.

Next, recall that under high elaboration, our theory suggests that confidence should bias the favorability of a person's thoughts. In line with expectations, this is exactly what we found, $b = .16$, $SE = .03$, $p < .001$. Importantly, when a person lacks the ability and/or motivation to carefully process a message, our theory suggests that confidence should not bias the favorability of thoughts. Once again, this is precisely what the data suggest, $b = .05$, $SE = .04$, $p = .24$. Follow-up tests were performed to compare the coefficients reflecting the direct effect of speaker confidence on thoughts across levels of elaboration. Supporting the theory, the data revealed that speaker confidence was a significantly greater predictor of thoughts under high – compared with low-elaboration, $\chi^2 = 5.20$ ($df = 1$, $N = 258$, $p = .02$).

Finally, under high elaboration, we expected the thought to attitude path to be especially robust, which the data supported, $b = .88$, $SE = .11$, $p < .001$. Under low elaboration, our theory predicts that thoughts should also be a significant predictor of attitude, which is exactly what we found, $b = .37$, $SE = .10$, $p < .001$. However, recall that our theory predicts thoughts should be a significantly more powerful determinant of attitudes under high – relative to low elaboration. Indeed, a comparison of these coefficients across levels of elaboration revealed this was in fact the case, $\chi^2 = 10.81$ ($df = 1$, $N = 258$, $p < .001$).

Taken together, these data provide compelling evidence to support the predictions of our theoretical framework. Specifically, that confidence should function in a biasing role under high but not low elaboration. As in Experiment 1, clear evidence of this pattern emerged when performing direct tests of the coefficients reflecting each path in the high elaboration causal chain across both groups. In line with expectations, our data revealed that confidence was a significantly greater predictor of thoughts under high compared with low elaboration. Likewise, thoughts were a significantly more powerful determinant of attitude under high relative to low elaboration. In contrast, our theory suggested the effects of vocal pitch on confidence should be of comparable magnitude across levels of elaboration. As anticipated, this is precisely what we found.

Turning now to low elaboration, recall that our theoretical framework predicts vocal confidence should exert its effects on attitudes via a different process than we observed under high elaboration. As in Experiment 1, notice that under low elaboration we have a simpler process and thus fewer paths in our causal chain than we do under high elaboration. Although vocal pitch should still influence perceptions of speaker confidence (path 1), in this case our expectation was that confidence should now influence post-message attitudes by functioning as a

peripheral cue (path 2) rather than through biasing thought favorability as we observed under high elaboration.

Our next step involved testing whether this two-step causal chain was equivalent across high – and low elaboration. This was done using a similar process to that employed when testing our high elaboration causal chain. Our expectation was that the causal chain described above would emerge under low – but not under high elaboration. However, similar to Experiment 1, what we find is a non-significant difference in the overall mediation effect across levels of elaboration, $\chi^2 = 4.63$ ($df = 3$, $N = 258$, $p = .10$). When interpreting this result, recall that in accordance with our theory, the parameter reflecting the path between vocal pitch and confidence was no different across levels of elaboration. Once again, given the comparatively insensitive nature of an omnibus test, we decided to follow up by testing the parameter our theory predicted should differ across groups.

Recall that under low elaboration, our theory predicts confidence should function as a peripheral cue and have a direct effect on attitudes. Thus, our next step involved testing this parameter. As expected, the data revealed a significant effect of confidence on attitudes, $b = .17$, $SE = .05$, $p < .01$. In contrast, recall that under high elaboration, our theory predicts the effects of vocal pitch should be thought driven. This suggests that vocal confidence should not have a direct impact on attitudes. Indeed, the data confirmed this effect did not emerge, $b = .01$, $SE = .05$, $p = .82$. Importantly, when comparing the coefficients reflecting the direct effect of confidence on attitudes across levels of elaboration, tests confirmed our expectation that this effect was significantly more powerful under low – compared with high-elaboration, $\chi^2 = 4.59$ ($df = 1$, $N = 258$, $p = .03$).

These data replicate the pattern that emerged in Experiment 1 while also extending the findings to a different hallmark of vocal confidence. Supporting our theoretical framework, these data provide good evidence that under low elaboration, confidence does not influence thought favorability but rather directly affects the recipient's attitude by functioning as a peripheral cue[4].

3.3 Discussion

To our knowledge, these data present the first evidence by way of an electronic manipulation of vocal pitch, that changes in this vocal characteristic differentially influence perceptions of speaker confidence. Second, these data provide additional evidence to suggest that those vocal qualities directly influencing perceptions of confidence affect persuasion in a similar manner when people are pushed to the end points of the elaboration continuum. Finally, Experiment 2 serves as a conceptual replication of the bias and cue effects that emerged in Experiment 1. Specifically, when a person is engaged in effortful processing of a message, perceptions of speaker confidence biases the favorability of their topic-relevant thoughts but does not affect their attitude by functioning as a peripheral cue. By contrast, when effortful processing of a message is low, perceptions of speaker confidence do not influence the positivity or negativity of a person's topic-relevant thoughts but rather directly affects their attitude as a peripheral cue.

[4] Given that a variety of different attributes were measured, moderated mediation analyses were also conducted for each attribute to test the bias and cue effects the ELM predicts should emerge under high – and low elaboration. No consistent evidence of mediation via the bias and cue effects predicted under high – and low elaboration, or variation in these patterns across levels of elaboration was found. However, patterns consistent with our predictions did emerge in the case of sincerity. Thus, analyses were conducted in which both confidence and sincerity were entered as potential mediators. Results indicated all expected effects of confidence remained significant, while some effects of sincerity dropped to non-significant levels. This suggests confidence has a robust effect in both bias and cue roles even when controlling for a potential mediator that showed patterns of effects consistent with our theoretical model.

Chapter 4

The Effects of Multiple Levels of Vocal Speed on Persuasion in the Context of Strong and Weak Arguments

Experiments 1 and 2 investigated the effects of three hallmarks of vocal confidence on persuasion under conditions in which elaboration was clearly high or low. Recall that the ELM makes specific predictions regarding how a variable should function under these sets of conditions. However, as described earlier, under moderate levels of elaboration the ELM postulates that a variable can influence persuasion by an entirely different process than those investigated in Experiments 1 and 2. Specifically, under conditions of moderate elaboration, the ELM suggests that a variable (e.g., vocal confidence) can either increase or decrease the *amount of processing* that takes place.

Although some research has investigated how hallmarks of vocal confidence affect persuasion under moderate elaboration (i.e., Smith & Shaffer, 1995), our goal was to examine this relationship in a more comprehensive way. Specifically, what we propose is that for some hallmarks of vocal confidence, such as rate of speech, how this variable effects persuasion via the amount of processing may not be the same at the extreme ends of the vocal continuum. Recall that in prior research, testing how a variable like rate of speech functioned across a broader spectrum was not possible given that typically only two levels of this variable were examined. Thus, we sought to investigate the effects on persuasion of multiple levels of rate of speech in order to gain a better understanding of how this relationship changes across a broader spectrum of this variable. Applying our theoretical model to this relationship leads us to predict that rate of speech should have different effects on amount of processing as we move along the speed continuum.

Beginning with extremely rapid speech, recall that our theoretical model suggests two possibilities by which ability and motivation can affect persuasion based on the extent to which a listener engages in effortful elaboration of the content. The first possibility is that ability and motivation may have *contradictory* effects on amount of processing. For example, consider that very rapid speech may cause a listener to infer a high degree of speaker confidence and thus increase *motivation* to attend to the content. However, this increased motivation may be offset by the fact that rapidly communicated messages are difficult to process, which reflects a decrease in *ability*. In this case, we would predict either a leveling off or even a modest decline in amount of processing. The second possibility is that ability and motivation may have *complementary* effects on amount of processing. For example, a speaker who communicates very rapidly may be perceived as somewhat anxious, or nervous. In turn, this could reduce the listener's *motivation* to attend to the content because they may perceive the speaker as providing inaccurate information or even engaging in an attempt at deception. Similarly, the listener's *ability* to process the content may also be reduced because the extremely rapid pace results in difficulty processing the message. Here, because ability and motivation are working together in a complementary fashion, this leads to the prediction that a decrease in amount of processing should emerge.

In the case of moderately fast speech, here we would expect a much more robust amount of processing effects. The rationale behind this prediction is based on prior research (e.g., Brown et al., 1985; London, 1973; Scherer et al., 1973), which suggests that listeners attribute a comparatively high degree of confidence to speakers who communicate at a moderately fast pace. We would expect these perceptions of speaker confidence to translate into increased motivation to carefully attend to the message content. Importantly, moderately fast paced speech should be comparatively less likely to affect the listener's ability to process the content. Thus,

both ability and motivation should work together in a complementary fashion to enhance the effects of amount of processing on persuasion.

With respect to moderately slow speech, a listener may infer that the speaker is comparatively unconfident, and thus be less motivated to attend to the content. Although ability should remain relatively unaffected, because motivation to attend to the content has decreased, here we would predict a modest decrease in the extent to which amount of processing affects persuasion. As a result, at this point in the speech rate continuum, we might expect ability and motivation to have contradictory effects on the amount of processing.

Finally, in the case of very slow speech, our expectation is that ability and motivation should work together in a complementary fashion to decrease the effects of amount of processing on persuasion. Consider that because a slow rate of speech may induce boredom, we might expect a further decrease in perceptions of speaker confidence. Consequently, motivation levels are likely to be at their lowest point. Very slow speech may also cause fatigue because it requires sustained attention for a much longer amount of time. Moreover, the unnatural pacing of very slow speech may increase the difficulty of message processing. Accordingly, this should have a negative impact on ability, which in turn may further decrease the extent to which amount of processing impacts persuasion.

Taken together, at the upper end of the speed continuum, one possibility suggests that extremely rapid speech may have contradictory effects on processing (i.e., ability decreases, motivation increases). Another possibility suggests that it may have complementary effects on processing (i.e., ability and motivation decrease). At the lower end of the continuum, extremely slow speech may have complementary effects of processing (i.e., ability and motivation decrease).

4.1 Method

Participants

Participants (N = 332) were obtained on a volunteer basis from the introductory psychology research pool at Queen's University. This study formed part of a session in which participants completed several studies that together took no longer than one hour to complete. All studies were completed in a laboratory environment under semi-private conditions on a computer provided by the researchers. Course credit was provided in exchange for participation.

Design and Procedure

We employed a 4 (Vocal speed: extremely slow vs. moderately slow vs. moderately fast vs. extremely fast) x 2 (Argument quality: strong vs. weak) between participants factorial design. Assignment to all conditions was random. After being seated at a computer, participants were given headphones and told that they would be listening to an audio passage. Similar to Experiment 1, the passage described a policy under consideration for some provinces that would provide students with the opportunity to reduce their tuition in exchange for working as part-time university staff members. Importantly, no information was provided to suggest that Queen's University was or was not considering implementing this program. Thus, the relevance of the message to the participant was ambiguous. For this reason, our expectation was that participant's motivation to carefully evaluate the message would be comparatively moderate.

Next, participants were randomly assigned to receive an audio passage containing either strong or weak arguments in favor of the university service plan. For example, in the strong arguments version, participants were told that this policy would allow a greater portion of the university budget to be invested in monetary incentives for research and teaching, which would leave funding available to recruit additional outstanding professors, researchers, and Nobel prize-

winning laureates. By comparison, in the weak arguments version, participants were told that students would have less time to spend in the libraries and computer labs because they will be performing a variety of university services. This would allow the university to reduce the number of hours these facilities must remain open and staffed, which would save money that could then be put to alternative uses. These passages were drawn from Clark et al., (2008).

The strong and weak versions of the audio passages used in Experiment 3 were created at the same time as the moderate arguments version used in Experiment 1 and used the same female speaker. The audio passages were edited using a professional digital recording and editing program called Audacity®. This allowed us to digitally manipulate the speaker's rate of speech in order to produce four distinct levels of speed without affecting other vocal characteristics that were not of interest. Relative to the speaker's baseline rate of speech, we created two conditions that increased how fast the speaker was talking by 10% (188 WPM) and by 13% (194 WPM). Similarly, relative to the speaker's baseline rate of speech, we also created two conditions that decreased how fast the speaker was talking by 15% (145 WPM) and by 35% (114 WPM).

Following the audio passage, participants answered several questions that required them to evaluate the speaker's stylistic delivery of the message. Participants were then presented with a series of questions that asked them to evaluate different attributes of the speaker as well as the speaker's voice. Next, a measure of participant's attitude towards the university service plan was obtained. Finally, participants completed a thought-listing task that asked them to list up to 10 thoughts that came to mind while listening to the audio passage and to then rate the favorability of those thoughts as either positive, negative, or neutral as they applied to the topic. Once the study had concluded, debriefing forms were provided and 1 course credit was awarded in exchange for participation.

Measures

Stylistic Qualities Questionnaire.

Experiment 3 used the same stylistic qualities questionnaire as Experiment 1.

Speaker Attributes and Vocal Qualities Questionnaire.

Six questions were presented, of which two (i.e., vocal confidence, rate of speech) were of theoretical interest. The remaining four items (i.e., age, gender, height, accent-type) were included in order to disguise the two variables of interest. All questions were presented in a random order. Beginning with a description of our two variables of interest, participants were asked to rate the extent to which the speaker sounded confident using a scale ranging from 1 = *Not at all confident*, to 7 = *Very confident*. The speaker's rate of speech was evaluated using a scale ranging from 1 = *Extremely slow*, to 7 = *Extremely fast*. Concerning our filler questions, participants were asked to indicate the age of the speaker using an open-ended question format. The gender of the speaker was assessed by clicking a button labelled either male or female. The speaker's height was evaluated using a scale ranging from 1 = *Extremely short*, to 7 = *Extremely tall*. Finally, participants were asked to click a button to indicate whether the speaker's accent most reflected an individual of Canadian, American, Australian, or English decent.

Attitude Scale.

Experiment 3 used the same attitude scale as Experiments 1 and 2. Cronbach's α for the attitude scale was .89.

Thought Listing/Rating Task

Experiment 3 used the same thought-listing task as Experiment 2 (i.e., participants could list up to a maximum of 10 thoughts). However, because the thought-rating task did not provide the option to rate any thoughts as *unrelated* to the topic, this measure was the same as that used

in Experiment 1 (e.g., Cacioppo & Petty, 1981). Experiment 3 used identical coding procedures as the prior studies for all indices. Once again, thought favorability and thought relevance were evaluated using the same independent rates and identical procedures as in the prior two experiments. Similar to Experiments 1 and 2, a high degree of agreement emerged when comparing the two raters' judgements on both thought favorability (91%) and thought relevance (92%). Once again, we calculated the final values for thought favorability and thought relevance by averaging the scores for both independent raters on each dimension (e.g., Petty et al., 1981).

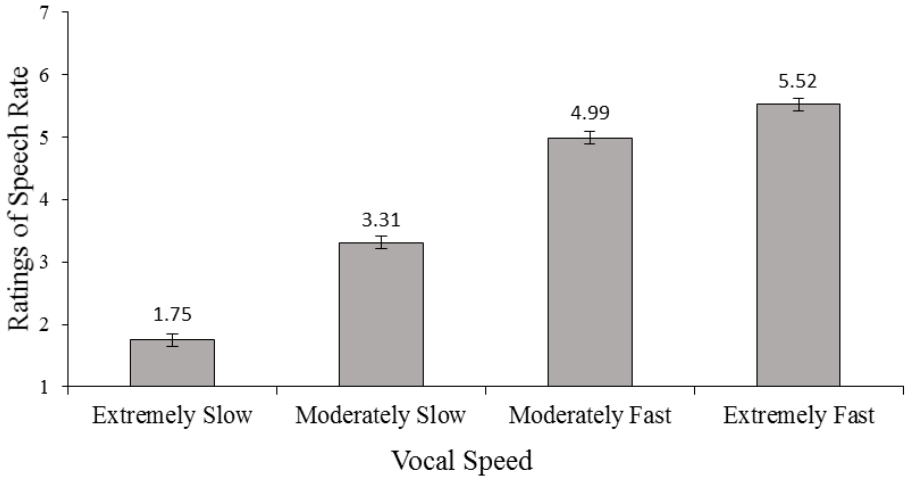
4.2 Results

Vocal Speed Manipulation Check

Prior to conducting our main analyses, we first sought to confirm the success of our vocal speed manipulation. This was tested through an ANOVA, in which vocal speed (i.e., rate of speech) and argument quality were designated as our independent variables and ratings of speech rate served our dependent variable.

As expected, the data revealed a significant main effect of vocal speed, $F(3, 324) = 275.31$, $p < .001$, partial $\eta 2 = .72$. Pairwise comparisons across each level of vocal speed were made using the least significant difference (LSD) test. Figure 5 provides the vocal speed means so the reader can more clearly visualize the pattern of this effect. Beginning with the right-hand side of Figure 5, our results indicated the extremely fast speaker ($M = 5.52$, $SE = .10$), was perceived as talking significantly faster than the moderately fast speaker ($M = 4.99$, $SE = .10$), $p < .001$. Likewise, the moderately fast speaker was perceived as talking significantly faster than the moderately slow speaker ($M = 3.31$, $SE = .10$), $p < .001$, who in turn was perceived as talking significantly faster than the extremely slow speaker ($M = 1.75$, $SE = .10$), $p < .001$.

Figure 5.
Ratings of Speech Rate as a Function of Vocal Speed



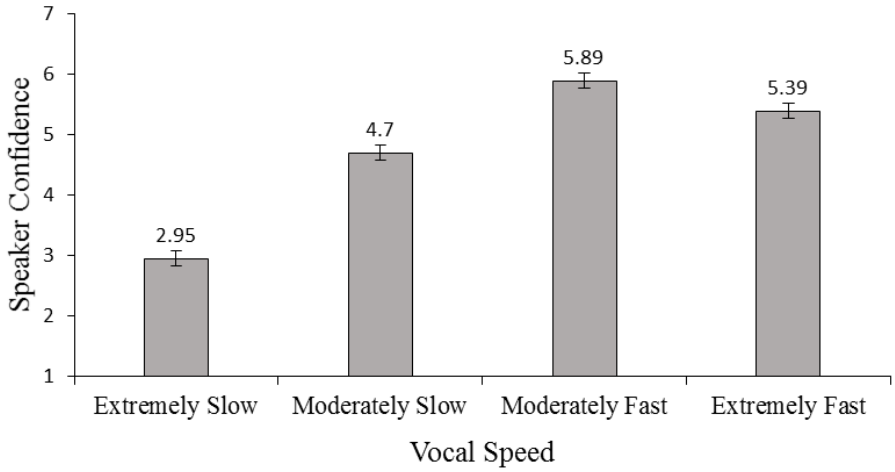
A significant main effect of argument quality also emerged, $F(1, 324) = 4.51$, $p = .034$, partial $\eta 2 = .01$, such that participants perceived the speaker as talking significantly faster when presented with strong ($M = 4.00$, $SE = .07$) relative to weak arguments ($M = 3.78$, $SE = .07$). Finally, a significant two-way interaction between vocal speed and argument quality was found, $F(3, 324) = 2.69$, $p = .046$, partial $\eta 2 = .02$. A closer examination revealed that participants rated a moderately fast speaker as talking significantly quicker when presented with strong ($M = 5.30$, $SE = .15$), relative to weak arguments ($M = 4.68$, $SE = .15$), $p < .01$. No further differences in rate of speech were found across levels of argument quality. These data confirm the success of our vocal speed manipulation.

Evaluation of Vocal Confidence Measure

As our next step, we sought to confirm that rate of speech produced the expected pattern on ratings of speaker confidence. This was tested using an ANOVA in which vocal speed and argument quality were designated as the independent variables and ratings of vocal confidence served as the dependent variable.

Confirming expectations, the data revealed a significant main effect of vocal speed, $F(3, 324) = 103.00$, $p < .001$, partial $\eta 2 = .49$. Once again, pairwise comparisons across each level of vocal speed were made using the LSD test. Beginning with the left-hand side of Figure 6, as expected, our data revealed that ratings of speaker confidence increased in a roughly linear fashion as rate of speech progressed from extremely slow ($M = 2.95$, $SE = .13$), to moderately slow ($M = 4.70$, $SE = .13$), $p < .001$, to moderately fast ($M = 5.89$, $SE = .13$), $p < .001$. However, consistent with our hypothesis, ratings of speaker confidence decreased when comparing an extremely fast ($M = 5.39$, $SE = .13$), relative to a moderately fast speaker, $p < .01$. These data reveal a pattern of effects that fit with our prediction that rate of speech does not necessarily affect perceptions of speaker confidence in a linear fashion.

Figure 6.
The Effects of Speech Rate on Perceptions of Speaker Confidence



No main effect of argument quality was predicted and none emerged, $F(1, 324) = 1.07$, $p = .30$, partial $\eta 2 = .00$. Likewise, no interaction between vocal speed and argument quality was anticipated and none was found, $F(3, 324) = 1.11$, $p = .34$, partial $\eta 2 = .01$.

Replicating Experiment 1, these data provide a second demonstration that changes in a speaker's rate of speech reliably influenced perceptions of speaker confidence. Importantly, and

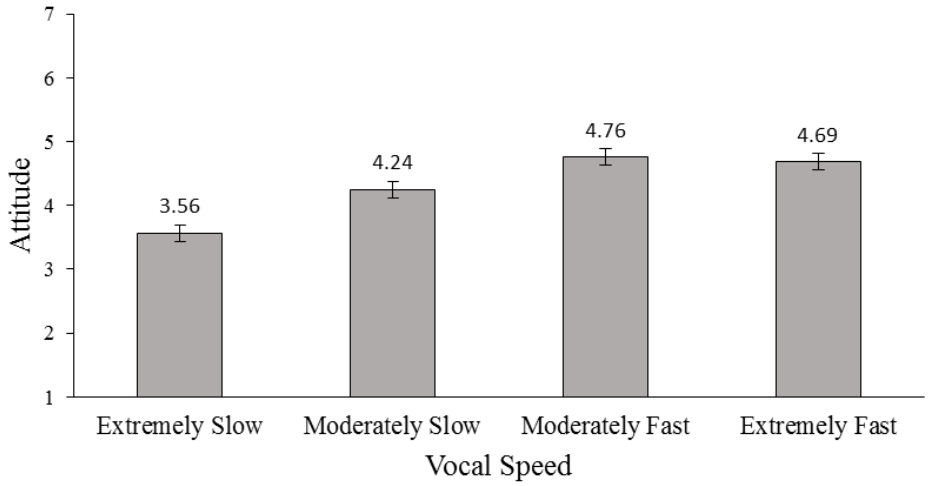
as one might expect, these data also suggest that rate of speech does not have a simple linear relationship with perceptions of confidence. Indeed, our results suggest that at extremely fast rates of speech, perceptions of confidence actually decreased – perhaps because an extremely fast speaker was perceived as somewhat anxious.

The Effects of Vocal Speed and Argument Quality on Attitudes

Next, we turn our attention to examining the effects of speech rate and argument quality on participant's attitude toward the university service plan. First, recall that under conditions of moderate elaboration, our theoretical model suggests that the effects of a variable on persuasion are driven by the amount of processing. While there are several ways this can be tested, typically the most common – and indeed the gold standard – has traditionally been to investigate the magnitude of argument quality effects on post-message attitudes. The logic supporting this analysis as the critical test of amount of processing is that if the recipient is carefully processing the message, then the quality of the arguments should have a substantial impact on the recipient's attitude. Importantly, if the argument quality is not exerting a substantial impact on the recipient's attitude, that then implies the recipient must be recruiting more superficial strategies when evaluating the message. Thus, whereas we would expect large differences in the effect of argument quality on post-message attitudes when the recipient is carefully evaluating the message, these differences should be comparatively weak – and indeed non-significant – when the recipient is not carefully evaluating the message. For this reason, our first analysis examines the effects of speech rate and argument quality on attitudes via amount of processing. This was tested using an ANOVA in which vocal speed and argument quality were designated as the independent variables and the participant's attitude served as the dependent variable.

Beginning with our main effect of speech rate, although we had no compelling basis to predict this effect should reach significance, our results indicated speech rate did in fact have a significant effect on attitudes, $F(3, 324) = 17.11$, $p < .001$, partial $\eta 2 = .14$. Turning our attention to the left-hand side of Figure 7, pairwise comparisons revealed that relative to an extremely slow rate of speech ($M = 3.56$, $SE = .13$), participant's attitudes became significantly more favorable as the speaker's rate of speech increased to a moderately slow pace ($M = 4.24$, $SE = .13$), $p < .001$. Likewise, attitudes became significantly more favorable as the speaker's rate of speech increased to a moderately fast pace ($M = 4.76$, $SE = .13$), $p < .01$. Finally, one could imagine seeing either a levelling off or a decrease in persuasion as the speaker's rate of speech moved from moderately fast to extremely fast. Indeed, we found that at extremely fast rates of speech ($M = 4.69$, $SE = .13$), persuasion no longer increased but rather leveled off, $p = .70$.

Figure 7.
The Effects of Speech Rate on Attitudes

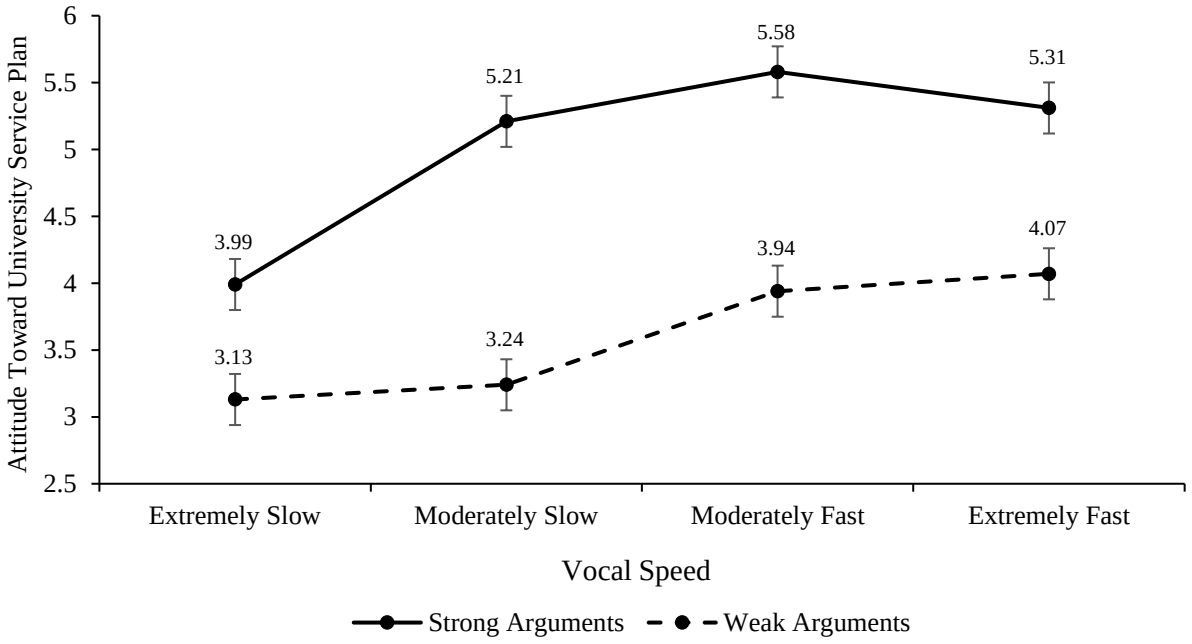


Next, we predicted a main effect of argument quality such that strong arguments should produce more favorable attitudes relative to weak arguments. As expected, the data revealed significantly more favorable attitudes toward the university service plan for those participants who received strong arguments ($M = 5.03$, $SE = .09$), compared with weak arguments ($M = 3.59$,

SE = .09), $F(1, 324) = 117.37$, $p < .001$, partial $\eta 2 = .27$. These data also serve to confirm the success of our argument quality manipulation.

Based on the logic of our theoretical framework, we predicted a two-way interaction between vocal speed and argument quality such that the difference between the effects of strong and weak arguments on post-message attitudes should change as we move along the speech rate continuum. Recall that under moderate elaboration, this two-way interaction is the critical and most widely accepted test that examines the effects of a variable on persuasion as driven by the amount of processing. Importantly, because amount of processing is reflected by the magnitude of the argument quality effect on persuasion, this analysis tests whether the difference between strong and weak arguments changes as a function of speech rate. Indeed, the data confirmed this effect was significant, $F(3, 324) = 3.48$, $p = .016$, partial $\eta 2 = .03$, (see Figure 8).

Figure 8.
The Effects of Speech Rate and Argument Quality on Attitudes



Beginning with the left-hand side of Figure 8, planned contrasts revealed that when the speaker was talking extremely slow (114 WPM), strong arguments (M = 3.99, SE = .19) generated significantly more favorable attitudes than weak arguments (M = 3.13, SE = .19), $p < .01$. Moving one-step to the right, we would expect a moderately slow speaker (145 WPM) to produce a modest increase in the difference between strong and weak arguments. Once again, the data revealed significantly more favorable attitudes in response to strong (M = 5.21, SE = .18), compared with weak arguments (M = 3.24, SE = .19), $p < .001$. Follow up analyses using planned contrasts tested the interaction effect of rate of speech and argument quality within these four cells. Our prediction was that the difference between strong and weak arguments would increase as the speaker's rate of speech moved from extremely slow (MD = .86, SE = .27) to moderately slow (MD = 2.0, SE = .26). Indeed, the results indicated this pattern emerged as expected, $F(1, 324) = 18.71$, $p < .001$. This suggests that even though a significant difference in amount of processing was found when the speaker communicated at an extremely slow rate of speech (114 WPM), this difference was significantly increased by enhancing rate of speech to a moderately slow pace (145 WPM).

Next, we should find that a moderately fast rate of speech (188 WPM) further increases the difference between strong and weak arguments. Once again the data revealed that strong arguments (M = 5.58, SE = .19), produced significantly more favorable attitudes than weak arguments (M = 3.94, SE = .19), $p < .001$. Planned contrasts were used to test the interaction effect of rate of speech and argument quality between the moderately slow and moderately fast groups. Against expectations, the data provided no evidence to suggest an increase in amount of processing when comparing a moderately slow rate of speech (MD = 2.0, SE = .26), with a moderately fast rate of speech, (MD = 1.64, SE = .27), $F(1, 324) = 1.92$, $p = .17$.

However, in response to an extremely fast rate of speech (194 WPM), here our theoretical model leads us to predict either a levelling off or a decrease in the difference between strong and weak arguments. As in the prior analyses, strong arguments (M = 5.31, SE = .18), generated significantly more favorable attitudes than weak arguments (M = 4.07, SE = .19), $p < .001$. In this case, planned contrasts were used to test the interaction effect of rate of speech and argument quality between the moderately fast and extremely fast groups. Bear in mind that an extremely fast rate of speech should reduce the listener's ability to carefully evaluate the arguments contained within the message. Importantly, recall that because the listener may perceive an extremely fast speaker as either somewhat more confident (i.e., contradictory effects) or possibly as somewhat more anxious (i.e., complementary effects), relative to a moderately fast speaker, this suggests we may observe either a modest increase or decrease in the recipient's motivation to attend to the message. However, whether amount of processing levels off or decreases is a function of the combined influence of both ability and motivation. If these factors are operating in a contradictory fashion, we may find that amount of processing levels off. In contrast, if these factors are operating in a complementary fashion, a decrease in amount of processing is more likely to emerge. Taken together, our expectation was that either a levelling off or a decrease should emerge in the magnitude of argument quality effects on persuasion compared with the effects observed for a moderately fast speaker.

An evaluation of the data revealed that although a decrease in the difference between strong and weak arguments emerged when comparing an extremely fast rate of speech (MD = 1.24, SE = .27), with a moderately fast rate of speech, (MD = 1.64, SE = .27), this difference did not reach significance, $F(1, 324) = 2.27$, $p = .13$. Based on these results we can conclude that under this specific set of conditions, amount of processing certainly levels off when comparing

an extremely fast rate of speech (194 WPM) with a moderately fast rate of speech (188 WPM), and likely declines with further increases in rate of speech.

Interestingly, a further point to raise is whether we see a significant decrease in amount of processing when comparing these effects at their optimal level (i.e., moderately slow speech), with their weakest point (i.e., extremely fast speech). This relationship was analyzed by way of planned contrasts, which were used to test the interaction effect of rate of speech and argument quality between the moderately slow and extremely fast groups. Indeed, the data revealed a significant decrease in amount of processing for those participants who heard a speaker communicating at an extremely fast rate of speech (MD = 1.24, SE = .27), compared with those participants who heard a speaker communicating at a moderately slow rate of speech (MD = 2.0, SE = .26), $F(1, 324) = 8.36$, $p < .001$. What this suggests is that at an extremely fast rate of speech, the joint effects of ability and motivation were sufficient to produce a significant decrease in the amount of processing compared with a moderately slow rate of speech.

Taken together, these data nicely fit the pattern we would expect based on the logic of our model.[5] The one effect that did not match our original predictions (i.e., amount of processing would increase when moving from a moderately slow to moderately fast pace), suggests that a

[5] Recall that our hypothesis suggested part of the reason rate of speech moderates the argument quality effect on post-message attitude is because of how it affects our perceptions of speaker confidence – which captures the motivational component of our hypothesis. If this is in fact the case, then controlling for confidence and its interactions in our model should substantially reduce the two-way interaction between speech rate and argument quality on post-messages attitude while also revealing a significant two-way interaction between confidence and argument quality on post-message attitude. To test this, we conducted a General Linear Model that included speech rate and argument quality as our independent variables, mean-centered confidence as our covariate, and post-message attitude as our dependent variable, while also including all possible interactions. The results indicated the original two-way interaction between speech rate and argument quality (F = 3.48, p = .016), was now reduced to non-significance (F = 1.78, p = .151). Although the data reveal a substantial reduction in this effect, it is interesting to note that the p-value was only reduced to p = .15, which suggests there could be some residual variance being accounted for by a different mechanism (perhaps ability) that may reach significance with a larger sample size. The two-way interaction between confidence and argument quality was also non-significant (F = 2.55, p = .11). As in the case of the two-way interaction with speech rate and ability, this effect may reach significance given a larger sample size. Taken together, although the general pattern of effects is similar to what we would expect if confidence was functioning as a mediator, none of the effects are sufficiently strong that clear claims can be made based on these data.

decline in amount of processing may actually occur somewhat earlier in the speech rate continuum than we anticipated. However, it is important to point out that this effect could be dependent on a variety of factors, none of which this experiment was originally designed to test.

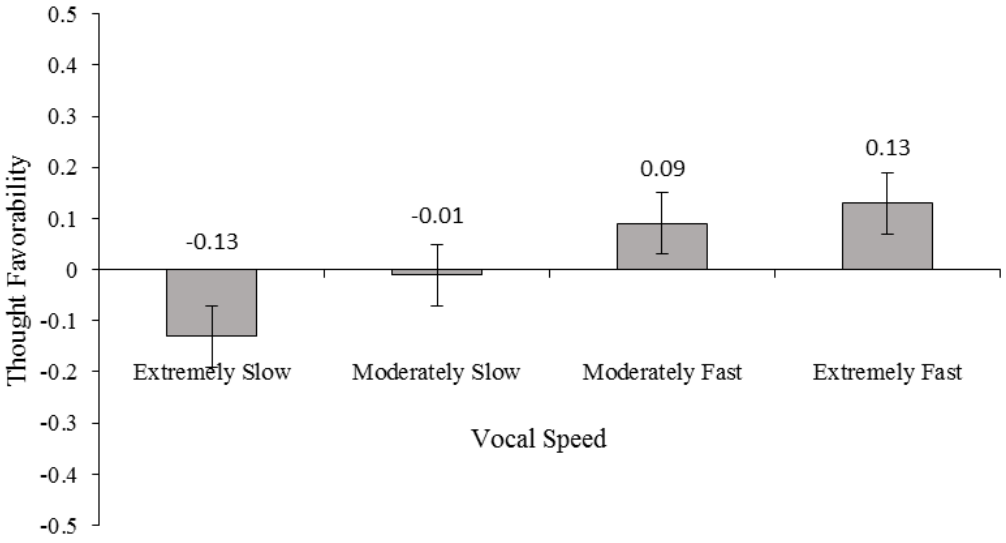
The Effects of Vocal Speed and Argument Quality on Thought Favorability

A second analysis often used to investigate the effects of a variable on persuasion under moderate elaboration uses a measure of thought favorability as an index of amount of processing. The logic behind our predictions is the same as in the prior analysis that examined post-message attitudes as the dependent variable. In this case, however, if the recipient was carefully processing the message, then the quality of the arguments should have a substantial impact on the favorability of the recipient's thoughts towards the issue. Similarly, if the argument quality was not exerting a substantial impact on the favorability of the recipient's thoughts, that then implies the recipient must be recruiting more superficial strategies when evaluating the message. Thus, as in the prior analysis, large differences in the effect of argument quality on thought favorability should emerge when the recipient is carefully evaluating the message. In contrast, these differences should be comparatively weak – and indeed non-significant – when the recipient is not carefully evaluating the message. This was tested by conducting an ANOVA in which vocal speed and argument quality were designated as the independent variables and participant's cognitive responses (i.e., thought-favorability) served as the dependent variable.

As in the prior analysis, although there was no clear reason to predict a main effect of vocal speed, the data revealed this effect did reach significance, $F(3, 306) = 2.71$, $p = .045$, partial $\eta 2 = .03$. Beginning with the left-hand side of Figure 9, pairwise comparisons revealed that relative to an extremely slow rate of speech ($M = -.13$, $SE = .07$), no difference in thought favorability emerged as rate of speech increased to a moderately slow pace ($M = -.01$, $SE = .07$),

p = .24. Likewise, thought favorability was no different as rate of speech increased to a moderately fast pace (M = .09, SE = .07), p = .32. Finally, no difference in thought favorability was found as rate of speech moved from moderately fast to extremely fast (M = .13, SE = .07), p = .65. However, where differences in thought favorability emerged was when comparing extremely slow speech with both moderately fast speech, p = .03, and extremely fast speech, p < .01. This pattern reflects a more general trend that suggests when collapsing the data across levels of argument quality thoughts became correspondingly more favorable as rate of speech increased.

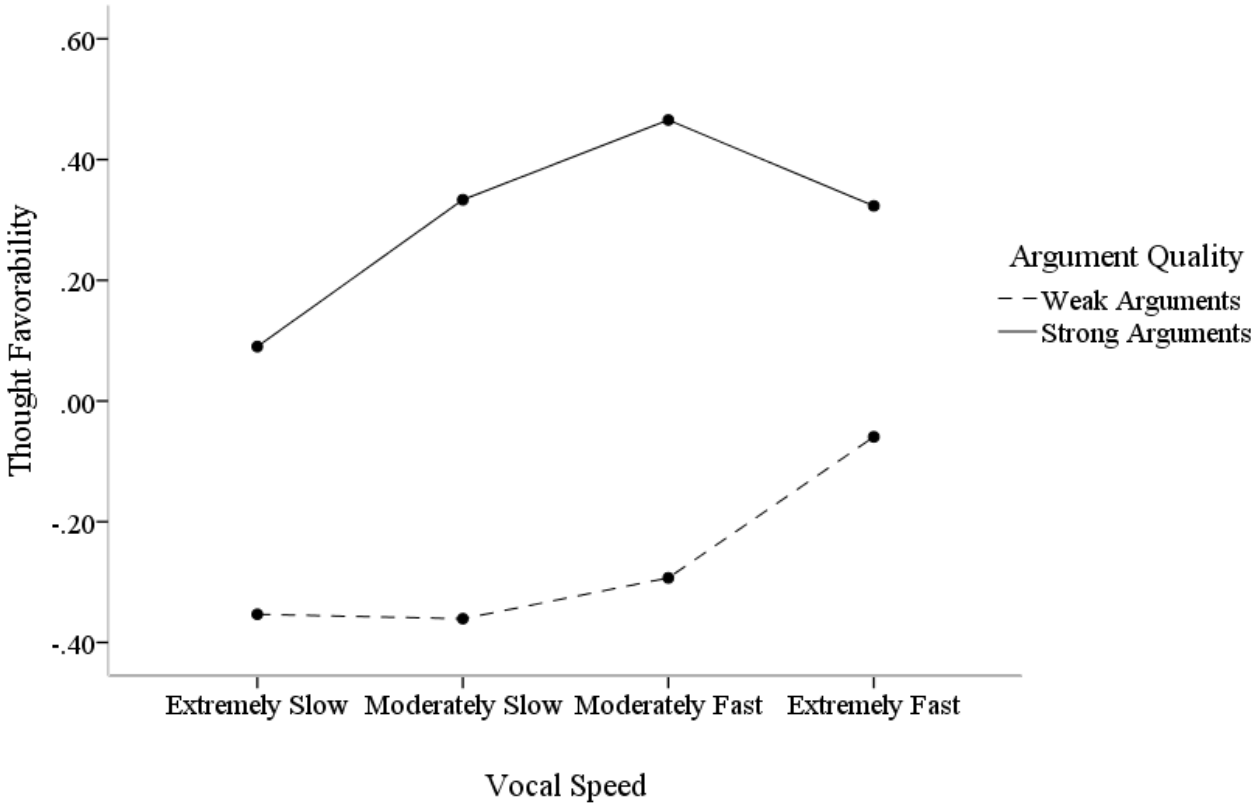
Figure 9.
The Effects of Speech Rate on Thought Favorability



Turning now to argument quality, our expectation was that this effect would reach significance because strong arguments should elicit more favorable thoughts relative to weak arguments. Indeed, the data revealed that strong arguments (M = .30, SD = .05), produced significantly more favorable thoughts compared with weak arguments, (M = -.27, SD = .05), $F(3, 306) = 64.54$, p < .001, partial $\eta 2$ = .17.

Finally, our model suggests a two-way interaction between vocal speed and argument quality should emerge. Although the data indicated this effect failed to reach significance, $F(3, 306) = 1.69$, $p = .17$, partial $\eta 2 = .02$ (see Figure 10), the general pattern very much resembled what we observed when examining the amount of processing effects with post-message attitude as the dependent variable (see Figure 8). That this effect was non-significant is not entirely surprising when considering the much less sensitive nature of this measure. However, given the lack of significance, attempting to draw any causal conclusions would not be appropriate.

Figure 10.
The Effects of Speech Rate and Argument Quality on Thought Favorability

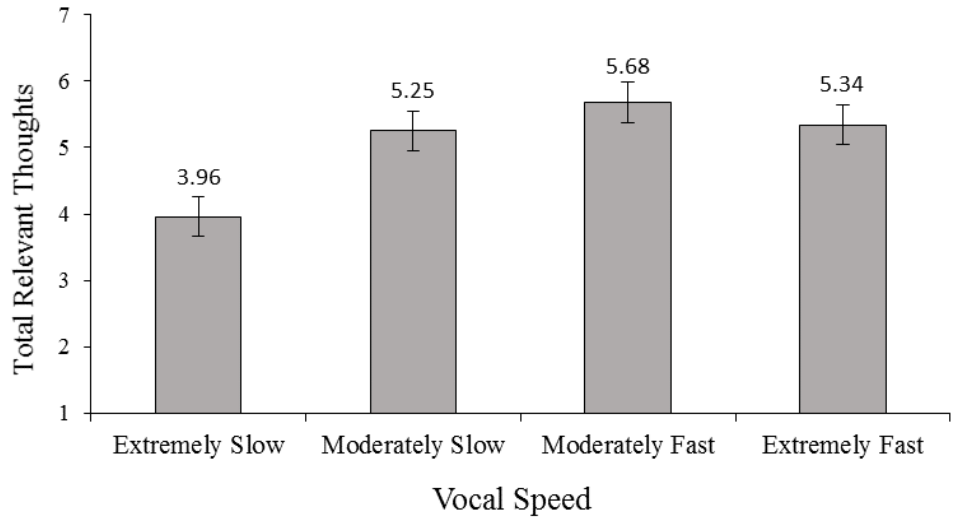


Our final two analyses, although not commonly used as a measure of amount of processing, are nonetheless included both for continuity with the prior studies as well as for their value in providing an overview of general trends in the data. The first analysis examines the total

number of topic-relevant thoughts generated by participants. In this case, our only prediction was that a main effect of vocal speed may emerge such that as rate of speech increased, participants would generate more topic-relevant thoughts. This pattern should emerge until the point where the speaker's rate of speech becomes so rapid that speed has a negative effect on both ability and motivation, thus leading to a decrease in the number of topic-relevant thoughts. This was tested by conducting an ANOVA in which vocal speed and argument quality were designated as the independent variables and the total number of topic-relevant thoughts served as the dependent variable.

As predicted, the data revealed a significant main effect of speech rate, $F(3, 324) = 5.87$, $p < .01$, partial $\eta 2 = .05$. Beginning with the left side of Figure 11, we see that compared with an extremely slow rate of speech ($M = 3.96$, $SE = .31$), pairwise comparisons indicated a significantly greater number of topic-relevant thoughts were generated in response to a moderately slow rate of speech ($M = 5.25$, $SE = .31$), $p < .01$. However, when comparing a moderately slow rate of speech with a moderately fast rate of speech ($M = 5.68$, $SE = .31$), the data revealed this increase in rate of speech did not produce a difference in the number of topic-relevant thoughts, $p = .33$. Likewise, no difference in the number of topic-relevant thoughts emerged as rate of speech increased to an extremely fast pace ($M = 5.34$, $SE = .31$), $p = .45$. In fact, because extremely fast speech may have a negative effect on both ability *and* motivation, this could be reflected by a levelling off in the total number of relevant thoughts – which is precisely what we found.

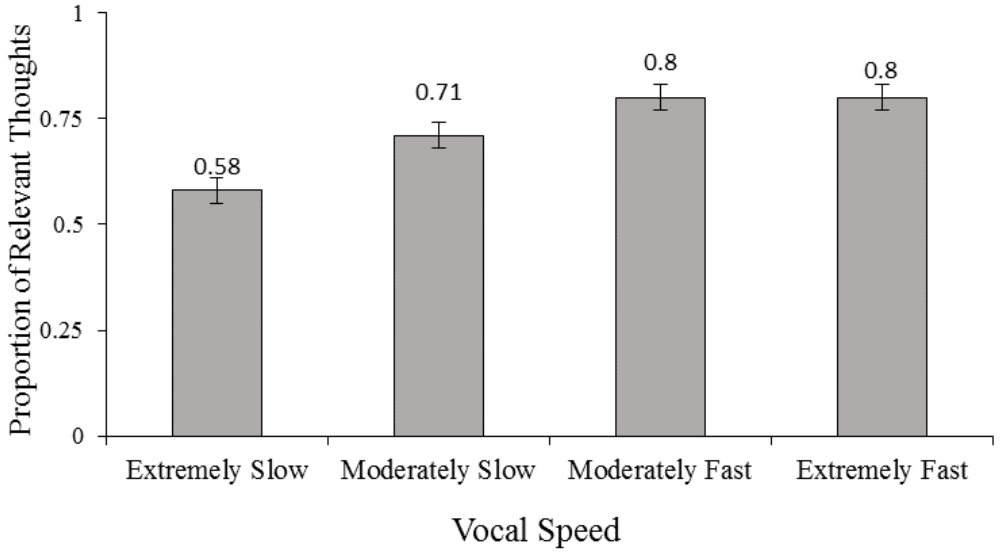
Figure 11.
The Effects of Speech Rate on Total Number of Relevant Thoughts



As noted, no main effect of argument quality was anticipated and none was found, $F(1, 324) = 2.44$, $p = .12$, partial $\eta 2 = .01$. Likewise, a two-way interaction between vocal speed and argument quality was not predicted and did not emerge, $F(3, 324) = .92$, $p = .43$, partial $\eta 2 = .17$.

A similar analysis using proportion of relevant thoughts as the dependent variable also revealed the predicted main effect of speech rate, $F(1, 322) = 9.41$, $p < .001$, partial $\eta 2 = .08$. Beginning with the left-hand side of Figure 12, pairwise comparisons revealed a significant increase in the proportion of topic-relevant thoughts as rate of speech progressed from extremely slow ($M = .58$, $SE = .03$) to moderately slow ($M = .71$, $SE = .03$), $p < .01$. However, as rate of speech increased to a moderately fast pace ($M = .80$, $SE = .03$), unlike the prior analysis, here we find a marginally significant increase in the proportion of topic-relevant thoughts, $p = .08$. Finally, recall that extremely rapid speech ($M = .80$, $SE = .03$), was hypothesized as potentially having a negative effect on both ability *and* motivation. Matching the prior analysis, this was reflected by a levelling off in the proportion of topic-relevant thoughts, $p = .98$.

Figure 12.
The Effects of Speech Rate on Proportion of Relevant Thoughts



As in the prior analyses, no main effect of argument quality was predicted and none was found, $F(1, 322) = 2.53$, $p = .11$, partial $\eta 2 = .01$. Finally, replicating the prior analysis, the two-way interaction between vocal speed and argument quality was not predicted and did not emerge, $F(3, 322) = .56$, $p = .64$, partial $\eta 2 = .01$.

As supplementary analyses to our primary measure of amount of processing, these data present a generally encouraging picture. Although the two-way interaction on thought favorability did not reach significance, this outcome was not entirely unexpected. Indeed, the less sensitive nature of this measure is commensurate with the weight attributed to any conclusions drawn from its results. However, these analyses converge to suggest an overall increase in amount of processing in line with what our theoretical model predicts. Specifically, that processing should increase as the speaker's rate of speech moves from extremely slow to moderately fast, at which point further increases in speech rate have a negative effect on the listener's ability and motivation to process a message.

4.3 Discussion

By investigating a much broader spectrum of speech rate than has been explored in prior research, these data provide the first empirical evidence demonstrating a curvilinear relationship between rate of speech and perceptions of speaker confidence. Moreover, our data suggests this general pattern may also extend to the relationship between rate of speech and persuasion. Importantly, our results support past research (e.g., Hausknecht & Moore, 1986; Moore et al., 1986; Smith & Shaffer, 1995), that shows a decrease in the relative difference by which argument quality affects persuasion as a function of speech rate. However, most critical to our model is the finding that under conditions of moderate elaboration, the process by which hallmarks of vocal confidence affect persuasion are not the same as when people are pushed to the end points of the elaboration continuum – as we observed in Experiments 1 and 2. In line with what the ELM suggests, what we find is that rate of speech exerts its effects on persuasion based on the extent to which a person engages in effortful processing of a message.

Chapter 5

The Effects of Multiple Levels of Vocal Intonation on Persuasion in the Context of Strong and Weak Arguments

The aim of Experiment 3 was to more thoroughly investigate the effects of rate of speech on persuasion under moderate elaboration by examining a broader spectrum of this variable. However, beyond rate of speech, other hallmarks of vocal confidence exist that have yet to be examined in the context of moderate elaboration. One example of this is vocal intonation. Importantly, we would not necessarily expect all hallmarks of vocal confidence to function in the same way. For example, whereas rate of speech has different effects on persuasion as we move

from one end of the continuum to the other, other variables such as intonation may influence persuasion in a relatively straightforward manner.

Applying our theoretical framework to this relationship requires that we address the potential role of both ability and motivation in terms of how each factor may affect persuasion via amount of processing. With regard to ability, relatively straightforward predictions can be made as far as how this factor may influence processing as a function of variability in rate of speech. However, with intonation, there is no compelling basis to suggest why variability in this hallmark of vocal confidence should necessarily affect one's *ability* to process a message. Thus, our expectation is that changes in vocal intonation will have a comparatively weak impact on a person's ability to process a message.

However, there are clear reasons why one might expect changes in vocal intonation to influence amount of processing based on how this vocal property affects motivation. For example, because rising intonation suggests the speaker is posing a question, which implies a degree of uncertainty, this may be perceived as reflecting a lack of confidence (Brennan & Williams, 1995; Smith & Clark, 1993). As a result, the recipient may infer the information is less valuable and/or inaccurate, which in turn reduces their *motivation* to attend to the content. Reduced motivation should lead to decreased processing of the message, which then lessens the impact of the content on persuasion. By comparison, because falling intonation suggests the speaker is making a statement of fact, this may be interpreted as reflecting a high degree of confidence (Brennan & Williams, 1995; Smith & Clark, 1993). In this case, the recipient may reason that the speaker is sharing valuable and/or accurate information. Because the informational value of a target can influence a person's motivation to acquire more knowledge about the target (Ryan & Deci, 2000) and because people are motivated to hold correct attitudes,

the belief that the speaker is sharing valuable and accurate information should enhance *motivation* to attend to the content and thus increase processing of the message (Chaiken et al., 1989; Petty & Cacioppo. 1979; Petty & Wegener, 1999). Increasing the amount of processing should then intensify the effect of the content on persuasive appeals.

In thinking of how variability in vocal intonation might affect amount of processing across a broader spectrum of intonation, our theoretical framework suggests this mechanism should predominantly be driven by changes in motivation. Importantly, our prediction is that changes in motivation should reflect changes in perceptions of speaker confidence, which fluctuate based on changes in vocal intonation. Recall that with rate of speech, our prediction was that a backfire effect might emerge at extremely fast rates of speech such that motivation to carefully evaluate the message could decrease because an extremely fast talker may be perceived as anxious or nervous. However, in the case of vocal intonation, no compelling basis exists to predict a backfire effect should emerge at either end of the intonation continuum.

Thus, our expectation was that vocal intonation should have a roughly linear relationship with amount of processing based on how changes in intonation affect perceptions of speaker confidence which in turn influence the listener's motivation to carefully process a message. More specifically, strongly falling intonation may further enhance perceptions of speaker confidence beyond what we observed through moderately falling intonation. In turn, these increased perceptions of confidence may influence amount of processing by further enhancing the listener's motivation to carefully process the arguments. In contrast, strongly rising intonation may further erode perceptions of speaker confidence beyond what we observed through moderately rising intonation. Similarly, these decreased perceptions of confidence may influence

amount of processing by further reducing the listener's motivation to carefully process the arguments.

Taken together, unlike rate of speech, there is no clear reason why variability in intonation should necessarily affect one's *ability* to process a message. However, as noted, there is a compelling basis to suggest why variability in vocal intonation should affect one's *motivation* to process a message. Thus, Experiment 4 investigated the possibility that under moderate elaboration, intonation does not influence persuasion by affecting ability but rather by affecting individuals' motivation to attend to the content, which then influences the amount of processing. This hypothesis was examined by comparing the effects of a similarly broad spectrum of vocal intonation on persuasion.

5.1 Method

Participants

Participants (N = 332) were obtained on a volunteer basis from the introductory psychology research pool at Queen's University. This study formed part of a session in which participants completed several studies that together took no longer than one hour to complete. All studies were completed in a laboratory environment under semi-private conditions on a computer provided by the researchers. Course credit was provided in exchange for participation.

Design and Procedure

We employed a 4 (Vocal intonation: strongly rising intonation vs. moderately rising intonation vs. moderately falling intonation vs. strongly falling intonation) x 2 (Argument quality: strong vs. weak) between participants factorial design. Assignment to all conditions was random. After being seated at a computer, participants were given headphones and told that they would be listening to an audio passage. The passage described a policy under consideration by

some universities that would require students in their senior year to pass a general exam in their major area before receiving their university degree. Similar to Experiment 3, no information was given to suggest that Queen's University was or was not considering implementing this program. Thus, the relevance of the message to the participant was ambiguous. For this reason, our expectation was that participant's motivation to carefully evaluate the message would be comparatively moderate.

Next, participants were randomly assigned to receive an audio passage containing either strong or weak arguments in favor of senior comprehensive exams (e.g., Petty & Cacioppo, 1977). For example, in the strong arguments version, participants were informed that "admissions officers of law, medical, and graduate schools have endorsed the comprehensive exam policy and indicated that students at schools without the exams would be at a significant disadvantage in the very near future." By comparison, in the weak arguments version, participants were told that "data from the Educational Testing Service confirms that students are eager to compare grades with one another when they are in the same classes. Senior comprehensive exams would allow such a comparison even across universities."

The strong and weak versions of the audio passages used in Experiment 4 used the same male speaker as Experiment 2. The audio passages were edited using a professional digital recording and editing program called PRAAT®. This allowed us to digitally manipulate the speaker's vocal intonation in order to produce four distinct levels of intonation without affecting other vocal characteristics that were not of interest. In order to manipulate vocal intonation, we selected 15 sentences that were similarly placed within both versions of the passage (i.e., strong vs. weak arguments), and either raised or lowered the intonation in the speaker's voice on the last word in each sentence. Importantly, a change in intonation reflects a change in vocal pitch, but in

this case, changes in pitch are specific to the last word in each sentence. Thus, relative to the speaker's baseline, we created two conditions that, on average, raised the speaker's intonation by either a moderate (35 hertz) or strong amount (75 hertz). Similarly, relative to the speaker's baseline, we created two conditions that, on average, lowered the speaker's intonation by either a moderate (15 hertz) or strong amount (20 hertz). These manipulations were selected because the differences in intonation were believed to be sufficiently distinct to the untrained ear.

Following the audio passage, participants answered several questions that required them to evaluate the speaker's stylistic delivery of the message. Next, a series of questions were presented that asked participants to evaluate different attributes of the speaker as well as the speaker's voice. Following this, a measure of participant's attitude towards senior comprehensive exams was obtained. Finally, participants completed a thought-listing task that asked them to list up to 10 thoughts that came to mind while listening to the audio passage and to then rate the favorability of those thoughts as either positive, negative, or neutral as they applied to the topic. Once the study had concluded, debriefing forms were provided and 1 course credit was awarded in exchange for participation.

Measures

Stylistic Qualities Questionnaire.

Experiment 4 used the same stylistic qualities questionnaire as Experiment 3.

Speaker Attributes and Vocal Qualities Questionnaire.

Six questions were presented, of which two (i.e., vocal confidence, vocal intonation) were of theoretical interest. As in Experiment 3, the remaining four items (i.e., age, gender, height, accent-type) were included in order to disguise the two variables of interest. All questions were presented in a random order. Beginning with a description of our two variables of interest,

participants were asked to rate the extent to which the speaker sounded confident using a scale ranging from 1 = *Not at all confident*, to 7 = *Very confident*. The speaker's vocal intonation was evaluated by asking participants to rate the extent to which the intonation used by the speaker mostly fell or rose at the end of each sentence using a scale ranging from 1 = *Mostly fell*, to 4 = *Neither rose nor fell*, to 7 = *Mostly rose*. The format of our filler questions was identical to that in Experiment 3.

Attitude Scale.

Experiment 4 used the same attitude scale as the prior studies. Cronbach's α for the attitude scale was .88.

Thought Listing/Rating Task

Experiment 4 used the same thought-listing and rating tasks as Experiment 3. Identical coding procedures as those in the prior studies were used for all indices. Likewise, thought favorability and thought relevance were evaluated using the same independent rates and identical procedures as in the prior studies. As in the prior studies, a high degree of agreement was found between the two raters' judgements on both thought favorability (91%) and thought relevance (89%). In line with prior research, we calculated the final values for thought favorability and thought relevance by averaging the scores for both independent raters on each dimension (e.g., Petty et al., 1981).

5.2 Results

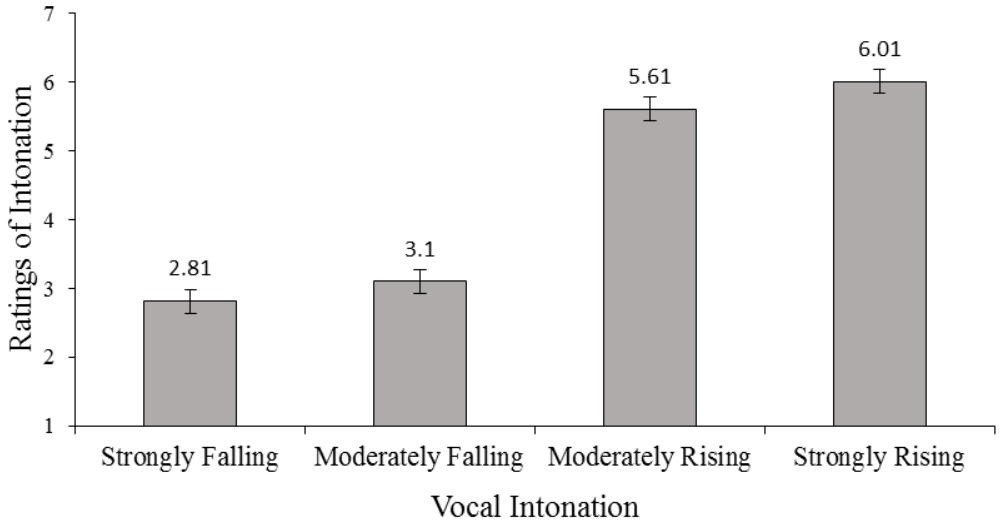
Vocal Intonation Manipulation Check

Prior to conducting our main analyses, we first sought to confirm the success of our vocal intonation manipulation. This was tested through an ANOVA, in which vocal intonation and

argument quality were designated as our independent variables and ratings of intonation served as the dependent variable.

As expected, the data revealed a significant main effect of vocal intonation, $F(3, 324) = 92.99$, $p < .001$, partial $\eta 2 = .46$. Pairwise comparisons across each level of vocal intonation were made using the least significant difference (LSD) test. Figure 13 provides the vocal intonation means so the reader can more clearly visualize the pattern of this effect. Beginning with the left-hand side of Figure 13, our results indicated no difference in ratings of the extent to which the speaker's intonation fell at the end of a sentence when comparing the speaker with strongly falling intonation ($M = 2.81$, $SE = .17$), relative to moderately falling intonation ($M = 3.10$, $SE = .17$), $p = .23$. However, intonation was perceived as rising at the end of a sentence to a significantly greater extent when comparing the speaker with moderately rising intonation ($M = 5.61$, $SE = .17$), relative to moderately falling intonation, $p < .001$. No difference emerged in ratings of intonation when comparing the speaker with strongly rising intonation ($M = 6.01$, $SE = .17$), relative to moderately rising intonation, $p = .10$.

Figure 13.
Ratings of Intonation Change as a Function of Vocal Intonation



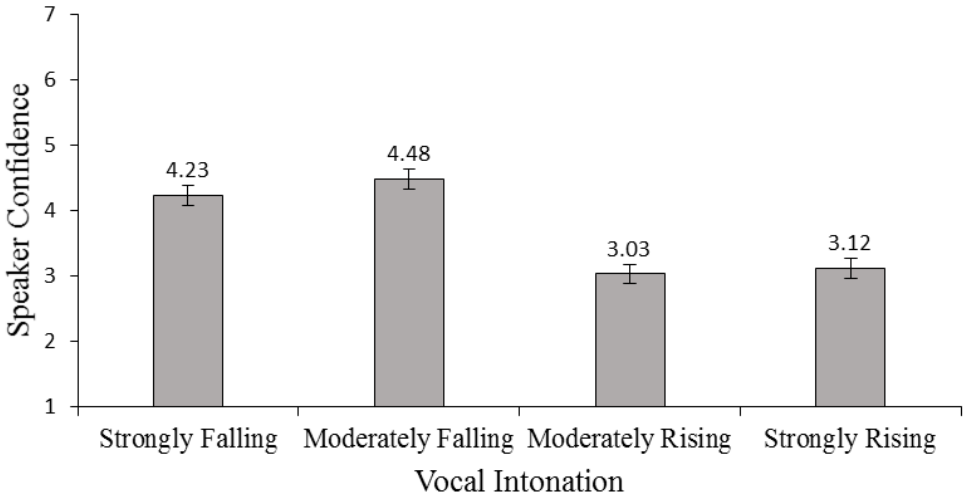
No effect of argument quality was predicted and none emerged, $F(1, 324) = .56$, $p = .45$, partial $\eta 2 = .00$. Likewise, a two-way interaction between vocal intonation and argument quality was not predicted and did not emerge, $F(3, 324) = .57$, $p = .64$, partial $\eta 2 = .00$. These data confirm the relative success of our vocal intonation manipulation.

Evaluation of Vocal Confidence Measure

As our next step, we sought to confirm that vocal intonation produced the expected pattern on ratings of speaker confidence. This was tested using an ANOVA in which vocal intonation and argument quality were designated as the independent variables and ratings of vocal confidence served as the dependent variable.

Confirming expectations, the data revealed a significant main effect of vocal intonation, $F(3, 324) = 25.99$, $p < .001$, partial $\eta 2 = .19$. Once again, pairwise comparisons across each level of intonation were made using the LSD test. Beginning with the left-hand side of Figure 14, no difference in ratings of speaker confidence was found when comparing the speaker with strongly falling intonation ($M = 4.23$, $SE = .15$), to the speaker with moderately falling intonation ($M = 4.48$, $SE = .15$), $p = .24$. However, ratings of speaker confidence significantly decreased when comparing the speaker with moderately rising intonation ($M = 3.03$, $SE = .15$), relative to moderately falling intonation, $p < .001$. No difference in ratings of speaker confidence was found when comparing the speaker with strongly rising intonation ($M = 3.12$, $SE = .15$), relative to moderately rising intonation, $p = .64$.

Figure 14.
Perceptions of Speaker Confidence as a Function of Vocal Intonation



Although we did not specifically predict a main effect of argument quality, it would not be particularly surprising to find that participants who received strong arguments rated the speaker as more confident than participants who received weak arguments. As it turned out, the data revealed a significant main effect of argument quality that fit this pattern, $F(1, 324) = 6.79$, $p = .01$, partial $\eta 2 = .02$. Specifically, participants rated the speaker as significantly more confident when receiving strong arguments ($M = 3.91$, $SE = .10$), compared with weak arguments ($M = 3.52$, $SE = .10$). No interaction between vocal intonation and argument quality was anticipated and none was found, $F(3, 324) = .92$, $p = .43$, partial $\eta 2 = .01$.

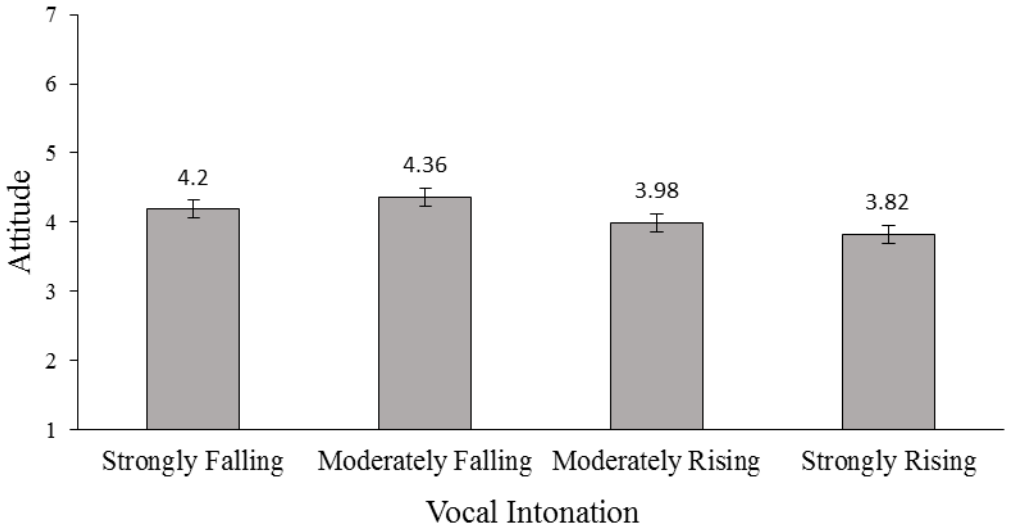
Although differences in ratings of speaker confidence did not emerge when comparing between gradations of either falling or rising intonation, nonetheless, these data replicate the patterns found in Experiment 1 by providing a second demonstration that changes in a speaker's vocal intonation reliably influenced perceptions of speaker confidence.

The Effects of Vocal Intonation and Argument Quality on Attitudes

Next, we turn our attention to examining the effects of vocal intonation and argument quality on participant's attitudes toward the university service plan. Once again, recall that under conditions of moderate elaboration, our theoretical framework suggests that the effects of a variable on persuasion are driven by the amount of processing. When testing this mechanism, the gold standard used by persuasion researchers has traditionally been to investigate the magnitude of argument quality effects on post-message attitudes. As previously explained, whereas strong and weak arguments should produce large differences in post-message attitudes when the recipient is carefully evaluating the message, these differences should be comparatively weak when the recipient is not carefully evaluating the message. This was tested using an ANOVA in which vocal intonation and argument quality were designated as the independent variables and the participant's attitude served as the dependent variable.

Results indicated a significant main effect of intonation, $F(3, 324) = 3.56$, $p < .015$, partial $\eta 2 = .03$. Beginning with the left-hand side of Figure 15, pairwise comparisons revealed that relative to strongly falling intonation ($M = 4.20$, $SE = .13$), no difference in attitudes emerged in response to a speaker with moderately falling intonation ($M = 4.36$, $SE = .13$), $p = .38$. As the speaker's intonation continues to rise, we would expect that attitudes should become less favorable towards the advocacy. Indeed, we find that moderately rising intonation ($M = 3.98$, $SE = .13$), generated significantly less favorable attitudes relative to moderately falling intonation, $p = .036$. Likewise, we would expect attitudes to become even less favorable as the speaker's intonation shifted from moderately rising to strongly rising ($M = 3.82$, $SE = .13$). However, as observed when comparing across gradations of falling intonation, the data revealed this effect did not emerge, $p = .34$.

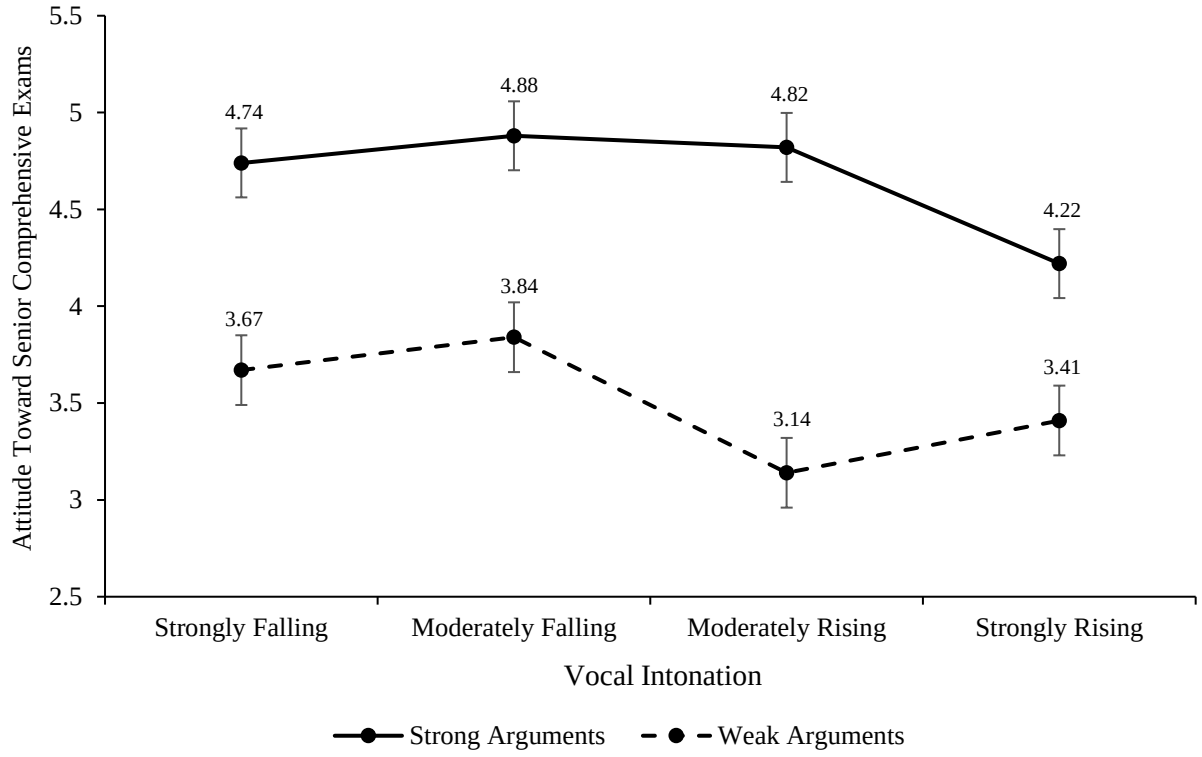
Figure 15.
The Effects of Vocal Intonation on Attitudes



Next, we anticipated a main effect of argument quality such that strong arguments should produce more favorable attitudes relative to weak arguments. As anticipated, the data revealed significantly more favorable attitudes toward the university service plan for those participants who received strong arguments (M = 4.67, SE = .09), compared with weak arguments (M = 3.51, SE = .09), $F(1, 324) = 83.07$, $p < .001$, partial $\eta 2 = .20$. These data also serve to confirm the success of our argument quality manipulation.

Based on the logic of our theoretical framework, we predicted a two-way interaction between vocal intonation and argument quality, such that the difference between strong and weak arguments should change as we move along the intonation continuum. Once again, recall that under moderate elaboration, this two-way interaction is the critical and most widely accepted test that examines whether the effects of a variable on persuasion are driven by the amount of processing. When examining the data, what we find is a non-significant effect, $F(3, 324) = 2.18$, $p = .09$, partial $\eta 2 = .02$ (see Figure 16).

Figure 16.
The Effects of Vocal Intonation and Argument Quality on Attitudes



Beginning with the left-hand side of Figure 16, pairwise comparisons revealed that when the speaker's intonation was strongly falling, strong arguments (M = 4.74, SE = .18) generated significantly more favorable attitudes than weak arguments (M = 3.67, SE = .18), $p < .001$. Moving one-step to the right, we would expect a modest decrease in the difference between strong and weak arguments when the speaker's intonation was moderately falling. Once again, the data revealed significantly more favorable attitudes in response to strong arguments (M = 4.88, SE = .18), compared with weak arguments (M = 3.84, SE = .18), $p < .001$. Follow up analyses using planned contrasts tested the interaction effect of vocal intonation and argument quality within these four cells. Our prediction was that the difference between strong and weak arguments would decrease as the speaker's intonation moved from strongly falling (MD = 1.07, SE = .26) to moderately falling (MD = 1.04, SE = .26). However, no evidence was found to

suggest a decrease in amount of processing when comparing strongly falling intonation against moderately falling intonation, $F(1, 324) = .01$, $p = .92$.

Next, we would expect that a speaker with moderately rising intonation should produce a decrease in the difference between strong and weak arguments when compared against a speaker with moderately falling intonation. Again the data revealed that strong arguments ($M = 4.82$, $SE = .18$), produced significantly more favorable attitudes than weak arguments ($M = 3.14$, $SE = .18$), $p < .001$. Planned contrasts were used to test the interaction effect of vocal intonation and argument quality between the moderately falling and moderately rising groups. Against expectations, the data revealed a significant *increase* in amount of processing when comparing moderately rising intonation, ($MD = 1.68$, $SE = .27$), against moderately falling intonation ($MD = 1.04$, $SE = .26$), $F(1, 324) = 6.38$, $p = .01$.

Finally, we would predict a further decrease in the difference between strong and weak arguments when comparing a speaker with strongly rising intonation against a speaker with moderately rising intonation. As in the prior analyses, the data revealed that strong arguments ($M = 4.22$, $SE = .18$), produced significantly more favorable attitudes than weak arguments ($M = 3.41$, $SE = .18$), $p < .001$. In this case, planned contrasts were used to test the interaction effect of vocal intonation and argument quality between the moderately rising and strongly rising groups. In line with expectations, what we find is a significant decrease in amount of processing when comparing strongly rising intonation, ($MD = .81$, $SE = .26$), against moderately rising intonation ($MD = 1.68$, $SE = .27$), $F(1, 324) = 11.71$, $p < .001$.

Taken together, consider first that the overall pattern of effects across the vocal intonation spectrum was non-significant – but more importantly, relatively discrepant from our expectations. Second, recall that our manipulation of vocal intonation was not powerful enough

that participants could differentiate between gradations of intonation in either direction (i.e., within falling or rising intonation). Thus, the absence of our predicted two-way interaction is not particularly surprising. Consequently, attempting to draw conclusions based on this mixed pattern of results does not seem very sensible.

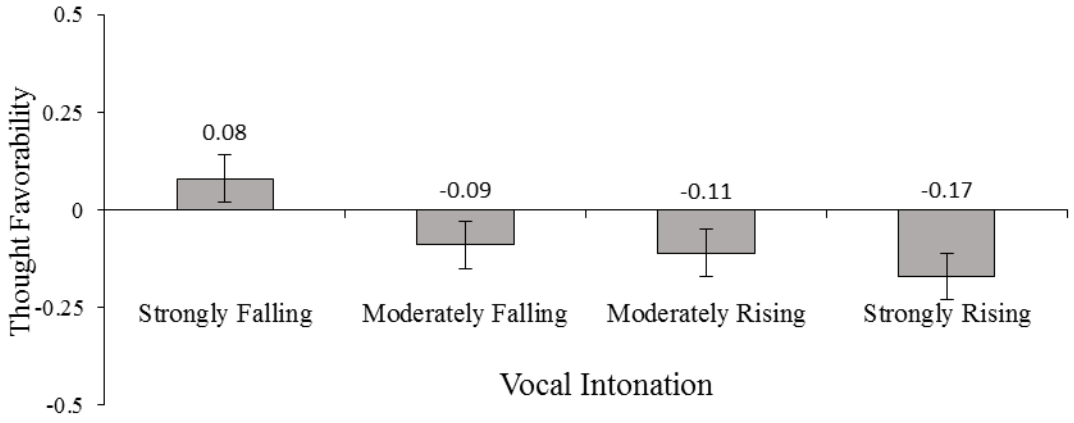
The Effects of Vocal Intonation and Argument Quality on Thought Favorability

As in Experiment 3, thought favorability was used as a secondary index of amount of processing. Once again, the logic behind our predictions is the same as in the prior analysis using post-message attitudes as the dependent variable. Thus, we would expect large differences in the effect of argument quality on thought favorability when the recipient is carefully evaluating the message. In contrast, these differences should be comparatively weak when the recipient is not carefully evaluating the message. This was tested by conducting an ANOVA in which vocal intonation and argument quality were designated as the independent variables and participant's cognitive responses (i.e., thought-favorability) served as the dependent variable.

As in the prior analysis, although there was no clear reason to predict a main effect of vocal intonation, the data revealed this effect did reach significance, $F(3, 308) = 2.60$, $p = .05$, partial $\eta 2 = .03$. Beginning with the left-hand side of Figure 17, pairwise comparisons revealed that relative to strongly falling intonation ($M = .08$, $SE = .07$), a non-significant decrease in thought favorability emerged for moderately falling intonation ($M = -.09$, $SE = .07$), $p = .07$. Likewise, no difference in thought favorability was found when comparing moderately falling intonation against moderately rising intonation ($M = -.11$, $SE = .07$), $p = .84$. Similarly, no difference in thought favorability emerged when comparing moderately rising intonation against strongly rising intonation ($M = -.17$, $SE = .07$), $p = .56$. This pattern reflects a weak but general trend that suggests when collapsing the data across levels of argument quality, thoughts became

moderately less favorable as the speaker's intonation moved from strongly falling to strongly rising.

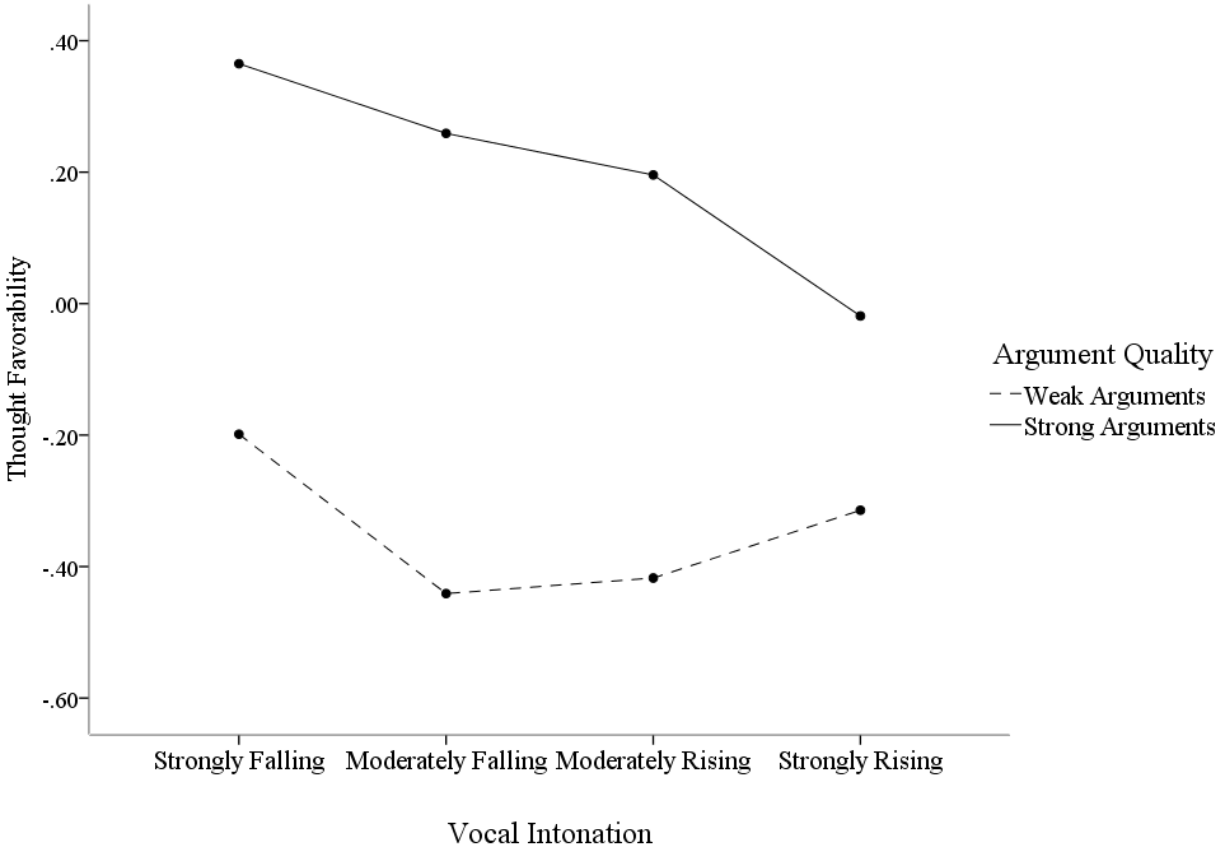
Figure 17.
The Effects of Vocal Intonation on Thought Favorability



Turning now to argument quality, our expectation was that this effect would reach significance because strong arguments should elicit more favorable thoughts relative to weak arguments. Indeed, the data revealed that strong arguments (M = .30, SD = .05), produced significantly more favorable thoughts compared with weak arguments, (M = -.27, SD = .05), $F(3, 306) = 64.54$, $p < .001$, partial $\eta 2 = .17$.

Finally, our model suggests a two-way interaction between vocal intonation and argument quality should emerge. However, the results indicated this effect failed to reach significance, $F(3, 308) = 1.66$, $p = .18$, partial $\eta 2 = .02$ (see Figure 18). Once again, given that our manipulation of vocal intonation was not sufficiently powerful to allow participants to differentiate between gradations of intonation in either direction, the absence of our predicted two-way interaction is not particularly surprising.

Figure 18.
The Effects of Vocal Intonation and Argument Quality on Thought Favorability

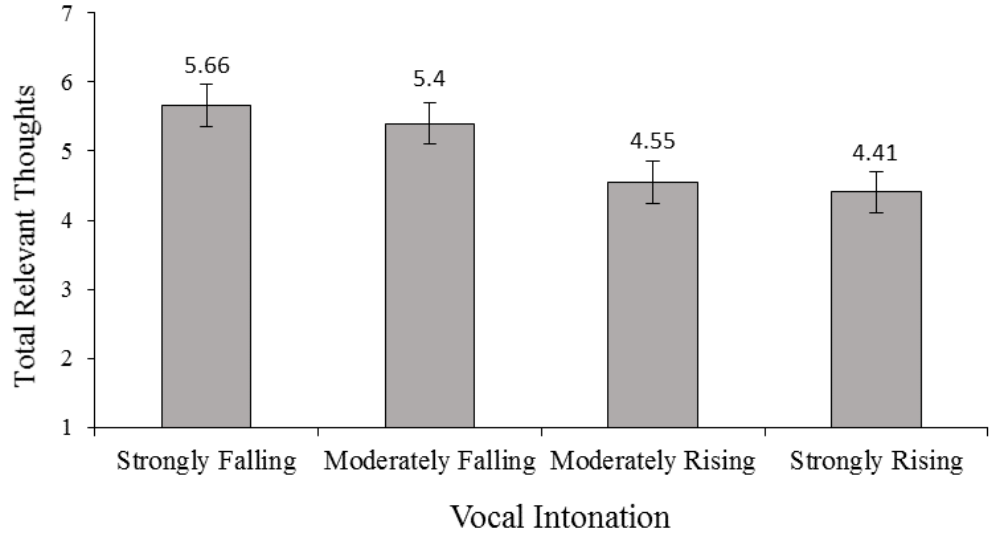


Our final two analyses examined the total number of topic-relevant thoughts and the proportion of topic-relevant thoughts generated by participants. In each case, our only prediction was that a main effect of vocal intonation may emerge such that as intonation rose, participants would generate fewer topic-relevant thoughts, and a lesser proportion of topic-relevant thoughts. Consider that because rising intonation signals uncertainty, which should be perceived as reflecting a lack of confidence, this should translate into decreased motivation to attend to the content. In turn, decreased motivation should reduce the number of topic-relevant thoughts. This was tested by conducting an ANOVA in which vocal speed and argument quality were

designated as the independent variables and the total number of topic-relevant thoughts served as the dependent variable.

As predicted, the data revealed a significant main effect of vocal intonation, $F(3, 324) = 4.21$, $p < .001$, partial $\eta 2 = .04$. Beginning with the left side of Figure 19, pairwise comparisons revealed no difference in the number of topic-relevant thoughts when comparing strongly falling intonation ($M = 5.66$, $SE = .30$), with moderately falling intonation ($M = 5.40$, $SE = .30$), $p = .56$. However, when comparing moderately falling intonation against moderately rising intonation ($M = 4.55$, $SE = .30$), the data revealed a significant decrease in the number of topic-relevant thoughts, $p = .046$. Finally, no difference in the number of topic-relevant thoughts emerged when comparing moderately rising intonation against strongly rising intonation ($M = 4.41$, $SE = .30$), $p = .74$. These data suggest that although differences in the direction of intonation (i.e., falling vs. rising) affected the total number of topic-relevant thoughts, gradations in vocal intonation within a given direction (i.e., falling or rising) were insufficient to affect the amount of processing.

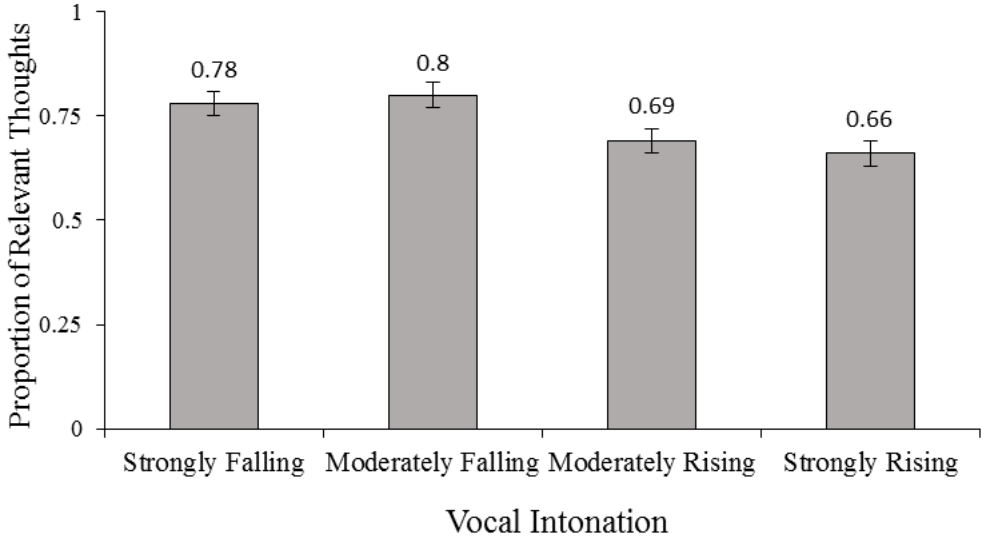
Figure 19.
The Effects of Vocal Intonation on Number of Topic-Relevant Thoughts



As noted, no main effect of argument quality was anticipated and none was found, $F(1, 324) = .73$, $p = .39$, partial $\eta 2 = .00$. Likewise, a two-way interaction between intonation and argument quality was not predicted and did not emerge, $F(3, 324) = .10$, $p = .96$, partial $\eta 2 = .00$.

A similar analysis using proportion of topic-relevant thoughts as the dependent variable also revealed the predicted main effect of intonation, $F(3, 321) = 4.26$, $p < .001$, partial $\eta 2 = .04$. Beginning with the left-hand side of Figure 20, pairwise comparisons revealed no difference in the proportion of topic-relevant thoughts when comparing strongly falling intonation ($M = .78$, $SE = .03$), against moderately falling intonation ($M = .80$, $SE = .03$), $p = .76$. However, as anticipated, when comparing moderately falling intonation against moderately rising intonation ($M = .69$, $SE = .03$), the data revealed a significantly lesser proportion of topic-relevant thoughts, $p = .028$. Finally, no difference in the proportion of topic-relevant thoughts was found when comparing moderately rising intonation against strongly rising intonation ($M = .66$, $SE = .03$), $p = .42$. These data present a similar pattern to that of the prior analysis.

Figure 20.
The Effects of Vocal Intonation on Proportion of Relevant Thoughts



As in the prior analyses, no main effect of argument quality was predicted and none was found, $F(1, 321) = .11$, $p = .75$, partial $\eta 2 = .00$. Finally, replicating the prior analysis, the two-way interaction between vocal intonation and argument quality was not predicted and did not emerge, $F(3, 321) = .25$, $p = .86$, partial $\eta 2 = .00$.

Taken together, these data present a very mixed picture that do not allow us to draw any strong conclusions. First, our primary analysis revealed a non-significant pattern that did not fit with our theoretical framework. Indeed, in some cases, we observed a pattern that was exactly the opposite of our expectations (see Figure 16). Likewise, when examining thought favorability, a non-significant effect emerged for our critical two-way interaction. Although somewhat more sensible, this pattern was different from what we observed in our two-way interaction on post-message attitudes. The only pattern consistent with our predictions arose in our total relevant thought and proportion of relevant thought analyses, both of which revealed more processing in response to falling intonation compared with rising intonation.

5.3 Discussion

At the most general level, our attempt to investigate a broader spectrum of vocal intonation replicated the effects on perceptions of speaker confidence observed in Experiment 1. Specifically, our data suggest that speakers who finish their sentences with falling intonation are perceived as significantly more confident than speakers who finish their sentences with rising intonation. Perhaps not surprisingly, these data also suggest that at a general level, speakers who use falling intonation elicit more favorable topic-relevant thoughts compared with speakers who use rising intonation. Importantly, our data indicate that this general pattern can be extended to persuasive appeals such that falling intonation results in more persuasion compared with rising intonation. However, it is important to note that these results are somewhat tempered by the fact

that our manipulations of vocal intonation were not sufficiently powerful to demonstrate the mechanism predicted by our theoretical framework under moderate elaboration.

Chapter 6

General Discussion

Summary of Findings

These data replicate past research (e.g., Brennan & Williams, 1995; Brown et al., 1985; Smith & Clark, 1993; Jiang & Pell, 2014; London, 1973; Scherer et al., 1973), by demonstrating that rate of speech and vocal intonation play an important role in evaluating the extent to which a speaker is perceived as confident. Moreover, we demonstrate that perceptions of confidence can be influenced by other properties of voice beyond those previously associated with confidence, such as vocal pitch. In addition, our data suggest that some vocal properties may affect perceptions of confidence in a non-linear fashion. Importantly, these experiments provide some evidence that, when combined, different vocal properties work together in an additive rather than interactive fashion to influence perceptions of speaker confidence.

More broadly, these data provide evidence to support the predictions made by the Elaboration Likelihood Model regarding the processes by which vocal confidence should affect persuasion. That is, when engaged in effortful processing of a message, perceptions of speaker confidence biases thought favorability but does not influence a person's attitude by functioning as a peripheral cue. By contrast, when effortful processing of a message is low, perceptions of speaker confidence do not influence thought favorability but rather directly influence attitudes by functioning as a peripheral cue. Across two experiments, we demonstrated these bias and cue effects in the context of speech rate, intonation, and pitch. Finally, we have some evidence that vocal properties influence persuasion via amount of processing under moderate elaboration. We

demonstrate this in the case of rate of speech, where importantly we show that the effects on persuasion are non-linear across a wider spectrum of this variable. Indeed, at extremely fast rates of speech, persuasion levels off and perhaps even declines following exposure to strong arguments but increases following exposure to weak arguments. At this point, however, the evidence that amount of processing regulates the effects of intonation on persuasion is unclear.

Theoretical and Practical Implications

Oral exchanges constitute a large portion of our daily communication. An important point to bear in mind, however, is that the process of oral communication involves more than simply the exchange of information. Indeed, a number of studies within the domains of communications and emotions research have shown that vocal characteristics such as tone and emotionality play an important role in oral exchanges (e.g., Johnson et al., 1986; Mandal, 2008; Pell et al, 2009). Past research in social psychology, however, has largely ignored how vocal characteristics affect communication – and in particular, persuasion. The current research bridges some gaps in this literature by presenting a compelling illustration of the multifaceted relationship between vocal characteristics that reflect confidence and their effects on persuasion. These data address this relationship in a number of important ways.

At the most fundamental level, advances in technology allowed us to employ a digital recording and editing process that provided a far more precise way of manipulating specific properties of voice than those techniques used in prior research – importantly, without affecting other vocal properties that were not of interest. As a result, our studies directly addressed problems surrounding the interpretation of past research that may – at least in part – have stemmed from methodological issues with their manipulations of voice.

For example, in past research, manipulations of voice were often created by asking a speaker to intentionally change how they spoke (e.g., fast vs. slow, or confident vs. unconfident), or by forcibly compressing an analog recording and then rerecording the audio track to create the desired rate of speech (e.g., Jiang & Pell, 2014; Miller et al., 1976; Moore et al., 1986; Scherer et al., 1973; Smith & Shaffer, 1991/95). One problem with this approach is that pretesting was not conducted to determine whether the speaker may have inadvertently changed other properties of voice beyond the target property and thus confounded the manipulation. Indeed, research has shown that vocal properties such as rate of speech, volume, and pitch typically covary in natural communication (Black, 1961). Thus, it is entirely plausible that participants in past research were responding to cues related to pitch and/or loudness as well as to those reflecting rate of speech. A second problem is that creating vocal manipulations either by forcibly compressing or expanding an audio file could have altered certain parameters of voice that may have affected the extent to which the listener perceived the voice as sounding natural. Consequently, it becomes somewhat unclear how this manipulation affected perceptions of the speaker and the downstream effects this may have had on persuasion. Finally, because some past research presented stimuli that combined both audio and visual channels (e.g., Gunderson & Hopper, 1976; Woodall & Burgoon, 1983), it becomes impossible to determine the extent to which voice influenced persuasion.

By using a digital recording and editing process, we were able to rule out the possibility that any effect voice had on either confidence or persuasion may in part have been due to contributions of other vocal properties. Moreover, this process also allowed us to avoid potentially distorting the audio track through either compressing or expanding the recording and the corresponding affect this may have had on perceptions of the speaker. Of course, by using

only one modality as opposed to crossing audio and visual channels, this removed any ambiguity regarding the extent to which changes in properties of voice influenced perceptions of the speaker as well as persuasion.

Interestingly, a further benefit of using a digital recording and editing process was that it allowed us to simultaneously investigate the joint effects of multiple vocal properties both on perceptions of confidence as well as on persuasion. Unpacking this question using the methodology in past research would have presented significant obstacles resulting from the unique challenge of simultaneously altering two properties of voice in a controlled manner. For example, consider the difficulty a speaker might experience when attempting to convey a message at an extremely slow rate of speech while speaking with a very high-pitched voice – without altering any other properties of voice. Only adding to the inherent difficulty of this approach is the fact that in order to avoid discrepancies in vocal pitch that would then confound the manipulation, the speaker would need to match the exact pitch while conveying the same information at different rates of speech. By using a digital recording and editing process to combine manipulations of voice, these obstacles were a non-issue in our research.

Beyond providing insight into the joint effects of multiple hallmarks of vocal confidence, these data present a more nuanced perspective than past research by demonstrating that not all vocal properties influence perceptions of confidence in the same way. Our research began to unpack this question by investigating how vocal speed and vocal intonation affect confidence across a broader spectrum of each variable. We speculated that at extremely rapid rates of speech, a speaker may be perceived as somewhat anxious, thus eroding ratings of confidence. In contrast, we had no compelling basis to predict a similar effect at extreme ends of the vocal intonation continuum. As it turns out, our data provide some evidence that both vocal speed and

intonation differentially affect perceptions of confidence at the extreme ends of each vocal continuum in accordance with our predictions.

Taken together, through advances in technology, we were able to create more precise manipulations of voice that allowed us to definitively rule out many of the issues with the vocal manipulations used in past research. Importantly, having addressed these methodological issues while also replicating the effects of speech rate and intonation on confidence, our data provide stronger evidence for this relationship. Moreover, we extended past research by demonstrating a relationship between vocal pitch and perceptions of confidence. Finally, our data provided the first evidence that when combined, vocal properties influence perceptions of confidence as well as persuasion in an additive rather than interaction fashion. This suggests that the extent to which a speaker is perceived as confident – as well as the likelihood that their persuasive appeal will be successful, can either be enhanced or reduced to the extent that a speaker combines multiple properties of voice that exert similar effects on perceptions of confidence.

Beyond clarifying our understanding of how different properties of voice influence confidence, these data address inconsistencies in past research that have led to much speculation regarding the processes by which vocal properties influence persuasion. Indeed, debate over this issue has often taken an either-or approach such that some researchers have advocated a single mechanism as being responsible for the effects of voice on persuasion (e.g., Miller et al., 1976; Hausknecht & Moore, 1986; Moore et al., 1986; Smith & Shaffer, 1991/95). Our data present compelling evidence demonstrating that this way of conceptualizing the relationship between vocal properties and persuasion is too simplistic because it does not capture the different psychological processes that emerge under different levels of thought. Importantly, our data confirm that not only do different processes regulate the effects of vocal confidence on

persuasion at different points along the elaboration continuum, but also that at each point along the elaboration continuum, the same process applies to different hallmarks of vocal confidence.

At a more general level, these experiments are another test of the Elaboration Likelihood Model's ability to organize a broad range of variables into a cohesive structure that predicts how a variable will function under a diverse set of conditions and the underlying psychological processes responsible for its effect on attitudes. This notion of multiple roles has been applied to a host of variables across a diverse range of topics with great success (see Petty et al., 2004, for a review). Our data show that this framework can be extended to apply in the context of vocal properties, thus providing further support for the utility of the ELM as a broad theoretical perspective.

Taken together, these data offer the best evidence to date that illustrate not only how but also why (i.e., the underlying psychological processes) different properties of voice influence the success of a persuasive appeal at different points along the elaboration continuum. These findings are particularly important in light of inconsistencies in past research that have fueled considerable debate regarding the processes responsible for the effects of speech rate on persuasion.

Beyond the more theoretical implications, these data also hold promise for their practical relevance in a variety of applied contexts. For example, consider how a better understanding of vocal properties might increase the effectiveness of sales pitches, whether delivered over the radio, on television, or in a face-to-face context. Indeed, given that other non-verbal aspects of communication such as body language, facial expressions, proximity, and even physical contact are non-existent in communications delivered via radio, we might expect features of a speaker's voice to be especially important within this context. For example, research has found that for

male speakers, lower pitched voices are perceived as more pleasant, attractive, and persuasive (Bond et al., 1987; Brown et al., 1973; Zuckerman & Miyake, 1993). Moreover, relative to male speakers with higher pitched voices, speakers with lower pitch receive higher ratings of competence and benevolence (Brown et al., 1973). The benefits of having a lower pitched voice also extend to increased perceptions of honesty, strength, and lower ratings of anxiety (Apple et al., 1979; Bond et al., 1987). Similarly, rate of speech is frequently relied upon as an important determinant when judging attributes such as speaker credibility (Hausknecht & Moore, 1986; Moore et al., 1986; Nickell & Pinto, 1984; Smith & Shaffer, 1991; 1995), knowledge, intelligence (Miller et al., 1976; Moore et al., 1986; Nickell & Pinto, 1984), expertise (Smith & Shaffer, 1995), and confidence (Brown et al., 1985; Jiang & Pell, 2014; London, 1973; Scherer et al., 1973). Likewise, a speaker's intonation can affect the listener's perceptions of speaker confidence (Brennan & Williams, 1995), certainty, and credibility (Smith & Clark, 1993). Thus, our evaluations of others can be influenced across a wide range of attributes by the variability in different features of voice, which in turn has clear implications regarding the success of a persuasive appeal – particularly in contexts in which exposure to a persuasive appeal occurs only through the speaker's voice.

From a marketing perspective, including features in an advertisement that capture a listener's attention has important downstream consequences that can influence future purchasing decisions. This is particularly relevant from a pragmatic standpoint given that large sums of money are often invested into advertisements that expose a potential consumer to a product for as little as only 15 seconds (Newstead & Romaniuk, 2009). While a variety of factors can contribute to the overall effectiveness of an advertisement (see, Muehling & Bozman, 1990; Petty, Cacioppo, & Schumann, 1983; for reviews), the frequent reliance on actors to

communicate the benefits of a product to an audience (Chattopadhyay et al., 2003), suggests that perhaps ad effectiveness can be influenced by certain features of the speaker. Indeed, research suggests one factor that likely plays an influential role is the variability in different qualities of a speaker's voice (Hausknecht & Moore, 1986; Moore et al., 1986, LaBarbera & MacLachlan, 1979).

For example, increasing the speaker's rate of speech not only decreases the length of advertisements, which in turn reduces their cost (MacLachlan & Siegel, 1980), but also leads to more favorable evaluations on a host of attributes, including credibility, expertise, intelligence, and confidence (e.g., Hausknecht & Moore, 1986; Jiang & Pell, 2014; Miller et al., 1976; Moore et al., 1986; Scherer et al., 1973; Smith & Shaffer, 1991; 1995). Favorable evaluations of the source can elicit positive emotional responses in the listener, which can enhance the memorability of the advertisement (Hollis, 1995; du Plessis, 1998; Thorson, 1991) because people typically prefer to devote cognitive resources toward processing hedonically rewarding stimuli (Biel, 1990; du Plessis, 1998; Wegener, Petty, & Smith, 1995). In turn, a positive mood-state may lead to approach-oriented behavior and thus influence purchasing decisions (Wegener & Petty, 1994). Indeed, research by Haley and Baldinger (1991) has revealed that the likeability of an advertisement is one of the strongest predictors of sales.

A further context in which the practical application of these data may lead to real-world benefits might involve training people to become more effective communicators in domains such as law, politics, education, health-care, and business. For example, consider the importance of being perceived by one's audience as confident when presenting arguments in a courtroom setting or political debate. One can imagine the influence a confident witness might have on the testimony of other witnesses who are uncertain of the extent to which they accurately recall the

details of a crime. In line with this, research by Goodwin, Kukucka, and Hawks (2013) suggests that when responding to questions before their co-witness, a confident witness can influence both the public and private memory reports of a co-witness as well as self-reported confidence in their recall of events. This suggests that in some cases confident eyewitnesses may inadvertently exert pressure on co-witnesses to conform to their recollection of events, which could have a substantial influence on sentencing decisions. Research has documented similar outcomes within the context of patient-physician relationships. For example, physicians who communicate in a confident manner have been linked to higher rates of patient compliance, satisfaction, and improved medical outcomes (Bendapudi, Berry, Frey, Parish, & Rayburn, 2006). These examples underscore the profound influence that non-verbal expressions of confidence can exert on recipients in contexts where decisions can affect the course of one's life in non-trivial ways.

Finally, increasing our understanding of vocal properties could help address the widespread fear of public speaking by teaching people how to convey information in a confident manner and thus enhance its impact on their audience. As these examples illustrate, there are clear benefits to enriching our knowledge with respect to how different qualities of voice play a role in the communication process. Clearly, then, from both a practical and theoretical standpoint, the present set of studies holds great promise for advancing our understanding and application of perhaps the most empirically overlooked aspect of communication: the voice.

Unresolved Issues and Potential Criticisms

Although the results supported many of our predictions regarding the relationship between hallmarks of vocal confidence and persuasion, there were some aspects of our findings that did not turn out as expected. For example, in Experiment 1, we expected a factorial ANOVA to reveal a two-way interaction between vocal speed/vocal intonation and elaboration on thought favorability.

Likewise, in Experiment 2, we expected a similar pattern of effects to emerge for our predicted two-way interaction between vocal pitch and elaboration on thought favorability. Contrary to expectations, the data failed to support this prediction for either interaction.

As a reminder, recall that under high elaboration our theoretical framework predicts that vocal speed/intonation should influence perceptions of speaker confidence, which then biases thought favorability. Under low elaboration, vocal speed/intonation should also influence perceptions of speaker confidence but in this case should not affect thought favorability. While this pattern emerged across Experiments 1 and 2 in our multi-sample structural equation model (pages 45 and 60, respectively), it was not found when testing this relationship through an ANOVA. Why might this be the case?

First, recognize that both vocal speed/intonation (and in Experiment 2, vocal pitch) are two steps removed from thought favorability in our theoretical model. As a predictor and outcome variable become more distal from one another, the relationship between the two becomes increasingly weaker. Thus, we would expect less statistical power to detect a significant effect than if thought favorability was the most proximal outcome for each vocal property. Second, consider that when evaluating the two-way interaction, our mediational model is a more sensitive test than an ANOVA because it allows us to partial for a variety of different direct and indirect effects – which an ANOVA is not designed to do. This is particularly important in our case because under high elaboration, the direct effects of our vocal qualities on thought favorability fall in the opposite direction of our mediated effect. In turn, this erodes the biasing effect (i.e., via speaker confidence) by which we predicted vocal speed/intonation to influence thought favorability under high – but not low elaboration. Moreover, under low elaboration, we find a positive effect of our vocal qualities on thought favorability, which further washes out any

differences in the relationship between these variables across levels of elaboration. Evidence that this pattern emerged across Experiments 1 and 2 can be found when looking at our path analyses, thus revealing the reason our predicted two-way interactions were not significant.

Another prediction not supported by the data was our failure to detect the amount of processing effect we anticipated via the interaction between our manipulation of vocal intonation and argument quality in Experiment 4. There are actually several possible explanations for this result. One possibility is that unlike rate of speech, perhaps changes in vocal intonation do not have a strong effect on amount of processing.

A second possibility is that perhaps our manipulations of vocal intonation were not sufficiently powerful to produce an amount of processing effect on persuasion. Given the failure of our manipulation to reveal differences when comparing between gradations of intonation within the same direction (falling or rising), this explanation seems plausible. However, as previously noted, we would still expect an amount of processing effect to emerge when comparing across levels of intonation. This should then lead us to consider that amount of processing is evaluated based on the magnitude of the argument quality effect on persuasion; in other words, testing the difference between strong and weak arguments as they affect post-message attitudes. This is important because as our theoretical framework suggests, vocal intonation is expected to affect amount of processing based on how it influences perceptions of speaker confidence, which is two steps removed from post-message attitudes. Thus, perhaps the issue is that our manipulation of intonation did not have a sufficiently powerful effect on confidence that it would then influence amount of processing. Indeed, when comparing the effect size we observed for rate of speech on confidence (partial $\eta 2 = .49$) with that of intonation on confidence (partial $\eta 2 = .19$) we find that intonation has a comparatively moderate effect.

A third possibility is that perhaps in certain cases amount of processing affects persuasion based predominantly on changes in ability rather than motivation. Recall that in theorizing how vocal properties might affect amount of processing, we laid out the logic that explained how both rate of speech *and* intonation should influence motivation while suggesting that *only* rate of speech should affect ability to process a message. We observed the predicted amount of processing effect with rate of speech - when both ability and motivation were theorized to play a role, but did not find this effect with intonation - when only motivation was expected to play a role. Importantly, recall that our theory predicted an amount of processing effect should emerge when comparing our falling versus rising intonation groups – precisely where motivation was hypothesized to decrease and thus affect processing, yet this effect was not found. Although a plausible explanation, it must be conceded that because no measures were included to directly measure changes in ability and motivation, at this point we can only speculate on the extent to which ability and motivation influenced amount of processing.

Beyond several anomalies in the data, there are some aspects of our methodology that warrant further discussion. For example, in Experiments 3 and 4, we suggested that rate of speech and intonation should affect persuasion based on the extent to which these hallmarks of vocal confidence influence amount of processing. Once again, recall that our theoretical framework suggests that amount of processing is a function of a person's ability and motivation to process the message content. In Experiment 3, we hypothesized that rate of speech should influence amount of processing based on how it affects *both* ability and motivation. By comparison, in Experiment 4 we hypothesized that vocal intonation should influence amount of processing based *only* on how it affects motivation and that ability should not play a role in this context. While this may be the case, the keen reader will note that no direct measures of either

ability or motivation were included in these studies. That being said, although we have some evidence to infer the role of motivation, it must be conceded that at this point, we are unable to provide even indirect evidence for the role of ability.

Having acknowledged this shortcoming in our data, recall that our assumption was that speaker confidence influenced amount of processing because of the impact confidence had on the listener's motivation to attend to the content. In thinking of how motivation may influence amount of processing, our logic was based on the premise that the recipient should be more or less motivated to attend to the message based on how the confidence with which the speaker delivered the information influenced the extent to which the information was perceived as valuable and accurate. Our expectation was that a confident sounding speaker should increase the likelihood that the recipient perceive the information as valuable and accurate. In turn, this should enhance motivation to attend to the content, thereby increasing the amount of processing. In contrast, we would expect the reverse outcome in the case of an unconfident sounding speaker. Supporting this, research has shown that the informational value of a target can influence a person's motivation to acquire more knowledge about the target (Ryan & Deci, 2000). Similarly, research has demonstrated that accuracy-related goals influence motivation – and in turn enhance systematic processing – particularly in situations where the issue is personally relevant to the recipient (Chaiken et al., 1989; Petty & Cacioppo. 1979; Petty & Wegener, 1999). Thus, prior research suggests our data provide some indirect evidence to infer motivation may have played a role in this process.

Taken together, although these data do not provide direct support for the mediating role of either ability or motivation as drivers of amount of processing, they provide some evidence to infer the potential role of motivation. Future research will need to empirically test this question

by including direct measures of ability and motivation before drawing any firm conclusions regarding the possible mediating role of these constructs.

A further issue the reader may wonder about is how our specific rate of speech and vocal pitch manipulations were chosen. Starting with rate of speech, recall that this vocal quality was manipulated in Experiments 1 and 3. The same speaker and topic were used in both experiments. Likewise, in both experiments, rate of speech was increased by 10% and decreased by 15%. Experiment 3 investigated a broader spectrum of rate of speech and so included additional manipulations that increased speech rate by 13% and decreased speech rate by 35%.

When choosing these manipulations, bear in mind that a certain degree of variability exists across individuals in their natural baseline rate of speech. Some people tend to speak relatively quickly whereas others speak relatively slowly. A further important point to consider is that our primary focus was to ensure that our manipulations of rate of speech produced their intended effects on perceptions of speaker confidence. Given the natural variability in people's baseline rate of speech, this suggests that in order for our manipulations to be successful, it was important that we specifically calibrate them with our speaker's baseline rate of speech. For example, because our speaker's natural baseline was somewhat on the quicker end, only a modest increase (10%) was required in order to produce significant increases in ratings of speaker confidence. By extension, this also meant that a larger decrease (15%) was required in order to produce significant decreases in ratings of confidence. Thus, because of the natural variability in people's baseline rate of speech, we would not necessarily expect or even desire that our manipulations be symmetrical. With respect to the additional manipulations used in Experiment 3 (13% increase, 35% decrease), these were chosen largely based on our

speculations regarding the possible effects of speech rate on confidence after reviewing the data from a prior study conducted in our lab using the same speaker and materials.

Our manipulations of vocal pitch in Experiment 2 were based on the same logic used when manipulating rate of speech. First, recall that we employed a male speaker. Second, the average fundamental frequency (F0) for male adults (100 – 120 Hz) is significantly lower compared with female adults (200 – 220 Hz), (see, Hillenbrand, Getty, Clark, & Wheeler, 1995; Simpson, 2009 for reviews). From a practical standpoint, what this means is that our ability to lower the speaker's fundamental frequency before the voice sounded distorted was constrained to a greater extent than our ability to raise the speaker's fundamental frequency. Thus, similar to rate of speech, we would not expect nor necessarily desire our manipulations of vocal pitch to be symmetrical. Likewise, as with rate of speech, our primary focus was to ensure that our manipulations of vocal pitch produced their intended effects on perceptions of speaker confidence – which the data confirmed.

Finally, one could argue that perhaps these data are to a certain extent idiosyncratic to our sample – or more broadly, to western culture as a whole. Indeed, a large body of literature exists that documents many phenomena once thought to be universal only to have later research disconfirm these earlier notions (see, Heine, 2002; Markus & Kitayama, 1991, for reviews). While it seems somewhat implausible that our sample of university students should be unique among western culture in their responses to hallmarks of vocal confidence, there is some reason to believe the patterns observed in this research may not fully generalize to individuals of other cultures.

For example, in thinking of how rate of speech might influence perceptions of speaker confidence for East Asians, Confucian philosophy suggests that it is more desirable to carefully reflect on one's thoughts and to be slow to convey those thoughts to others rather than to quickly

voice one's opinions or beliefs (Tweed & Lehman, 2002). Similarly, Buddhist and Taoist philosophies also propose that states of silence and introspection are considered beneficial for high levels of thinking, such as the pursuit of the truth (Kim, 2002). Whereas research informs us that North Americans perceive a speaker who talks quickly as being more confident relative to one who speaks slowly (e.g., Brown et al., 1985; London, 1973; Scherer et al., 1973), one consequence of these eastern philosophies emphasis on introspection, careful reflection, and being slow to speak may be that an individual who has taken the time to carefully reflect on an issue may also speak at a slower rate of speed. Because these eastern philosophies emphasize the value of being slow to speak, it may be the case that an individual who communicates their thoughts at a slower pace is also perceived as being more confident in the validity or accuracy of their position, opinions, or beliefs.

Future Directions

Given the comparatively small body of literature investigating the relationship between qualities of voice and persuasion, there are numerous potential directions one could take when designing future studies. However, because these data raise several issues that could prove informative in later research, it seems sensible to design the next set of studies with these issues in mind. One issue in particular concerns our manipulation of vocal intonation. Considering that participants were unable to differentiate between gradations of intonation; whether falling or rising, an obvious fix would involve proper development and pre-testing of our manipulations of intonation prior to commencing the study. Once successful manipulations have been created, this would then allow us to adequately test the effects of a broader range of vocal intonation on amount of processing – as attempted in Experiment 4.

A second issue entails a proper test of the potential mediating role of ability and motivation insofar as determining how these constructs affects amount of processing. Bear in mind that a fundamental premise of the Elaboration Likelihood Model is that a person's ability and motivation to effortfully process information determines where they fall along the elaboration continuum. Thus, it seems somewhat curious that manipulation checks of elaboration appear to focus only on inferring whether ability and motivation influence elaboration but not directly measuring whether changes in these constructs directly influence elaboration in order to provide stronger evidence for these claims. Accomplishing this would either involve creating and pre-testing different measures of ability and motivation or relying upon existing measures to more directly evaluate the nature of this relationship. This would prove useful both in testing the effects of a broader spectrum of intonation and speech rate on amount of processing, as well as provide a means of more comprehensively evaluating the predictions of our theoretical framework as they apply across the entire elaboration continuum.

Beyond addressing concerns with the present set of studies, several potentially fruitful directions for future research come to mind. One potentially interesting question is whether a significant decrease in the difference between strong and weak arguments might emerge if rate of speech was increased even further than in Experiment 3. Recall that while persuasion levelled off when moving from a moderately fast to extremely fast speaker, a decrease in the magnitude of argument quality effect was not found. This levelling off effect was achieved with an increase of only 6 WPM. If speech rate was increased by 15 or perhaps even 20 WPM, this may be sufficient to produce a significant decrease in the difference between strong and weak arguments as predicted by our theoretical framework. From both a theoretical and practical perspective it would

be valuable to identify the point at which the effects of speech rate on persuasion both levelled off and led to a significant reduction in the difference between strong and weak arguments.

Along similar lines, it would be useful to investigate how other hallmarks of vocal confidence (e.g., vocal pitch, loudness) influence persuasion across a broader spectrum of these variables. Moreover, testing whether combinations of these variables have additive or interactive effects under moderate levels of elaboration would provide further insight into the complex relationship between vocal properties and persuasion.

Yet another useful line of inquiry would be to test how various hallmarks of vocal confidence influence the strength of an attitude, its accessibility, as well as its resistance to persuasive appeals. This might involve examining the role of vocal properties at both formation and persuasion. For example, attitudes formed in response to a confident speaker may be stronger, more accessible, and more resistance to persuasive attempts compared with attitudes formed in response to an unconfident speaker. Thus, whereas persuasive appeals should be more effective when delivered by a confident relative to unconfident speaker when attitudes are formed in response to an unconfident speaker, we may find that speaker confidence elicits only a comparatively modest difference in persuasion when attitudes are formed in response to a confident speaker.

A further direction that may yield insight regarding the generalizability of these data would be to test these findings from a cross-cultural perspective. As previously noted, it may be the case that within some cultural contexts, vocal properties do not influence perceptions of confidence in the same way as we observed in a western sample. This line of research could then lead to several additional possibilities for future research. One obvious yet important direction would focus on exploring attributes not linked to speaker confidence that a perceiver may

associate with various properties of voice. For example, whereas a speaker may project confidence through their voice, this does not necessarily imply anything about the degree to which they are sincere or trustworthy.

Moving beyond research focused specifically on the role of hallmarks of vocal confidence in the attitude formation and persuasion processes, consider that the interpersonal communication process often involves other non-verbal aspects of communication such as facial expressions and body language. Similar to voice, both facial expressions and body language also provide a rich variety of information that likely interacts in important ways with vocal properties to influence attitude formation and change. Indeed, while an extensive body of literature has catalogued the specific emotions associated with a particular configuration of facial muscles (see Ekman, 1989; Ekman, 1992; Ekman, Davidson, & Friesen, 1990; Tassinary & Cacioppo, 1992, for reviews), research has not examined whether perceptions of speaker confidence varies according to one's facial expressions. For example, whereas a given facial expression may imply the speaker holds a certain degree of confidence in the validity of their current emotional state, this may not necessarily translate into others perceiving them as confident. Thus, investigating how varying combinations of facial features, body language, vocal properties, and message content might interact to regulate the persuasion process is an important next step in disentangling how a multitude of factors work in combination with one another to influence the efficacy of persuasive appeals.

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Appendix A: Study Materials

Script for University Service Plan: Moderate Arguments
(Experiment 1)

A policy under debate and being considered for some provinces would give all students the opportunity to attend university with drastically reduced tuition in exchange for working as part-time university staff members. The plan would have no impact on students choosing not to participate. In the new plan, the period of work would depend on the length of time left in the student's course of study, with a maximum requirement of two years of "University Service," even if the student takes longer than the two years to finish his or her coursework. A number of student groups and provincial administrators have issued statements favoring such a development. Some of the arguments supporting such a proposal include the following....

First, the option for students to provide university services may increase the likelihood that a university education will remain affordable for the vast majority of students desiring to earn a university education. Another "across the board" raise in tuition would make the price of a university education in Canada, already near the mean of industrialized countries in the world, approximately 3.4% more expensive for many students pursuing a university degree.

Second, this provision for university service by students may allow universities to direct fiscal expenditures toward various faculty related expenses. That is, a greater portion of the university budget could potentially be invested in nicer offices for faculty, more money to fund their travel, and more vacation time. As a result, it is possible that a greater number of the faculty currently employed in the university system will be more satisfied with their work environment. Moreover, the extra funding will also enable faculty members to enjoy larger annual increases to their salary, including a Christmas bonus.

The increase in available funds can also be used to improve the classroom experience for students. For example, changes to classroom lighting can be made to lessen the strain on student’s eyes by incorporating new Dura-soft energy-efficient bulbs into each classroom. This change will leave students feeling relaxed and comfortable during long lectures, thus improving ratings of teaching quality.

With students performing university services, additional funds and personnel may be available to maintain and increase the quality of services provided by the library systems. If this occurs, funding can be diverted to hire new staff to greet students as they enter the library as well as purchasing several espresso machines so that students can enjoy a variety of coffee blends while they study.

Additionally, the extra money made available through students’ involvement in university services will allow the commission of a number of statues honoring accomplished current and previous senior administrators of universities. In addition, funds can be allocated to hire local artists to paint several colorful murals to appeal to incoming arts students.

Finally, students taking part in the university services program will benefit from an improved understanding of the value of manual labor. Students will have the opportunity to learn new skills that, while likely unrelated to their major, may prove valuable at some point in the future.

Anything that can help increase the quality of education in universities, and thus add to the positive reputation of each university, may enhance the desirability of a degree in the real world. That's what this program is capable of doing.

Script for Phosphate Laundry Detergent Passage: Moderate Arguments
(Experiment 2)

Among the various brands of laundry detergents currently on the market, those containing phosphates are the best. To begin with, the packaging of most phosphate detergents is more attractive than that of other kinds of detergents. This is partly because of the colorful designs. Furthermore, because phosphate detergents look better, managers frequently locate them in places within the supermarket that are salient to shoppers. Perhaps for this reason, phosphate detergents have topped the charts in customer satisfaction a couple of times.

Even more important, however, is the fact that phosphate detergents weigh 5 % less than non-phosphate detergents. This makes carrying phosphate detergents home from the store much easier. In addition, according to 6 of the 10 women that were asked in one of the local markets, phosphate detergents smell as good as other detergents. Linda Roberts, an employee of a local cosmetics company who uses phosphate detergents regularly, shares this opinion. Therefore it is wisest to use phosphate detergents for household laundry.

Script for University Service Plan: Strong Arguments
(Experiment 3)

A policy under debate and being considered for some provinces would give all students the opportunity to attend university with drastically reduced tuition in exchange for working as part-time university staff members. The plan would have no impact on students choosing not to participate. In the new plan, the period of work would depend on the length of time left in the student's course of study, with a maximum requirement of two years of "University Service," even if the student takes longer than the two years to finish his or her coursework. A number of student groups and provincial administrators have issued statements favoring such a development. Some of the arguments supporting such a proposal include the following....

First, the option for students to provide university services will ensure that a university education will remain affordable for the vast majority of students desiring to earn a university education. Another "across the board" raise in tuition would make the price of a university education, already at a high level, virtually prohibitive to a great number of students pursuing a university degree.

Second, this provision for university service by students will allow universities to direct fiscal expenditures toward maintaining and increasing the quality of the faculty. That is, a greater portion of the university budget can be invested in monetary incentives for research and teaching. Exceptional faculty, currently employed in the university system will be more likely to remain in their respective universities. Moreover, the funding will be available to recruit additional outstanding professors, researchers, and Nobel prize-winning laureates.

In addition to increasing the quality of the faculty at universities, there will also be improvements in the courses offered. With the additional money available, more teaching positions can be funded for both professors and graduate teaching associates. Therefore, more courses can be offered as well as a greater number of smaller classroom sessions and individualized instruction possibilities.

With students performing university services, the additional funds and personnel will be available to maintain and increase the quality of services provided by the library systems. More money can be spent on the acquisition of new books and journals. In addition, students providing library services will ensure that the libraries will be able to maintain and even extend current operating hours.

Students working in university services will help to alleviate the huge monetary pressure placed on university budgets that are currently dedicated merely for maintaining the physical upkeep of the university. With students performing basic grounds keeping services such as landscaping, mowing, and painting, university campuses will remain beautiful and the money will become available for the fundamental purpose of the university: education.

Finally, students' participation in university services will provide the opportunity for students to enhance their social life by meeting and getting to know other students with whom they otherwise would not have the opportunity to become friends. Universities are an environment in which diversity is encouraged. However, often one's experiences with people, especially early on, can be vastly limited to one's classes or one's dormitory floor. The university service program can provide the opportunity to widen one's experiences and one's circle of friends.

Anything that can help increase the quality of education in universities, and thus add to the positive reputation of each university, may enhance the desirability of a degree in the real world. That's what this program is capable of doing.

Script for University Service Plan: Weak Arguments
(Experiment 3)

A policy under debate and being considered by some provinces would require all students to work as part-time secretarial and maintenance staff. The plan requires students who choose not to participate in the program to pay Out-of-Province tuition amounts. In the new plan, the period of work would depend on the length of time left in the student's course of study, with a maximum requirement of four years of "University Service," even if the student takes longer than the four years to finish his or her coursework. Of course, a number of student groups vehemently oppose such a bill. Yet, a number of provincial university administrators have issued statements favoring such a development. Some of the arguments supporting such a proposal include the following....

First, enrollments at provincially funded universities are sure to decrease because some students won't want to work extra hours. Therefore, for instance, universities will likely return to a size more comparable to local community colleges. This will reduce the student load on many of the university facilities, parking lots, and paths. Tickets to athletic events should also be easier to acquire as a result of the decrease in enrollments.

Second, students that choose to perform university services will have a substantial reduction in their amount of leisure time. This will help students to learn how to structure their remaining time to maximize the efficiency with which they study, work, and relax. This, of course, will be excellent training for when students graduate from university, become employed, and have families. They will have gained the experience of having to maximize the quality of their leisure time.

In addition to learning how to maximize their leisure time, there will be much less time for students to spend partying, drinking, and frequenting bars. Therefore, there will be a reduction in the number of campus police and security officers necessary to keep student rowdiness under control. There will likely be a large reduction in the number of civil disturbance complaints, and fewer campus crimes.

Students will also have less time to spend in the libraries and computer labs because they will be performing the university services. Therefore, it will be possible to reduce the numbers of hours these facilities must remain open and staffed. This will contribute to an increase in the savings of university money that can be put to alternative uses.

With students performing university services, there will be a great deal more money with which to improve and beautify the campus environment. A greater proportion of the fiscal budget can be spent on materials such as paint for buildings, new machinery for mowing and landscaping, and planting shrubbery, flowers, and trees, in order to make each university an even more scenic and beautiful place to spend one’s university years.

Finally, students working in university services will gain the experience of working in dining hall, janitorial, and clerical positions. Although these positions are not likely to contribute to work experience in students' chosen majors, the work experience might prove useful in obtaining other part-time jobs during their university years and for some time after graduation.

Anything that can help increase the quality of education in universities, and thus add to the positive reputation of each university, may enhance the desirability of a degree in the real world. That's what this program is capable of doing.

Script for Senior Comprehensive Exams: Strong Arguments
(Experiment 4)

Some colleges and universities are considering the adoption of senior comprehensive exams. With the program, seniors would be required to pass a general exam in their major area before receiving their college degree. If exams were required, it seems likely that a number of good things would happen.

Students and faculty would work harder. The National Scholarship Achievement Board recently conducted a five-year study on the effectiveness of comprehensive exams at Duke University. The results of the study showed that since the comprehensive exams have been introduced at Duke, the grade point average of undergraduates has increased by 31%. At comparable schools without the exams, grades increased by only 8% over the same period. The prospect of a comprehensive exam clearly seems to be effective in challenging students to work harder and faculty to teach more effectively. It is likely that the benefits observed at Duke University could also be observed at other universities that adopt the exam policy.

Students from institutions with comprehensive exams are more likely to be accepted into good graduate programs. Graduate schools as well as law and medical schools are beginning to show clear and significant preferences for students who receive their undergraduate degrees from institutions with comprehensive exams. As the Dean of the Harvard Business School said: "Although Harvard has not and will not show preferences based on aspects of student records not under their control, we do show a strong preference for applicants who have demonstrated their expertise in an area of study by passing a comprehensive exam at the undergraduate level." Admissions officers of law, medical, and graduate schools have also endorsed the comprehensive exam policy and indicated that students at schools without the exams would be at a significant disadvantage in the very near future. Thus, the institution of comprehensive exams would be an aid to those who seek admission to graduate and professional schools after graduation.

In recent years, starting salaries of students from institutions with comprehensive exams have been, on average, $3,000 to $4,000 higher than starting salaries for students graduating from comparable institutions. As Saul Siegel, a vice-president of IBM put it in Business Week recently, "We are much quicker to offer the large salaries and executive positions to these students because by passing their area exam, they have proven to us that they have expertise in their area rather than being people who may or may not be dependable and reliable." Another benefit is that universities with the exams attract larger and more well-known corporations to campus to recruit students for their open positions. The end result is that students at schools with comprehensive exams have a 55% greater chance of landing a top job than students at schools without the exams.

Script for Senior Comprehensive Exams: Weak Arguments
(Experiment 4)

Some colleges and universities are considering the adoption of senior comprehensive exams. With the program, seniors would be required to pass a general exam in their major area before receiving their college degree. If exams were required, it seems likely that a number of good things would happen.

Students would work harder. The National Scholarship Achievement Board recently conducted a five-year study on the effectiveness of comprehensive exams at Duke University. The results of the study showed that since the comprehensive exams have been introduced at Duke, the anxiety of undergraduates has increased by 31%. At comparable schools without the exams, anxiety increased by only 8% over the same period. The Board reasoned that anxiety over the exams, or fear of failure, would motivate students to study more in their courses while they were taking them. It is likely that this increase in anxiety observed at Duke could also be observed and be of benefit at other universities that adopt the exam policy.

Graduate students have always had to take a comprehensive exam in their major area before receiving their degrees, and it is only fair that undergraduates should have to take them also. As the Dean of the Harvard Business School said, "If a comprehensive exam is considered necessary to demonstrate competence for a graduate degree, it should not be excluded as a requirement for an undergraduate degree. What administrators don't realize is that this is discrimination just like discrimination against minority groups. There would be trouble if universities required only some minority groups to take comprehensive exams. Yet many universities do the same thing by requiring graduate students but not undergraduates to take the exams." Comprehensive exams could be as useful for undergraduates as they have been for graduate students.

Data from the University of Virginia show that some students favor the senior comprehensive exam policy. For example, one faculty member asked his son to survey his fellow students at the school since it recently instituted the exams. Over 55% of his son's friends agreed that in principle, the exams would be beneficial. Of course, they didn't all agree but the fact that most did proves that undergraduates want the exams. As Saul Siegel, a student whose father is a vice-president of IBM, said: "Comprehensive exams sound like something the ancient Greeks would have done. If comprehensive exams were to be instituted, we would be following their example." Another benefit is that the exams provide a means through which students would compare their accomplishments with students at other schools. Data from the Educational Testing Service confirms that students are eager to compare grades with one another when they are in the same classes. Senior comprehensive exams would allow such a comparison even across universities.

Personal Relevance Manipulation
(Experiment 1)

High Elaboration Participants:

Currently, the issue of implementing the proposed student tuition plan has been discussed at numerous Canadian Universities, including Queen's University. These schools project that the proposed student tuition plan will be implemented before May 2015. Consequently students currently enrolled in these Canadian universities will be affected by this policy.

Please note: Queen's University is currently debating implementing the proposed student tuition plan. If this policy is implemented, you will be required to enroll in this plan in order to pursue and/or continue your degree at Queen's University.

Low Elaboration Participants:

Currently, the issue of implementing a student tuition plan has only been discussed at a scarce number of institutions in the United States. These schools project that if the proposed student tuition plan is implemented it will not be until 2015. Consequently, the tuition plan will not affect any current students enrolled at these various institutions.

Please note: The proposed student tuition plan will not be implemented at Queen's University. You will not be affected in any way by this policy during your studies at Queen's.

Personal Responsibility Manipulation
(Experiment 2)

High Elaboration Participants:

In a moment, you will be listening to a short audio recording that discusses the merits of phosphate-based laundry detergents. Please listen carefully.

IMPORTANT: Because there are so few students completing this survey, YOU may be one of the only students offering feedback. Thus, YOUR FEEDBACK IS HIGHLY IMPORTANT to us!

Low Elaboration Participants:

In a moment, you will be listening to a short audio recording that discusses the merits of phosphate-based laundry detergents. Please listen carefully.

IMPORTANT: Because there are so many students completing this survey, it may be necessary to discard your survey responses. Thus, any information you provide may not be read.

Appendix B: Measures

Cognitive Load Task Instructions
(Experiments 1 & 2)

Low Elaboration Participants Only:

Often when we listen to a speech, it is necessary that we have to do more than one thing at a time. For example, remembering a phone number while taking to a person on the phone. We are interested in how people engage in this dual-tasking while listening to speeches. As such, please remember the following 8-digit number in your mind while you listen to the following speech. You may not write this number down. However, you may use any other strategy (i.e. rehearsing the digits in your head) to help you remember the number. You will be quizzed on your recall of this number following the termination of the recording.

You will have 10 seconds to remember the number. Click ahead to see the number.
69415738

Cognitive Load Questionnaire
(Experiments 1 & 2)

Low Elaboration Participants Only:

Please answer the following questions regarding the 8-digit number you were asked to remember prior to listening to the speech discussing [INSERT TOPIC]:

What is the 8-digit number you were asked to remember?

What strategy did you use to remember the number?

Was there anything about the particular characteristics of the given number that made it especially difficult or easy for you to remember?

How difficult was it for you to remember the number?

1	2	3	4	5	6	7
Very Easy						Very Difficult

Thought Listing Instructions
(All Experiments – All Conditions)

We are interested in what thoughts came to mind while you were listening to the speech on [INSERT TOPIC]. That is, as you listened to the speech, you probably had positive reactions and thoughts to what you were listening to, negative reactions and thoughts to what you were listening to, or neutral or unrelated reactions and thoughts. Whatever you thought is perfectly fine. We are simply interested in knowing what those thoughts were.

On the following screens, you will find a series of TEN boxes. Simply type whatever you were thinking while you listened to the message about [INSERT TOPIC] in the boxes provided. Type the first idea that comes to mind in the first box, press enter, then type the second idea in the second box, press enter, and so forth. PLEASE PUT ONLY ONE THOUGHT OR IDEA IN EACH BOX. Only try to record those ideas, reactions, and thoughts that you were thinking while you were actually listening to the [INSERT TOPIC] speech. Do not worry about spelling, grammar, or having complete sentences.

You may enter as many or as few thoughts as you would like. If you run out of thoughts please type the word NONE in each box until no more boxes are presented.

Please begin now.

Thought Rating Instructions
(All Experiments – All Conditions)

Next, we would like you to re-read each of the thoughts you have just listed. For each of the boxes that you used to share a thought, please indicate whether that thought is favorable toward [INSERT TOPIC], unfavorable toward [INSERT TOPIC] or neutral toward [INSERT TOPIC]. (Or *unrelated* in the case of Experiment 2)

If your thought was favorable toward [INSERT TOPIC], click the plus (+) button next to the box.

If your thought was unfavorable toward [INSERT TOPIC], click the minus (-) button next to the box.

If your thought was neutral toward [INSERT TOPIC], click the zero (0) button next to the box.

If your thought was unrelated toward [INSERT TOPIC], click the question mark (?) button next to the box.

Click "no thought" for each box you did NOT write a thought in.

Make sure that there is either a plus sign (+), a minus sign (-), or a zero (0) [or question mark (?)], next to each of the boxes that you have written a thought in.

Cognitive Responses
(All Experiments – All Conditions)

To assess the processes by which vocal confidence exerted its effect on persuasion, participants completed a Thought-Listing Task (TLT; Cacioppo & Petty, 1981). First, participants were asked to write down up to ten [*twelve* – Experiment 1] thoughts that came to mind while listening to the audio passage. Participants were told that they could write down as many or as few thoughts as they chose, but directed to list only one thought for each of the 10 [*12*] empty text boxes provided on the computer. Once this task had been completed, all participants were asked to review each of their previously recorded thoughts and indicate whether the thought was positive, negative, or neutral (or *unrelated* in the case of Experiment 2) towards the topic presented in the audio recording.

Next, a series of cognitive response indexes were created. First, a *thought-favorability* index was created that calculated the overall valance of the total thoughts generated by each participant after having removed all thoughts rated by the researcher as irrelevant to the issue. Examples of irrelevant thoughts might include: "I wonder what time it is?" "Why does the speaker sound like he is asking a question?" and "I'm meeting my friend for lunch after this study is over." The positivity of thoughts index was calculated by subtracting the number of relevant negative thoughts from the number of relevant positive thoughts and then dividing the result by the total number of thoughts generated. This equation produced a value that could range from negative 1 (i.e. all thoughts generated were relevant and negative) to positive 1 (i.e. all thoughts generated were relevant and positive).

Next, a *total number of relevant thoughts* index was created by summing the number of relevant positive, negative, and neutral thoughts. This produced a value that could range from zero (i.e. no relevant thoughts were generated) to ten [twelve] (i.e. the maximum number of thoughts were listed and all thoughts generated were relevant).

Finally, a *proportion of relevant thoughts* index was created by dividing the total number of relevant thoughts (created by summing the number of relevant positive, negative, and neutral thoughts) by the total number of thoughts generated (created by summing the number of positive, negative, neutral as well as irrelevant thoughts). This produced a value that could range from zero (i.e. all thoughts generated were irrelevant to the topic presented) to one (i.e. all thoughts generated were relevant to the topic presented).

Stylistic Qualities Questionnaire
(Experiments 1, 3, & 4)

Please answer the following questions based on the stylistic qualities of the speech you just heard:

How clearly did the speaker present their ideas?

1	2	3	4	5	6	7
Very Unclear						Very Clear

What was the level of complexity of the vocabulary the speaker used?

1	2	3	4	5	6	7
Very Basic						Very Complex

How well were the speaker's points organized?

1	2	3	4	5	6	7
Very Poorly						Very Organized

Attitude Scale
(All Experiments)

Following these instructions there will be a set of words that could be used to describe your overall evaluation of an issue. Please use the words provided to describe your evaluation of [INSERT TOPIC]. Use the intermediate numbers between 1 and 7 to indicate responses between these two extremes.

Work rapidly. Your first reaction is best. Please make evaluations for all of the words provided. This should only take a minute or two. Please begin.

Dislike:

1 2 3 4 5 6 7
Not At All Definitely

Good:

1 2 3 4 5 6 7
Not At All Definitely

Negative:

1 2 3 4 5 6 7
Not At All Definitely

Undesirable:

1 2 3 4 5 6 7
Not At All Definitely

Bad:

1 2 3 4 5 6 7
Not At All Definitely

Like:

1 2 3 4 5 6 7
Not At All Definitely

Positive:

1 2 3 4 5 6 7
Not At All Definitely

Desirable:

1 2 3 4 5 6 7
Not At All Definitely

Speaker Attributes and Vocal Qualities Questionnaire
(Experiment 1)

Now we would like to ask you some questions about the speaker who presented the speech regarding the University Service Plan:

How confident did the speaker seem while presenting her speech?

1	2	3	4	5	6	7
Very Unconfident						Very Confident

How quickly was the speaker presenting her speech?

1	2	3	4	5	6	7
Very Slow						Very Fast

How loud was the speaker's voice while she was presenting her speech?

1	2	3	4	5	6	7
Very Quiet						Very Loud

How intelligent did the speaker sound while she was presenting her speech?

1	2	3	4	5	6	7
Very Unintelligent						Very Intelligent

Speaker Attributes and Vocal Qualities Questionnaire
(Experiment 2)

Now that you have heard the recording, we are interested in receiving your feedback regarding several aspects of the speaker's voice. Please answer the following questions using the rating scales provided. This should only take a moment. Your first response is best.

To what extent does the speaker sound confident?

1	2	3	4	5	6	7
Not at all						A Great Deal

Please indicate the level of pitch in the speaker's voice:

-3	-2	-1	0	+1	+2	+3
Very Low						Very High

To what extent does the speaker sounds anxious?

1	2	3	4	5	6	7
Not at all						A Great Deal

To what extent does the speaker sound competent?

1	2	3	4	5	6	7
Not at all						A Great Deal

To what extent does the speaker sounds Honest?

1	2	3	4	5	6	7
Not at all						A Great Deal

To what extent does the speaker sound sincere?

1	2	3	4	5	6	7
Not at all						A Great Deal

To what extent does the speaker sound trustworthy?

1	2	3	4	5	6	7
Not at all						A Great Deal

To what extent does the speaker sound credible?

1	2	3	4	5	6	7
Not at all						A Great Deal

To what extent does the speaker sounds knowledgeable?

1	2	3	4	5	6	7
Not at all						A Great Deal

To what extent does the speaker sound intelligent?

1	2	3	4	5	6	7
Not at all						A Great Deal

To what extent does the speaker sounds natural?

1	2	3	4	5	6	7
Not at all						A Great Deal

Based only on the characteristics of the speaker's voice, please indicate the age you believe THE SPEAKER to be by typing a number in the box below. DO NOT provide an age range. Please enter a SPECIFIC age. [PARTICIPANT ENTERS AGE HERE]

Speaker Attributes and Vocal Qualities Questionnaire
(Experiment 3)

Now we would like to ask you some questions about the speaker who presented the speech regarding the implementation of the proposed student tuition plan:

To what extent does the speaker seem confident?

1	2	3	4	5	6	7
Not at all Confident						Very Confident

How fast was the speaker talking?

1	2	3	4	5	6	7
Extremely Slow						Extremely Fast

How tall do you think the speaker is?

1	2	3	4	5	6	7
Extremely Short						Extremely Tall

In listening to the speaker's voice, which of the following best reflects the type of accent they have?

1. American Accent 2. English Accent 3. Canadian Accent 4. Australian Accent

Was the speaker male or female?
1. Male 2. Female

How old do you think the speaker is? Please indicate your answer using the NUMBERS keys on the keyboard. Do NOT provide age range. [PARTICIPANT ENTERS AGE HERE]

Speaker Attributes and Vocal Qualities Questionnaire
(Experiment 4)

Now we would like to ask you some questions about the speaker who presented the speech on the topic of implementing senior comprehensive exams.

To what extent does the speaker seem confident?

1	2	3	4	5	6	7
Not at all Confident						Very Confident

Thinking back to the audio recording you just heard, did the intonation in the speakers voice mostly rise at the end of each sentence or mostly fall at the end of each sentence?

1	2	3	4	5	6	7
Mostly Fall			Neither Rise nor Fall			Mostly Rise

How tall do you think the speaker is?

1	2	3	4	5	6	7
Extremely Short						Extremely Tall

In listening to the speaker's voice, which of the following best reflects the type of accent they have?

1. American Accent 2. English Accent 3. Canadian Accent 4. Australian Accent

Was the speaker male or female?
1. Male 2. Female

How old do you think the speaker is? Please indicate your answer using the NUMBERS keys on the keyboard. Do NOT provide age range. [PARTICIPANT ENTERS AGE HERE]

Appendix C: Participant Forms (Ethics Materials)

Letter of Information
(All Experiments)

This research is being conducted by Joshua Guyer, a Ph.D thesis student, and Dr. Leandre Fabrigar, Associate Professor, of the Department of Psychology at Queen's University in Kingston, Ontario. This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen's policies. Some important details are:

In this study, we will ask for your opinions on the stylistic qualities of a speech. As such, you will be asked your opinions about a speech that you will listen to over a set of headphones. We estimate that this study will be run in a session approximately 60 minutes long. There are no known physical, psychological, economic, or social risks associated with this task. This research has been cleared by the Queen's University General Research Ethics Board.

Although it would be greatly appreciated if you answer all the questions as frankly as possible, you should not feel obliged to answer any questions that you find objectionable or that make you feel uncomfortable. You may also withdraw from this study at any time with no effect on your compensation.

We will keep your responses confidential. We will store the data in a locked room until the data is no longer needed. Only authorized personnel will have access to this area. To help us ensure confidentiality, please do not put your name on the questionnaire. The data may also be published, but any such presentations will be of general findings and will not breach individual confidentiality. Should you be interested, you are entitled to a copy of the findings. Furthermore, if this research is published, the data will be released upon request to authorized researchers. However, no identifying information will be provided.

In exchange for your participation in all tasks in this experimental session, we will indicate that you have earned 1.0 of a maximum of 5.0 credits toward your final Psychology 100 grade, or $5 if you have arranged with the research assistant to be compensated monetarily.

Any questions about study participation may be directed to Dr. Leandre Fabrigar, (533-6492; fabrigar@queensu.ca). Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board (chair.greb@queensu.ca; 533-6081).

Again, thank you. Your interest in participating in this research study is greatly appreciated.

Léandre R. Fabrigar
Professor

Joshua J. Guyer
Ph.D Candidate

Consent Form
(All Experiments)

Name (please print clearly):_____

1. I have read the Letter of Information and have had any questions answered to my satisfaction.

2. I understand that I will be participating in the study called [STUDY NAME]. I understand that this means I will be asked for my opinions on the stylistic qualities of several speeches and answer a few questionnaires.

3. I understand that my participation in this study is voluntary and I may withdraw at any time without penalty.

4. I understand that every effort will be made to maintain the confidentiality of the data now and in the future. The data will be stored in a locked room that only authorized personnel have access to.

5. I understand that I may withdraw from this study at any time up until the end of the study by notifying the experimenter. This will not affect my compensation and my data will be destroyed. However, because responses are anonymous, once the study is completed I acknowledge that I can no longer withdraw my data.

6. I understand that this study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen's policies.

7. I understand that in the event that I have any complaints, ethical concerns, or questions about this research, I may contact Dr. Leandre Fabrigar, (533-6492; fabrigar@queensu.ca), or Dr. Joan Stevenson, the General Research Ethics Board Chair at Queen's University (533-6081; chair.greb@queensu.ca).

I have read the above statements and freely consent to participate in this research:

Signature:_____ Date:_____

Debriefing Form
(Experiments 1 & 2)

The purpose of this present research is to understand how vocal confidence facilitates attitude change and to examine the mechanisms through which vocal confidence may exert its effects. To do this, we had you listen to a set of arguments in which the speaker's voice was electronically manipulated to display the hallmarks of vocal confidence. Some of you were also given an additional task, which was to keep a number memorized in your head while listening to the arguments. The purpose of this task was to distract you from being entirely able to attend to the spoken message, therefore increasing the likeliness that you would respond to features of the argument that were more salient (e.g. vocal properties that reflect vocal confidence), rather than to the content of the message itself. We expect that when individuals are not able to think, they will rely on properties of voice that signify vocal confidence to make their judgment. However, when individuals are able to think, we expect that this will make them hyper-critical of the content contained in the message if the voice lacks confidence, consequently allowing them to generate content-relevant thoughts, which in turn play a role in decreasing the persuasiveness of the overall message.

Your participation in this study is greatly appreciated and your responses will be kept confidential. The results of this study will only be published in summary form in standard academic outlets. Also, when the data is no longer needed, it will be destroyed.

Please note that all the materials regarding the implementation of a student tuition plan are fictitious. These materials were constructed purely for research purposes and do not describe an actual policy that will be implemented at universities.

If you are interested in learning more about this area, the following publication is recommended: Cacioppo, J.T., Petty, R.E., Kao, C.F., & Rodriguez, R. (1986). Central and Peripheral routes to persuasion: An individual difference perspective. Journal of personality and social psychology, 51(5), 1032-1043.

All of the questionnaires in these packets have been reviewed and have ethics clearance through the Department of Psychology according to the recommended principles of Canadian ethics guidelines, and Queen's policies.

If you have any questions or comments, or if you would like a copy of the final results, please feel free to contact Dr. Leandre R. Fabrigar (fabrigar@queesnu.ca; 533-6492). If you have any ethical concerns resulting from your participation in this study, you may contact the Queen's University General Research Ethics Board Chair, Dr. Joan Stevenson (533-6081; chair.greb@queensu.ca). We ask you to please not discuss this project with anyone, as this is an on-going study and knowledge about the procedure or our hypothesis may alter the results we obtain from future participants. Thank you very much for your cooperation and your participation in this study.

Professor: Dr. Léandre R. Fabrigar Ph.D Candidate : Joshua J. Guyer

Debriefing Form
(Experiments 3 & 4)

The purpose of this research is to understand how vocal confidence facilitates attitude change and to examine the mechanisms through which vocal confidence may exert its effects. Research has found that two properties of voice that can influence a listener's perceptions of how confident a speaker is are the rate at which a person speaks and whether the intonation in their voice rises or falls at the end of a sentence. Thus, in these two studies, you were provided with an audio recording in which we manipulated vocal confidence by changing either how fast the speaker was talking or whether the intonation in their voice rose or fell at the end of a sentence. Based on a well-researched theory of attitude change (i.e., the Elaboration Likelihood Model: ELM, Petty & Cacioppo, 1984), because we did not provide information designed either to enhance or reduce your ability to process the arguments contained within the audio passage you heard, the vocal confidence of the speaker should influence the amount of message processing that occurs. Importantly, we anticipate that rate of speed and intonation (i.e., vocal confidence) will not function in the same way to influence attitude change. For example, changes in both rate of speech and intonation can influence perceptions of speaker confidence by either enhancing or reducing a person's motivation to process a message. However, whereas changes in rate of speech can influence a person's ability to process a message, changes in intonation do not affect processing ability. One important goal of these two experiments is to demonstrate how different qualities of voice that reflect vocal confidence function in different ways to ultimately influence attitude change.

Your participation in this study is greatly appreciated and your responses will be kept confidential. The results of this study will only be published in summary form in standard academic outlets.

Please note that all the materials regarding the implementation of a student tuition plan are fictitious. These materials were constructed purely for research purposes and do not describe an actual policy that will be implemented at universities.

If you are interested in learning more about this area, the following publication is recommended: Cacioppo, J.T., Petty, R.E., Kao, C.F., & Rodriguez, R. (1986). Central and Peripheral routes to persuasion: An individual difference perspective. Journal of personality and social psychology, 51(5), 1032-1043.

The questionnaires included in this packet are for research purposes only. They are not meant to diagnose a psychological disorder or be in any way meant to determine whether you need psychological treatment. If answering any of the questions in this packet has raised concerns for you, and/or if you would like to speak to a psychologist about a psychological or emotional issue, please contact Health, Counseling and Disability Services at 613-533-2506.

All of the questionnaires in these packets have been reviewed and have ethics clearance through the Department of Psychology according to the recommended principles of Canadian ethics guidelines, and Queen's policies.

If you have any questions, comments, or concerns about the study, please feel free to contact Dr. Leandre R. Fabrigar at 533-6492/ fabrigar@queensu.ca or the Chair of the General Research Ethics Board (533-6081/ chair.greb@queensu.ca). We ask you to please not discuss this project with anyone, as this is an on-going study and knowledge about the procedure or our hypothesis may alter the results we obtain from future participants. Thank you very much for your cooperation and your participation in this study.

Professor: Dr. Léandre R. Fabrigar Ph.D Candidate: Joshua J. Guyer