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How the Voice Persuades

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Abstract

Research has examined persuasive language, but relatively little is known about how persuasive people are when they attempt to persuade through *para*language, or acoustic properties of speech (e.g., pitch and volume). People often detect and react against *what* communicators say, but might they be persuaded by speakers' attempts to modulate *how* they say it? Four experiments support this possibility, demonstrating that communicators engaging in paralinguistic persuasion attempts (i.e., modulating their voice to persuade) naturally use paralinguistic cues that influence perceivers' attitudes and choice. Rather than being effective because they go undetected, however, the results suggest a subtler possibility. Even when they are detected, paralinguistic attempts succeed because they make communicators seem more confident without undermining their perceived sincerity. Consequently, speakers' confident vocal demeanor persuades others by serving as a signal that they more strongly endorse the stance they take in their message. Further, we find that paralinguistic approaches to persuasion can be uniquely effective even when linguistic ones are not. A cross-study exploratory analysis and replication experiment reveal that communicators tend to speak louder and vary their volume during paralinguistic persuasion attempts, both of which signal confidence and, in turn, facilitate persuasion.

Keywords: persuasion, influence, paralanguage, nonverbal behavior, confidence

How the Voice Persuades

Persuasion attempts are everywhere. Non-profits try to persuade donors, activists try to persuade politicians, and managers try to persuade employees. Public health organizations spend millions trying to convince people to quit smoking and get vaccines (Allday, 2009; Bernstein, 2014) and presidential candidates spend billions trying to sway voters and drive support (Center for Responsive Politics, 2017).

Influencing others is challenging, though, because the very act of trying to persuade can decrease persuasion. People are wary of being influenced, and if they can tell someone is trying to persuade them, it often backfires (Campbell & Kirmani, 2000; Kirmani & Zhu, 2007). Listeners react against the message, either ignoring it, or arguing against it, thus undermining its persuasive intent (Friestad & Wright, 1994; Tormala & Petty, 2002).

Might there be another approach?

Most persuasion research has focused on *what* people say (i.e., the words or language used), but less is known about the efficacy of *how* they say it. In addition to the words used, communicators can also modulate their paralanguage, or acoustic properties of speech such as pitch or volume. Communicators can speak loudly or softly, use a high or low pitch, and vary a number of other vocal features. How do communicators modulate these types of acoustic features when attempting to persuade others? And might such paralinguistic persuasion attempts actually boost persuasion?

While linguistic persuasion attempts are often ineffective, we suggest that paralinguistic attempts can increase influence. People convey their attitudes and thoughts through acoustic features of their voice (Hall & Schmid Mast, 2007; Schroeder & Epley, 2015, 2016) and may modulate their voice during persuasion attempts in a manner that enhances persuasion. Four experiments test this hypothesis and the underlying process. Further, a multi-study analysis of speakers' paralinguistic cues and a follow-up experiment provides insight into what vocal features people use when trying to persuade, and which, if any, are actually effective.

Taken together, the studies shed light on paralinguistic persuasion. In addition to examining whether and how it influences message recipients, we also explore how communicators modulate their voice in their efforts to persuade. In so doing, we expand on prior research that has primarily focused on how specific cues impact perceivers' attitudes and largely ignored communicators' active role in the persuasion process. Further, we build on the broader persuasion literature by differentiating between persuasion attempts executed through language and those executed through paralanguage.

Resistance to Linguistic Persuasion Cues

Dating back to Hovland, Janis and Kelley (1953), scholars have noted that communicators' persuasion attempts often backfire. Friestad and Wright (1994) suggest that this is particularly likely when recipients know others are trying to persuade them. People develop strategies for inoculating themselves from others' attempts to persuade akin to a persuasion "radar" (Kirmani & Campbell, 2004). When persuasive messages contain cues that allow recipients to diagnose communicators' intent to persuade, the radar goes off and recipients often resist persuasion efforts (Kirmani & Zhu, 2007). This occurs because people are wary that persuasion agents have devious motives (Cambell & Kirmani, 2000; Kirmani & Zhu, 2007).

The vast majority of persuasion research, however, has focused on persuasion cues that are linguistic in nature. Research has examined written arguments (e.g., Tormala & Petty, 2002, 2004), print advertisements (e.g., Jain & Posavac, 2004; Kirmani & Zhu, 2007), text-based hypothetical vignettes (e.g., Campbell & Kirmani, 2000), or the written scripts followed by speakers (e.g., Nickerson & Rogers, 2010). Jain, Agrawal, and Maheswaran (2006), for example, find that relative to more neutral statements (e.g., "meets your needs"), positively valenced statements (e.g., "exceeds your needs") sometimes backfire and harm persuasion. In other work, Ahluwalia and Burnkrant (2004) find that relative to semantically identical statements (e.g., "Mizuno shoes are beneficial for you."), ads containing rhetorical questions (e.g., "Mizuno shoes are beneficial for you, aren't they?") are less persuasive.

Limited Evidence of Paralinguistic Persuasion

There has been less attention, however, to paralinguistic persuasion. In addition to language, or the words they use, speakers also control their paralanguage, or the nonverbal qualities of their voice (Knapp, Hall, & Horgan, 2014). A given message can be delivered in various ways, by varying acoustic cues like volume, pitch, and speech rate. Thus, people may modulate properties of their voice when trying to persuade, which we refer to as a paralinguistic persuasion attempt.

But are such paralinguistic persuasion attempts effective? Although scholars have explored how specific paralinguistic cues impact perceivers, this work has largely ignored whether communicators actually use those cues when attempting to persuade.

Some work focuses on natural variation in acoustic features, exploring correlations between paralinguistic cues and persuasion. Packwood (1974), for example, asked three judges to rate how persuasive they perceived counselors to be in 900 different recordings. They then measured speakers' volume and found that speakers spoke louder in the 24 recordings rated as most persuasive than in the 15 rated as least persuasive. Other papers have asked judges to rate the presence of different acoustic features (e.g., loudness, pitch, tempo) and tested for correlations between these features and persuasion (e.g., Burgoon, Birk, & Pfau, 1990;

Oksenberg, Coleman, & Cannell, 1986). Because this research does not manipulate or measure speakers' intent to persuade, however, it cannot speak to whether speakers alter their paralinguistic cues when attempting to persuade—let alone whether their persuasion attempts are effective.

Another popular approach is to manipulate the degree to which specific paralinguistic cues are displayed by asking trained actors to modify their use of a specific cue or electronically modifying recordings to contain higher or lower levels of a focal cue. For example, scholars have tested for effects on speech rate by instructing trained actors to speak faster (e.g., Miller, Maruyama, & Beaber, & Valone, 1976; Woodall & Burgoon, 1983) or compressing recordings to play faster (e.g., Moore, Hausknecht, & Thamodaran, 1986; Smith & Shaffer, 1991, 1995). Similarly, other work examining the effect of pitch cues on persuasion has electronically modified recordings to contain a high vs. low pitch (e.g., Chattopadhyay, Dahl, Ritchie, & Shahin, 2003; Klofstad, Anderson, & Peters, 2012) or rising vs. falling intonation (e.g., Guyer, Fabrigar, & Vaughan-Johnston, 2018).

While manipulating specific cues increases experimental control, it has other limitations. First, there is always a risk of confounding the manipulation with other cues. Much like actors may inadvertently modulate other voice properties when instructed to display a particular cue, electronically modifying a recording carries the risk of altering other vocal parameters (Guyer et al., 2018). Second, by focusing on a narrow set of cues, this approach ignores the possibility that speakers may naturally display other cues during persuasion attempts that suppress any effect of a focal cue. Third, and more importantly, such approaches cannot address whether experimentally manipulated cues are representative of what speakers' paralinguistic attempts actually look like. Because researchers adopting this approach often define what represents a “high” and “low” level of a particular cue in a somewhat arbitrary fashion, it is unclear whether manipulations of specific cues are representative of naturalistic persuasion attempts by laypeople.

We are aware of only two papers that have considered communicators’ active role in the paralinguistic persuasion process. However, they are inconclusive regarding the efficacy of paralinguistic attempts. Mehrabian and Williams (1969) find that communicators may modulate properties of their voice when attempting to persuade, but they do not examine whether such modulation actually impacts listeners’ message reception. Further, the one paper that manipulates communicators’ persuasion motives finds no effect on persuasion (Hall 1980), albeit with a relatively small sample size ($N = 43$). Consequently, it is unclear *whether* persuasion attempts executed through paralinguistic channels actually have any effect, and if so, *why*.

How Paralinguistic Attempts May Enhance Persuasion

We suggest that paralinguistic attempts can increase persuasion. Speakers’ paralanguage conveys information about their traits, states, and feelings (Aronovitch, 1976; Hall & Schmid Mast, 2007; Schroeder & Epley, 2016) that should influence how speakers’ messages are received. Further, we explore two ways that paralinguistic attempts may boost persuasion

Detectability Account

One reason paralinguistic attempts might be effective is that they evade detection. Persuasion cues vary in the extent to which people see them as signaling persuasive intent (Friestad & Wright, 1994). While common linguistic persuasion cues like stating one’s intent to persuade are often unambiguously identified (e.g., Reinhard, Messner, & Sporer, 2006), it can be difficult to infer communicators’ intent through their paralinguistic cues (Tenney, Meikle, Hunkhauser, Moore, & Anderson, 2018)—especially when communicators are motivated to conceal their intentions (Bond, Kahler, Paolicelli, 1985; DePaulo et al., 2003; ten Brinke, Stimson, & Carney, 2014).[1] Communicators are adept at nonverbal self-presentation (DePaulo, 1992; Goffman, 1959), so they may be savvy enough to engage in paralinguistic attempts without revealing their intent to persuade. It may be relatively easy to tell when others try to persuade you through *what* they say, but a challenge when they try to persuade you through *how* they say it.

Consequently, a *detectability account* suggests that communicators' paralinguistic attempts should succeed because they evade detection. Further, such an account suggests that while paralinguistic attempts may increase persuasion, this effect may disappear in the presence of linguistic persuasion cues that facilitate the detection of communicators' intent to persuade. Linguistic persuasion cues encourage people to scrutinize communicators' intentions (Campbell & Kirmani, 2000) while providing semantic information that makes it easier to infer speakers' intentions from their paralanguage (Jiang & Pell, 2016; Paulmann & Pell, 2011; Pell & Long, 2003). Consequently, linguistic persuasion cues should facilitate the detection of speakers' intent to persuade from their paralinguistic attempts. Therefore, the detectability account predicts an interaction effect where paralinguistic attempts are effective when communicators' intent to persuade is unknown or ambiguous. However, when linguistic persuasion cues are present that invite perceivers to scrutinize communicators' intentions, their paralinguistic attempts should be detected and resisted.

Confidence Account

[1] Although prior research has highlighted the role of paralanguage in allowing perceivers to infer communicators' intentions (e.g., Hellbernd & Sammler, 2016; Nygaard & Lunders, 2002; Rigoulot, Fish, & Pell, 2014), almost all of this research has considered posed speech where trained actors or lay communicators were instructed to modulate their voice in a manner that could allow others to accurately infer their intent.

Another possibility, however, is that paralinguistic attempts can be effective despite being detectable. We suggest that one way communicators might accomplish this is by signaling confidence in their attitudes. Although it can enhance persuasion through various routes, communicator confidence is a powerful persuasion cue that shapes perceivers' judgment (Gaertig & Simmons, 2018; Radzevick & Moore, 2011; Sah, Moore, & MacCoun, 2013) and attitudes (Karmarkar & Tormala, 2009; Tenney, MacCoun, Spellman, & Hastie, 2007).

We conceptualize confidence as the extent to which people perceive speakers as conveying attitude certainty, or a subjective sense of conviction in their expressed attitudes (Tormala & Rucker, 2007). This is similar to other characterizations of confidence that focus on precision in the accuracy and validity of one's beliefs (e.g., Moore & Healy, 2008). Although our theorizing views confidence as a situational factor that varies with paralinguistic persuasion attempts, we recognize that it may vary across individuals and reflect dispositional differences in beliefs about the validity of their attitudes and judgment (e.g., Aronovitch, 1976).

Compared to the words communicators use, people generally perceive nonverbal behaviors to be relatively spontaneous and difficult to modulate (DePaulo, 1992; Tenney et al., 2018). As a consequence, people should be reluctant to label paralinguistic confidence displays as disingenuous. Although they discount unambiguously biased linguistic confidence claims (Sah et al., 2013; Tenney et al., 2007; Tenney, Spellman, & MacCoun, 2008), people continue to be influenced by nonverbal confidence displays even when they know the source to be biased (Kennedy, Anderson, & Moore, 2013). Tenney and colleagues (2018) attribute this to people giving communicators benefit-of-the-doubt due to the inherent difficulty of unambiguously labeling nonverbal confidence displays as inappropriately excessive. This suggests that, even if communicators' intent to persuade is known, perceivers may have difficulty identifying whether any confidence they convey is genuine or so excessive that it must be a disingenuous ploy.

Provided that it does not come across as disingenuous, paralinguistic confidence could enhance persuasion independently of message content. A central feature of persuasion process theories is that communicators can persuade others through cues that operate independently of their actual arguments. For example, Chaiken's (1980) heuristic versus systematic model of persuasion would predict that communicator confidence should influence the persuasion process through simple decision rules (e.g., "she sounds confident, so she must be right"). Relatedly, the elaboration likelihood model of persuasion (Petty & Cacioppo, 1986) suggests that communicator confidence can simultaneously influence perceivers' attitudes directly and indirectly by shaping how they process communicators' messages (Guyer et al., 2018). Finally, the Persuasion Knowledge Model (Friestad & Wright, 1994) argues that individuals' perception of the appropriateness of paralinguistic confidence displays should shape their impression of communicators and receptivity to their messages.

Communicators express their degree of confidence through a number of paralinguistic cues, such as their volume (Jiang & Pell, 2017; Scherer, London, & Wolf, 1973), pitch (Monetta, Cheang, & Pell, 2008), and speech rate (Kimble & Seidel, 1991; Scherer et al., 1973). Inferring confidence from speakers' paralanguage comes so naturally that even those with cognitive impairments hindering their ability to process non-semantic aspects of speech can differentiate between confident and unconfident speakers (Monetta et al., 2008; Pell & Long, 2003; Pell, 2007).

Though no work has examined whether communicators deliberately convey confidence when trying to influence others—let alone whether their efforts enhance persuasion—

communicators do increase their volume and speech rate when attempting to persuade (Mehrabian & Williams, 1969). Perceivers make inferences about communicators' confidence using these same cues (Aronovitch, 1976; Scherer et al., 1973), suggesting that vocal features during persuasion attempts may make communicators appear more confident, and in turn, enhance persuasion. This *confidence account* suggests that independently of perceivers' ability to diagnose them, paralinguistic persuasion attempts increase influence by making speakers seem more confident. Therefore, it predicts a main effect where paralinguistic attempts should be similarly effective irrespective of whether communicators' intent to persuade is known.

Overview of Studies

Four experiments test the persuasiveness of paralinguistic persuasion attempts, examining both attitudes (Experiment 1-3) and choice (Experiment 4).

Further, they test both the detectability and confidence accounts. Experiments 1 and 2 test the detectability account through moderation, examining whether disclosure statements (Experiment 1) or explicit acknowledgement of persuasive intentions (Experiment 2) reduces the effectiveness of paralinguistic attempts. Experiments 3 and 4B more directly test the detectability account by assessing whether people can detect paralinguistic persuasion attempts. All studies test the confidence account by assessing perceptions of speakers' confidence. Experiment 4B probes the confidence account further by exploring how it impacts the persuasion process.

Finally, we also examine the specific acoustic features that underlie these effects. Are speakers consistently modulating certain acoustic cues (e.g., pitch or volume) when trying to persuade? Further, are certain cues more effective at persuading listeners, and are these the same cues that inform perceivers' attitudes and choice? Following Experiment 3, an exploratory analysis looks across studies to examine which particular paralinguistic cues impact the persuasion process. Further, Experiment 4A replicates these findings on a separate sample of speakers. Taken together, this approach provides insight into which particular paralinguistic cues are used when communicators attempt to persuade, and which, if any, of those cues actually enhance persuasion.

Experiment 1

Experiment 1 tests the impact of paralinguistic persuasion attempts. First, we had a group of people (i.e., speakers) read the same product review out loud twice: once as they normally would (control) and once in a way that might persuade a listener to purchase the product (paralinguistic attempt). Then, in the main study, another set of participants (i.e., listeners) listened to a single message from one of the speakers that either contained a paralinguistic attempt or did not. These listeners then rated how likely they would be to purchase the product and how satisfied they would be with it. We predicted that listeners would hold more positive attitudes towards the product when speakers engaged in a paralinguistic persuasion attempt.

In addition, we test both the detectability and confidence accounts. The detectability account suggests that if people know someone is trying to persuade them, the efficacy of paralinguistic attempts should be reduced. To investigate this possibility, we examine whether a linguistic persuasion cue known to signal communicators' persuasive intent (i.e., a disclosure statement) moderates the persuasiveness of paralinguistic attempts by reducing their efficacy. For half the listeners, we provided a disclosure statement suggesting that the manufacturer paid the speaker to review the product.

The confidence account suggests that paralinguistic attempts should be similarly effective irrespective of whether communicators' intent to persuade is known. Further, it predicts that perceptions of communicators' confidence should mediate this effect.

Stimulus Generation: Eliciting Paralinguistic Persuasion Attempts

Before examining their impact, we first generated a set of naturalistic paralinguistic persuasion attempts to use as stimuli in the main study. Because we intended on conducting exploratory analyses on speakers' paralinguistic cues, we aimed to recruit a minimum of 20 speakers. We reasoned that this sample size would enable us to detect large effects of paralinguistic attempts on speakers' cues (Simmons, Nelson, & Simonsohn, 2011). Participants ("speakers," $N = 24$, $M_{Age} = 21.92$, $SD = 6.83$, 63% female, from a private East Coast University) were seated in private, soundproof rooms and read aloud a positive review about a smart television (see the Supplemental Online Material, or SOM). They recorded themselves reading their reviews and were told that the recordings would be played for future participants (materials for this and all other experiments are available at https://osf.io/zk4a2/?view_only=1115c9531e6c4145b64ac811811211ad).

We manipulated paralinguistic attempts within subjects. Consistent with prior work (Hall, 1980), we allowed laypeople to use whatever tactics they wanted. Speakers read the same review twice: once as they normally would ("your goal is to read the review aloud as you normally would") and once when prompted to make a paralinguistic persuasion attempt ("your goal is to read the review aloud in a way that can persuade a future research participant watching this video that he or she should purchase the TV"). The order was randomized across participants. In this, and all subsequent studies, paralinguistic persuasion was incentivized by telling participants that they would be entered into a raffle for a $50 Amazon gift card should a future participant listening to their recoding indicate a willingness to either purchase a TV (Experiments 1 and 2) or perform a focal task (Experiments 3 and 4).

Importantly, the actual words speakers read were held constant across conditions. In both conditions, speakers were told to read the reviews word-for-word (“you cannot change the words you say, but you can choose to say them in whatever style you think is best”). All speakers followed the instructions except three individuals who each captured one recording with a single extraneous word (“and,” “I,” “good”). We include them in the analyses, but all effects reported below at $p < .05$ also remain at $p < .05$ when excluding them from analyses.

Main Experiment

Participants. With no a priori expectation of effect sizes, we aimed for a minimum sample size of 175 per cell. This sample size is sufficient to detect effects of $d = 0.4$ (approximately the average published effect size in social psychology; see Richard, Bond Jr., & Stokes-Zoota, 2003) with at least 95% power. Further, it ensured that at least seven people could listen to each of the 24 speakers in each of the four conditions. This resulted in a sample of 713 Amazon Mechanical Turk workers ($M_{Age} = 35.08$ years, $SD = 11.29$, 43% female; those who failed a sound check were rejected before viewing dependent measures). Participants were randomly assigned to conditions in a 2 (paralanguage: control, persuasion) X 2 (disclosure statement: no, yes) between-subjects design.

Procedure. First, we manipulated participants’ awareness of a persuasion attempt. Before listening to a product review, participants read a description (Figure 1). We manipulated the presence or absence of a disclosure statement, as such statements increase the salience of persuasive intentions (Boerman, van Reijmersdal, & Neijens, 2012; Johar & Simmons, 2000). In the no disclosure condition, the description simply read, “I review the latest Smart TV to hit the market.” In the disclosure condition, we adapted YouTube’s guidelines for sponsored content and the Word of Mouth Marketing Association’s guidelines for social media disclosure by adding language that indicates the speaker's interest in influencing the listener ("I was paid by the manufacturer to review #paid").

Second, we manipulated paralanguage. Participants listened to a randomly selected recording that either did or did not include a paralinguistic persuasion attempt.

Third, participants completed our dependent measure, which assessed their attitudes about the product reviewed. Participants indicated how much they "would like to purchase this TV" and their anticipated satisfaction (should they purchase the TV) with its picture quality, interactive features, and overall viewing experience on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The four items were averaged into an attitude favorability index ($\alpha = .90$).

To test the confidence account, we measured how confident the speaker seemed. Participants indicated their agreement with two items adapted from prior research (Packard, Gershoff, & Wooten, 2016; Packard & Berger, 2017): "the reviewer is confident in his or her evaluation of the TV," and "the reviewer is certain in his or her attitude about the TV" ($\alpha = .95$) on the same scale as the persuasion measure.

To account for random variance attributable to speakers across participants, analyses for this and all subsequent experiments were conducted using multilevel models. In Experiments 1-3, this approach involved nesting participants within speakers using a speaker-specific random intercept (estimated using maximum likelihood estimation) while treating experimental manipulations and their interaction as fixed effects. For ANOVA models, we used the MIXED procedure in SPSS to estimate denominator degrees of freedom via Satterthwaite approximation (Satterthwaite, 1946). This means that although we do not have missing data points, denominator degrees of freedom vary across factors and variables (reported degrees of freedom are rounded to the nearest integer). All mediation analyses in Experiments 1-3 are multilevel mediation analyses

(Krull & MacKinnon, 2001) using regression models fit via the "xtmixed" command in Stata and bootstrapped resamples are stratified within speakers. The data for this experiment and all subsequent experiments is posted at https://osf.io/sajvz/?view_only=7c6a35f32ce04a60b832c25091c8195c.

Results

Attitudes. Not surprisingly, a 2 (paralanguage) X 2 (disclosure statement) ANOVA revealed that disclosure statements made people like the TV less ($M_{\text{Disclosure}}$ = 5.00, *SD* = 1.12 vs. $M_{\text{No Disclosure}}$ = 5.18, *SD* = 1.00), $F(1, 687) = 4.90$, $p = .027$, $d = 0.16$, 95% CI = [0.02, 0.31].

~~More importantly, as predicted~~As hypothesized, paralinguistic attempts enhanced persuasion, $F(1, 704) = 3.88$, $p = .049$, $d = 0.15$, 95% CI = [0.001, 0.29].[2] Compared to the control condition (*M* = 5.01, *SD* = 1.11), listeners exposed to paralinguistic persuasion attempts viewed the TV more positively (*M* = 5.17, *SD* = 1.02).

Comment [JB1]: This seems like out point, so why drop it?

There was no interaction between paralanguage and the disclosure statement, $F(1, 687) = 0.22$, $p = .64$, indicating that paralinguistic persuasion attempts were similarly efficacious irrespective of whether participants were aware of the speaker's intent to persuade. This is inconsistent with the detectability account, but consistent with the confidence account.

Confidence. A 2 X 2 ANOVA revealed that disclosure statements made speakers appear less confident ($M_{\text{Disclosure}}$ = 5.18, *SD* = 1.48 vs. $M_{\text{No Disclosure}}$ = 5.49, *SD* = 1.30), $F(1, 685) = 9.27$, $p = .002$, $d = 0.22$, 95% CI = [0.08, 0.36].

C~~More importantly, and c~~onsistent with the confidence account, engaging in paralinguistic persuasion attempts enhanced speakers' perceived confidence, $F(1, 703) = 8.93$, *p*

Comment [JB2]: Same here

[2] This effect is similar in magnitude when isolating analyses to the single item assessing purchase intent, $F(1, 704) = 5.21$, $p = .023$, $d = .17$.

= .003, $d = 0.22$, 95% CI = [0.08, 0.36]. Compared to the control condition ($M = 5.17$, $SD = 1.49$), paralinguistic persuasion attempts made speakers appear more confident ($M = 5.51$, $SD = 1.29$). There was no interaction between paralanguage and the disclosure statement, $F(1, 685) = 0.73$, $p = .39$.

Mediation. Consistent with the confidence account, mediation analysis suggests that paralinguistic attempts work because they make speakers seem more confident. Confidence predicted attitudes independently of the paralinguistic attempt manipulation, $\beta = 0.56$, $z = 18.10$, $p < .001$. Further, controlling for confidence eliminated the main effect of paralinguistic attempts on attitudes (from $\beta = 0.07$, $p = .049$ to $\beta = 0.01$, $p = .78$). A bootstrap with 5,000 replications revealed a significant indirect effect of paralinguistic attempts on attitudes through confidence, $Z = 3.03$, $p = .002$, indirect effect = 0.27, 95% CI = [0.10, 0.44].

Discussion

Experiment 1 finds that paralinguistic persuasion attempts can increase persuasion. Consistent with prior research, a linguistic persuasion cue (in this case, a disclosure statement) undermined persuasion. Paralinguistic attempts, in contrast, generated more favorable attitudes toward the TV.

Further, the results provide preliminary evidence for the mechanism underlying this effect. Consistent with the confidence account, speakers making paralinguistic attempts were seen as more confident, which increased the favorability of perceivers' attitudes towards a product speakers had evaluated positively. This occurred to a similar degree irrespective of whether communicators' intent to persuade was known.

There was less support for the detectability account. Although the disclosure statement caused participants to resist communicators' persuasive message as a whole, it did not cause participants to resist communicators' paralinguistic persuasion attempts. This suggests that even when presented with information known to increase the salience of communicators' persuasive intentions, participants did not become more likely to resist paralinguistic attempts.

Experiment 2

Experiment 1 provides preliminary evidence that paralinguistic attempts can boost persuasion. Further, it suggests that perceived confidence underlies this effect, and that it occurs irrespective of whether people know communicators are trying to persuade.

That said, one could argue that we did not fairly test the detectability account because communicators' intent to persuade was too subtle. Because the disclosure statement only undermined persuasion to a minor degree (d = 0.16), maybe the disclosure statement was too vague or insufficiently prominent in our stimulus materials. To address this possibility, Experiment 2 uses an alternate approach, manipulating speakers' persuasive intent via more direct linguistic cues.

We manipulated both whether speakers engaged in a paralinguistic attempt and whether they explicitly acknowledged their intent to persuade. Speakers again read a script two ways: as they normally would and while making a paralinguistic persuasion attempt. Further, some speakers read a script explicitly acknowledging their intent to persuade. Listeners were then randomly assigned to listen to a single recording from one of the speakers and indicate their attitudes toward the product.

Stimulus Generation: Eliciting Paralinguistic Persuasion Attempts

Due to the inclusion of a between-subjects factor (see SOM for script), we aimed to recruit a minimum of 20 speakers reading each script, or 40 total.

Speakers (N = 49, M_{Age} = 21.10, SD = 5.14, 71% female) made paralinguistic persuasion attempts using the procedure from Experiment 1. In addition to manipulating paralinguistic attempts within subjects, we also used a between-subjects manipulation whereby speakers read a script either acknowledging an intent to persuade ("I would like to convince you to purchase this Smart TV") or not ("I would like to talk about my experience using this Smart TV").

Aside from two speakers who failed to record one of the reviews, we retained all recordings of our speakers. This resulted in a final sample of 98 stimulus recordings (49 speakers each recording themselves reading the same statement twice).[3] We later identified seven participants who collectively created nine recordings that contained either a single extraneous word (e.g., "the," "in," "viewing") or disfluencies ("uh," "um"). All other speakers conformed to our instructions to read their reviews word-for-word. We include all recordings in the analyses because following directions did not systematically vary by paralanguage, $\chi^2(1, N = 98) = 0.12$, $p = .73$. All effects reported at $p < .05$ remain at $p < .05$ when excluding them from analyses.

Main Experiment

Participants. Based on the effect sizes in Experiment 1, we aimed to recruit a sample large enough to detect an effect of $d = 0.2$ with at least 90% power.[4] To do this, we obtained a sample of 1,104 Amazon Mechanical Turk workers (M_{Age} = 35.25 years, SD = 11.19, 48% female; those who failed a sound check were rejected before viewing dependent measures). This sample ensured that at least eleven people could listen to each of the 49 speakers in each of the four conditions.

[3] Speakers randomly assigned to the no intent to persuade condition are the same speakers we used for Experiment 1.

[4] Given that our effect size in Experiment 1 was smaller than expected and would require very large samples to reliably study, we lowered our power threshold for Experiments 2 and 3 in order to be economical.

Procedure. The study follows a 2 (paralanguage: control, persuasion) X 2 (intent to persuade: no, yes) between-subjects design. Participants listened to a randomly selected review of the Smart TV that manipulated the presence of (1) paralinguistic persuasion attempts and (2) speakers' acknowledgment of their intent to persuade.

We used the same measures of attitudes and confidence as Experiment 1.

Results

Attitudes. Not surprisingly, a 2 (paralanguage) X 2 (intent to persuade) ANOVA revealed that speakers' acknowledgement of their persuasive intent made participants like the TV less (M_{Intent} = 4.70, *SD* = 1.23 vs. $M_{\text{No Intent}}$ = 5.08, *SD* = 1.02), *F*(1, 47) = 17.83, *p* < .001, *d* = 0.32, 95% CI = [0.17, 0.48].

~~More importantly, as predicted~~As hypothesized, and similar to Experiment 1, paralinguistic persuasion enhanced persuasion, *F*(1, 1074) = 8.72, *p* = .003, *d* = 0.18, 95% CI = [0.07, 0.29].[5] Compared to the control condition (*M* = 4.78, *SD* = 1.18), listeners exposed to paralinguistic persuasion attempts liked the TV more (*M* = 4.98, *SD* = 1.10).

There was no interaction between paralanguage and speakers' intent to persuade, *F*(1, 1074) = 0.73, *p* = .39, suggesting that even when speakers explicitly acknowledged their intent to persuade, paralinguistic persuasion attempts were as effective as when their intentions were more ambiguous. Again, this is inconsistent with the detectability account and consistent with the confidence account.

Confidence. A 2 X 2 ANOVA indicated that acknowledging their intent to persuade made speakers appear less confident (M_{Intent} = 4.96, *SD* = 1.74 vs. $M_{\text{No Intent}}$ = 5.67, *SD* = 1.30), *F*(1, 47) = 21.37, *p* < .001, *d* = 0.46, 95% CI = [0.27, 0.65].

[5] This effect is similar in magnitude when isolating analyses to the single item assessing purchase intent, *F*(1, 1074) = 3.20, *p* = .074, *d* = .11.

CMore importantly, consistent with Experiment 1 and the confidence account, paralinguistic persuasion attempts made speakers seem more confident ($M_{\text{Paralinguistic}} = 5.46$, $SD = 1.50$ vs. $M_{\text{Control}} = 5.15$, $SD = 1.64$), $F(1, 1070) = 11.94$, $p < .001$, $d = 0.19$, 95% CI = [0.08, 0.30]. There was no interaction between paralanguage and speakers' intent to persuade, $F(1, 1070) = 0.005$, $p = .95$.

Mediation. Consistent with Experiment 1 and the confidence account, perceptions of speakers' confidence mediated the effect of paralinguistic attempts. Confidence predicted attitudes independently of the paralinguistic attempt manipulation, $\beta = 0.54$, $z = 20.99$, $p < .001$. Further, controlling for confidence eliminated the effect of paralinguistic attempts on attitudes (from $\beta = 0.09$, $p = .002$ to $\beta = 0.04$, $p = .14$). A bootstrap with 5,000 replications revealed a significant indirect effect of paralinguistic attempts on attitudes through confidence, $Z = 3.42$, $p < .001$, indirect effect = 0.15, 95% CI = [0.07, 0.24].

Discussion

Experiment 2 provides further support for our theorizing. First, paralinguistic persuasion attempts again increased influence. Speakers who tried to persuade through paralanguage were in fact more persuasive.

Further, consistent with the confidence account, the effect of paralinguistic attempts was driven by confidence. Attempting to persuade through one's voice made speakers seem more confident, which persuaded listeners.

Additional evidence casts doubt on the detectability account. Experiment 2 uses a more direct manipulation to increase the salience of communicators' persuasive intent (an explicit acknowledgement of their intent to persuade). Even though communicators' persuasive intent was clear, and despite eliciting stronger resistance to persuasion ($d = .32$) than Experiment 1, this manipulation had no influence on participants' ability to resist persuasion attempts executed through paralinguistic channels. This is inconsistent with the detectability account.

Experiment 3

Experiments 1 and 2 suggest that paralinguistic attempts work because they make speakers appear confident. Even though they did not moderate the efficacy of paralinguistic attempts, linguistic persuasion cues (disclosure statements and explicit statements of one's intent to persuade) undermined persuasion. In both experiments, however, communicators read a script that they did not play a role in composing. Therefore, Experiment 3 considers the efficacy of paralinguistic persuasion attempts when speakers can use whatever linguistic persuasion strategy they want. This allows for a direct comparison between naturalistic paralinguistic and linguistic persuasion attempts.

Experiment 3 also provides an alternative test of the detectability account, directly assessing whether participants can infer communicators' persuasive intent from paralinguistic persuasion attempts. Although being aware of speakers' intent to persuade did not moderate the efficacy of paralinguistic persuasion attempts, it is not clear whether participants could actually detect them. Because the detectability account would predict that participants should not detect paralinguistic attempts, evidence that they do detect them would be direct evidence against the detectability account.

Finally, Experiment 3 provides a more conservative test of paralinguistic persuasion. Because participants in Experiments 1 and 2 evaluated a hypothetical review, they may not have been sufficiently motivated to scrutinize and resist paralinguistic persuasion attempts. To address this concern, Experiment 3 exposes participants to a persuasive argument with personal relevance: Evaluations of a real task they may potentially perform. People become more likely to scrutinize communicators' intentions when their persuasive appeals have personal relevance (Petty & Cacioppo, 1979). Consequently, this context provides a more conservative test of paralinguistic persuasion and whether the confidence account holds even if paralinguistic attempts are detected.

Stimulus Generation: Eliciting Persuasion Attempts

Before conducting the main study, we collected a set of recordings in a 2 (paralanguage: control vs. persuasion) X 2 (language: control vs. persuasion) mixed design. As with Experiment 2, we aimed to recruit a minimum of 20 speakers for each between-subject condition, or 40 total.

First, speakers (N = 45, M_{Age} = 25.42, SD = 9.76, 58% female, from a private East Coast University) performed two emotion-recognition tasks (i.e., posture and faces, adapted from Nowicki & Carton, 1993). In the postures task, for example, they had to guess what emotion actors were expressing based simply on pictures of the actors' body posture (faces were hidden). In the faces task, they also guessed actors' posed emotions, but did so after viewing pictures of actors' facial expressions (with their body posture hidden).

Second, we told speakers they would prepare a recording discussing either the positive or negative aspects of one of the tasks that would be played to a future research participant. They were all subsequently prompted to "write a brief statement about the positive aspects of the Faces task" that they would later record themselves reading. We advised participants to write a review that was 3-6 sentences long.

Third, we manipulated linguistic persuasion attempts (see Table S1 in SOM for a complete list of speakers' scripts). In the control condition, speakers were simply asked to write a statement and not given any incentive to persuade. In the linguistic attempt condition, we prompted speakers to "write your statement in a way that will persuade a future research participant that he or she should choose to do the Faces task." As in prior experiments, we incentivized speakers to be persuasive with entry into a raffle for a $50 Amazon gift card.[6]

Fourth, we manipulated paralinguistic attempts. The instructions mirrored those from Experiments 1 and 2. Speakers recorded themselves reading their prepared statement aloud twice: once when making a paralinguistic persuasion attempt and once without any such attempt (randomized order).

In total, we obtained a final sample of 90 stimulus recordings (45 speakers reading the same review twice). All speakers conformed to our instructions to read their reviews word-for-word except seven individuals who created nine recordings that contained 1-2 extraneous words (e.g., "the," "a," "it is") or disfluencies ("um," "uh"). We include them in the analyses below because they did not systematically vary by paralanguage, $\chi^2(1, N = 90) = 0.12$, $p = .73$, but all effects reported below hold when excluding them from analyses.

Main Experiment

Participants. Aiming for a sample size large enough to detect effects of $d = 0.2$ with at least 90% power, we obtained a sample of 1,086 Amazon Mechanical Turk workers (M_{Age} = 34.08 years, SD = 10.50, 44% female; those who failed a sound check were rejected before viewing dependent measures). Like Experiment 2, this sample ensured that at least eleven people could listen to each of the 49 speakers in each of the four conditions.

Procedure. Participants were told they would listen to a review of an emotion-recognition task from a prior research participant. To increase the personal relevance of the

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[6] We entered speakers in the linguistic attempt condition into the raffle if a randomly selected person who listened to one of their recordings scored above the neutral midpoint of an item assessing participants' intent to perform the emotion-recognition task. We conducted a separate raffle for all speakers in the paralinguistic attempt condition using the same criteria.

review, we told participants that their experience as an Amazon Mechanical Turk worker gives them a unique perspective on deciding "whether to complete tasks based on limited information" and that we were interested in "how you use information from others to make decisions about whether to perform specific tasks." In real-world contexts, speakers' motives are often unknown, so to simulate this ambiguity, participants were told that the prior participant might have a financial incentive for them to "evaluate one of the tasks favorably." Participants then listened to a randomly selected recording that manipulated whether speakers attempted to persuade through (1) paralinguistic channels and (2) linguistic channels.

After participants listened to the recordings, we assessed their attitudes about the task. To fit the experimental context, we created a two-item index of attitude favorability: "If I were to perform the task discussed in the recording, I would be satisfied with it," and "I would like to do the task discussed in the recording" ($\alpha = .86$, 1 = *strongly disagree*, 7 = *strongly agree*).

To further test whether paralinguistic persuasion attempts are effective merely because they go undetected (detectability account), we directly measured whether participants thought someone was trying to persuade them: "I thought it was pretty obvious that the speaker was trying to persuade me to evaluate the emotion-recognition task favorably" (1 = *strongly disagree*, 7 = *strongly agree*).

To test the confidence account, we adapted the two confidence items from Experiments 1 and 2: "The speaker is confident in his or her evaluation of the task," and "the speaker is certain in his or her attitude about the task" ($\alpha = .95$).

Results

Attitudes. A 2 (paralanguage) X 2 (language) ANOVA found no effect of linguistic persuasion attempts, $F(1, 43) = 0.68$, $p = .41$. Relative to the control condition ($M = 4.73$, $SD =$

1.26), participants exposed to a linguistic attempt held less favorable attitudes toward the task (*M* = 4.65, *SD* = 1.30), but the effect was not significant.

In contrast, and consistent with the prior experiments, paralinguistic persuasion attempts boosted persuasion, $F(1, 1040) = 21.56$, $p < .001$, $d = 0.28$, 95% CI = [0.16, 0.39].[7] Relative to the control condition ($M = 4.51$, $SD = 1.31$), listeners exposed to paralinguistic persuasion attempts viewed the task more positively ($M = 4.86$ $SD = 1.22$).

There was no interaction between paralanguage and language, $F(1, 1040) = 0.84$, $p = .40$, suggesting that paralinguistic attempts were similarly effective irrespective of speakers' use of linguistic attempts.

A comparison of main effects confirmed that paralinguistic persuasion attempts had a larger positive impact on attitudes than linguistic persuasion attempts, $z = 3.56$, $p < .001$. This confirms that paralinguistic attempts not only succeeded, but that they were more markedly more effective than linguistic persuasion attempts at influencing participants' attitudes.

Persuasion awareness. A 2 X 2 ANOVA revealed that linguistic and paralinguistic persuasion attempts were similarly detectable. There were main effects of persuasion attempts executed through both linguistic channels ($M_{\text{Linguistic}} = 4.57$, $SD = 1.71$ vs. $M_{\text{Control}} = 4.16$, $SD = 1.69$), $F(1, 43) = 4.62$, $p = .037$, $d = 0.24$, 95% CI = [0.03, 0.45], and paralinguistic channels ($M_{\text{Paralinguistic}} = 4.56$, $SD = 1.64$ vs. $M_{\text{Control}} = 4.18$, $SD = 1.77$), $F(1, 1039) = 14.65$, $p < .001$, $d = 0.22$, 95% CI = [0.11, 0.33]. This suggests that neither approach went unnoticed. A comparison of effect sizes indicates that the two approaches were detected to a similar degree, $z = 0.15$, $p =$

[7] This effect is similar in magnitude when isolating analyses to the single item assessing participants' intent to perform the task, $F(1, 1040) = 15.55$, $p < .001$, $d = .24$.

.88. This is inconsistent with the detectability account. Paralinguistic attempts were more successful than linguistic attempts even though they were just as detectable.

Confidence. A 2 X 2 ANOVA revealed that, consistent with the confidence account, paralinguistic persuasion attempts made speakers appear more confident, ($M_{\text{Paralinguistic}} = 5.18$, $SD = 1.34$ vs. $M_{\text{Control}} = 4.71$, $SD = 1.51$), $F(1, 1040) = 31.95$, $p < .001$, $d = 0.32$, 95% CI = [0.21, 0.44]. There was no main effect of language, $F(1, 43) = 0.04$, $p = .83$, nor was there an interaction between language and paralanguage, $F(1, 1040) = 1.74$, $p = .19$.

Mediation. Consistent with the confidence account, and the prior experiments, perceptions of speakers' confidence mediated the effect of paralinguistic attempts. Confidence predicted attitudes independently of the paralinguistic attempt manipulation, $\beta = 0.49$, $z = 18.48$, $p < .001$. Further, controlling for confidence reduced the main effect of paralinguistic attempts on attitudes (from $\beta = 0.14$, $p < .001$ to $\beta = 0.06$, $p = .029$). A bootstrap with 5,000 replications revealed a significant indirect effect of paralinguistic attempts on attitudes through confidence, $Z = 5.61$, $p < .001$, indirect effect = 0.20, 95% CI = [0.14, 0.28].

Discussion

Using a personally relevant context, Experiment 3 underscores the impact of paralinguistic persuasion attempts and the mechanism underlying this effect. Persuading though vocal features enhanced persuasion independently of communicators' efforts to craft persuasive language. Though linguistic persuasion attempts did not decrease persuasion when they were operationalized in a manner similar to paralinguistic attempts, they were ineffective nonetheless.

More importantly, Experiment 3 further supports the confidence account while providing stronger evidence against the detectability account. As in the prior experiments, paralinguistic attempts influenced listeners' attitudes because they made communicators seem more confident.

Further, this occurred despite clear evidence that paralinguistic attempts were detectable. When communicators tried to persuade through paralanguage, listeners detected these attempts, yet were still persuaded. Thus, unlike prior experiments, which merely failed to find evidence supporting the detectability account, Experiment 3 provides direct evidence *against* the detectability account. By showing that paralinguistic persuasion attempts were effective despite clear evidence that people could infer communicators' persuasive intent, Experiment 3 is inconsistent with the possibility that paralinguistic attempts succeed because people fail to detect them. Instead, perceptions of communicators' confidence appear responsible for driving the effect.

Ancillary analyses: Were speakers' confidence displays strategic? To further probe the confidence account, we tested whether speakers actually attempted to convey confidence when engaging in paralinguistic attempts. We asked speakers about the extent to which they attempted to convey confidence (1 = *strongly disagree* to 7 = *strongly agree*) both when engaging in a paralinguistic persuasion attempt and when reading as they normally would (randomized order).

A 2 (paralanguage) X 2 (language) mixed ANOVA found that when engaging in paralinguistic persuasion attempts, speakers attempted to convey more confidence ($M_{\text{Paralinguistic}}$ = 6.36, SD = 0.80 vs. M_{Control} = 4.91, SD = 1.46), $F(1, 43) = 42.03$, $p < .001$, d = 1.91, 95% CI = [1.41, 2.40]. Note that while speakers attempted to convey confidence in both conditions (both *p*s < .001 relative to the neutral scale midpoint), they attempted to convey even *more* confidence when engaging in paralinguistic persuasion attempts. This provides further insight into the confidence account. Speakers were not only perceived as more confident when engaging in paralinguistic attempts, but this perception was triggered by their efforts to signal confidence.

In contrast, speakers did not report trying more to convey confidence when engaging in linguistic persuasion attempts ($M_{\text{Linguistic}} = 5.22$, $SD = 1.31$ vs. $M_{\text{Control}} = 4.59$, $SD = 1.56$), $F(1, 43) = 0.96$, $p = .33$. We also analyzed their written scripts using the Linguistic Inquiry and Word Count software (LIWC; Pennebaker, Booth, Boyd, & Francis, 2015). We extracted three measures that could potentially signal confidence: the percentage of words conveying certainty, the percentage of words conveying tentativeness, and Clout, a proprietary measure assessing speakers' confidence and expertise. Speakers' certainty ($M_{\text{Linguistic}} = 1.28$, $SD = 1.96$ vs. $M_{\text{Control}} = 1.91$, $SD = 1.25$) and Clout ($M_{\text{Linguistic}} = 75.19$, $SD = 22.47$ vs. $M_{\text{Control}} = 79.76$, $SD = 22.47$) did not differ by condition (both $ps > .20$). However, they did convey marginally *more* tentativeness when engaging in linguistic persuasion attempts ($M_{\text{Linguistic}} = 4.01$, $SD = 2.83$ vs. $M_{\text{Control}} = 2.69$, $SD = 2.38$), $t(43) = 1.69$, $p = .099$.

Cross-Study Brunswikian Lens Analysis: Specific Paralinguistic Cues and the Dyadic Persuasion Process

While the results of the three experiments provide consistent evidence that paralinguistic attempts increase persuasion, and that they work by making speakers seem more confident, one might still wonder how these effects are occurring. Are speakers consistently modulating certain properties of their voice (e.g., pitch, speed, or volume) when trying to persuade others? Further, are certain vocal features effective at persuading listeners, and are these the same features speakers tend to modulate?

To better understand how speakers' paralinguistic attempts enhanced persuasion, we analyzed the recordings used in each experiment. We then applied Brunswik's (1956) lens model to understand how systematic variance in speakers' vocal properties while engaging in paralinguistic persuasion attempts served as behavioral cues that influenced perceivers' attitudes.

Extraction of Cues

Rather than relying on judges' subjective impressions to measure vocal cues (e.g., Hall, 1980; Mehrabian & Williams, 1969), we extracted objective phonetic measures using the Praat program (Boersma & Weenik, 2018). Prior researchers have linked confidence perceptions to speakers' volume, variability in volume, pitch, variability in pitch, intonation, speech rate, and use of pauses (Aronovitch, 1976; Brennan & Williams, 1995; Kimble & Seidel, 1991; Scherer et al., 1973). Therefore, we wrote a script that could automate the extraction of these cues from each recording we used for Experiments 1-3. Following the recommendation of Eyben et al. (2016), we normalized estimates of variability using the coefficient of variation, making them less dependent on speakers' mean volume and pitch (all effects reported below held in analyses using the regular standard deviation).[8] See the SOM for more details about the extraction of cues and Table S2 for conditional descriptive statistics of speakers' cues in Experiments 1 and 2 (where speakers read a prepared product review) as compared to Experiment 3 (where speakers prepared their own review of an emotion recognition task).

Volume measures. We measured speakers' mean amplitude, or intensity, by taking the mean of speakers' volume across the duration of each recording (*Volume*, in decibels). To measure variability in volume, we divided the standard deviation of speakers' volume by the mean to obtain the normalized standard deviation, or coefficient of variation ($Volume\ SD_{Norm}$)[9]; we multiplied the resulting measure by 100 to convert it into a measure corresponding to the

[8] The mean of acoustic parameters tends to correlate highly with the standard deviation (Scherer, Sundberg, Fantini, Trznadel, & Eyeben, 2017). Therefore, by normalizing the standard deviation by the mean, we are adjusting for the influence that speakers' mean volume and pitch has on their volume and pitch variability. All significant effects involving volume and pitch variability in the manuscript hold when using the non-normalized standard deviation.

standard deviation as a percentage of the mean. To ensure that these measures of volume reflect speakers' voice (rather than background noise during silences), we conducted analyses only on voiced portions of speech (see the SOM for details on how we isolated voiced portions of speech).

Pitch measures. To extract measures of speakers' pitch, we applied a range of 75-250 Hertz (Hz) for males and 100-300 Hz for females. Prior research has found that these settings yield estimates that are nearly identical to the results of labor-intensive "gold standard" techniques used by phonetics experts (Vogel, Maruff, Snyder, & Mundt, 2009). Because measures of speakers' pitch can be sensitive to the settings used to extract them, we also estimated speakers' pitch using alternative pitch settings and generated estimates of their mean pitch in each spoken sentence. We provide details about these alternative pitch estimates, which allowed us to explore the robustness of any pitch effects, in the SOM.

To measure pitch, we captured the mean of speakers' fundamental frequency across the duration of each recording (*Pitch*), in Semitones (ST, 1 Hz reference value).[10] As with volume, we also obtained a normalized standard deviation measure by dividing the standard deviation of speakers' fundamental frequency by the mean and multiplying by 100 ($Pitch\ SD_{Norm}$).

We also captured speakers' *intonation*, or the extent to which their pitch rises or falls at the end of sentences. Following prior researchers (Liu & Xu, 2007), we captured this by estimating speakers' final velocity, or the rate of change of pitch in the last 30 milliseconds of the final segment of speech in a given recording. This resulted in a measure corresponding to

[10] We use semitones as the unit of analysis rather than Hz because the semitone scale more closely represents how the human ear perceives pitch than the linear Hz scale (Nolan, 2003).

speakers' estimated rate of pitch increase (in semitones per second) at the end of their final segment of speech compared to the 30 seconds prior.

Speech rate measures. We measured two different aspects of speech rate. First, we used a script developed by de Jong and Wempe (2009) to assess *articulation rate*, or number of syllables per period of time speaking. Second, we used this same script to measure the number of times speakers paused (at least 0.2 seconds of silence) during a recording (*pauses*).

Results

Across experiments, we analyzed both (1) how speakers altered their voice when trying to persuade through auditory channels (cues displayed) and (2) whether these modulations actually impacted the persuasion process (cues utilized). Further, mediation analyses test which vocal cues, if any, accounted for paralinguistic attempts' ability to signal confidence and enhance persuasion.

We used three-level random-intercept models (estimated using maximum likelihood) that nest recordings within speakers, who are in turn nested within studies. To facilitate the comparison of each cue's relative effect, we standardized all measures. As recommended by prior research (Bonett, 2009; Cumming, 2014), we incorporated random coefficients allowing effects to vary across studies (estimated using an unstructured covariance matrix), which relaxes assumptions of fixed-effect models that assume each study is testing for the same effect in a homogeneous context. To account for potential speaker gender effects, we control for speaker gender and all of its two-way interactions with model predictors (e.g., Ko, Sadler, & Galinsky, 2015). We did not find any evidence of interaction effects between speakers' gender and the paralinguistic attempt on their use of paralinguistic cues (all ps > .14).

Cues displayed by speakers during nonverbal persuasion attempts. As detailed in the SOM (Table S2), paralinguistic attempts caused speakers to modify their cues in a similar manner across studies, with the exception of pauses. Further, as documented in Table 1, when trying to persuade through paralanguage, speakers (1) spoke at a higher volume ($z = 6.50$, $p < .001$), (2) spoke at a higher pitch ($z = 6.26$, $p < .001$), (3) varied their volume to a greater extent ($z = 2.45$, $p = .014$), and (4) spoke at a faster rate ($z = 2.24$, $p = .025$). While pitch variability measures extracted using sex-specific settings suggest that speakers varied their pitch to a greater extent while engaging in paralinguistic attempts ($z = 2.88$, $p = .004$), this finding is not robust to alternative pitch settings and should be interpreted with caution (see SOM, Table S3).

Cues utilized by listeners. To understand which vocal behaviors influenced listeners, we entered all into a single model to estimate each one's independent effect on listeners' attitudes. Speakers were more persuasive when they spoke at a higher volume ($z = 2.64$, $p = .008$) and when they varied their volume ($z = 2.14$, $p = .033$). Notably, these two cues were both displayed by speakers when engaging in paralinguistic persuasion attempts. Though speakers increased their pitch, pitch variability, and speech rate during paralinguistic attempts, these cues did not impact attitudes.

Did speakers' vocal cues mediate the persuasion process? Because volume and variance in volume were the two cues displayed by speakers during paralinguistic persuasion attempts that were utilized by perceivers, we conducted a mediation analysis to better understand how they impacted the persuasion process (Figure 2). Results indicate that speakers' paralinguistic persuasion strategy of increasing their volume and varying their volume made them appear more confident, which in turn made them more persuasive.

First, volume and variance in volume mediated the effect of paralinguistic attempts on attitudes. Volume ($z = 2.38$, $p = .017$) and variance in volume ($z = 2.06$, $p = .039$) each predicted attitudes independently of the paralinguistic attempt manipulation. Further, controlling for volume and variance in volume reduced the main effect of paralinguistic attempts on attitudes (from $\beta = 0.10$ to $\beta = 0.09$). A bootstrap with 5,000 replications revealed independent indirect effects of paralinguistic attempts on attitudes through speakers' volume, $Z = 3.12$, $p = .002$, indirect effect = 0.01, 95% CI = [0.004, 0.02], and variance in volume, $Z = 2.05$, $p = .04$, indirect effect = 0.004, 95% CI = [0.0003, 0.01].

Second, volume and variance in volume also mediated the effect of paralinguistic attempts on confidence. Volume ($z = 3.06$, $p = .002$) and variance in volume ($z = 2.73$, $p = .006$) each predicted confidence independently of the paralinguistic attempt manipulation. Further, controlling for volume and variance in volume reduced the main effect of paralinguistic attempts on confidence (from $\beta = 0.12$ to $\beta = 0.10$). A bootstrap with 5,000 replications revealed independent indirect effects of paralinguistic attempts on confidence through speakers' volume, $Z = 4.71$, $p < .001$, indirect effect = 0.02, 95% CI = [0.01, 0.02], and variance in volume, $Z = 3.32$, $p < .001$, indirect effect = 0.01, 95% CI = [0.003, 0.01].

Finally, the indirect effect of paralinguistic attempts on confidence through volume and variance in volume could account for the downstream effect that these same cues had on persuasion. When controlling for these paralinguistic cues and the paralinguistic attempt manipulation, perceptions of confidence predicted attitudes ($z = 33.12$, $p < .001$). Further, controlling for confidence eliminated the residual effects of volume (from $\beta = 0.07$, $p = .017$, to $\beta = 0.02$, $p > .250$) and variance in volume (from $\beta = 0.05$, $p = .039$, to $\beta = 0.01$, $p > .250$) on attitudes. A bootstrap with 5,000 replications revealed an indirect effect of speakers' vocal cues on attitudes through confidence, $Z = 6.47$, $p < .001$, indirect effect = 0.10, 95% CI = [0.07, 0.13].

Discussion

This cross-study Brunswikian lens analysis sheds further light on paralinguistic persuasion by identifying specific paralinguistic cues that contribute to the persuasion process. Increasing and varying their volume during paralinguistic attempts made speakers appear more confident, which ultimately enhanced their persuasiveness. This adds more precision to the confidence account. Although communicators used a variety of other cues while engaging in paralinguistic persuasion attempts (i.e., increased pitch, variance in pitch, and speech rate), increases in volume and volume variability enhanced persuasion by making speakers appear more confident.

While we found strong evidence that volume was a critical cue to the persuasion process, it is noteworthy that when speakers project their voice, they often tense their vocal chords, which results in their voice emitting a greater proportion of energy at high frequencies (Tolkmitt, Standke, & Scherer, 1982). As a result, high-frequency energy is highly dependent on volume (Sundberg & Nordenberg, 2004, 2006) and correlates strongly with perceptions of speakers' loudness independently of their objective volume (Master et al., 2006; Pinczower & Oates, 2005). Therefore, it could be possible that high-frequency energy triggered by increases in volume, rather than volume *per se*, impacts the persuasion process.

To explore this possibility, we conducted post-hoc analyses examining a) speakers' use of high-frequency energy (relative to low-frequency energy) and b) the impact of high-frequency energy on perceivers' attitudes. As detailed in the SOM, when attempting to persuade, speakers' relative concentration of high-frequency energy (> 1 kHz) increased. Further, their concentration of energy in high frequencies were strongly related to volume ($r = 0.65$) and mediated the effect of speakers' mean volume on their persuasiveness, suggesting that high-frequency energy triggered by increases in volume impacted the persuasion process. However, it is noteworthy that speakers in Experiments 1-3 did not use a microphone with a windscreen that blocks low-frequency air bursts. Because speakers tend to emphasize vowels and deemphasize consonants that produce low-frequency air pressure when projecting their voice (Rostolland, 1982), it could be possible that reduced low-frequency air pressure (thus resulting a higher relative proportion of high-frequency energy) during speakers' attempts to increase their volume in the paralinguistic attempt condition made their recordings clearer and, subsequently, more persuasive. We address this issue in Experiment 4A by using a microphone with a windscreen.

Comment [JB3]: This is about the process. Would just be careful overall here as we don't want to make the reader think the completely explains our effect

Probing the Confidence Account

Experiments 1-3 demonstrate that communicators modulate their paralinguistic cues during paralinguistic attempts in a manner that enhances persuasion by making them appear more confident. This occurred despite the fact that paralinguistic attempts were detectable, casting doubt on the detectability account.

Building on this, it is worth considering *why* paralinguistic attempts succeed despite being detectable. Although research often focuses on the notion that detected persuasion attempts backfire (e.g., Campbell, 1995; Campbell & Kirmani, 2000; Jain & Posavac, 2004; Kirmani & Zhu, 2007), it often implicitly conflates detection with assuming that communicators have disingenuous motives.[11] But detected persuasion attempts do not always backfire (Campbell,

[11] For example, Campbell and Kirmani (2000) argue that when people believe a communicator's claim is "motivated by the intent to persuade, perceptions of sincerity are discounted" (p. 70).

Mohr, & Verlegh, 2013; Wei, Fischer, & Main, 2008) and people are willing to cooperate with the transparent persuasion attempts of communicators they judge favorably (Kirmani & Campbell, 2004). This suggests that the impressions people form of communicators dictate their receptivity to transparent persuasion attempts. Therefore, even if paralinguistic attempts are detected, they may still influence the persuasion process through the impressions communicators elicit from perceivers.

Compared to written messages, speech makes communicators' personal characteristics more salient. Consequently, people are particularly attuned to cues that shape their impression of communicators' attitudes and attributes (Chaiken & Eagly, 1983). These perceptions should, in turn, influence how speakers' messages are received. Given the role of confidence in driving the persuasion process, we consider four different routes through which paralinguistic confidence might enhance persuasion. In Experiment 4, we test for whether these routes might explain the persuasive benefit of paralinguistic confidence displays.

Attitude Extremity Route

Perhaps the most straightforward way confidence might enhance persuasion is by signaling attitude extremity. When people are more confident, others often infer they hold more extreme attitudes (Blankenship & Craig, 2007). Consequently, when people indicate that they have positive attitudes towards something, confidence should suggest that they like it even more. This, in turn, should enhance persuasion (Packard & Berger, 2017).

Likability Route

Building on this assumption, Kirmani and Zhu (2007) measure persuasion knowledge activation using items that assess the sincerity of a message (e.g., "unbelievable," "not truthful," "deceptive").

Considerations of others' competence and warmth tend to dominate person perception (Fiske, Cuddy, & Glick, 2007). We therefore consider the possibility that confidence enhances persuasion because it makes speakers seem more warm or likable. People strongly associate confidence with attractiveness and likability (DeGroot, Aime, Johnson, & Kluemper, 2011; Hecht & LaFrance, 1995; Zuckerman & Driver, 1989). Because people are more likely to comply with the requests of those they like (Cialdini & Goldstein, 2004), perceived confidence might enhance persuasion by making speakers seem more likable.

Competence Route

Yet another possibility could be that confidence might enhance persuasion by signaling that a speaker is competent or possesses domain expertise. Confidence serves as a credibility cue that makes communicators appear competent (Anderson, Brion, Moore, & Kennedy, 2012; Price & Stone, 2004; Sniezek & Van Swol, 2001; Van Zant & Moore, 2013). Because people believe competent individuals possess superior judgment, they tend to follow their advice (Pornpitakpan, 2004). Accordingly, even in subjective domains where there is no objectively correct outcome or truth (e.g., a recommendation about a good or service), confidence can make communicators seem to possess more expertise (Karmarkar & Tormala, 2009) and make them more persuasive (Zarnoth & Sniezek, 1997). This suggests that speakers might modulate their voice during paralinguistic attempts in a manner that conveys competence or domain expertise and enhances persuasion.

Dominance Route

Although it can often be correlated with one's competence, dominance is another viable route to persuasion that communicators can wield independently of how competent others perceive them to be (Cheng, Tracy, Foulsham, Kingstone, & Henrick, 2013). Therefore, a final possibility we consider is that confidence enhances persuasion through dominance. Because people infer communicators' dominance from the way they modulate their voice (Cheng, Tracy, Ho, & Henrich, 2016), this suggests that when conveying confidence, speakers may also convey a sense of pressure or urgency that makes perceivers comply with their wishes.

Experiments 4A and 4B: Replicating Paralinguistic Persuasion and Probing the Confidence Account

The cross-study analysis provides evidence for the role of increased volume and variability in volume in driving the persuasion process. In Experiments 4A and 4B, we aimed to replicate the effects of paralinguistic attempts on speakers' use of volume cues (Experiment 4A) while assessing whether our effects extend beyond perceivers' attitudes and impact their choice (Experiment 4B). Further, we aimed to explore the confidence account by understanding more precisely how speakers' confidence displays during paralinguistic attempts enhance persuasion.

Experiment 4A

Given that our cross-study analyses was exploratory in nature, we first aimed to confirm speakers' use of volume cues during paralinguistic attempts by conducting a replication study on a separate sample of participants. Further, to address alternative explanations for our findings, we made two adjustments to the procedure used to generate stimulus recordings in Experiment 3. First, we provided participants with an incentive to compose their control condition recording. One could worry that the results of Experiments 1-3 were somehow driven by the fact that participants could earn additional payment in the paralinguistic attempt condition, but not in the control condition. We therefore ensured that participants had the opportunity to earn extra compensation in both conditions.

Second, we used clip-on microphones with a windscreen. In the prior studies, speakers spoke into a microphone attached to a computer. Consequently, one might be concerned that our volume effects reflect variance in participants' distance from the computer rather than actual speaking volume. Clip-on microphones remedy this issue because they remain at the same distance from speakers' mouth regardless of how close they are to the computer screen. The addition of a windscreen also helps filter out low-frequency energy generated by speakers' wind bursts.

Participants

Based on a preregistered data collection rule aimed at recruiting a minimum of twenty speakers with two valid recordings (http://aspredicted.org/blind.php?x=af6c9t), we ended up with a final sample of 44 speakers (M_{Age} = 24.59, *SD* = 11.96, 34% female, from a public East Coast University). This total excludes one participant who failed to record the review twice.

Procedure

Upon arriving to the laboratory, speakers sat in a private room while a research assistant attached a clip-on microphone to their shirt lapel before leaving the room. Speakers then proceeded to perform the same emotion-recognition tasks as those in Experiment 3. They wrote a positive review about one of the tasks, using the same prompt as speakers in Experiment 3 who were not prompted to engage in a linguistic persuasion attempt.

We then manipulated paralinguistic persuasion attempts by asking speakers to record their prepared statement aloud twice: once when making a paralinguistic attempt and once when preparing a control recording without any such attempt (randomized order). The prompt in the paralinguistic attempt mirrored those presented to Experiment 3 speakers. However, we adapted the control condition prompt to allow speakers the opportunity to earn a $50 gift card for simply creating a recording, regardless of their ability to persuade future research participants. This ensured that both of their recordings presented an opportunity to earn a bonus payment. Whereas speakers in the paralinguistic attempt condition could be eligible if they successfully persuaded others, those in the control condition were eligible irrespective of their success at persuading.

In total, we obtained 88 stimulus recordings for use in vocal cue analyses (44 speakers reading the same review twice). Aside from the one speaker we omitted due to failing to record the review twice, all participants conformed to the experimental instructions and did not deviate from the linguistic content of their review.

To analyze speakers' cue display, we used the same multilevel modeling approach as in the Brunswikian Lens Analysis. We did not find evidence of any paralinguistic attempt X speaker gender interaction effects on speakers' paralinguistic cues.

Results and Discussion

Volume cues. Results replicated the Brunswikian Lens Analysis findings regarding speakers' volume ($z = 4.87$, $p < .001$) and volume variability ($z = 2.39$, $p = .017$). Compared to the control, speakers spoke with a louder volume and varied their volume more when attempting to persuade (see Table 2 for conditional means).

Other cues. Results also replicated the cue display pattern where, relative to the control condition, speakers increased their pitch ($z = 4.38$, $p < .001$) and varied their pitch to a greater extent ($z = 2.39$, $p = .017$) while engaging in paralinguistic attempts (see Table 2 for conditional means). As with the Brunswikian Lens Analysis, we failed to identify effects of paralinguistic attempts on speakers' intonation and use of pauses (both *p*s > .25). The pattern where speakers increased their speech rate while attempting to persuade also did not replicate. In fact, speakers spoke at a slightly *slower* rate in the paralinguistic attempt condition than in the control condition, although the effect was not significant ($z = 0.85$, $p = .39$).

Discussion

By replicating the effects in the Brunswikian Lens Analysis where speakers increased their volume and varied their volume to a greater degree during paralinguistic attempts, we confirmed the causal effect of paralinguistic attempts on speakers' volume cues. Further, although these cues do not influence attitudes, we again found that speakers increased their pitch and variance in pitch while engaging in paralinguistic attempts. However, it is noteworthy that we did not replicate the finding where speakers increased their speech rate while attempting to persuade.[12]

Given that the current study also used a microphone with a windscreen that could block speakers' low-frequency air bursts, we also reassessed whether speakers' increased concentration of high-frequency energy from wind bursts might have reduced their tendency to emit high-frequency energy when engaging in paralinguistic attempts. As expected, participants' relative use of low-frequency energy declined in Experiment 4A relative to Experiments 1-3 (see SOM), $t(274) = 8.18$, $p < .001$; this suggests that the use of a windscreen effectively reduced speakers' low-frequency noise. Further, we found that the effect of paralinguistic attempts on speakers' use of high-frequency energy was reduced in relation to Experiments 1-3 ($z = 2.36$, $p = .019$), and was no longer significant ($z = 1.45$, $p = .15$). This lends some credence to the idea that what may have appeared to be a paralinguistic persuasion strategy of increasing their high-frequency

[12] Our experimental design was very similar to Experiment 3 (which produced similar effects as Experiments 1 and 2), but subtle changes in the experimental procedure (e.g., the introduction of a bonus payment opportunity in the control condition) or the use of a different participant pool could potentially account for the null result.

energy in Experiments 1-3 might actually reflect speakers' reduced use of low-frequency air pressure. Although beyond the scope of this paper, psycholinguistic research that more carefully breaks down units of speech (e.g., consonants and plosives versus vowels) and tests for differential effects of paralinguistic attempts on these units of speech could shed more light on why the use of a windscreen reduced speakers' tendency to use high-frequency energy during paralinguistic attempts. At the very least, these findings suggest that in a more carefully controlled environment with a microphone that blocks low-frequency air pressure, paralinguistic attempts do not appear to have a strong influence on speakers' use of high-frequency energy.

Ancillary analysis: Were speakers' confidence displays strategic? With the goal of replicating the ancillary analyses of Experiment 3, we also asked speakers about the extent to which they attempted to convey confidence when engaging in paralinguistic attempts and in their control recordings. Once again, we found that speakers attempted to convey more confidence during paralinguistic attempts than in the control condition ($M_{\text{Paralinguistic}} = 6.07$, $SD = 1.37$ vs. $M_{\text{Control}} = 5.14$, $SD = 1.56$), $t(43) = 3.28$, $p = .002$, $d = 1.00$, 95% CI = [0.56, 1.44].

Experiment 4B

In addition to testing whether the effect of paralinguistic attempts extends beyond attitudes and impacts perceivers' choice, Experiment 4B had two additional goals in mind. First, we attempted to gain a more precise understanding of the confidence account. Although the prior studies consistently demonstrate that paralinguistic attempts enhance persuasion through perceptions of speakers' confidence, it is unclear exactly why this might be the case. Therefore, Experiment 4B considers four different routes through which confidence might enhance persuasion: 1) by sending a signal about how much communicators like the task (attitude extremity route), 2) by making speakers likable (likability route), 3) by making speakers appear knowledgeable about the task at hand (competence route), or 4) by causing perceivers to comply with perceived pressure from speakers (dominance route).

Second, we probe why paralinguistic persuasion attempts did not backfire, despite evidence in Experiment 3 that they are detectable. A critical assumption of the confidence account is that even when speakers' intent to persuade is detected in their paralinguistic attempts, their confidence displays are effective because they do not appear disingenuous. Although paralinguistic attempts may not necessarily boost speakers' perceived sincerity, we predicted that they are effective in part because they allow communicators to convey confidence without undermining their perceived sincerity. Because we alerted participants in Experiment 3 about speakers' potential incentive to persuade, this could have made them more vigilant in attempting to detect speakers' paralinguistic attempts. In Experiment 4B, we address this issue by removing the warning about speakers' potential incentive to persuade.

Selection of Recordings

In our prior studies, we identified small effects of paralanguage on attitudes (d = .21 for Experiments 1-3). Taking these small effects into consideration with our interest in using a binary dependent measure of choice, which we expected to reduce statistical power (cf. Ragland, 1992), we aimed to increase our statistical power through the selection of recordings presented to participants.

In the interest of increasing power while still using stimuli that are ecologically representative of the paralinguistic persuasion attempts we observed in our studies, we aimed to identify speakers from Experiment 4B whose paralinguistic attempts (relative to control recordings) 1) exhibited systematic variance in cues critical to the paralinguistic persuasion process (volume and variance in volume) aligned with the mean of our speaker sample while 2) exhibiting relatively little variance in other paralinguistic cues. In adopting this approach, we aimed to present participants with recordings that contained ecologically valid variation in volume cues across paralinguistic attempts and control recordings (cf. Brunswik, 1955). However, by taking steps to reduce speakers' variability in other cues across paralinguistic attempt and control conditions, we aimed to increase statistical power by reducing variance in cues that did not impact perceivers' attitudes in Experiments 1-3 (cf. Meyvis & Van Ossealar, 2017). To further bolster power, we restricted the number of speakers used for the main experiment to one male and one female in order to minimize between-speaker variance attributable to differences in the content of speakers' script. We used the following procedure to accomplish this (preregistered at http://aspredicted.org/blind.php?x=he6w5z):

1. We computed a difference score representing each speaker's conditional difference (paralinguistic – control) in volume and variance in volume relative to the mean conditional difference of same-gender speakers. For speaker *i*'s use of a given cue, this meant computing the following score (n = number of same-gender speakers):

$$Difference_i = (Paralinguistic_i - Control_i) - \mu, \text{ where}$$

$$\mu = \frac{\sum_{i=1}^{n}(Paralinguistic_i - Control_i)}{n}$$

2. To put the difference score in (1) on a common scale for volume and volume variability, we standardized by the standard deviation for all same-gender participants and took its absolute value (scores approaching zero indicate a smaller standardized deviation from the mean of all speakers' conditional difference for that particular cue):

$$z_{Difference_i} = abs\left[\frac{Difference_i}{std(Difference)}\right]$$

3. We summed the standardized difference scores obtained in (2) for volume and variance in volume and identified the male and female whose scores were the closest to zero.
4. We verified that these speakers' conditional difference in every other cue (pitch, pitch variance, final velocity, articulation rate, pauses) was within one standard deviation of the sample standard deviation for same-gender speakers across conditions.[13]

Both speakers selected for the main experiment conformed to our instructions to read their reviews word-for-word. Their recordings did not contain any extraneous words or disfluencies. We provide acoustics for these speakers in the SOM (Table S4).

Main Experiment

Participants. Although we took steps to reduce between-speaker variance with our selection of speaker stimuli, we anticipated that we would need even more statistical power than Experiment 3 to detect an effect of paralinguistic persuasion cues on participants' binary choice. As such, we increased our power threshold and aimed to recruit a minimum of 1,300 participants, which is approximately the amount needed to detect an effect of $d = 0.2$ with 95% power. To accomplish this goal, we posted 1,305 assignments to Amazon Mechanical Turk and stopped data collection once all assignments had been submitted. This resulted in a final sample of 1,313 participants ($M_{\text{Age}} = 36.02$, $SD = 11.10$, 43% female; those who failed a sound check were rejected before viewing dependent measures).

Procedure. Participants followed the same procedure as those in Experiment 3. However, we made three modifications. First, instead of measuring persuasion using an

[13] Because we explored speakers' concentration of high-frequency energy after conducting this study, it was not a part of our preregistration. Nonetheless, our selected speakers' concentration of high-frequency energy met this criterion (see SOM).

attitudinal scale, we assessed participants' choice by asking them to choose whether they would like to spend the duration of the study completing the task recommended by the speaker (guessing emotions from facial expression) or an alternative task (guessing emotion from body posture).

Second, we added additional measures. We added four of them to use as potential mediators that might explain the link between confidence and persuasion. We also added a measure assessing perceptions of speakers' sincerity. To measure confidence ($\alpha = .91$) and persuasion awareness, we used the same measures as Experiment 3.

Third, we did not warn participants about the possibility of speakers' intent to persuade like we did in Experiment 3. We made this modification in order to verify that paralinguistic persuasion attempts enhance the detectability of paralinguistic attempts in a context where participants do not necessarily have reason to believe speakers have persuasion motives.

Potential mediators. First, to measure perceived attitude extremity, we adapted a prior measure used by Pagoto, Spring, Cook, McChargue, and Schneider (2006) by asking participants about the extent to which listeners thought speakers found the task to be enjoyable, had a pleasant experience with the task, and were engaged with the task ($\alpha = .86$).[14] For this and all other measures, participants indicated their agreement on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

[14] This operationalization is consistent with prior research assessing perceptions of others' attitudes, as enjoyment and pleasantness have been used as proxies for others' attitude extremity or degree of liking (e.g., Packard & Berger, 2017). Because our context involves predictions about speakers' attitudes towards a task, we also included an item assessing "engagement" because it is an indicator of how fun and enjoyable people find a task (Read, MacFarlane, & Casey, 2002). However, if we remove the "engagement" item, all effects we report involving perceptions of speakers' attitudes hold.

Second, we measured likability by asking participants to indicate their agreement with the statement "the speaker is likable" (adapted from Van Zant & Kray, 2014).

Third, to measure perceptions of speakers' competence, we asked participants about the extent to which speakers were "knowledgeable about emotion-recognition tasks" (Packard & Berger, 2017).

Finally, to measure the extent to which speakers exerted dominance, we used a two-item measure adapted from Cheng et al. (2013): "the speaker was pushy" and "I felt like the speaker was pressuring me to choose one of the emotion-recognition tasks favorably" ($\alpha = .86$).

Sincerity. We measured perceptions of speakers' sincerity using three items adapted from Barasch, Berman, and Small (2016): "the speaker was sincere when discussing the task," "the speaker's opinion about the task was genuine," and "the speaker was being truthful when discussing his or her feelings about the task" ($\alpha = .93$). Participants indicated their agreement with these statements on the same response scale as the measures described above.

Because we only used stimuli generated from two different speakers, we used fixed effects models when estimating effects associated with speakers' cue utilization to account for variance attributable to between-speaker differences.[15] As such, we analyzed the effect of paralinguistic persuasion cues on participants' choice using a logistic regression model with a speaker fixed effect. Similarly, all other variables were analyzed using a fixed-effect linear regression model. To conduct mediation analyses, we used the procedure outlined by MacKinnon and Dwyer (1993) for models with binary dependent variables. All analyses we report follow our preregistered data analysis plan (https://aspredicted.org/blind2.php).

[15] Variance components of random effects tend to be underestimated in multilevel models when there are fewer than 10 clusters (Austin, 2010).

Results

Causal Effects of Paralinguistic Persuasion Cues. First, we tested the effect of paralinguistic persuasion attempts on choice and speakers' perceived confidence.

Choice. Paralinguistic persuasion attempts influenced participants' task choice, $z = 2.49$, $p = .013$, OR = 1.40, 95% CI = [1.07, 1.83]. Relative to the control condition (76%), paralinguistic attempts increased participants' likelihood of choosing the same task reviewed by speakers (81%).

Confidence. Consistent with our prior results and the confidence account, paralinguistic persuasion attempts also made speakers appear more confident ($M_{\text{Paralinguistic}} = 5.74$, $SD = 1.05$ vs. $M_{\text{Control}} = 5.15$, $SD = 1.35$), $t(1310) = 8.89$, $p < .001$, $d = 0.49$, 95% CI = [0.38, 0.60].

Mediation. Consistent with the confidence account, and our prior studies, perceptions of speakers' confidence mediated the effect of paralinguistic persuasion attempts on participants' choice. Confidence predicted choice independently of the presence of a paralinguistic attempt, $B = 0.27$ ($SE = 0.05$), $z = 5.07$, $p < .001$. Further, controlling for confidence reduced the effect of paralinguistic attempts on choice (from OR =1.40, $p = .013$, to OR = 1.19, $p = .22$). A bootstrap with 5,000 replications revealed a significant indirect of paralinguistic persuasion attempts on choice through confidence, $Z = 4.45$, $p < .001$, indirect effect = 0.04, 95% CI = [0.02, 0.06].

Probing the confidence account. We then tested the various routes through which paralinguistic attempts influenced confidence. First, we tested for main effects of paralinguistic attempts on perceptions of speakers' attitudes, likability, competence, and dominance. Paralinguistic persuasion attempts made speakers appear to: 1) hold more favorable attitudes about the focal task ($M_{\text{Paralinguistic}} = 5.34$, $SD = 0.97$ vs. $M_{\text{Control}} = 4.61$, $SD = 1.35$), $t(1310) = 11.39$, $p < .001$, $d = 0.63$, 95% CI = [0.52, 0.74], 2) be more likable ($M_{\text{Paralinguistic}} = 5.28$, $SD =$

1.14 vs. $M_{Control}$ = 4.57, *SD* = 1.40), *t*(1310) = 10.15, *p* < .001, *d* = 0.56, 95% CI = [0.45, 0.67], 3) possess more competence ($M_{Paralinguistic}$ = 5.30, *SD* = 1.13 vs. $M_{Control}$ = 4.81, *SD* = 1.39), *t*(1310) = 7.04, *p* < .001, *d* = 0.39, 95% CI = [0.28, 0.50], and 4) be more dominant ($M_{Paralinguistic}$ = 2.82, *SD* = 1.60 vs. $M_{Control}$ = 2.61, *SD* = 1.46), *t*(1310) = 2.60, *p* = .009, *d* = 0.14, 95% CI = [0.04, 0.25].

To explore which of these measures might explain why confidence impacted choice, we conducted a serial mediation analysis (Figure 3). Having already established an indirect effect of paralinguistic persuasion attempts on choice through confidence, we focus on testing whether confidence mediated the effect of paralinguistic attempts on each of these measures and then explore which of these measures might uniquely explain any downstream effect of confidence on choice.

We first conducted four separate regressions to determine whether confidence mediated the effect of paralinguistic persuasion attempts on each measure reported above. When controlling for paralinguistic attempts, confidence predicted perceptions of speakers' attitudes, *t*(1309) = 30.06, *p* < .001, speakers' likability, *t*(1309) = 20.74, *p* < .001, and speakers' perceived competence, *t*(1309) = 22.74, *p* < .001, However, confidence did not predict perceptions of speakers' dominance, *t*(1309) = 1.50, *p* = .13. A series of bootstraps with 5,000 replications revealed indirect effects of paralinguistic attempts through confidence on perceptions of speakers' attitudes (*Z* = 8.52, *p* < .001, indirect effect = 0.36, 95% CI = [0.28, 0.45]), likability (*Z* = 8.17, *p* < .001, indirect effect = 0.31, 95% CI = [0.24, 0.39]), and competence (*Z* = 8.28, *p* < .001, indirect effect = 0.33, 95% CI = [0.25, 0.42]).

We then examined whether the indirect effects reported above could account for the indirect effect of paralinguistic attempts on choice through confidence. To do this, we ran a regression predicting the effect of confidence on choice (controlling for paralinguistic persuasion attempts), and then added perceptions of speakers' attitudes, likability, competence, and dominance as simultaneous mediators. When controlling for confidence, perceptions of speakers' attitudes towards the focal task positively predicted choice, $B = 0.21$ ($SE = 0.09$), $Z = 2.34$, $p = .02$. In contrast, perceptions of speakers' dominance *negatively* predicted choice after controlling for confidence, $B = -0.34$ ($SE = 0.05$), $Z = 7.40$, $p < .001$. Speakers' likability and competence did not predict choice independently of confidence (both *p*s > .10). A bootstrap with 5,000 replications revealed an indirect effect of confidence on choice through speakers' perceived attitude, $Z = 2.28$, $p = .023$, indirect effect = 0.08, 95% CI = [0.01, 0.15]. Although it predicted speakers' choice, we did not find evidence of an indirect effect through dominance, $Z = 1.57$, $p = .12$, 95% CI = [-0.01, 0.09].

Taken together, these analyses suggest that confidence perceptions triggered by paralinguistic persuasion attempts enhanced persuasion through an attitude extremity route. Speakers' perceived confidence in their positive review led to the perception that they possessed more positive attitudes about the task they reviewed positively in their message. This perceived conviction in their stance made speakers more persuasive. Although paralinguistic attempts also influenced perceptions of speakers' likability, competence, and dominance, we did not find evidence of indirect effects of confidence on persuasion through these impressions.

Why did paralinguistic attempts not backfire? As in Experiment 3, we again tested whether participants could detect speakers' paralinguistic attempts. Further, we examined whether speakers telegraphed their intent to persuade without undermining their sincerity.

Persuasion awareness. As in Experiment 3, participants detected speakers' intent to persuade from their paralinguistic persuasion attempts ($M_{\text{Paralinguistic}} = 4.25$, $SD = 1.60$ vs. M_{Control}

= 3.78, SD = 1.70), $t(1309) = 5.22$, $p < .001$, $d = 0.29$, 95% CI = [0.18, 0.40]. Once again, this is direct evidence against the detectability account.

Sincerity. As expected, paralinguistic persuasion attempts did not undermine speakers' sincerity. In fact, although we did not hypothesize it, they actually *enhanced* speakers' perceived sincerity ($M_{\text{Paralinguistic}} = 5.61$, SD = 1.05 vs. $M_{\text{Control}} = 5.10$, SD = 1.32), $t(1309) = 7.71$, $p < .001$, $d = 0.43$, 95% CI = [0.32, 0.54].

Discussion

Manipulating paralinguistic persuasion attempts (volume and volume variability) in a naturalistic, yet controlled manner, Experiment 4B demonstrates that they impact choice. Notably, we again found evidence consistent with the confidence account. However, Experiment 4B allows us to glean some insight into exactly *how* confidence enhances persuasion. Specifically, we found that although paralinguistic attempts made speakers appear more likable, knowledgeable, and dominant, we did not find evidence that these impressions could explain why confidence enhanced persuasion. Instead, we found that confidence influenced participants' choice through its tendency to signal that speakers' positive review reflected more positive internal attitudes about the task. Participants appeared to infer speakers' attitudes from their confidence in their review; to the extent that speakers were perceived as holding more positive internal attitudes about the focal task, participants were more likely to choose to perform that same task. This provides evidence for confidence enhancing persuasion via an attitude extremity route.

Finally, Experiment 4B also sheds some light as to why, despite being detectable, paralinguistic persuasion attempts do not backfire. Although we simply expected that paralinguistic attempts would not undermine speakers' perceived sincerity, we ultimately found evidence that they *enhanced* speakers' perceived sincerity. This finding helps us reconcile our findings with other research demonstrating that persuasion attempts often backfires when speakers' intent to persuade is known (e.g., Campbell & Kirmani, 2000; Kirmani & Zhu, 2007). Although awareness of a communicator's intent to persuade often undermines his or her perceived sincerity (Kirmani & Zhu, 2007), judgments of communicators' sincerity and their intent to persuade do not necessarily go hand-in-hand (e.g., Kirmani & Campbell, 2004; Tuk, Verlegh, Smidts, Wigboldus, 2009). Therefore, it appears that one reason paralinguistic attempts do not backfire is because they make speakers' transparent persuasion attempts appear motivated by genuine conviction in their message, as opposed to an ulterior motive like financial gain.

However, these results should be interpreted with some caution. First, unlike our prior studies, we only presented participants with a small subset of recordings generated by speakers. Although we adopted this approach in the interest of increasing statistical power while maintaining ecological validity in the strength of our manipulation, it could be possible that our speaker selection procedure inadvertently introduced a selection bias where we selected on speakers who were unusually effective at paralinguistic persuasion. This raises the possibility that Experiment 4B overestimates the extent to which other speakers' paralinguistic attempts would impact choice.

Second, our exploration of the confidence account is merely a first step in gaining a better understanding of how paralinguistic confidence enhances persuasion. Although we found evidence that perceptions of speakers' attitude extremity was critical to driving the persuasion process, we only considered a context where speakers were advocating in favor of a task. Future research would be well advised to engage in a more thorough exploration of the attitude extremity route by considering whether speakers' efforts to persuade others to view an attitude object *un*favorably through paralinguistic confidence displays enhance persuasion by signaling extreme negative attitudes. Relatedly, we focused our exploration of the confidence account on four routes we considered particularly likely to explain how confidence enhances persuasion in our empirical context. Of course, there may be other routes through which confidence enhances persuasion. Our finding in favor of attitude extremity as a central driver of paralinguistic persuasion by no means conclusively rules out the possibility that other routes to persuasion we did not consider may exist, nor does it even rule out the possibility that the routes to persuasion we did consider might explain how confidence enhances persuasion in other contexts.

General Discussion

The study of persuasion is almost as old as psychology itself (Murphy, Murphy, & Newcomb, 1937). But while decades of research have studied persuasive language (Cialdini, Petty, & Cacioppo, 1981), there has been less attention to paralanguage, or how people modulate their voice to deliver the words they use.

Four experiments find evidence that paralanguage persuades, even in contexts where linguistic persuasion attempts are ineffective. Rather than flying under the radar (i.e., the detectability account), the results suggest that paralinguistic attempts work because they make communicators seem more confident. When trying to vocally persuade, communicators speak louder, and with greater variability in volume. These behaviors make them seem confident, which enhances persuasion by making them appear to hold more extreme attitudes consistent with the stance they take.

Theoretical Implications

Our findings have several implications for theories of persuasion and nonverbal behavior. First and foremost, they establish paralinguistic persuasion as a process triggered by communicators' efforts at nonverbal self-presentation (DePaulo, 1992). In examining paralinguistic persuasion as a dynamic process that begins with communicators modulating their voice to signal confidence, we find that communicators' intent to persuade shapes the persuasion process. Because prior research on persuasion has almost exclusively focused on how specific linguistic and paralinguistic cues impact perceivers, we have a limited understanding of how people adapt their behavior during attempts to persuade others—let alone whether they succeed. In demonstrating that communicators can effectively modulate their voice to persuade others, we build on a limited set of prior research that has even considered how communicators adapt their behaviors during persuasion attempts executed through linguistic or paralinguistic channels (Hall, 1980; Mehrabian & Williams, 1969, Rocklage, Rucker, & Nordgren, 2018).

Second, our findings demonstrate that paralinguistic persuasion attempts have unique benefits that linguistic attempts do not. Although persuasion attempts may sometimes be ineffective in spontaneous video-based appeals (Barasch et al., 2016), prior work has not differentiated between linguistic and paralinguistic approaches. Communicators' paralanguage naturally varies with the language they use (Halliday, 1970), so differentiating the effects of linguistic persuasion attempts from those of paralinguistic attempts is critical to understanding how people can effectively persuade others. Our finding that communicators failed to effectively convey confidence through linguistic channels, despite succeeding through paralinguistic channels, suggests that they are more effective at persuading through paralanguage.

We also find evidence that, despite being detectable from their paralinguistic cues, communicators' intent to persuade does not undermine their perceived sincerity. Although research testing the Persuasion Knowledge Model (Friestad & Wright, 1994) often focuses on the notion that persuasion attempts backfire when people can detect communicators' intent to persuade (e.g., Campbell, 1995; Campbell & Kirmani, 2000; Kirmani & Zhu, 2007), we find that detecting speakers' intent to persuade does not undermine the efficacy of their persuasion attempts executed through paralanguage. Similar to prior work demonstrating that people cooperate with those they perceive to be helpful (Kirmani & Campbell, 2004), our findings suggest that having one's persuasive intentions detected does not necessarily undermine the pitch. What is more critical to the persuasion process is that persuasion attempts are executed in a manner that appears to reflect a sincere desire to help. Paralinguistic attempts are one way to accomplish this.

Finally, we provide clarity on what paralinguistic cues speakers actually use during persuasion attempts and which of these cues influence the persuasion process. Consistent with the one paper to explore the effect of communicators' intended persuasiveness on their paralinguistic cues (Mehrabian & Williams, 1969), we found evidence that communicators increased their volume during persuasion attempts, along with mixed evidence that they increased their speech rate.

Limitations and Future Directions

Perhaps the most obvious practical implication of our research is that communicators motivated to persuade others might be best suited focusing less on the words they use and more on *how* they nonverbally deliver the message. People falsely intuit that their language plays more of a role in shaping others' impressions than paralanguage (Schroeder & Epley, 2015). Consequently, one reason spontaneous persuasion attempts may fail (e.g., Barasch et al., 2016) is because people focus on the linguistic content of their appeals at the expense of the paralinguistic delivery of the language they use. Planning ahead may help solve this issue. By crafting their language in advance, communicators may be able to focus more on paralanguage in the heat of the moment when delivering a message. Future research would be well advised to consider practical strategies communicators could implement to maximize their chances of delivering a linguistically coherent message while giving their vocal delivery the attention it warrants.

Relatedly, it is worth considering whether speakers can use particular strategies to enhance the efficacy of their vocal delivery. Although communicators' paralinguistic attempts were generally successful, we note that the overall effect was small. This suggests that there may be a lot of untapped potential for communicators to improve the efficacy of their paralinguistic persuasion attempts. Prompting them to use concrete and proven paralinguistic persuasion strategies might enhance their efficacy. Based on our findings and others showing positive effects of volume on persuasion (Oksenberg et al., 1986; Packwood, 1974), it seems that encouraging people to speak moderately louder and to selectively vary their loudness would be a promising tactic that should enhance their persuasiveness. Applied research that considers these tactics and other strategies that allow speakers to enhance their vocal persuasiveness holds considerable promise (Ketrow, 1990).

But volume cues may not be the only ones that matter. First, we found some evidence that voice quality may also impact the persuasion process. Although it did not replicate when we used a more carefully controlled environment (Experiment 4A), speakers used a greater proportion of high-frequency energy (relative to low-frequency energy) in Experiments 1-3; this appeared to explain the effect of volume on perceivers' attitudes. People use a greater proportion of high-frequency energy when trying to exert control over others (Weinstein, Zougkou, & Paulmann, 2018), so it could be possible that in some circumstances speakers modulate their use of high-frequency energy when attempting to influence others. However, unlike volume, which is a vocal cue that laypeople are familiar with and can modulate on command (e.g., Nordenberg

Comment [JB4]: Given it doesn't replicate, why give it more weigh? I would suggest downplaying

& Sundberg, 2004; Sundberg & Nordenberg, 2006; Master, De Biase, Chiari, & Lukkanen, 2008), they may require vocal training before they can effectively modulate their high-frequency energy independently of volume. For example, trained stage actors learn to concentrate their energy in higher frequencies than laypeople across a variety of volume levels (Bele, 2006; Master et al., 2006; Nawka, Anders, Cebulla, & Zurakowski, 1997). Given the strong dependency of high-frequency energy on volume (Nordenberg & Sundberg, 2004; Sundberg & Nordenberg, 2006) and perceivers' association of high-frequency energy with loudness (Master et al., 2006; Pinczower & Oates, 2005), untrained speakers attempting to enhance their persuasiveness might be better served by simply attempting to speak louder—irrespective of whether their volume directly enhances persuasion or does so indirectly through an increased use of high-frequency energy.

Second, it could be possible that some cues that failed to influence perceivers' attitudes in our studies impact persuasion in different contexts. Although we did not replicate these findings in our studies, other research has identified effects of increased pitch (Oksenberg et al., 1986), increased speech rate (Mehrabian & Williams, 1969; Miller, et al., 1976), and fewer pauses (Burgoon et al., 1990), on persuasion. But these cues might matter in different contexts. In our experimental context, confidence enhanced persuasion through attributions perceivers made about communicators' attitudes. However, we investigated persuasion in the domain of subjective judgments in the form of recommendations about an attitude object. In these types of interactions, considerations about communicators' internal attitudes towards an attitude object are likely to dominate considerations about communicators' competence. Volume may be a particularly important cue in these situations because it helps place an emphasis on key words or phrases that highlight one's attitude or subjective stance. As observed by Scherer (1979), people raise their volume to emphasize key points. Therefore, speakers in our studies may have been persuasive because they strategically raised their baseline volume at selected moments to place an emphasis on portions of their messages they deemed most important.

In contrast, other paralinguistic cues may be influential in more objective domains where accurate judgments are paramount. Although perceivers use volume as a cue to communicators' competence (Oksenberg et al., 1986), they also associate competence with a faster speech rate (Smith, Brown, Strong, & Rencher, 1975; Street, Brady, & Putnam, 1983), fewer pauses (Burgoon et al., 1990; Brennan & Williams, 1995), and falling intonation (Brennan & Williams, 1995). This suggests that when it is particularly important for perceivers to be accurate or verify the veracity of communicators' claims (e.g., Miller et al., 1976), these competence-signaling cues might play more of a role in the persuasion process.

Further, considerations of social context might dictate whether other cues might enhance persuasion. For example, when there is an opportunity to develop a continued relationship with a communicator, perceivers may be particularly attentive to cues that influence their liking for communicators. Because variability in pitch tends to increase perceptions of benevolence (Brown, Strong, & Rencher, 1973) and mindfulness (Schroeder & Epley, 2016), it might be particularly relevant in these types of contexts. Indeed, Oksenberg et al. (1986) found that telephone surveyors with a variable pitch were more effective at appearing likable and convincing people to agree to an extended phone interaction. Relatedly, when communicators have some degree of power over perceivers, dominance might be a viable route to persuasion. This suggests that when communicators have the capacity to wield authority over perceivers or credibly threaten them in some manner, dominance cues like a lowered pitch might enhance persuasion (Cheng et al., 2016; Klofstad et al., 2012; Klofstad, Anderson, & Nowicki, 2015).

These considerations about how context might dictate which vocal cues enhance persuasion highlights a major gap in the literature on nonverbal behavior and persuasion. Because virtually all research in the area (including the current research) focuses on a single context within a given paper, researchers have given very little consideration to how various social psychological factors might impact the efficacy of different paralinguistic persuasion cues. Clearly, such an endeavor would be a tall order in any single paper. As such, meta-analytic research considering how contextual factors moderate the effect of different paralinguistic cues on persuasion could help account for discrepant findings across studies.

Another worthwhile avenue of research could be in exploring whether paralinguistic attempts work though simple heuristics, such as confidence (e.g., Price & Stone, 2004), or through more deeply shaping how communicators' arguments are processed. Although paralinguistic cues may enhance persuasion by increasing communicators' perceived credibility independently of the underlying merits of their argument (Miller et al., 1976; Petty & Cacioppo, 1986), they can simultaneously cause listeners to differentially process the arguments at hand. For example, Guyer and colleagues (2018) find that some specific paralinguistic confidence cues (speech rate, pitch, and intonation) can impact attitudes through both simple heuristics and deliberative argument processing.

The cognitive mechanisms underlying the paralinguistic persuasion attempts we investigated are unclear. Increased volume, for example, may signal confidence and increase persuasion via a simple heuristic that confident speakers are more credible. That being said, people are also less likely to scrutinize the central arguments of communicators they perceive as confident (e.g., Sah et al., 2013). This suggests that they may be more likely to process and counter-argue persuasive appeals from communicators who speak at a low volume and appear unconfident, thereby impacting persuasion through differential argument processing. Whether and when paralinguistic attempts influence persuasion through more central versus peripheral routes is an interesting direction that deserves attention.

Follow-up work might also examine other communication modalities or channels. These findings highlight the importance of confidence displays and auditory channels as a conduit allowing communicators to signal confidence. However, they also suggest that communication mediums allowing other nonverbal behaviors to be conveyed may further enhance the efficacy of planned persuasion attempts. For example, visual channels may allow communicators to display confidence through behaviors like an expansive posture, which may increase the effectiveness of persuasion attempts in face-to-face interactions and video-based appeals.

Conclusion

These findings not only shed light on vocal communication, but they also provide insight into how technology may shape social interaction. Technology has shifted the way we communicate. Rather than calling on the phone or talking face-to-face, computers, phones, and other devices have encouraged people to interact via text and email. But at least when trying to persuade, our findings suggest advantages to mediums that allow one's voice to be heard. More generally, vocal channels have impression management benefits that communicators often fail to anticipate (Schroeder & Epley, 2015). While some may prefer text-based modalities because it allows them to construct and refine what to say (Berger and Iyengar 2013; McKenna & Bargh, 2000; Toma, Hancock, & Ellison, 2008), the value of voice warrants consideration.

Finally, these results have clear implications for politicians, public health officials, and anyone trying to persuade. Beyond *what* to say, focusing on *how* to say it (i.e., paralanguage) may increase influence.

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Table 1

Experiments 1-3: A Brunswikian Lens Analysis of Paralinguistic Persuasion

	Cue Display	Cue Utilization
Cue	Effect of paralinguistic persuasion attempt on cue (β)	Effect of cue on attitudes (β)
Volume (dB)	.16 (.02)***	.09 (.03)***
Volume SD_{Norm}	.08 (.03)*	.06 (.03)*
Pitch (ST)	.06 (.02)***	.02 (.07)
Pitch SD_{Norm}	.09 (.03)**	.04 (.03)
Intonation (ΔST/sec)	-.002 (.07)	-.03 (.04)
Articulation Rate (syllables/sec)	.08 (.04)*	-.03 (.04)
Pauses	.06 (.04)	-.03 (.04)

Note. $N_{recordings}$ (cue display column) = 188. $N_{perceivers}$ (cue utilization column) = 2,903. Numbers in the "cue display" column represent standardized coefficient estimates of the effect of paralinguistic persuasion attempts on each vocal cue (standard errors in parentheses), controlling for the order in which speakers recorded a statement, speaker gender (centered at zero), and the speaker gender X paralinguistic attempt interaction. Numbers in the "cue utilization" column represent standardized coefficient estimates of the effect of each vocal cue on attitudes (standard errors in parentheses), controlling for speaker gender (centered at zero) and the interaction between speaker gender and each paralinguistic cue.

*** $p < .001$. * $p < .01$. * $p < .05$.

Table 2

Experiment 4A: Speakers' Cue Display by Condition

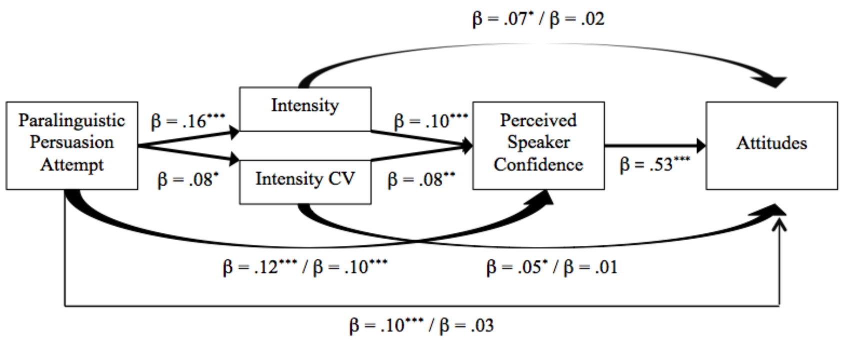
Cue	Paralinguistic Attempt	Control Condition	Effect Size (β)
Volume (dB)	71.89 (4.64)	70.89 (4.67)	0.11^{***}
Volume SD_{Norm}	6.67 (2.08)	6.29 (2.05)	0.07^{*}
Pitch (ST)	84.43 (4.70)	83.54 (4.51)	0.11^{***}
Pitch SD_{Norm}	4.75 (2.06)	4.28 (1.94)	0.12^{*}
Intonation (ΔST/sec)	-11.12 (39.23)	-2.79 (13.76)	-0.12
Articulation Rate (syllables/sec)	4.33 (0.45)	4.38 (0.47)	-0.07
Pauses	1.15 (1.88)	0.93 (1.56)	0.05

Note. $N_{recordings}$ (cue display column) = 88. Numbers in the "paralinguistic attempt" and "control condition" columns represent conditional means (standard deviations in parentheses). Numbers in the "effect size" column represent standardized coefficient estimates of the effect of paralinguistic attempts on each vocal cue, as estimated using hierarchical linear models with speaker-specific random intercepts and controls for speaker gender (centered at zero) and the speaker gender X paralinguistic attempt interaction.

*** $p < .001$. * $p < .05$.

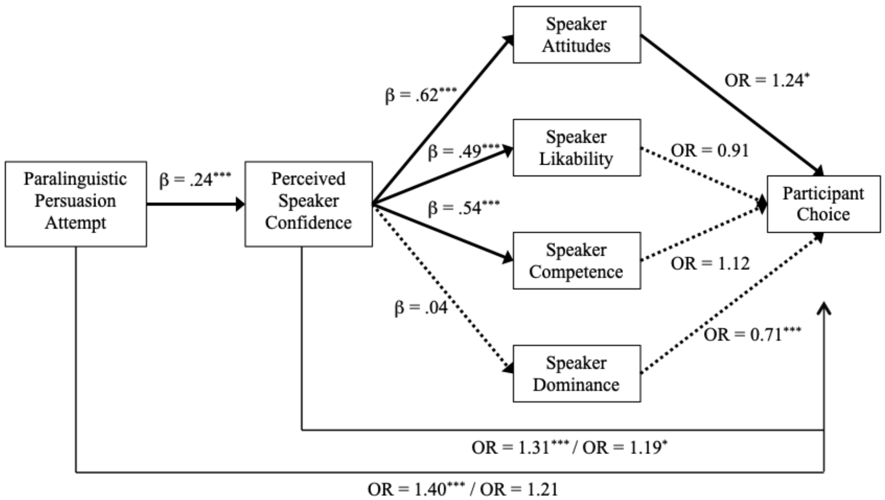
Figure 1. Experiment 1: A comparison of the disclosure statement condition (left) to the no disclosure statement condition (right).

Figure 2. Lens Analysis: Mediation of attitudes and confidence by speakers' vocal cues.



Note. Numbers represent standardized coefficient estimates, controlling for speaker gender (centered at zero) and its interaction with the paralinguistic persuasion attempt manipulation.
Vol SD_{Norm} = Coefficient of variation for volume (Volume SD_{Norm}).
$^{***}p < .001$. $^{**}p < .01$. $^{*}p < .05$.

Figure 3. Experiment 4B: Mediation of choice by speakers' perceived confidence and attitudes.



Note. Numbers represent odds ratios or standardized coefficient estimates, controlling for speaker. Solid lines represent mediation pathways with significant indirect effects.
$^{***}p < .001$. $^{*}p < .05$.