

The Sound of Intellect: Speech Reveals a Thoughtful Mind, Increasing a Job Candidate's Appeal



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Abstract

A person's mental capacities, such as intellect, cannot be observed directly and so are instead inferred from indirect cues. We predicted that a person's intellect would be conveyed most strongly through a cue closely tied to actual thinking: his or her voice. Hypothetical employers (Experiments 1–3b) and professional recruiters (Experiment 4) watched, listened to, or read job candidates' pitches about why they should be hired. These evaluators rated a candidate as more competent, thoughtful, and intelligent when they heard a pitch rather than read it and, as a result, had a more favorable impression of the candidate and were more interested in hiring the candidate. Adding voice to written pitches, by having trained actors (Experiment 3a) or untrained adults (Experiment 3b) read them, produced the same results. Adding visual cues to audio pitches did not alter evaluations of the candidates. For conveying one's intellect, it is important that one's voice, quite literally, be heard.

Keywords

communication, voice, speech, mind perception, social cognition, decision making, open data

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Some of the most important decisions in life are based on inferences about another person's mental capacities: Is this person trustworthy or deceptive? Was the perpetrator capable of judging right from wrong? Will this job candidate be smart enough to succeed here? Such inferences require sophisticated social cognition about invisible mental processes that go beyond observable behavior, guided by top-down mechanisms of egocentric projection (O'Brien & Ellsworth, 2012; Van Boven & Loewenstein, 2003) and stereotype application (Fiske, Cuddy, & Glick, 2007) as well as by bottom-up interpretations of another person's behavior (Gilbert & Malone, 1995).

Here we examine how judgments of another person's mental capacity—specifically, the capacity for reasoning and intellect—is affected by a cue directly linked to the person's ongoing mental experience: his or her voice. A person's voice, after all, is a conduit for expressing sophisticated thoughts, beliefs, and knowledge using the semantic and paralinguistic cues available in language (Pinker & Bloom, 1990). Research has revealed the unique importance of a person's voice, over and above the semantic content of the person's language, for

understanding the contents of his or her thoughts. Because of the paralinguistic cues in voice, such as intonation, cadence, and amplitude, observers who hear communicators guess their actual thoughts and feelings more accurately than observers who read the exact same words in text (Hall & Schmid Mast, 2007; Kruger, Epley, Parker, & Ng, 2005). Adding visual information to verbal information does not appear to increase this accuracy (Hall & Schmid Mast, 2007; Gesn & Ickes, 1999), which suggests that visual information may be redundant with speech or at least less informative for mental-capacity inferences.

We predicted that a person's speech, beyond communicating the contents of that person's mind (his or her specific thoughts and beliefs), also conveys the person's fundamental capacity to think (his or her capacity for reasoning, thoughtfulness, and intellect). Changes in the

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tone, cadence, and pitch of an individual's voice, for example, may reveal the process of thinking and reasoning while it is happening, thereby conveying the presence of mental capacity more clearly than would the semantic content of language alone. Just as variability in motion serves as a cue for biological life, so too may variability in voice serve as a cue for a lively, active, and capable mind. If so, then a person should appear to have greater mental capacity—to be more thoughtful, rational, and intelligent—when observers hear what the person has to say than when they read what the person has to say.

Inferences about another person's mental capacity are important in social life because the capacity for thinking, reasoning, and rationality is a defining feature of personhood according to both philosophers and laypeople (Demoulin et al., 2004; Dennett, 1987; Farah & Heberlein, 2007; Gray, Gray, & Wegner, 2007; Haslam, Bain, Douge, Lee, & Bastian, 2005; Kant, 1781/2007; Locke, 1841/1997). People are perceived as more capable of reasoning than are animals and robots. Failing to recognize another person's capacity for thinking, reasoning, and rationality is therefore a subtle form of dehumanization (Harris & Fiske, 2006; Haslam & Loughnan, 2014; Waytz, Schroeder, & Epley, 2014). By predicting that a person's speech reveals his or her capacity for intellect, we are also predicting that speech is humanizing.

Our hypotheses are based on three existing empirical results. First, observers more accurately predict another person's thoughts and feelings when they can hear that person speak than when they read the same content (Hall & Schmid Mast, 2007; Ickes, 2003; Kruger et al., 2005; Mehrabian & Wiener, 1967; Zaki, Bolger, & Ochsner, 2009). Communicators themselves do not seem to recognize this, as they expect to communicate equally well across media (Kruger et al., 2005). Second, giving a machine a human voice increases observers' tendency to anthropomorphize the otherwise mindless machine, attributing to it a mind capable of thinking and feeling (Nass & Brave, 2005; Takayama & Nass, 2008; Waytz, Heafner, & Epley, 2014). Third, paralinguistic characteristics of a person's voice (e.g., pitch level) alter observers' trait-based impressions of that person (Gregory & Webster, 1996; Hughes, Mogilski, & Harrison, 2014; Jones, Feinberg, DeBruine, Little, & Vukovic, 2010; Laplante & Ambady, 2003). In a series of experiments most relevant to our hypotheses (Schroeder & Epley, 2015), speakers were rated as less mindful—for example, as less thoughtful and reasonable—when observers read a transcript of their speech than when observers heard the very same speech. Likewise, adding an actor's voice to written text led observers to rate the original author as more mindful. In these experiments, pitch variance (i.e., intonation) conveyed the capacity for thinking most strongly. Actors who were instructed to read the words of a speech

putting “little feeling or life into the words” spoke in a relatively monotone voice and were subsequently rated as less mindful by observers, compared with actors who were asked to read a speech as if they “were the real speaker.” If people who read a person's speech do not spontaneously compensate for the lack of paralinguistic cues in text, then their impressions of the speaker's mental capacities could be systematically diminished compared with the impressions of observers who hear the person's speech.

We tested the importance of a person's voice for communicating intellect in a domain where judgments of a person's mental capacities are both common and critical: hiring decisions. We asked M.B.A. students to provide spoken and written “elevator pitches”—short descriptions of their qualifications—that they might use with potential employers. Across five experiments, either hypothetical employers (Experiments 1–3b) or professional job recruiters (Experiment 4) watched, listened to, or read these candidates' pitches and then evaluated the candidates' intellect, reported their general impressions of the candidates, and indicated their interest in hiring the candidates. We predicted that job candidates would seem more competent, thoughtful, and intelligent when evaluators heard them explain their qualifications than when evaluators read the text of the very same speeches, or read written descriptions of the candidates' qualifications. Because intellect is essential for many jobs, we also predicted that potential employers would have more favorable impressions of the candidates and be more interested in hiring the candidates when they heard the candidates' speech.

To ease presentation of the results, we report all analyses of evaluators' ratings at the level of the individual evaluators. However, we also analyzed the data in all of our studies using hierarchical linear models (HLMs) to account for the nesting of evaluators within candidates (e.g., as recommended by Judd, Westfall, & Kenny, 2012). To do this, we created multilevel random-intercept, random-slope models with evaluators (Level 1) nested within candidates (Level 2), treating experimental condition as a fixed effect and the candidate being evaluated as a random effect. These analyses all yielded results that were as strong as or stronger than the results of the more conservative tests we report here. We report the results for the HLMs in Supplemental Results, in the Supplemental Material available online.

Experiment 1: Voice Versus Transcript

We videotaped M.B.A. students giving spoken elevator pitches to their top potential employers. Evaluators then watched, listened to, or read transcripts of the videos. We predicted that candidates would seem more competent,

thoughtful, and intelligent when their pitches were heard rather than read, and that evaluators would consequently be more interested in hiring candidates whose pitches were heard rather than read.

Including the video condition provided a test between our proposed mechanism—that speech conveys intellect through paralinguistic cues in voice—and an alternative explanation—that speech conveys intellect through individuation. If additional individuating information conveys intellect, then video should make a person appear even more mentally capable than audio alone. If, as we predicted, mental capacity is revealed primarily through a person's voice, then evaluators' impressions should be similar whether they watch a video or listen to an audio recording.

Method

Participants. Eighteen M.B.A. students at the University of Chicago Booth School of Business (mean age = 28.2 years, $SD = 2.07$; 11 males) responded to our request for research assistance, serving as job candidates in exchange for a \$5 Starbucks gift card. We then recruited 162 people (mean age = 36.86 years, $SD = 15.01$; 80 males) visiting the Museum of Science and Industry in Chicago to evaluate the candidates in exchange for a food item. The sample size for evaluators was predetermined by our goal to have 3 people evaluate each of the 18 candidates in each of the three conditions (i.e., slightly more than 50 evaluators per condition). We did not know what effect size to predict in this first experiment, but we arrived at this number because it was feasible at our laboratory, offered multiple evaluators for each target, and was our best guess of the sample size needed to detect an effect of interest. Fifty participants per condition yields 80% power to detect a medium-sized effect.

Procedure. We recruited the M.B.A. students to participate as job candidates in a 20-min study on how people make hiring decisions. The candidates first named the company for which they would most like to work and then considered (for 1 min) the pitch they would make to encourage this company to evaluate them positively and to hire them. Each candidate provided both a spoken and a written pitch to the prospective employer (order counterbalanced). In the spoken-pitch condition, we told candidates that we would videotape them as they gave their pitch and that they should speak directly to the camera. We told them that they had 2 min to talk, although we allowed them to reach the natural conclusion of their pitch (actual video durations ranged from 49 s to 2 min 30 s). In the written-pitch condition, we told candidates to compose a letter to the prospective employer. Candidates had 10 min¹ to type their letter on a computer; if they

were still typing at the 10-min mark, we told them to finish their thought and stop typing.

After finishing their spoken and written pitches, the candidates completed a short survey asking them to predict (a) how positively someone would evaluate their written pitch (0 = *not at all positively*, 6 = *very positively*), (b) how interested someone would be in hiring them after reading their written pitch (0 = *not at all interested*, 6 = *very interested*), (c) how positively someone would evaluate their spoken pitch (0 = *not at all positively*, 6 = *very positively*), (d) how interested someone would be in hiring them after listening to their spoken pitch (0 = *not at all interested*, 6 = *very interested*), and (e) how many times they had given their pitch before. We collected these predictions in order to examine how the candidates expected they would be judged. Theoretically, such expectations matter because they indicate whether the cues that convey mental capacities in social interaction are obvious to those in the midst of the interaction. Practically, such expectations matter because they could guide how candidates approach potential employers. Candidates who believe their spoken pitch will be judged exactly the same as their written pitch may see no reason to seek voice time with a potential employer.

We used only the spoken pitches from the candidates to create the stimuli for the hypothetical employers (evaluators) in this experiment. The evaluators were assigned to one of three conditions: Those in the video condition watched and listened to a candidate's spoken pitch, those in the audio condition only listened to a spoken pitch, and those in the transcript condition read a transcribed pitch.² Each evaluator therefore observed only one candidate's pitch in one medium. After seeing, hearing, or reading a candidate's pitch, evaluators completed a survey. The survey first explained,

You just [watched/listened to/read the transcript of] an MBA student from the University of Chicago Booth School of Business talking about why he or she should be hired for his or her ideal job. This job is in the service sector and it requires a highly competent, thoughtful, and intelligent employee. Your role in this study is to pretend that you are the employer who is considering this candidate for the job. Based on the [clip/transcript] that you just [watched/listened to/read], please let us know your impressions of the candidate. You must evaluate this candidate against all of the other candidates who are also applying for the same job—you can assume these other candidates are also high achieving MBA students.

Evaluators then answered three questions about the candidate's intellect: They rated (a) how competent the

candidate seemed compared with an average candidate for an M.B.A.-level position ($-5 = \textit{much less competent}$, $5 = \textit{much more competent}$), (b) how thoughtful the candidate seemed compared with an average candidate for an M.B.A.-level position ($-5 = \textit{much less thoughtful}$, $5 = \textit{much more thoughtful}$), and (c) how intelligent the candidate seemed compared with an average candidate for an M.B.A.-level position ($-5 = \textit{much less intelligent}$, $5 = \textit{much more intelligent}$). Evaluators then reported their general impressions of the candidate: how much they liked the candidate ($0 = \textit{did not like at all}$, $10 = \textit{extremely liked}$), how positive their overall impression of the candidate was ($0 = \textit{not at all positive}$, $10 = \textit{extremely positive}$), and how negative their overall impression of the candidate was ($0 = \textit{not at all negative}$, $10 = \textit{extremely negative}$; reverse-scored). Finally, participants rated how likely they would be to hire the candidate for the job ($0 = \textit{not at all likely}$, $10 = \textit{extremely likely}$). We averaged the ratings of intelligence, competence, and thoughtfulness to form a composite measure of intellect ($\alpha = .91$) and the ratings of liking, positive impression, and negative impression to form a composite measure of general impressions ($\alpha = .89$).

Results

Degrees of freedom in the statistical tests reported vary slightly because some participants failed to answer every survey item.

Job candidates' predictions. The M.B.A. students were somewhat experienced in giving their spoken pitches. On average, they had already given their pitches 1.44 ($SD = 1.58$) times. These participants did not predict that they would be evaluated differently when employers listened to their spoken pitches ($M = 3.61$, $SD = 0.78$) than when employers read their written pitches ($M = 3.22$, $SD = 0.94$), paired $t(17) = 1.20$, $p = .25$, $d = 0.45$. They also did not expect any difference in their likelihood of getting hired depending on whether employers listened to their spoken pitches ($M = 3.28$, $SD = 0.89$) or read their written pitches ($M = 3.00$, $SD = 1.08$), paired $t(17) = 0.80$, $p = .44$, $d = 0.29$. In short, the students did not have strong expectations that other people's evaluations would depend on whether their pitches were heard or read. We directly tested the veracity of these candidates' predictions in Experiment 2.

Because these predictions were underpowered given the sample size of only 18 candidates, we collected data from two more samples of job candidates in an effort to better understand candidates' intuitions (for details, see Supplemental Results in the Supplemental Material). Sixteen M.A. students (mean age = 29.3 years, $SD = 5.94$; 11 males) and 40 community members (mean age = 28.6

years, $SD = 9.03$; 28 males) currently searching for jobs created written and spoken pitches for their preferred employers. These participants then made the same predictions as the M.B.A. job candidates.

As with the M.B.A. students, neither sample expected to be evaluated more favorably by employers who listened to their pitches than by those who read their pitches. The M.A. students did not predict that they would be evaluated differently by employers who listened to their pitches ($M = 3.88$, $SD = 1.20$) than by those who read their pitches ($M = 3.94$, $SD = 1.18$), paired $t(15) = 0.15$, $p = .88$, nor did they predict that their likelihood of getting hired would differ depending on whether employers heard their pitches ($M = 3.94$, $SD = 1.34$) or read their pitches ($M = 4.06$, $SD = 1.00$), paired $t(15) = 0.36$, $p = .73$, $d = 0.10$. The community members predicted that they would be evaluated significantly more positively by employers who read their pitches ($M = 4.53$, $SD = 1.26$) than by employers who listened to their pitches ($M = 3.52$, $SD = 1.38$), paired $t(39) = 4.47$, $p < .01$, $d = 0.76$. They also predicted that they would have a greater likelihood of being hired by employers who read their pitches ($M = 4.35$, $SD = 1.29$) than by employers who listened to their pitches ($M = 3.53$, $SD = 1.41$), paired $t(39) = 3.69$, $p < .01$, $d = 0.61$. Without further data, we are reluctant to speculate about why the community sample predicted that they would be perceived more positively in writing than in speaking. We simply note that none of the three samples expected to be seen as more mindful, or more employable, when employers heard their voice.

Hypothetical employers' evaluations. As predicted, evaluators' beliefs about job candidates' intellect—their competence, thoughtfulness, and intelligence—depended on the communication medium, $F(2, 157) = 10.81$, $p < .01$, $\eta^2 = .12$. As indicated by the standardized scores shown in Figure 1, evaluators who heard pitches rated the candidates' intellect more highly ($M = 0.91$, $SD = 1.79$) than did evaluators who read transcripts of pitches ($M = -0.70$, $SD = 2.81$), $t(157) = 3.79$, $p < .01$, 95% confidence interval (CI) of the difference = $[0.70, 2.51]$, $d = 0.60$. Evaluators who watched pitches did not evaluate the candidates' intellect ($M = 1.09$, $SD = 1.80$) differently than evaluators who listened to pitches, $t(157) < 1$. Simply adding more individuating information about a candidate through visual cues, such as physical appearance and nonverbal mannerisms, had no measurable impact on evaluations of the candidate's mind. Candidates' intellect was conveyed primarily through their voice.

Perhaps more important, evaluators who heard pitches also reported more favorable impressions of the candidates—liked the candidates more and had more positive and less negative impressions of the candidates—than did evaluators who read pitches ($M = 5.69$, $SD = 1.96$, vs.

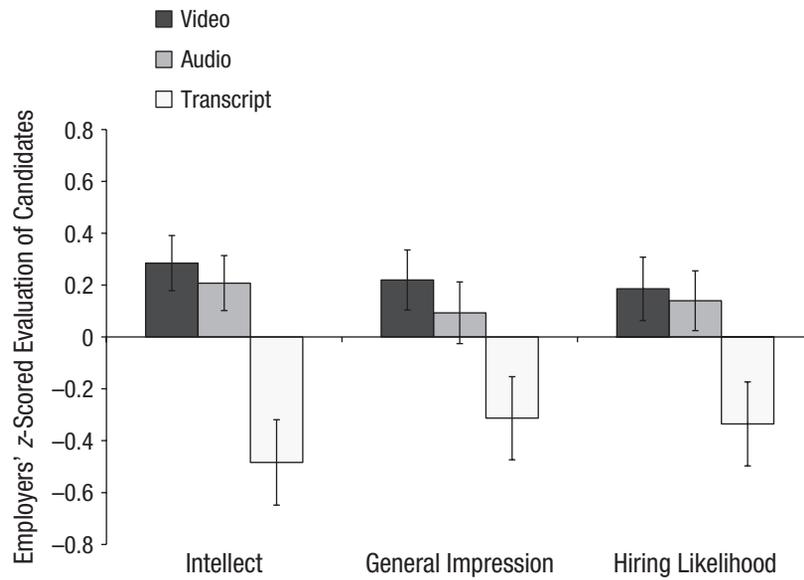


Fig. 1. Results from Experiment 1: evaluators' standardized ratings of the job candidates' intellect, their general impressions of the candidates, and their likelihood of hiring the candidates. Results are shown separately for the video, audio, and transcript conditions. Error bars represent ± 1 SEM.

$M = 4.78$, $SD = 2.64$), $t(159) = 2.16$, $p = .03$, 95% CI of the difference = [0.02, 1.80], $d = 0.34$ (see Fig. 1). Evaluators who heard pitches also reported being significantly more likely to hire the candidates ($M = 4.34$, $SD = 2.26$) than did evaluators who read exactly the same pitches ($M = 3.06$, $SD = 3.15$), $t(156) = 2.49$, $p = .01$, 95% CI of the difference = [0.22, 2.34], $d = 0.40$ (see Fig. 1). These results again did not appear to stem simply from having more individuating information about the candidates in the audio condition, because evaluators who watched pitches did not report more favorable impressions ($M = 5.98$, $SD = 1.91$) or an increased likelihood of hiring the

candidates ($M = 4.46$, $SD = 2.43$) compared with evaluators who heard pitches, $ts < 1$.

We predicted that a candidate's voice would make him or her seem more competent, thoughtful, and intelligent, which in turn would lead potential employers to a more favorable general impression, and increase their perception of how likely they were to hire the candidate. A mediation analysis (Fig. 2) supported this hypothesis: Evaluators' perceptions of a candidate's intellect and their general impressions of the candidate sequentially mediated the effect of hearing the candidate's voice (audio condition, coded as 1), rather than reading the

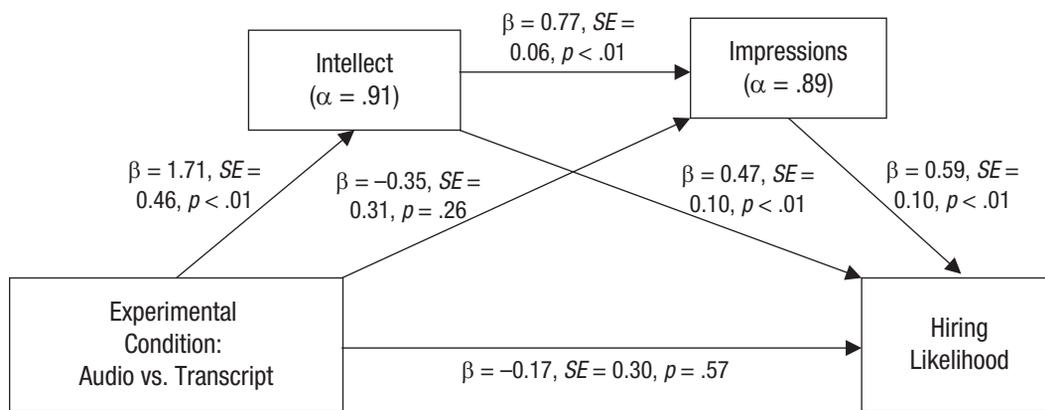


Fig. 2. Results from Experiment 1: mediation model testing the effect of experimental condition on reported likelihood of hiring a job candidate, as mediated by perceived intellect of the candidate and general impressions of the candidate.

candidate's pitch (transcript condition, coded as 0), on hiring likelihood. The effect of condition on hiring likelihood was significant before perceived intellect and general impressions were included in the model, $\beta = 1.21$, $SE = 0.54$, $p = .03$, but this effect became nonsignificant when the mediators were included ($\beta = -0.17$, $SE = 0.30$, $p = .57$). A 5,000-sample bootstrap test estimated that perceived intellect had a significant indirect effect of 0.80 ($SE = 0.28$, 95% CI = [0.33, 1.44]), that general impressions did not have a significant indirect effect (indirect effect = -0.21 , $SE = 0.18$, 95% CI = [-0.59, 0.13]), and that the two mediators had a significant combined indirect effect of 0.79 ($SE = 0.25$, 95% CI = [0.33, 1.33]; MacKinnon, Fairchild, & Fritz, 2007).

These analyses suggest that a potential job candidate's voice conveyed intellect, which led to a more positive impression of the candidate and increased hypothetical interest in hiring the candidate among evaluators. These results are consistent with our hypothesis that speech, because of the natural paralinguistic cues in voice that are particularly well equipped to express thought, can reveal a person's mental capacities. There was no systematic evidence that being able to see someone in addition to hearing him or her affected inferences about mental capacity. This suggests that it is not merely the addition of individuating information that reveals a person's mind. Rather, job candidates' intellect seemed greater when observers heard (rather than read) their speeches, regardless of the total amount of information in the communication medium.

Experiment 2: Speaking Versus Writing

In Experiment 1, we tested the importance of a person's voice in observers' evaluations of that person by transcribing candidates' speech to ensure that semantic content was identical in the audio and transcript conditions. In Experiment 2, we conducted a replication test of the main results from Experiment 1, using the same spoken pitches, and also added a critical third condition in which evaluators read candidates' written pitches. If a written pitch is evaluated like a spoken pitch, then candidates' voices are not necessary to convey intellect, but some aspect of evaluating a transcribed speech would apparently explain our prior results. If a written pitch is evaluated like a transcript, then this would provide stronger evidence that a person's voice conveys his or her mental capacities.

Method

Participants. We anticipated additional variance in this experiment because we varied not only the communication medium (speech vs. writing) but also the semantic

content (transcribed spoken pitch vs. written pitch). Therefore, we increased our targeted sample size to 4 evaluators per speaker per condition (total of 216 evaluators). Because we did not know what effect size to expect in this experiment, this was our best estimate of the sample size we would need to detect an effect of interest. Our final sample was 218 visitors to the Museum of Science and Industry in Chicago (mean age = 35.0 years, $SD = 12.8$; 106 males), who evaluated candidates in exchange for a food item. We collected data from more than our targeted number of evaluators because we continued running the experiment until the end of a scheduled room reservation.

Procedure. Both the spoken and the written pitches from the 18 M.B.A. students in Experiment 1 served as our stimuli. We assigned participants serving as hypothetical employers (evaluators) to one of three conditions: Those in the audio condition listened to a candidate's spoken pitch, those in the transcript condition read the transcript of a candidate's spoken pitch, and those in the writing condition read a candidate's own written pitch. After evaluators listened to the speech, read the transcribed speech, or read the written pitch, they completed a survey that included the same items as in Experiment 1. As in that experiment, we averaged ratings to create composite measures of intellect ($\alpha = .88$) and general impressions ($\alpha = .87$).

Results

Degrees of freedom in the statistical tests reported vary slightly because some participants failed to answer every survey item.

Evaluators' beliefs about job candidates' intellect—their competence, thoughtfulness, and intelligence—again varied by communication medium, $F(2, 215) = 3.07$, $p = .05$, $\eta^2 = .03$. As indicated by the standardized scores shown in Figure 3, evaluators who heard pitches rated the candidates' intellect more highly ($M = 1.12$, $SD = 1.85$) than did evaluators who read transcripts of pitches ($M = 0.35$, $SD = 2.41$), $t(215) = 2.09$, $p = .04$, 95% CI of the difference = [0.06, 1.47], $d = 0.29$. They also rated the candidates' intellect more highly than did evaluators who read written pitches ($M = 0.31$, $SD = 2.34$), $t(215) = 2.20$, $p = .03$, 95% CI of the difference = [0.12, 1.50], $d = 0.30$. Evaluations of the candidates' intellect did not differ between the transcript and writing conditions, $t(215) < 1$.

Evaluators' general impressions of the job candidates—liking, positive impression, and negative impression of the candidates—also varied by condition, $F(2, 214) = 4.72$, $p = .01$, $\eta^2 = .04$. Specifically, evaluators who heard pitches reported more favorable impressions of the candidates ($M = 6.30$, $SD = 1.78$) than did evaluators who

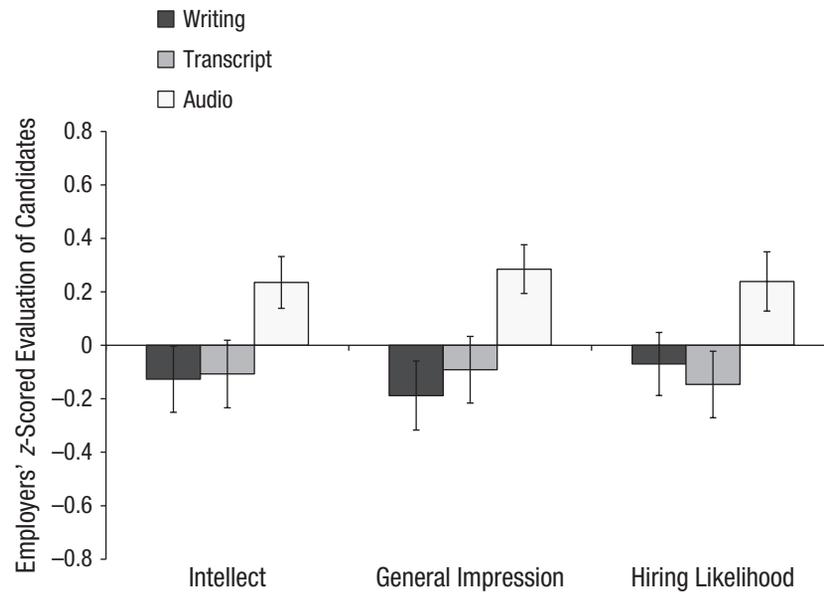


Fig. 3. Results from Experiment 2: evaluators' standardized ratings of the job candidates' intellect, their general impressions of the candidates, and their likelihood of hiring the candidates. Results are shown separately for the writing, transcript, and audio conditions. Error bars represent ± 1 SEM.

read transcripts of pitches ($M = 5.44$, $SD = 2.39$), $t(214) = 2.31$, $p = .02$, 95% CI of the difference = [0.16, 1.54], $d = 0.32$, and evaluators who read the candidates' written pitches ($M = 5.23$, $SD = 2.46$), $t(214) = 2.90$, $p < .01$, 95% CI of the difference = [0.37, 1.77], $d = 0.40$ (see Fig. 3). Evaluators who heard pitches also reported being more likely to hire the candidates ($M = 4.83$, $SD = 2.53$) than did evaluators who read transcripts ($M = 3.77$, $SD = 2.88$), $t(208) = 2.30$, $p = .02$, 95% CI of the difference = [0.15, 1.97], $d = 0.32$, and marginally more likely to hire the candidates than did evaluators who read written pitches ($M = 3.99$, $SD = 2.73$), $t(208) = 1.84$, $p = .07$, 95% CI of the difference = [-0.03, 1.73], $d = 0.26$ (see Fig. 3). General impressions of the candidates and hiring likelihood did not vary between the transcript and writing conditions, $t_s < 1$.

Finally, we again tested whether evaluators' perceptions of the candidates' intellect and general impressions of the candidates sequentially mediated the effect of hearing pitches (rather than reading them) on likelihood of hiring the candidates. Because the contrast between the audio and writing conditions on hiring likelihood was only marginally significant with a two-tailed test ($p = .07$), a sequential mediation analysis comparing these two conditions was technically unjustified. In a sequential mediation test comparing the audio (coded as 1) and transcript (coded as 0) conditions alone, adding perceived intellect and general impressions to the model reduced the effect of communication medium on hiring likelihood so that it became nonsignificant (without the

mediators: $\beta = 1.08$, $SE = 0.46$, $p = .02$; with the mediators: $\beta = 0.08$, $SE = 0.24$, $p = .74$). A 5,000-sample bootstrap test estimated that perceived intellect had a significant indirect effect of 0.42 ($SE = 0.20$, 95% CI = [0.05, 0.83]), that general impressions did not have a significant indirect effect (indirect effect = 0.14, $SE = 0.14$, 95% CI = [-0.11, 0.43]), and that the two mediators had a significant combined indirect effect of 0.41 ($SE = 0.19$, 95% CI = [0.06, 0.79]; MacKinnon et al., 2007).

As shown in Figure 4, a sequential mediation analysis comparing voice (audio condition, coded as 1) against text (transcript and writing conditions combined, coded as 0) yielded the same conclusions. Including perceived intellect and general impressions in the model made the effect of communication medium nonsignificant (without the mediators: $\beta = 0.95$, $SE = 0.40$, $p = .02$; with the mediators: $\beta = -0.04$, $SE = 0.21$, $p = .85$). A 5,000-sample bootstrap test estimated that perceived intellect had a significant indirect effect of 0.41 ($SE = 0.17$, 95% CI = [0.10, 0.76]), that general impressions did not have an indirect effect (indirect effect = 0.21, $SE = 0.12$, 95% CI = [-0.01, 0.46]), and that the two mediators had a significant combined indirect effect of 0.37 ($SE = 0.15$, 95% CI = [0.09, 0.67]; MacKinnon et al., 2007).

These results both replicate and extend those of Experiment 1. A person's voice again seemed to communicate a more thoughtful mind than written text did, and this effect emerged both when the semantic content of a speech was held constant by transcribing it and when the speaker was allowed to craft a written pitch him- or

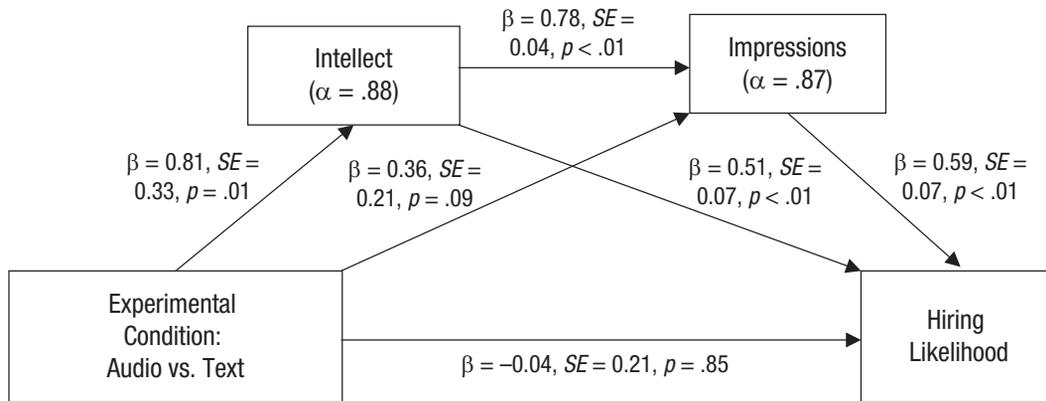


Fig. 4. Results from Experiment 2: mediation model testing the effect of experimental condition (audio condition vs. transcript and writing conditions combined) on reported likelihood of hiring a job candidate, as mediated by perceived intellect of the candidate and general impressions of the candidate.

herself. The capacity for intellect, it appears, is more readily conveyed through one's voice than through one's writing, even when the semantic content is identical. The results for the writing condition, of course, do not indicate that it is impossible for a talented writer to overcome the limitations of text alone; they indicate only that our M.B.A. students in Experiment 1 did not predict that they needed to overcome these limitations and did not do so spontaneously.

Experiments 3a and 3b: Giving Voice to Text

Experiments 1 and 2 suggest that *removing* a speaker's voice from his or her spoken pitch can make the speaker seem less mindful (less thoughtful, rational, and intelligent). In Experiments 3a and 3b, we conducted a more comprehensive test of our hypothesis by examining whether *adding* voice to text likewise affects evaluations of the author's intellect. In Experiment 3a, we recruited four trained stage actors to read all 18 pitches. To ensure that our results were not due to some aspect unique to actors' voices, we conducted a replication with a more representative sample of readers in Experiment 3b.

Experiment 3a

Method. The 4 most experienced stage actors who responded to our request for assistance received \$25 each for their participation (mean age = 20 years; 2 males; selected from a pool of 12). Actors came to a recording booth, where an experimenter gave them the following instructions:

Today, you will be reading 18 different "elevator pitches" from the University of Chicago Booth School of Business students. These 18 students were told to

pick their ideal job and write a pitch to the employer about why they would be a good fit for the job. We want you to pretend that you are the MBA student who wrote the pitch. We want you imbue your words with all of the thoughts, emotions, and substance that the writer him/herself felt. We want you to read it as if you were actually coming up with the lines naturally off the top of your head, as in a real conversation, rather than reading from a script. We want you to speak as naturally as you would if you were making a real pitch to an employer right now.

We designed these instructions in order to maintain the natural paralinguistic cues in readers' voices, so that the readings would not sound artificial or strange to listeners. Each actor read all 18 written pitches³ from Experiment 1 out loud, and we later separated each recorded pitch into its own sound file.

Evaluators were 265 visitors to the Museum of Science and Industry in Chicago (mean age = 35.03 years, $SD = 14.40$; 124 males), who agreed to participate in exchange for a food item. We targeted a sample of approximately 270 participants to serve as evaluators, so that approximately 3 participants would evaluate each version (four actors' renditions plus the candidate's original written version) of each of 18 job pitches. We collected as much data as possible until the end of a scheduled room reservation.

We randomly assigned participants serving as potential employers (evaluators) to one of three conditions: Those in the writing condition read a written pitch, those in the female-speaker condition listened to one of the female actors reading a written pitch, and those in the male-speaker condition listened to one of the male actors reading a written pitch. Because prior research suggests that people may evaluate the voice of a female differently

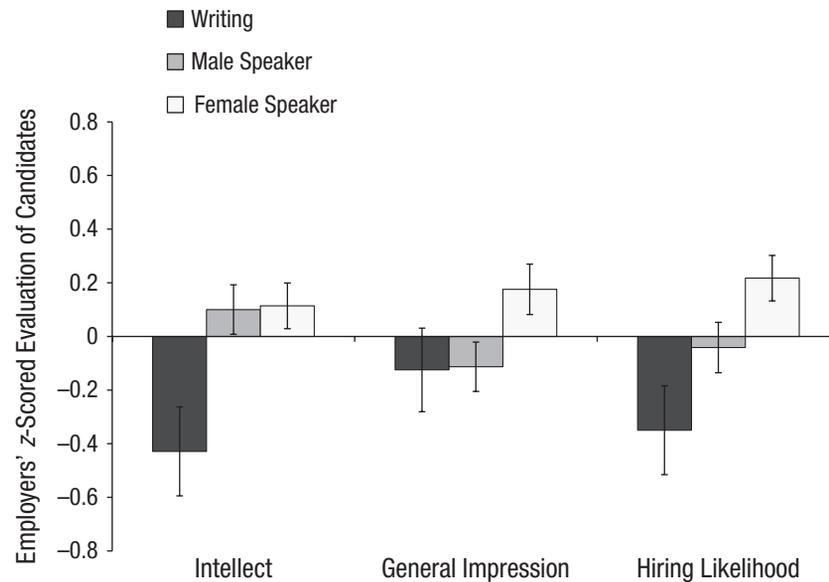


Fig. 5. Results from Experiment 3a: evaluators' standardized ratings of the job candidates' intellect, their general impressions of the candidates, and their likelihood of hiring the candidates. Results are shown separately for the writing, male-speaker, and female-speaker conditions. Error bars represent ± 1 SEM.

than the voice of a male (Brooks, Huang, Kearney, & Murray, 2014; Eagly & Mladinic, 1989), although we had observed no effects of the candidate's gender in Experiments 1 and 2, we randomly assigned evaluators to separate gender conditions. We therefore unconfounded the speaker's gender from the pitch's content so that we could test for gender effects holding semantic content constant. After reading or listening to a pitch, evaluators answered the same survey items used in Experiment 1. We averaged ratings to create composite measures of intellect ($\alpha = .84$) and general impressions ($\alpha = .80$).

Results. Degrees of freedom in the statistical tests reported vary slightly because some participants failed to answer every survey item.

Evaluators' judgments of the candidates' intellect, their general impressions of the candidates, and their reported likelihood of hiring the candidates did not differ significantly depending on whether the transcripts were read by the first or second female actor, or by the first or second male actor,⁴ $t_s < 1.70$, $p_s > .09$. We therefore collapsed across the two actors of each gender in the following analyses.

As predicted, evaluators' beliefs about the candidates' intellect varied significantly by experimental condition, $F(2, 262) = 6.34$, $p < .01$, $\eta^2 = .05$. As indicated by the standardized scores shown in Figure 5, evaluators judged candidates to have greater intellect when they listened to the female and male speakers ($M = 2.36$, $SD = 1.59$, and $M = 2.33$, $SD = 1.72$, respectively) than when they read the same pitches ($M = 1.37$, $SD = 2.19$), $t_s(262) = 3.29$ and

3.21 , $p_s < .01$, 95% CIs of the difference = [0.38, 1.59] and [0.33, 1.59], $d_s = 0.41$ and 0.40 . We observed weaker effects of experimental condition on evaluators' general impressions of the candidates, $F(2, 262) = 2.76$, $p = .07$, $\eta^2 = .02$ (see Fig. 5). Evaluators had marginally more positive impressions when they listened to the female speakers ($M = 6.33$, $SD = 1.82$) than when they read the same pitches ($M = 5.77$, $SD = 2.14$), $t(262) = 1.80$, $p = .07$, 95% CI of the difference = [-0.07, 1.21], $d = 0.22$. Evaluators had more negative impressions of male speakers ($M = 5.79$, $SD = 1.78$) than of female speakers, $t(262) = -2.12$, $p = .04$, 95% CI of the difference = [-1.03, -0.06], $d = 0.26$, but evaluations of male speakers did not differ from evaluations of candidates whose written pitches were read, $t(262) < 1$. Evaluators who listened to female speakers also reported being more likely to hire the candidates ($M = 6.31$, $SD = 2.06$) than did evaluators who read pitches ($M = 4.96$, $SD = 2.86$), $t(259) = 3.43$, $p < .01$, 95% CI of the difference = [0.56, 2.13], $d = 0.42$, and were marginally more likely to hire the candidates than were evaluators who listened to male speakers ($M = 5.69$, $SD = 2.27$), $t(259) = 1.91$, $p = .06$, 95% CI of the difference = [0.02, 1.20], $d = 0.24$ (see Fig. 5). Evaluators who listened to male speakers were also marginally more likely to hire the candidates than were those who read the same pitches, $t(259) = 1.86$, $p = .06$, 95% CI of the difference = [-0.10, 1.56], $d = 0.23$.

When we combined the data from the male-speaker and female-speaker conditions and compared evaluations of written versus spoken pitches, we observed that

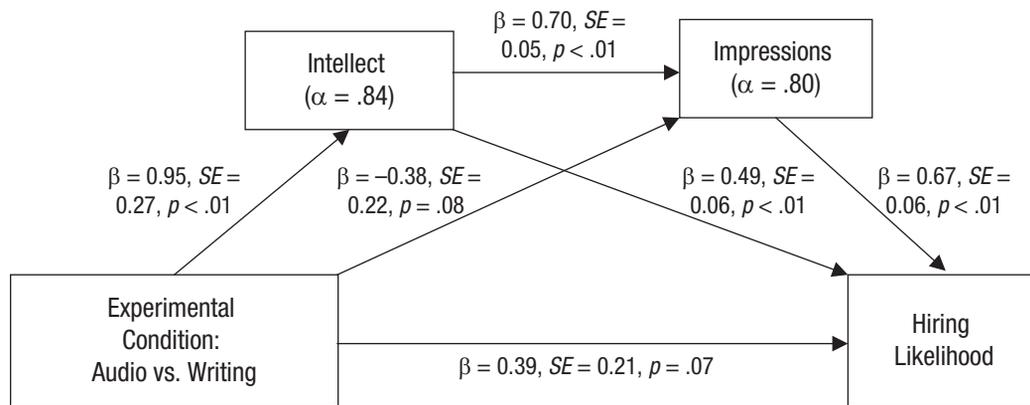


Fig. 6. Results from Experiment 3a: mediation model testing the effect of experimental condition on reported likelihood of hiring a job candidate, as mediated by perceived intellect of the candidate and general impressions of the candidate.

evaluators who listened to the pitches ($n = 212$) believed the candidates had greater intellect than did evaluators who read the same pitches ($n = 53$), $t(262) = 3.57, p < .01$, 95% CI of the difference = [0.44, 1.51], $d = 0.44$. They also reported being more likely to hire the candidates, $t(259) = 2.89, p < .01$, 95% CI of the difference = [0.33, 1.75], $d = 0.36$. However, evaluators who listened to the pitches did not have significantly more positive impressions of the candidates than did evaluators who read the pitches $t(262) = 1.02, p = .31$.

As in the prior experiments, and as shown in Figure 6, evaluators' beliefs about the candidates' intellect and their general impressions of the candidates sequentially mediated the effect of condition—audio condition (male- and female-speaker conditions combined, coded as 1) versus writing condition (coded as 0)—on hiring judgments. Including perceived intellect and general impressions in the model made the effect of communication medium nonsignificant (without the mediators: $\beta = 1.04, SE = 0.36, p < .01$; with the mediators: $\beta = 0.39, SE = 0.21, p = .07$). A 5,000-sample bootstrap test estimated that intellect had a significant indirect effect of 0.46 ($SE = 0.17, 95\% CI = [0.15, 0.79]$), that general impressions did not have an indirect effect (indirect effect = $-0.26, SE = 0.15, 95\% CI = [-0.57, 0.03]$), and that the two mediators had a significant combined indirect effect of 0.45 ($SE = 0.16, 95\% CI = [0.15, 0.77]$; MacKinnon et al., 2007).

Adding a human voice—whether male or female—to written pitches made the job candidates seem to have greater intellect, and increased reported interest in hiring the candidates. Results for general impressions of the candidates were less consistent, varying by the speaker's gender. We did not predict this variability, nor did we observe it in any other experiment. It is therefore unclear whether this result reflects something systematic about variability in what the voice conveys, something about manipulating a speaker's voice while holding the original

author's gender constant, or simply random variance of a moderately sized effect across multiple experiments. What is clear is that listening to pitches—even pitches spoken by actors and not by the candidates who created them—rather than reading the very same pitches affects evaluations of the authors' mental capacity. Once again, we found that a person's voice seems to reveal a mind capable of thinking and reasoning.

Although the results of Experiment 3a are consistent with our hypotheses, it is possible that they are accounted for by some unique aspect of actors' voices, such as being particularly attractive (Zuckerman & Driver, 1989). We therefore conducted a replication test in Experiment 3b, using speakers not uniquely selected for being actors.

Experiment 3b

Method. Eighteen visitors to the Museum of Science and Industry in Chicago (11 males) each agreed to read one job candidate's written pitch in exchange for a food item. Because we could not ask each visitor to read all 18 pitches, we were unable to orthogonally manipulate reader's gender as we did in Experiment 3a. Instead, we matched each reader's gender to the actual candidate's gender. Each reader received one hard copy of a job candidate's pitch. We gave the readers the same reading instructions as in Experiment 3a and allowed them to practice reading the pitch as many times as they wanted before we recorded them.

The procedure for evaluators was similar to that in the audio-pitch and written-pitch conditions in Experiment 3a. We predetermined that we needed a sample size of at least 108 evaluators, approximately 3 participants for each job candidate in each of the two conditions. Our final sample was 135 online workers on Amazon Mechanical Turk (mean age = 31.9 years, $SD = 9.9$; 87 males), who evaluated candidates in exchange for \$0.30.

Evaluators either listened to a reader's recording of a pitch or read a candidate's written pitch. Evaluators then evaluated the candidates using the same survey used in Experiment 1. We averaged ratings to create composite measures of intellect ($\alpha = .92$) and general impressions ($\alpha = .85$).

Results. As in Experiment 3a, evaluators who listened to the pitches ($n = 67$) believed that the candidates had greater intellect ($M = 8.21$, $SD = 1.62$), compared with those who read the pitches ($n = 68$; $M = 7.38$, $SD = 2.06$), $t(133) = 2.60$, $p = .01$, 95% CI of the difference = [0.20, 1.46], $d = 0.45$. They also had more positive impressions of the candidates ($M = 8.45$, $SD = 1.82$, vs. $M = 7.33$, $SD = 2.45$), $t(133) = 3.00$, $p < .01$, 95% CI of the difference = [0.38, 1.85], $d = 0.52$, and reported being more likely to hire them ($M = 7.85$, $SD = 2.25$, vs. $M = 6.74$, $SD = 3.00$), $t(133) = 2.44$, $p = .02$, 95% CI of the difference = [0.21, 2.02], $d = 0.42$. As in Experiments 1, 2, and 3a, beliefs about the candidates' intellect and general impressions of them sequentially mediated the effect of condition (hearing pitches vs. reading pitches) on hiring judgments. Including perceived intellect and general impressions in the model made the effect of communication medium nonsignificant (without the mediators: $\beta = 1.11$, $SE = 0.46$, $p = .02$; with the mediators: $\beta = -0.10$, $SE = 0.23$, $p = .66$). A 5,000-sample bootstrap test estimated that perceived intellect had a significant indirect effect of 0.41 ($SE = 0.39$, 95% CI = [0.10, 0.75]), that general impressions did not have an indirect effect (indirect effect = 0.30, $SE = 0.16$, 95% CI = [-0.09, 0.65]), and that the two mediators had a significant combined indirect effect of 0.51 ($SE = 0.23$, 95% CI = [0.12, 1.00]; MacKinnon et al., 2007). Thus, even untrained readers convey a more capable mind through their voices, making candidates seem more appealing and employable.

Experiment 4: Professional Recruiters

Replicating our experiments by manipulating information used in actual hiring decisions in real firms would be unethical, but we got closer to an ecologically valid test of our hypotheses in Experiment 4 by examining whether the same patterns observed in Experiments 1 through 3b would be replicated if the evaluators were expert recruiters. In their jobs, the professional recruiters in Experiment 4 were charged with actually hiring from the very same sample of M.B.A. students who made job pitches in our experiment.

Method

Participants. Thirty-nine professional recruiters (mean age = 30.85 years, $SD = 6.24$; 9 males) from Fortune 500

companies voluntarily agreed to evaluate pitches of job candidates from the University of Chicago Booth School of Business. These recruiters had attended a conference at the University of Chicago and were e-mailed afterward to request their participation. We initially e-mailed all 66 recruiters who had attended the conference and then extended a second, personal invitation to those who did not respond to the first e-mail. We did not continue our unsolicited request for participation beyond the second e-mail out of professional courtesy. Our target sample was every participant at the conference. We included all recruiters who completed the survey in the following analyses.

Procedure. Because we knew that our sample of evaluators would be smaller than in the previous experiments, we randomly selected three job candidates' spoken pitches from Experiment 1 to use as stimuli. In an online survey, we randomly assigned recruiters to either listen to one of the spoken pitches (audio condition) or read the transcription of one of those pitches (transcript condition). We recorded how long each recruiter spent on the survey page with the stimulus. The recruiters then answered the same survey items as in Experiment 1, with one change: All responses were recorded on Likert scales labeled from 0 to 10. Finally, because this experiment was conducted online, we also asked the recruiters to complete a memory test in which they reported "everything you can remember about the pitch the MBA student gave." This memory test allowed us to evaluate a possible alternative interpretation of our observed results based on the amount of information remembered when listening compared with reading. We averaged ratings to create composite measures of intellect ($\alpha = .92$) and general impressions ($\alpha = .93$).

Results

The pattern of evaluations by professional recruiters replicated the pattern observed in Experiments 1 through 3b (see Fig. 7). In particular, the recruiters believed that the job candidates had greater intellect—were more competent, thoughtful, and intelligent—when they listened to pitches ($M = 5.63$, $SD = 1.61$) than when they read pitches ($M = 3.65$, $SD = 1.91$), $t(37) = 3.53$, $p < .01$, 95% CI of the difference = [0.85, 3.13], $d = 1.16$. The recruiters also formed more positive impressions of the candidates—rated them as more likeable and had a more positive and less negative impression of them—when they listened to pitches ($M = 5.97$, $SD = 1.92$) than when they read pitches ($M = 4.07$, $SD = 2.23$), $t(37) = 2.85$, $p < .01$, 95% CI of the difference = [0.55, 3.24], $d = 0.94$. Finally, they also reported being more likely to hire the candidates when they listened to pitches ($M = 4.71$, $SD = 2.26$) than when

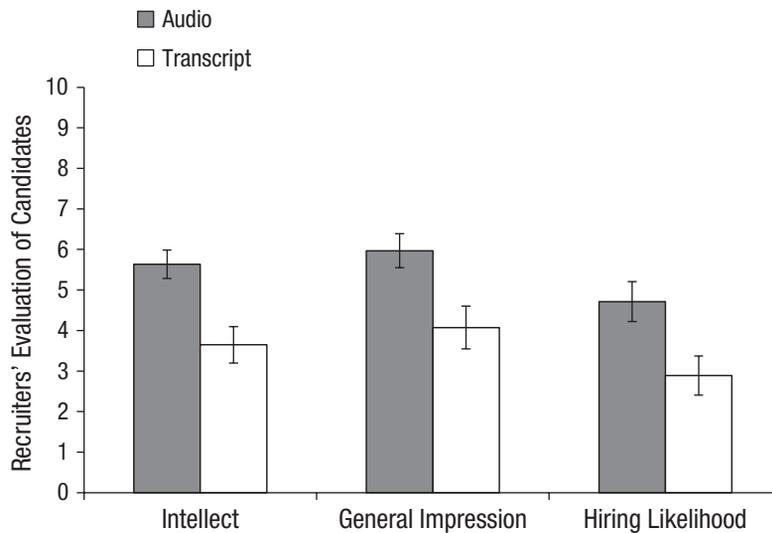


Fig. 7. Results from Experiment 4: professional recruiters' ratings of the job candidates' intellect, their general impressions of the candidates, and their likelihood of hiring the candidates. Results are shown separately for the audio and transcript conditions. Error bars represent ± 1 SEM.

they read the same pitches ($M = 2.89$, $SD = 2.06$), $t(37) = 2.62$, $p < .01$, 95% CI of the difference = [0.41, 3.24], $d = 0.86$.

Unlike in the prior experiments, however, the evaluators' beliefs about the candidates' intellect and their general impressions of the candidates only partially mediated the effect of communication medium (audio condition vs. transcript condition, coded 1 and 0, respectively) on hiring decisions (Fig. 8). When intellect and general impression were included in the model, the effect of communication medium became nonsignificant (without the mediators: $\beta = 1.83$, $SE = 0.70$, $p = .01$; with the mediators: $\beta = -0.04$, $SE = 0.52$, $p = .94$). A 5,000-sample bootstrap test estimated that perceived intellect had a significant indirect effect of 1.30 ($SE = 0.54$, 95% CI =

[0.37, 2.47]), but that general impressions (95% CI = [-0.30, 0.40]) and the two mediators combined (95% CI = [-0.14, 1.40]) did not have an indirect effect (MacKinnon et al., 2007). It appears that our professional recruiters, in contrast to the evaluators in Experiments 1 through 3b, based their interest in hiring more heavily on their perceptions of intellect alone than on joint considerations of intellect and general impressions. But just as in the previous experiments, those perceptions were influenced by the presence or absence of a candidate's voice.

Finally, the recruiters did not spend significantly different amounts of time engaging with the stimuli in the audio condition ($M = 173.85$ s, $SD = 145.97$) and the transcript condition ($M = 137.86$ s, $SD = 197.49$), $t(37) = 0.65$, $p = .52$, $d = 0.21$. Although 6 recruiters did not

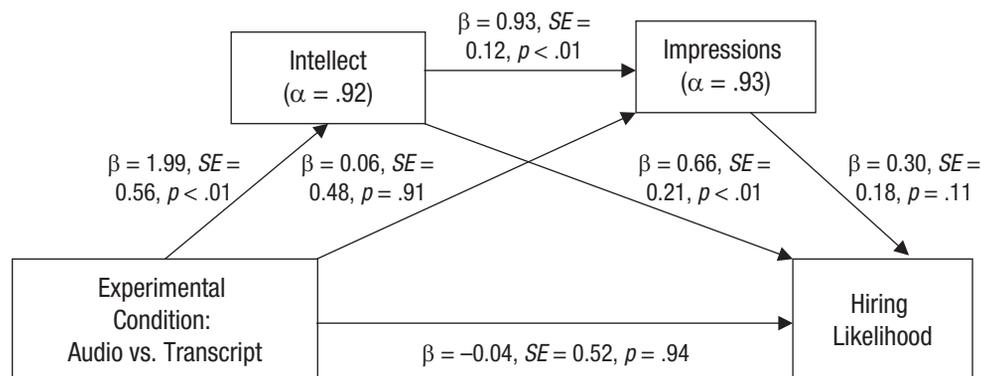


Fig. 8. Results from Experiment 4: mediation model testing the effect of experimental condition on reported likelihood of hiring a job candidate, as mediated by perceived intellect of the candidate and general impressions of the candidate.

complete the memory test, those who did complete it wrote similar amounts about the candidates in the audio condition ($M = 53.94$ words, $SD = 30.06$) and the transcript condition ($M = 58.67$ words, $SD = 15.07$), $t(31) = -0.55$, $p = .59$, $d = 0.20$.

If voice affected evaluations only of novice employers, then our results would be of more theoretical interest than practical importance. However, we obtained the same results among the very recruiters whose job it was to hire from the same sample of M.B.A. students who provided the elevator pitches, and who were relative experts in evaluating job candidates. Whereas some evidence suggests that experience reduces decision-making biases (e.g., List, 2003), the effect size we observed for hiring interest was actually larger among professional recruiters ($d = 0.86$) than among novice recruiters in the equivalent conditions in Experiments 1 and 2 (d s = 0.40 and 0.32). Unfortunately, our sample in Experiment 4 contained only a restricted set of randomly selected pitches from our larger set, and so these effect sizes are not perfectly comparable. At the very least, however, Experiment 4 demonstrates that the effect of voice does not appear to disappear among hiring experts. Our results may be of practical, and not just theoretical, importance.

General Discussion

The words that come out of a person's mouth convey the presence of a thoughtful mind more clearly than the words typed by a person's hands—even when those words are identical. Across five experiments, evaluators who listened to job pitches were consistently more interested in hiring the candidates than were evaluators who read identical pitches. A person's voice communicates not only the content of his or her thinking, but also the humanlike capacity for thinking.

These results would apparently be surprising to the speakers themselves. In Experiment 1, we asked three separate samples of job candidates to predict how they would be judged, and none expected that their spoken pitches would convey significantly greater intellect than their written pitches. Practically, such expectations matter because they may affect how job candidates approach employers. If candidates are unaware of how the communication medium affects the impression they convey, then they will be just as likely to write to employers as to speak with them. Theoretically, these expectations matter because they suggest that the underlying mechanisms responsible for conveying a person's mental capacities are surprising rather than obvious.

We believe that our experiments raise three interesting avenues for further research. First, speech may reveal the presence of a thoughtful mind, but our experiments do

not identify which paralinguistic cues of speech do so. Prior research using a broader set of mental-capacity measures (Schroeder & Epley, 2015) suggests that pitch variance, or intonation, plays a significant role. Just as variance in motion (i.e., movement) is a cue that reveals the presence of biological life, variance in pitch may reveal the presence of an active and lively mind. Pitch variance can convey enthusiasm, interest, and active deliberation, whereas a monotone voice sounds dull and mindless. Indeed, one reason why text may not convey a person's intellect is that readers do not spontaneously add pitch variance or other paralinguistic cues into written text. Identifying the cues that convey a person's mind through speech is essential for understanding moderators of the effects we observed.

Second, Experiment 1 suggests that being able to see a candidate may have no additional impact on evaluations of intellect above and beyond the impact of being able to hear the candidate. Although a person's body language (e.g., Imada & Hakel, 1977; Stewart, Dustin, Barrick, & Darnold, 2008), demographics (e.g., Bertrand & Mullainathan, 2003; Biernat & Kobrynowicz, 1997; Glick, Zion, & Nelson, 1988), and appearance (Borkenau & Liebler, 1993; Murphy, 2007) can affect evaluations, these prior experiments did not pit the importance of visual cues against vocal cues in the same experiment; instead, visual cues were manipulated in the absence of any vocal cues. Our experiments suggest that a person's voice could be uniquely equipped to communicate otherwise invisible mental capacities, but our experiments were also not designed to test the relative impact of visual and vocal cues. We suggest that a person's mental capacities, such as intellect, may be conveyed more strongly through speech than through body cues partly because body cues lack the semantic content inherent in spoken or text-based language. More experiments that directly compare different communication media are needed to clearly identify the independent influences of visual and auditory cues on inferences about other people's minds.

Finally, our experiments raise practical implications for people who are trying to reveal their thoughtful mind to others (e.g., job candidates). Not only inexperienced evaluators but also professional recruiters were influenced by a candidate's voice. Although text-based communication media, such as e-mail, may provide quick and easy ways to connect with potential employers, our experiments suggest that voiceless communication comes with an unexpected inferential cost. A person's voice, it seems, carries the sound of intellect.

Author Contributions

J. Schroeder and N. Epley developed the hypotheses and experiments to test them. J. Schroeder created materials, oversaw data collection, and conducted data analyses under the

supervision of N. Epley. J. Schroeder and N. Epley wrote the manuscript. Both authors approved the final version of the manuscript for submission.

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Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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Supplemental Material

Additional supporting information can be found at <http://pss.sagepub.com/content/by/supplemental-data>

Open Practices



All the data and some of the materials for these experiments have been made publicly available via Open Science Framework and can be accessed at <https://osf.io/e3afr/>. Because the stimuli contain identifying information, it would violate participants' confidentiality to post them on a public Web site. To obtain the stimuli for use in scientific research, please e-mail either Juliana Schroeder (jschroeder@chicagobooth.edu) or Nicholas Epley (epley@chicagobooth.edu). The complete Open Practices Disclosure for this article can be found at <http://pss.sagepub.com/content/by/supplemental-data>. This article has received the badge for Open Data. More information about the Open Practices badges can be found at <https://osf.io/tvyxz/wiki/view/> and <http://pss.sagepub.com/content/25/1/3.full>.

Notes

1. We arrived at these suggested time limits by asking two M.B.A. students to create spoken and written pitches without any time restrictions and then timing how long it took for them to speak and write these pitches.
2. One research assistant transcribed the spoken pitches, and a second checked the transcriptions for accuracy. In order to make the transcripts more readable, we removed verbal filler words unless their exclusion changed a sentence's meaning.
3. We slightly modified the pitches for this experiment by removing salutations (e.g., "Dear Employer") and signatures (e.g., "Sincerely, X") from the letters in order to facilitate translation to voice.

4. Three participants rated their candidate's intellect and their general impressions of the candidate, but not their likelihood of hiring the candidate.

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