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Sounds like a leader: An ascription-actuality approach to examining leader emergence and effectiveness

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ABSTRACT

Aspiring leaders are often advised to look the part—but what about *sounding* the part? This study supports and expands the ascription—actuality trait theory of leadership by proposing that vocal delivery matters for earning leadership opportunities, whereas leader competency matters for actual effectiveness in role. We tested hypotheses within an organizational simulation where 197 managers gave short campaign speeches to run for the organization's leadership positions. AI-informed voice-analytic technology was used to measure managers' vocal delivery, while the 360° assessments from their actual organizations were used to measure leader competency and leader effectiveness. Results supported our hypotheses: Vocal delivery was positively associated with leader emergence, but not leader effectiveness. In contrast, leader competency was positively associated with leader effectiveness, but not leader emergence. Theoretical and practical implications are discussed.

Introduction

Aspiring leaders are often advised on the importance of looking the part (e.g., "Dress for the job you want, not the job you have", "Remember to make eye contact"). Indeed, a variety of research supports the notion that appearance can impact whether people are seen as leaders or not (e.g., Judge & Cable, 2004, 2011; Koppensteiner, Stephan, & Jäschke, 2015). But what about *sounding* the part? Little attention has been paid to whether differences in individuals' vocal delivery can increase their chances of being seen as a leader or whether vocal delivery predicts effectiveness in role. We define vocal delivery as the inferences people make about others, based on paraverbal features of speech (e.g., pitch, intonation, pace, pausing, and volume variation).

There is some reason to believe that voice plays a role in both the selection of leaders and the evaluation of their performance. For instance, a study by Klofstad (2016) found that in the U.S. House of Representatives elections of 2012, candidates with lower-pitched voices were more likely to win. Similarly, DeGroot, Aime, Johnson, and Kluemper (2011) found that U.S. Presidents and Canadian Prime Ministers who were perceived as more 'vocally attractive' were also given higher ratings on 'greatness' by political historians. In addition, Cullen and Harte (2018) found that personal characteristics of Irish politicians could be reliably inferred from listening to their speeches and linked to perceptions of overall speaker appeal (e.g., charismatic, boring).

Together, these findings suggest that voice holds promise for advancing leadership research, particularly as much remains unknown. To date, the emerging research on vocal attributes has largely focused on the political arena. Yet, it is unclear whether these findings can be generalized to other types of leadership careers outside the scope of politics. Furthermore, previous research has primarily focused on leader selection or emergence. Defined as the process by which individuals become influential according to the perceptions of others (Acton, Foti, Lord, & Gladfelter, 2019; Lord & Maher, 1993), leader emergence may be studied in the context of formal leadership roles

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(e.g., who gets more votes in an election), or informal processes (e.g., who emerges as a team leader). However, less is known about whether vocal characteristics also impact the enactment of leadership. Indeed, in a follow-up lab study, DeGroot et al. (2011) found that vocal attractiveness was positively related to perceptions of leader effectiveness behaviors, but not necessarily related to leader effectiveness outcomes.

To further advance knowledge in this field, this study draws upon the ascription—actuality trait theory of leadership (Antonakis, 2011) to examine the role of vocal delivery in leader emergence and/or leader effectiveness. Further, we also inspect how inferences based on voice compare to those from actual observation of behavior and competencies in terms of their effect on leader emergence and effectiveness. To this end, data on 197 highly experienced functional managers were collected within two different settings: (1) An organizational simulation that elects its leaders based on candidates' short campaign speeches, where we measured leader emergence as reflected by candidates' vote share, and voice through their speech audio recordings; and (2) Managers' actual organizations, wherein behavioral ratings on an array of leader competencies were collected from both their peers and direct reports, and leader effectiveness was assessed by their actual boss. Consistent with the ascription-actuality trait theory of leadership, we predict that individuals who have an appealing vocal delivery will be more likely to emerge as leaders, whereas those who have demonstrated leader competencies will be more likely to be effective as leaders.

One innovative aspect of this study lies in the use of artificial intelligence (AI)-informed voice-analytic technology to assess vocal delivery. Specifically, we used VoiceVibes, (2018), a patented voice-analytic software which uses machine learning algorithms to compute predictions of how the average listener would perceive a speaker.

The findings of the current study may have important implications in the field of leader development, which focuses on building individuals' knowledge, skills and abilities associated with emerging and/or succeeding as a leader (Day, 2000; Liu et al., 2019). To advance research on leader development, it is important to grow a holistic understanding of both leader emergence and leader effectiveness processes, as they are inevitably intertwined. Identification as an emergent leader can be a requirement for receiving formal opportunities to develop the skills, abilities, and characteristics that enable effectiveness (Conger & Church, 2018).

Overall, this study offers four contributions to research and practice. First, it comparatively examines vocal delivery and behavioral leader competency, in their relationships to organizational leader emergence and leader effectiveness. Second, it expands the work of Antonakis (2011) and Wyatt and Silvester (2018) by empirically testing the ascription-actuality trait theory of leadership while using distinct constructs. Third, it underscores the importance of context by gathering data from the same manager in two different settings (i.e., in-situ from an organizational simulation as well as from their actual organizations), a research design that is unusual in management sciences (Liden & Antonakis, 2009). Fourth, it explores the application of the recent technology of AI-informed voice analytics to leader development.

The ascription-actuality trait theory of leadership

The ascription-actuality trait theory of leadership is an integrated model that proposes two different routes to leadership that are grounded in different types of traits (Antonakis, 2011), where traits are measurable psychological or biological characteristics that predict behaviors, attitudes, and outcomes. The first route—*ascription*—focuses on traits that observers use to *ascribe* or infer prototypical qualities of an ideal leader, as proposed by implicit leadership theories (ILTs; Lord, 1985; Shondrick, Dinh, & Lord, 2010). An increasingly studied topic, leader emergence is a process that involves the perception and selection of those who are perceived to have leader-like qualities (Hogan, Curphy, & Hogan, 1994), and thereby targeted as high potentials and endorsed for leadership positions (Ilies, Gerhardt, & Le, 2004).

Lord (1985) explains how these perceptions are shaped by implicit leadership theories (i.e., generalized, shared beliefs that people have about which traits characterize the prototypical "ideal" leader). Previous research across many social sciences has shown how a variety of superficial traits and characteristics relate to perceived qualities of leadership (Kahneman & Tversky, 1982). For example, facial appearance influences judgments of competence (Todorov, Mandisodza, Goren, & Hall, 2005) and trustworthiness (Little, Roberts, Jones, & DeBruine, 2012); height is associated with perceptions of dominance (Thomsen, Frankenhuis, Ingold-Smith, & Carey, 2011; Young & French, 1998) and persuasiveness (Young & French, 1996). Simply seeing a person exhibit one of these traits or characteristics can trigger an entire leadership schema (Lord & Dinh, 2014). Such brief observations of behavior can convey influential information (Uleman, Saribay, & Gonzalez, 2008) that determines implicit perceptions of leaders (Engle & Lord, 1997; Lord, Foti, & De Vader, 1984), and thereby leader emergence outcomes.

Social psychologists (e.g., Ambady & Rosenthal, 1993) have demonstrated that people often make judgments about others based on superficial traits and thin slices of behavior. From an evolutionary psychology standpoint, such quick judgments were likely once extremely useful for human survival (Cheng, Tracy, Ho, & Henrich, 2016). However, this formerly highly functional tendency may no longer be adaptive in our modern, socially complex world. To use signaling theory terms, first impressions of leaders today may lack "signal honesty" (Bird & Smith, 2005; Otte, 1974) by offering inaccurate signals about the qualities and attributes of the signaler. Someone who appears at the outset to have leader-like qualities may actually later prove unable to handle leader requirements.

This brings us to the second route of the ascription-actuality theory–*actuality*. This route to leadership focuses on traits leaders possess that *actually* enable them to perform effectively in their given roles (Antonakis, 2011). According to the theory, the attributes that evoke the ascription of prototypical leader qualities often do not actually make a leader effective. This is consistent with other studies which have shown that the criteria that predict leader emergence are not necessarily the same as those that predict leader effectiveness (Nevicka, De Hoogh, Van Vianen, Beersma, & McIlwain, 2011; Riggio, Riggio, Salinas, & Cole, 2003; Wyatt & Silvester, 2018).

Previous research on the effectiveness of leaders has demonstrated relationships between effectiveness and a variety of factors, including cognitive ability (Judge, Colbert, & Ilies, 2004; Vardiman, Jinkerson, & Houghton, 2006), personality (Hogan et al., 1994; Judge, Bono, Ilies, & Gerhardt, 2002; Mumford, Campion, & Morgeson, 2007), career and life experiences (McCall, Lombardo, & Morrison, 1988), motivations (Graves, Cullen, Lester, Ruderman, & Gentry, 2015; Luthans, 1998; McClelland, 1975), and behavioral competencies (Boyatzis, 1982; Fleenor, Taylor, & Chappelow, 2010). These traits, characteristics, and skills indicate how well a person is equipped to fulfill leadership demands.

The actuality pathway is also closely aligned with what Zaccaro et al. (2012, 2018) refer to as the performance requirements matching approach to predicting leadership outcomes. Specifically, Zaccaro and colleagues state that success in leadership positions can be predicted based on how well a leader's individual differences align with the needs and functional expectations of their leadership role. The higher the 'match' between their individual differences and the requirements of the role, the higher the likelihood that a given leader will be effective. The authors propose that the two main categories of individual differences that can increase leaders' effectiveness are foundational traits (e.g., personality, cognitive ability, values, and physical characteristics) and leadership capacities (e.g., cognitive skills, social capacities, and knowledge). This research has its roots in earlier work by Coffin (1944), Katz and Kahn (1978), and Mumford, Zaccaro, Harding, Jacobs, and Fleishman (2000), all of whom argued that achieving critical role

outcomes is the essence of effectiveness.

Wyatt and Silvester (2018) recently offered the first empirical test of the ascription-actuality trait theory of leadership as a tool for explaining differences in leader emergence and leader effectiveness in a political setting. Using a target sample of British politicians who were enrolled in a leadership development program, the authors compared the impact of observer ratings of facial appearance and self-ratings of personality traits. Supporting the theory, they found that ascribed qualities based on facial appearance were associated with leader emergence (operationalized as the percentage of votes), but not leader effectiveness (measured by their colleagues' ratings on a 360° assessment).

The present study expands these findings by exploring the idea that vocal delivery may be used to ascribe leader attributes predicting leader emergence, while competencies may be more relevant to leader effectiveness.

Vocal delivery

To date, little attention has been given to the assessment of human voice in the study of leadership. The majority of studies on nonverbal communication have focused on the face (e.g., Ekman, Friesen, & Ellsworth, 1972; Gerpott, Lehmann-Willenbrock, Silvis, & Van Vugt, 2018), and therefore relied on vision as the perceptual sense. However, there is reason to believe that auditory information is also important to consider. Koppensteiner et al. (2015) stripped video clips of speakers into separate stimuli, including the original video, audio tracks only, and speech content. Results showed that the audio tracks were powerful predictors of perceptions of personality traits. Recently, Mahrholz, Belin, and McAleer (2018) found that people can deduce personality traits whether listening to entire sentences or single word utterances, regardless of verbal content. Further, Juslin, Laukka, and Bänziger (2018) found that spontaneous vocal utterances are a common way for listeners to infer emotions.

We propose that leader-like qualities can be ascribed on the basis of voice. Findings from communication science and political science support this claim. For example, several studies on speaking styles and voting patterns have found that lower-pitched voices are associated with more votes and favorable traits, including dominance, attractiveness, trustworthiness, strength, competency, and intelligence (Klofstad, Anderson, & Nowicki, 2015; Klofstad, Anderson, & Peters, 2012; Tigue, Borak, O'Connor, Schandl, & Feinberg, 2012). In addition, both speech rate (how quickly one speaks) (Apple, Streeter, & Krauss, 1979; Street, 1984) and pausing (number of voice breaks in a speech) (Feldman & Rimé, 1991) have been found to positively correlate with perceptions of competency.

Moreover, several studies suggest an association between captivating vocal delivery and leadership. Rosenberg and Hirschberg (2009) analyzed the speeches of well-known American politicians and found that several vocal qualities (e.g., variation in pitch and average pace) were positively associated with ratings of charisma, while other intonational features were associated with being boring. Similarly, in the Irish Political Speech Database, Cullen and Harte (2018) identified vocal features that raters associated with charisma, and other features with being boring. Howell and colleagues determined that actors trained to have a captivating voice tone, induced higher task performance in their followers compared to alternative leadership styles (Howell & Frost, 1989; Shea & Howell, 1999). Other findings have shown that vocal delivery is linked to charisma (Kirkpatrick & Locke, 1996), and that those who vary their voice are perceived as more charismatic and rated more positively (Brown, Strong, & Rencher, 1973; DeGroot & Gooty, 2009).

Given this prior research, vocal characteristics may be an important feature people use to ascribe qualities of an "ideal" leader. Therefore, we posit that vocal delivery will influence voters' perception of who sounds like a leader. In particular, we use an AI-informed assessment of vocal delivery that provides ratings of how captivating and not-boring individuals sound upon first impression. However, based on preliminary findings from DeGroot et al. (2011) and informed by the ascription-actuality theory of leadership, we do not believe that vocal delivery will play a role in the actual demonstration of leader effectiveness. Thus, we expect that:

H_1. Vocal delivery positively relates to leader emergence (H_{1a}), but not leader effectiveness (H_{1b}).

We test this hypothesis using AI-informed voice-analytic technology to estimate the qualities associated with a speaker's vocal delivery.

Leader competency

Among the main predictors of leader effectiveness are long-term observable demonstrations of leader competencies. The study of leader competencies is supported by nearly 50 years of research identifying competencies that predict positive work outcomes (Boyatzis, 1982; McClelland, 1973). Competencies are learned capabilities that lead to effective performance and are displayed by a set of behaviors that share the same underlying intent (Boyatzis, 2018). Competencies have been shown to consistently predict individual performance and effectiveness in both professional and academic settings (Bonesso, Gerli, Pizzi, & Cortellazzo, 2018; Boyatzis, Good, & Massa, 2012; Boyatzis, Rochford, & Cavanagh, 2017; Dulewicz, Higgs, & Slaski, 2003; Law, Wong, & Song, 2004; McClelland, 1998; Truninger, Fernández-i-Marín, Batista-Foguet, Boyatzis, & Serlavós, 2018). Thus, they form the basis of traditional leadership development programs (Naquin & Holton, 2006).We suspect, however, that competencies may not predict leader emergence in our study. In our organizational simulation setting, leader candidates and voters are socially distant (Antonakis & Atwater, 2002)–e.g. are not personally acquainted with one another prior to the start of the leadership development program. In situations where there is little opportunity to observe actual behaviors and demonstrations of leader competency related to effectiveness, theory suggests that observers are likely to rely on superficial features (e.g., vocal delivery) to inform ascriptions of leader-like qualities, based on their implicit leadership theories (Antonakis & Atwater, 2002). Consequently, we hypothesize that:

H_2. Leader competency positively relates to leader effectiveness (H_{2a}), but not leader emergence (H_{2b}).

It should be noted that leader competencies are not considered traits, but rather, behavioral leadership capabilities, which can be developed over time, and thereby are not as stable as traits (Antonakis, 2011). However, given that we are not measuring changes over time, we think that this should not alter the theory's propositions within the current study. Furthermore, both Antonakis, Day, and Shyns' (2012) and Zaccaro, Green, Dubrow, and Kolze's (2018) integrated leadership frameworks propose that both foundational traits and leadership capacities are necessary to consider when trying to understand the mechanisms of leader effectiveness. We thus believe that expanding the application of the ascription-actuality theory of leadership to include behaviors may motivate further testing and validation of the theory, and thereby support its relevance for studying leader emergence and leader effectiveness processes.

Method

Research design

The present study examines the vocal delivery of individuals campaigning to be elected for leadership positions in an organizational simulation, as well as their 360° competency and effectiveness scores. Its principal aim is to explore the different predictive routes to leader emergence and leader effectiveness. To empirically parse these two routes, we needed to design a study that met specific criteria. First, we

needed a setting in which there was a clear separation between leader emergence and leader effectiveness. Second, we needed observation-based data from leaders' colleagues to assess their actual competencies and effectiveness. Third, because we are interested in the effect of voice on leader effectiveness and leader emergence, we needed to obtain clear and natural audio samples from leaders. As such, we chose the setting of a leadership development program, which involved both an organizational simulation with a formal leader election process (and campaign speech) and the collection of leader competency metrics (i.e., 360° assessments from observers in the leaders' actual workplace).

Participants and procedure

Data were collected from 197 functional managers working in a variety of industries, organizations, sectors, and geographic locations. Participants were attendees in a 5-day, open-enrollment leadership development program in a private, not-for-profit organization. The program is composed of people unacquainted with one another and aims to develop and train senior leaders in charge of functions, divisions, or business units of large organizations and specifically targets individuals facing functional leadership challenges in their organizations. On the first day of the program, attendees take part in a 6.5-hour organizational simulation, *Looking Glass Inc*. (LGI; McCall & Lombardo, 1982). Developed in 1978 and continuously updated and revised, this simulated company elicits the behaviors and attitudes managers display during a day at work and is intended to be true to the reality of the managerial world for this specific leader level.

One of the first tasks in the simulation is to elect two leaders for the fictitious company: President and Managing Director of Strategic Initiatives. Attendees who are interested in these roles are asked to self-nominate and give a speech in front of the group explaining why they should be elected for one of these positions (they are not allowed to run for both positions). In total, from a pool of 602 attendees enrolled in 30 cohorts of the leadership development program (each cohort had a mean of 20 attendees), 197 attendees self-selected to run for one of the two lead roles in the simulation. These 197 attendees then became our sample for this study, referred to hereafter as 'participants'.[2] This sampling procedure conforms with purposive sampling (Neuman, 2005).

During this study, all speeches were audio recorded on an iPad for later voice analysis. After the attendees cast their votes, the two leaders were announced and once all other simulation roles (e.g., Director of Marketing and Sales, Plant Manager, etc.) were assigned, the simulation began.

As part of the leadership development program, participants also took part in a 360° assessment of leader competencies, wherein they obtained feedback from multiple co-workers in their home organizations, namely direct reports, peers, and bosses. A total of 1508 direct reports and peers provided leader competency ratings, with an average of 7.65 raters per participant. A total of 194 bosses rated participants on leader effectiveness. Participation in this study was voluntary and confidential, and all participants were asked for consent to use their data for this research.

In terms of the final sample, 34.5% self-identified as female and the mean age was 45 years (*SD* = 7.42 years; *SD* below the median = 4.15 years; *SD* above the median = 3.94 years); 4 participants did not report their gender and 7 participants did not report their age. Approximately 73.6% were from the United States, 4.6% from India, and 3.6% from Canada, with the remaining participants coming from 19 other countries across the world. The majority of participants (69.5%) were Caucasian and 46.2% had a Master's degree; 29 participants did not report their race and 10 participants did not report their level of education.

[2] Due to the likelihood of self-selection bias, we tested the group differences between the attendees who ran for the leadership positions and those who did not. This test is fully described in *Additional analyses* within the Results section.

Measures

Vocal delivery

We used the voice-analytic cloud-based software, VoiceVibes (2018) developed using AI and machine learning algorithms, to estimate what listeners might infer, on average, from hearing participants' election speeches. VoiceVibes measures the paraverbal features of speech (tone, pitch, volume, pausing, intonation, etc.) and assigns values for 20 different "vibes" conveyed by the speaker. The vibes are based on proprietary predictive models which, at the time of this study, had been trained on 720,000 human perception ratings using supervised machine learning and cross-validation processes recommended by Kuhn and Johnson (2013). The score for each vibe assesses the probability, on average, of communicating the particular vibe to a listener. More detail on the development of the vocal delivery measure is reported in Appendix A.

Specifically, in the current study, we used "strength of speech opening," a variable scaled between 0 and 10 that assesses how engaging speakers sound in the first 30 seconds of their speech. It is based on a combination of two of the vibes, "captivating" and "boring", with a high score indicating that the listeners are captivated and not bored by the speaker. This variable was designed by VoiceVibes to provide speakers with an assessment of whether they are likely to make a good first impression through their vocal delivery. We selected this measure because we hypothesized that first impressions regarding whether individuals sound captivating (and not boring) may be related to leader ascriptions.

Leader competency

We used the Center for Creative Leadership's Leading the Function 360° Competency Inventory (hereinafter referred to as LF 360° for simplicity), in which multiple raters from participants' professional sphere assess thirteen leadership competencies associated with leading a major organizational function (see Table 1 for a description of these competencies). This instrument was developed from the BENCHMARKS® by Design™ bank of validated competency scales (see Gentry & Leslie, 2007). It includes a total of 89 items,with an average of 7 items for each competency. Responses are scored on a 5-point Likert scale with the following fixed reference points: 1 = To a very little extent; 2 = To a little extent; 3 = To some extent; 4 = To a great extent; and 5 = To a very great extent. The response scale also includes a "Don't know/Not applicable" option.

Multiple external raters from participants' home organizations, namely direct reports, peers, and bosses, provided ratings of the participant based on their perceptions of behaviors observed from their daily workplace interactions prior to the 5-day program. Because participants' bosses also provided ratings of leader effectiveness in their organizations (see below), we have excluded their competency ratings so as to avoid common method bias (Batista-Foguet, Revilla, Saris, Boyatzis, & Serlavós, 2014). Composite scores were created by first averaging ratings across peers and direct reports for each item, then creating a mean of all items for each competency.

Leader emergence

Leader emergence was operationalized as the percentage of votes cast in the organizational simulation elections. Because the percentage of votes was positively skewed, we applied a logarithmic transformation.

Leader effectiveness

Leader effectiveness was measured via boss ratings on three reflective indicators, namely: "How would you rate this person's performance in his/her present job?"; "Where would you place this person as a leader

[3] The results of these first-order factor CFAs will be sent upon request.

Table 1
Leading the Function 360° Competency Inventory.

Leader competency	Definition	Example item
Approachability	Displays warmth and a sense of humor.	Has a good sense of humor.
Working across boundaries	Works across the organization to build collaborative relationships.	Considers the impact of his/her actions on the entire system.
Communicating effectively	Expresses ideas clearly.	Conveys ideas through lively examples and images.
Influence	Inspires and motivates others to take action.	Delegates effectively.
Innovation	Integrates knowledge, perspectives, and approaches to create new outcomes.	Experiments with new approaches.
Leading globally	Knows how to lead and conduct business throughout the world.	Discerns and manages cultural influences on business practices.
Learning agility	Learns from experience within an organizational context.	Acknowledges when he/she does not have expertise on an issue.
Engagement	Motivates others to perform at their best.	Understands what motivates people to perform at their best.
Understanding the enterprise	Understands the perspectives of different functional areas in the organization.	Understands the perspectives of different functional areas in the organization.
Results orientation	Aligns resources and assigns clear accountability to accomplish key objectives.	Aligns organizational resources to accomplish key objectives.
Self-awareness	Has an accurate picture of his/her strengths and developmental needs.	Is aware of his/her feelings.
Thinking and acting strategically	Gains perspective and balances the tension between daily tasks and strategic actions that impact the long-term viability of the organization.	Translates vision into action.
Demonstrates vision	Understands, communicates, and stays focused on the organization's vision.	Is good at selling the organization's vision to others.

relative to other leaders in similar roles?"; and "How would you rate this person's overall effectiveness in the organization?" The response scale was a 5-point Likert scale ranging from 1 to 5 (with the following fixed reference points: 1 = Among the worst; 2 = Less well than most; 3 = Adequately; 4 = Better than most; 5 = Among the best).

Control variables

Given that previous research suggests both vocal delivery and leadership prototypes tend to be gendered (Eagly & Karau, 2002), we controlled for the gender of a participant on both predictors (strength of speech opening and leader competency) and outcomes (leader emergence and leader effectiveness). Age, education, and speech duration were controlled for outcomes as well. Research suggests age and education are relevant to leader emergence (Goldberg, Sweeney, Merenda, & Hughes, 1998). Additionally, studies have shown that speech duration is associated with self-assessments of leader-like qualities such as confidence (Beatty, Forst, & Stewart, 1986). Regarding these control variables: Gender was coded as a dummy variable (1 = female; 0 = male; hereafter referred to as Female for ease of interpretation), age was measured in years, speech duration was measured in seconds, and education was assessed via six categories (1 = High School; 2 = Associate's; 3 = Bachelor's; 4 = Master's; 5 = Professional; and 6 = Doctorate). Although we did not control for speech content, recent research has shown that first impressions based on short speeches are stable across different content areas (Mahrholz et al., 2018).

Data analytic procedure

We followed Anderson and Gerbing's (1988) two-step analytical strategy to test our hypotheses. According to this strategy, the measurement model, which concerns the epistemic relationships between the observed variables and its latent constructs, is fit first using factor analysis to verify the factorial structure of each construct. Before testing the measurement model of leader competency, we computed interrater agreement statistics to assess the appropriateness of aggregating the LF 360° items across raters. Once a measurement model with acceptable fit was obtained, structural equation modeling (SEM) with Mplus version 8.3 (Muthén & Muthén, 1998-2017) was used to test the hypothesized relationships between the constructs. In our final model, leader effectiveness was modeled as a latent variable with its respective three items as its indicators, and all other variables were observed variables.

In addition, because the sample of participants was gathered over 30 different cohorts of the leadership development program, we needed to account for the hierarchical structure of our data, whereby differences at the cohort level (e.g., gender composition or average competency scores of each cohort) could affect individual-level outcomes. As such, we relaxed the random effects assumption that the cohort random intercepts were uncorrelated with individual-level regressors by specifying a correlated random effects (CRE) model (following recommendations by Antonakis, Bastardoz, & Rönkkö, 2019). This model involves the addition of cohort means for each regressor, which enables a consistent and unbiased estimation of both contextual effects (i.e., the cohort effects on individual-level outcomes) and within effects, (i.e., which describe how individual-level characteristics affect individual-level outcomes; Antonakis et al., 2019).

The MLR estimator was used for factor analyses and SEM models. Global model fit was evaluated using the following: Pearson's chi-squared test, Tucker-Lewis Index (TLI; Tucker & Lewis, 1973), comparative fit index (CFI; Bentler, 1990), root mean square error of approximation (RMSEA; Steiger & Lind, 1980), and the standardized root mean square residual (SRMR; Bentler, 1995). The following values indicate a good fit of the model to the data: TLI and CFI ranging from 0.95 to 1, RMSEA below 0.06, and SRMR below 0.08 (Hu & Bentler, 1999). All SEM parameter estimates reported are STDYX standardization estimates generated by MPlus. Lastly, we used SEM to test the structural model, wherein we specified the following structural equations:

$$\begin{aligned} \textit{Leader emergence} = {} & \beta_0 + \beta_1 \textit{Vocal delivery} + \beta_2 \textit{Leader competency} + \beta_3 \textit{Female} + \beta_4 \\ & \textit{Age} + \beta_5 \textit{Education} + \beta_6 \textit{Duration} + \beta_7 \overline{\textit{Vocal delivery}} + \beta_8 \\ & \overline{\textit{Leader competency}} + \beta_9 \overline{\textit{Female}} + \beta_{10} \overline{\textit{Age}} + \beta_{11} \overline{\textit{Education}} + \beta_{12} \\ & \overline{\textit{Duration}} + \varepsilon_{\textit{Leader emergence}} \end{aligned} \quad (1)$$

$$\begin{aligned} \textit{Leader effectiveness} = {} & \beta_0 + \beta_1 \textit{Vocal delivery} + \beta_2 \textit{Leader competency} + \beta_3 \textit{Female} + \beta_4 \\ & \textit{Age} + \beta_5 \textit{Education} + \beta_6 \textit{Duration} + \beta_7 \overline{\textit{Vocal delivery}} + \beta_8 \\ & \overline{\textit{Leader competency}} + \beta_9 \overline{\textit{Female}} + \beta_{10} \overline{\textit{Age}} + \beta_{11} \overline{\textit{Education}} + \beta_{12} \\ & \overline{\textit{Duration}} + \varepsilon_{\textit{Leader effectiveness}} \end{aligned} \quad (2)$$

$$\textit{Vocal delivery} = \beta_0 + \beta_1 \textit{Female} + \varepsilon_{\textit{Vocal delivery}} \quad (3)$$

$$\textit{Leader competency} = \beta_0 + \beta_1 \textit{Female} + \varepsilon_{\textit{Leader competency}} \quad (4)$$

Table 2
Means, standard deviations, correlations, and Cronbach's alpha values.

Variable	Mean	*SD*	1	2	3	4	5	6	7	8	9	10
Control variables												
1. Female	0.35	0.48										
2. Age (years)	45.14	7.42	−0.04									
3. Education	3.70	0.87	0.09	−0.09								
4. Duration (seconds)	65.95	24.19	0.04	0.05	0.06							
Vocal delivery												
5. Strength of speech opening	3.31	1.21	0.40**	−0.14	0.03	0.09						
Leader competency												
6. Leader competency	7.58	0.79	0.02	−0.02	−0.02	0.04	0.02	(0.89)				
7. Interpersonal competency	3.71	0.45	−0.01	0.02	−0.07	0.05	0.01	0.96**	(0.96)			
8. Task-based competency	3.87	0.38	0.04	−0.06	0.04	0.03	0.02	0.94**	0.81**	(0.92)		
Leader emergence												
9. Percentage of votes (log)	−1.40	0.63	0.24**	−0.04	0.08	0.23**	0.26**	0.04	0.04	0.03		
Leader effectiveness												
10. Leader effectiveness	11.91	2.18	0.05	−0.28**	−0.02	−0.05	−0.05	0.30**	0.25**	0.33**	0.05	(0.88)

Notes. Due to sporadic missing data, *N* varies from 170 to 197 across correlations. Internal reliability coefficients (Cronbach's alpha values) are listed along the diagonal. $^{*}p < .05$. $^{**}p < .01$.

Results

Descriptive statistics

Table 2 presents the means, standard deviations, correlations, and Cronbach's alpha values for the variables in the current study. Strength of speech opening, duration of speech, and Female all correlated with leader emergence. Specifically, individuals with higher strength of opening scores, longer speeches, and who identified as female were more likely to emerge as leaders. Identifying as female also positively correlated with strength of speech opening.

Measurement model

Leader effectiveness

A confirmatory factor analysis (CFA) was conducted in which leader effectiveness was modeled as a latent variable with three reflective indicators (its corresponding three items). This one-factor model demonstrated excellent fit (CFI: 1.00, TLI: 1.00, RMSEA: 0.00, SRMR: 0.00), thus allowing us to continue with its inclusion in the SEM model.

Leader competency

Extensive research contends that leader competency is a multidimensional aggregate construct formed by two dimensions: Interpersonal competency and task-based competency (Cartwright & Zander, 1960; Fleishman, 1953; Kahn, 1956; Smith, Misumi, Tayeb, Peterson, & Bond, 1989; Yukl, Gordon, & Taber, 2002). As such, these two competency dimensions were theoretically specified as second-order factors underlying the 13 competencies assessed by the LF 360º instrument. The interpersonal dimension was manifested by 7 competencies: Approachability, communicating effectively, engagement, influence, learning agility, self-awareness, and working across boundaries. The task-based dimension consisted of 6 competencies: Demonstrates vision, innovation, leading globally, results orientation, thinking and acting strategically, and understanding the enterprise. This measurement model of leader competency was tested in five steps. We conducted an EFA followed by CFA for each of the thirteen competencies to ensure the factor structure for each competency was acceptable before conducting further analyses[3]. Second, by averaging across the items of each competency we obtained 13 competency scores that were used as the manifest indicators (item parcels) of the second-order factors (the interpersonal and task-based competency dimensions). Third, each dimension was treated as a theoretically constructed parcel of items and their unidimensionality was examined. The initial CFA had a poor fit (CFI: 0.87, TLI: 0.85, RMSEA: 0.16, SRMR: 0.07). We thus began removing item parcels that explained the least amount of variance, under the specification that a factor needed at least 3 items to be identified. After removing 7 item parcels, a final two-factor structure showed good to excellent fit (CFI = 0.97, TLI = 0.94, RMSEA = 0.13, SRMR = 0.03). Fourth, we averaged across the final three item parcels comprised in interpersonal competency (engagement, influence, and working across boundaries), and the three in task-competency (demonstrates vision, results orientation, and thinking and acting strategically), to obtain a single score for each factor. Lastly, the interpersonal and task-based competency scores were summed to create an overall leader competency variable to be subsequently entered into the structural model.

Prior to fitting the measurement model of leader competency, we examine the appropriateness of aggregating peer and direct report ratings on the LFI 360º competency items. We computed inter-rater agreement statistics using $r^{*}_{WG(J)}$ (Lindell, Brandt, & Whitney, 1999) based on two null distributions: the uniform null distribution (expected error variance = 2) and a slightly skewed null distribution (expected error variance = 1.34). Using the uniform null distribution, the median $r^{*}_{WG(J)}$ values ranged from 0.68 to 0.73, and using the slightly skewed null distribution, the median $r^{*}_{WG(J)}$ values ranged from 0.53 to 0.60 for the thirteen competencies. Following the interpretative guidelines of LeBreton and Senter (2008), these values overall represent moderate to strong inter-rater agreement, therefore justifying the aggregation of peer and direct report ratings of the final version for each competency item in our dataset.

Structural model

We tested our initial structural model, the CRE model, which, in addition to the explanatory variables (vocal delivery and leader competency) and control variables (Female, age, duration of speech, and education), also included the cohort means of each regressor to test for potential contextual effects (see Eqs. (1) and (2) above). This model yielded poor fit ($\chi^2(51) = 122.79$, $p < .001$; CFI: 0.83, TLI: 0.74, RMSEA: 0.09, SRMR: 0.07), and all cohort means for the six regressor variables were nonsignificant ($ps > 0.06$).

Thus, we removed the cohort means from the model and proceeded to specify a random effects (RE) model, with regressors and control variables only. This model showed excellent fit ($\chi^2(21) = 16.08$, $p = .77$; CFI: 1.00, TLI: 1.00, RMSEA: 0.00, SRMR: 0.03). To be sure we could proceed with the RE model (without cohort means), we examined the random effects assumption by computing the likelihood ratio test

(Antonakis et al., 2019). The RE model fit the data significantly better than the CRE model ($\chi^2(6) = 8.23$ ($p = .22$)), thus implying we could not reject the random effects assumption.

In the RE model, however, neither Female ($ps > 0.058$) nor education ($ps > 0.448$) significantly predicted either outcome variable and, thus, were removed so that a more parsimonious model could be tested. This model continued to show excellent fit ($\chi^2(19) = 16.74$, $p = .61$; CFI: 1.00, TLI: 1.00, RMSEA: 0.00, SRMR: 0.04) and therefore was retained as the final model. See Fig. 1 for a depiction of this model, and Appendix B, where the estimates for the CRE, RE and final models are reported.

In the final SEM model, vocal delivery significantly predicted leader emergence ($\beta = 0.25$, $p < .001$) but not leader effectiveness ($\beta = -0.07$, $p = .37$), and leader competency was significantly associated with leader effectiveness ($\beta = 0.31$, $p < .001$) but not leader emergence ($\beta = 0.03$, $p = .72$). In terms of the control variables, duration of speech significantly predicted leader emergence ($\beta = 0.22$, $p < .001$) but not leader effectiveness ($\beta = -0.05$, $p = .51$), and age significantly predicted leader effectiveness ($\beta = -0.30$, $p < .001$), but not leader emergence ($\beta = -0.02$, $p = .76$). Additionally, Female significantly predicted vocal delivery ($\beta = 0.39$, $p < .001$) such that women were more likely to have higher strength of speech opening scores, but not leader competency ratings ($\beta = 0.39$, $p = .79$).

Equality of coefficients testing

We examined whether there were significant differences between the influence of the predictors in our model (i.e., vocal delivery and leader competency) on leader emergence versus leader effectiveness. Following the logic of Chow's (1960) tests, we estimated a model with restrictions on the equality of these coefficients. Specifically, we used the "model constraint" command in Mplus to create two new variables denoting (1) the difference between the slopes representing the regression of leader emergence on vocal delivery and the regression of leader effectiveness on vocal delivery and (2) the difference between the slopes representing the regression of leader emergence on leader competency and the regression of leader effectiveness on leader competency. This command yields z-tests for the two new parameters. The z-tests for these two new parameters were statistically significant ($b = -0.17$, $p = .003$; $b = -0.22$, $p = .023$), rejecting the null hypothesis that the tested differences were zero. As such, both vocal delivery and leader competency had significantly different relationship strengths with leader emergence versus leader effectiveness.

Additional analyses

We performed additional analyses to test for endogeneity in our model and self-selection bias in the sample of participants.

Endogeneity

There was a concern that some of our predictors could be endogenous. For instance, leader competency could share antecedents with leader effectiveness, such as personality traits (Zaccaro et al., 2018) or cognitive ability (Judge et al., 2004). Similarly, voice could also correlate with personality traits, as previous studies have found it to be related to extraversion (Scherer, 1978). If this was the case, we would have non-zero correlations between the independent variables and the error term, violating a central assumption of the ordinary least squares (OLS) estimator and, thereby, implying the estimates reported above were inconsistent or biased. In the presence of endogeneity in a model, the two-stage least squares (2SLS) estimator is one of the most robust for obtaining unbiased estimates, as it uses instrumental variables (IVs)—exogenous variables that are solely correlated with the endogenous predictor—to purge a regressor from the variance that overlaps with the error term (Antonakis, Bendahan, Jacquart, & Lalive, 2010). To inspect the presence of endogeneity in a model, the Durbin-Wu-Hausman test (Durbin, 1954; Hausman, 1978; Wu, 1973) compares the differences between estimates obtained from a consistent estimator, such as the 2SLS, with those of an inconsistent but efficient one, such as the OLS. When these differences are non-significant, the regressor is deemed exogenous.

Since we had data available from the Workplace Big Five Profile 4.0 (Howard & Howard, 2009), we were able to use these variables as IVs to compute the Durbin-Wu-Hausman test. Our results indicated that the differences between 2SLS and OLS estimates were nonsignificant ($ps > 0.165$), suggesting that personality variables are not contributing to endogeneity in our model. However, we did not have IVs available to examine if cognitive ability was a source of endogeneity. Therefore, we must acknowledge the possibility that our estimate of the relationship between leader competency and leader effectiveness might be biased due to these variables' likely positive correlations with cognitive ability.

Self-selection bias

Because our sample of participants (i.e., the attendees who ran for the leadership roles) was obtained through self-selection and not random sampling, we needed to assess the potential of self-selection bias. We thus computed two independent-sample *t*-tests to compare the group of self-selected participants with the larger pool of program

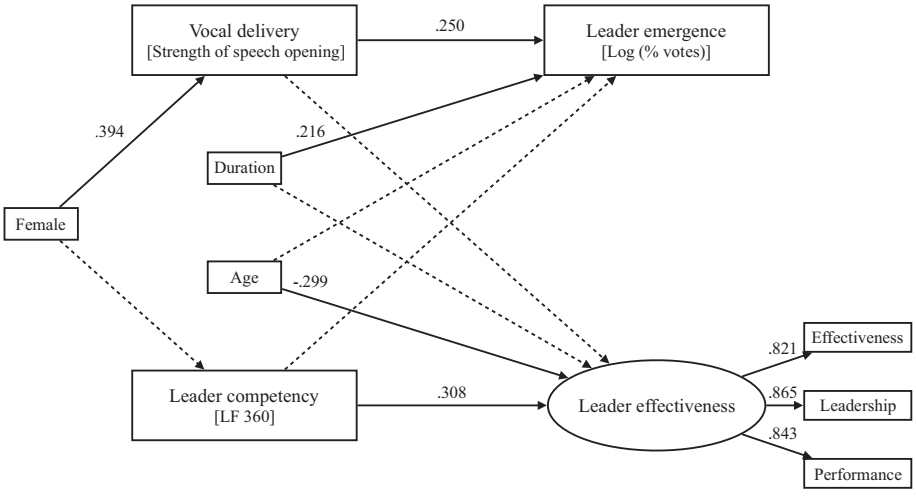

Fig. 1. Structural and measurement model.
Notes. Non-significant paths denoted by dashed lines; $\chi^2(19) = 16.74$, ($p = .61$); RMSEA = 0.00; CFI = 1.00; TLI = 1.00; SRMR = 0.04.

attendees regarding mean differences in both leader competencies and a set of demographic variables (Female, age, and education). A Bonferroni correction for multiple tests (in our case 12 *t*-tests) would yield a new significance value of $p = .004$. Our results, displayed in Table 3, indicated the presence of self-selection bias with small, albeit significant, mean differences in age and competency scores. Unexpectedly, these mean differences were negative: The attendees who ran for the leadership positions were younger and less competent than those who did not run, such that our self-selection sampling resulted in larger standard deviations in the sample of participants, as compared to the larger pool of attendees. The effect sizes of the differences were, however, modest with Cohen's *d* ranging from 0.26 to 0.38.

Discussion

This study examines the validity of the ascription-actuality trait theory of leadership by examining the distinction between the "traits that *really* matter for leadership and those that *seem* to matter" (Antonakis, 2011, p. 273). Both of our hypotheses were supported: (H1) Vocal delivery was positively associated with who, among strangers, got elected as a leader, but not with ratings of leader effectiveness; (H2) Leader competency, as assessed by peer and direct report ratings, was significantly related to leader effectiveness as perceived by their boss, but not to who got elected to leadership roles in the simulation. These findings are relevant to leader development theory, research, processes, and practices.

In addition, there were a few non-hypothesized results that are worth mentioning. First, in our structural model, there was a negative association between age and leader effectiveness. This was unpredicted, but upon reflection, unsurprising. Other studies have found a negative relationship between age and perceived effectiveness (Ostroff, Atwater, & Feinberg, 2004). Moreover, research on age bias has shown that older workers tend to receive lower performance ratings and lower potential for development evaluations (Finkelstein, Burke, & Raju, 1995; Truxillo, Finkelstein, Pytlovany, & Jenkins, 2015).

We also found evidence of self-selection bias in our sample (i.e., the attendees who ran for the leadership positions had slightly lower, albeit significant, mean ages and leader competency ratings than those who did not run). This unexpected finding resulted from the combination of two factors: 1) The distribution of competency scores was negatively skewed in the pool of program attendees, and 2) The attendees who chose to run for the leadership positions were, although by a small margin, among the younger and less competent of the pool.

We also found that participants who identified as female scored higher on strength of speech opening as compared to participants who identified as male in our sample, even when education, duration, and age were accounted for; and that strength of speech opening was positively associated with emergence as a leader. At first, these findings seem counterintuitive, given that previous research has found a preference for leaders with lower-pitched voices (e.g., Klofstad, 2016; Tigue et al., 2012), a distinctive feature of male voices. However, there are many potential explanations. First, it should be noted that our strength of speech opening measure did not assess pitch, but rather how captivating and (not) boring participants were in their first 30 seconds of speaking, according to AI estimates. Therefore, our finding suggests that participants who identified as female were simply more effective in using their voice. Implicit leadership theories that equate men as leaders and women as followers (e.g., Braun, Stegmann, Hernandez Bark, Junker, & van Dick, 2017) suggest women might have needed to be more vocally persuasive to reach the same leadership level as men. Indeed, research suggests that speaking up is more important for women leaders (Pearson & Dancey, 2011). Finally, it is important to emphasize that the pattern of findings for both genders was the same—higher performance on strength of speech opening predicted leader emergence.

Theoretical implications

The findings of this study provide empirical evidence in support of the ascription-actuality trait theory of leadership. We found that both the implicit leadership approach to leader emergence and the understanding of leader effectiveness based on requisite skills are related to leadership outcomes. The implicit leadership approach, linked to the ascription route described by Antonakis (2011), suggests that individuals acquire the mantel of leadership when observers code their attributes in accordance with a leadership prototype. In this study, this phenomenon was demonstrated by examining the vocal delivery of the first 30 seconds of a brief election campaign speech for purposes of

Table 3
T-Tests for equality of means between the sample of participants and the pool of attendees regarding leader competencies and demographic variables.

Variable	Participants' group	*t* (df)	*p*-value (2-tailed)	Mean	*SD*	Mean difference	*SD* difference	*Std. error* difference	Cohen's *d*
Female	1	0.19 (589)	0.85	0.35	0.48	0.01	0.00	0.04	0.02
	0			0.34	0.48				
Age	1	−2.98 (579)	0.00	45.14	7.42	−1.85	0.61	0.62	0.26
	0			46.98	6.81				
Education	1	0.30 (448)	0.77	3.70	0.87	0.03	−0.22	0.08	0.03
	0			3.67	1.09				
Engagement	1	−4.34 (588)	0.00	3.54	0.52	−0.19	0.03	0.04	0.37
	0			3.73	0.49				
Influence	1	−4.00 (588)	0.00	3.88	0.44	−0.14	0.05	0.04	0.34
	0			4.02	0.39				
Working across boundaries	1	−4.47 (588)	0.00	3.72	0.45	−0.16	0.06	0.04	0.38
	0			3.88	0.39				
Demonstrates vision	1	−3.43 (588)	0.00	3.91	0.43	−0.12	0.06	0.03	0.29
	0			4.01	0.37				
Results orientation	1	−2.81 (588)	0.01	3.92	0.40	−0.09	0.05	0.03	0.24
	0			4.01	0.36				
Thinking and acting strategically	1	−3.87 (588)	0.00	3.79	0.39	−0.13	0.02	0.03	0.33
	0			3.92	0.36				
Interpersonal competency	1	−4.46 (588)	0.00	3.71	0.45	−0.16	0.05	0.04	0.38
	0			3.88	0.41				
Task-based competency	1	−3.64 (588)	0.00	3.87	0.38	−0.11	0.04	0.03	0.31
	0			3.98	0.34				
Leader competency	1	−4.31 (588)	0.00	7.58	0.79	−0.28	0.09	0.06	0.37
	0			7.86	0.70				

Notes. Due to sporadic missing data, *N* varies from 578 to 591 across tests. Cohen's *d* reflects absolute value.

electing the leaders of a simulated organization composed of strangers. In those 30 seconds, the degree to which the speaker sounded captivating and not boring was associated with the share of votes. Following Lord and Maher (1993), we believe that the candidates' opening style offered an implicit signal that informed voters' judgment of who would make a good leader. Our study suggests that voice perception is a mechanism by which people recognize leader status in others.

The actuality approach to understanding leader outcomes was supported by the relationship between leader competency (as rated by peers and direct reports) and leader effectiveness (as rated by bosses). In line with the Zaccaro et al.' (2018) work, this result suggests that effective individuals demonstrated the competencies related to the performance requirements of the leadership role.

The set-up of our study and the ascription-actuality theory enabled comparing the different paths to leader emergence and leader effectiveness within the same sample of managers. Our findings suggest that vocal delivery is more relevant for leader emergence, while leader competency is more relevant for leader effectiveness. Leader emergence and leader effectiveness are both established research topics for understanding leader development, but they are often explored separately. The results of this study and previous examinations by Zaccaro et al. (2018) suggest that perhaps they should be studied together as approaches for recognizing talent. Overlooking someone with skills associated with leader effectiveness may hinder their self-efficacy perceptions and thereby discourage and deter their development of a leader identity (Guillén, Mayo, & Korotov, 2015). It also restricts the wealth of experiences essential to developing effectively as a leader. Research on leader role identity (e.g., Kwok, Hanig, Brown, & Shen, 2018) and experience-driven talent management practices are areas which would be strengthened by an integrated approach to studying leader emergence and leader effectiveness processes.

Practical implications

The current study suggests an important caution for human resource departments and others aiming to identify and develop talent: People who exhibit the sizzle associated with leadership may not have the substance. Specifically, our findings suggest that individuals may equate effective vocal delivery with effective leadership—a false correlation that could lead to more effective candidates being passed over. To combat this bias, organizations and human resource professionals should replace executive selection 'decisions' by executive selection 'processes' (Day, 2009), and define and develop evidence-based assessments. For example, given that our findings suggest that competencies are strongly related to effectiveness, 360° assessments could be used to assess whether high potentials are ready to step into leadership. Human resource professionals should also consider creating leader selection processes that limit the role of voice (e.g., relying on written statements over vocal presentations). These processes could even be coupled with other methods to decrease implicit bias such as using a "blind audition" service, which allows applicants to anonymously apply for jobs by completing a job challenge (thus minimizing biases related to gendered or racialized names, etc.).

However, we caution that more research needs to be done before we can definitively recommend that vocal delivery is irrelevant to leadership. It is quite likely that there are other elements of leadership outside the scope of this study for which vocal delivery is a significant predictor (see Limitations and Future Research). Even if additional research demonstrates that voice does not predict any leadership outcomes, the dissemination of these findings and subsequent preventative measures to segregate vocal impact from leader selection is likely to take time to become standard practice. In the meantime, talented and capable high potentials are likely to be overlooked in favor of peers who are better spoken. As such, we believe it is prudent for would-be leaders to become more aware of how their vocal delivery can impact others' initial perceptions of their leadership potential. Just as potential leaders are advised to dress for the job they want (despite any reason to believe that a better wardrobe will actually improve performance), they should be advised to speak for the job they want as well. This has implications for coaching and development initiatives, which currently rely heavily on building leader competency. This study suggests that the leader development field may want to consider additional ways to help individuals establish themselves as leaders, such as through vocal training. This is aligned with the recent trend of developing "executive presence"—effectively training leaders to cultivate leader-like qualities through adjusting physical and non-verbal cues of gravitas, appearance, communication style, and other related traits (Hewlett, 2014).

Moreover, understanding the role of voice in leader development holds promise because vocal delivery can be practiced and developed—unlike many other attributes associated with implicit theories of leadership such as height or gender. Individuals can rehearse ways of speaking which better express leader characteristics such as confidence, integrity, or intelligence (Judge & Piccolo, 2004). Margaret Thatcher, for example, learned from acting coaches how to lower the pitch of her speaking voice, which may have helped facilitate her political career (Klofstad, Nowicki, & Anderson, 2016). This study in particular, shows that "strength of speech opening", our measure of how captivating and not boring speakers sound in the first thirty seconds of their speech, was positively related to leader emergence. This suggests that individuals should pay special attention to the opening moments of their speaking engagements, and focus on learning how to vary the volume and intonation of their voice, so as to engage audiences. Additionally, our use of speech duration as a control suggests that in the context of a brief speech, speaking longer than others may also make individuals seem more leader-like. At the same time, leader development practitioners should make it clear that while vocal characteristics can improve individuals' ability to be seen as leader-like, leader competency is still more strongly associated with effectiveness.

A broader implication of this study is the general use of AI for leader development purposes. This study suggests that potential leaders can benefit from interventions that take advantage of the development of tools based on AI such as voice-analytic software packages. These tools make it possible to democratize leadership development activities, increasing access and scalability for those who might not have the luxury of in-person coaching and enabling individuals to personalize general trends for their benefit. For example, voice-analytic software could be used in high schools or community colleges to provide students with expert quality feedback and vocal training that they could not afford or have access to otherwise, possibly increasing their ability to acquire leadership positions down the road. Voice analytics could also be used within healthcare systems to provide doctors and nurses with real time feedback about their vocal bedside manner without having to take time off for additional training. Increased vocal performance could improve patient experience scores, key metrics for Medicare reimbursements.

Limitations and future research

This study has several limitations. One potential threat to internal validity involves the presence of endogeneity in our model, as there was a chance that the regressors shared antecedents with the outcomes (such as personality traits and cognitive ability) that were omitted in our model. While we were able to rule out personality traits as a source of endogeneity (by using instrumental variables to compute the Durbin-Wu-Hausman test), we did not have instrumental variables to test whether cognitive ability was biasing our estimate of the relationship between leader competency and leader effectiveness. Future research should include measures of cognitive ability, to be used either as regressors, controls or, ultimately, as instrumental variables in inspections of endogeneity. A second threat is that, due to the applied nature of the setting, we could not distinguish between the content of candidates' speeches and the style of their delivery. Content and delivery are important to tease apart in developing a richer understanding of

leadership potential. A between-subjects laboratory study might be an ideal way to examine content and delivery in a more standardized way. For example, a trained confederate could be recorded giving the same speech with different vocal deliveries to separate audiences who would then evaluate the confederate's leadership potential. Subjects could be randomly assigned to each condition. Given the power of vocal style in the current study, we would expect that vocal style would influence results, even when controlling for content.

The election aspect of the simulation also adds a caveat to external validity, as most organizations do not formally vote to elect presidents or managing directors; nor do all leadership emergence scenarios involve selecting leaders based on first impressions. However, leaders are often subjected to "implicit voting" in the real world. Whether interviewing for a new role, recruiting new hires, or selling an idea to stakeholders, leaders are regularly put in positions where they have to quickly convince others of their leadership ability without being given an opportunity to first demonstrate their competency. In such situations, first impressions and snap judgments happen, and although they may not be followed by a vote, they may be followed by either proactive attempts to invest time and energy into the individual or disinterest in the individual's development. Because of this dynamic, it is possible that while vocal delivery may not impact effective leadership, it might still be a necessary element for successful leadership. We would like to see future research explore this possibility. For example, future studies could examine whether vocal delivery predicts outcomes such as stakeholder buy-in, employee engagement, or follower loyalty. Such studies could be done by pairing voice-analytic ratings with existing metrics of the aforementioned constructs.

Another limitation is that our sample only consisted of leaders engaged in a formal leadership development program and may not be typical of the leadership population at large. However, we believe that this sample was quite appropriate. All the participants described their leadership roles as leading a function, giving some consistency to the sample. Also, because they were in a development program, we were able to obtain more than one type of data from each person. Furthermore, because this study examined leader emergence based on first impressions, the context of the program allowed strangers to quickly form impressions of one another. The people who voted did not know the candidates before the program, creating a realistic setting for studying first impressions. Ultimately, we believe that the strengths of our design, such as collecting data from the same business leaders from multiple raters in two different settings, outweigh these aforementioned limitations.

We expect the results of this study will spark future studies incorporating vocal delivery. Voice analytics has promise as a tool for both research and development with its emphasis on measuring the micro-components of speech and the use of AI to understand how features of speech are received. It could be used to better understand the dimensions of transformational leadership (Bass & Avolio, 1994; Judge & Piccolo, 2004). Similarly, a potentially rich direction is to investigate voice more deliberately in the context of team relationships. Little attention has been paid to understanding how voice influences the quality of interactions in the workplace. Yet, the phenomenon of emotional contagion by which emotions ripple through groups (Barsade, 2002) is supported by neuroscience findings (e.g., Hatfield, Rapson, & Le, 2009). In particular, studies are showing how people catch others' emotions through voice (Rueff-Lopes, Navarro, Caetano, & Silva, 2015). With their role in the spotlight, leaders have the ability to influence others emotionally and win support.This study shows that can actually occur in less than 30 seconds. A voice-analytic tool could thus be used to examine the spread of emotions in a work group. Our expectation is that the tone a person uses will impact the emotions of others. Such a study would allow for a sharper focus on the interactions between people in an organization as they engage in collaborative or shared work. An experimental design could be used to examine the effects of different leader vibes on team outcomes such as engagement, creativity, and performance. It would be possible to see if groups respond in a way that is in accord with the vocal characteristics of the speaker.

Future research should also consider the impact of gender on the outcome variables. While we had interesting correlations with gender, the results were not hypothesized and are hard to interpret. Further, we did not control for the gender of voters or the gender make-up of each cohort. Future research could more carefully take into account the gender balance of the group, gender of individual voters, and gender of the raters on the 360°assessment to generate a deeper understanding of the role of gender, voice, and leadership.

Moreover, while we were unable to explore dialect and accent due to the relatively small and homogenous nature of our sample, we believe future research should address how these elements of speech may also influence who is seen as leader-like. Future research should also consider the role of ethnicity, nationality, and other demographics in understanding these phenomena. Because voice is an implicit feature, its investigation may add to the understanding of differential responses to leaders with different social identities. There are several ways that vocal characteristics can be used to understand inclusion in organizations. Voice analytics could help to better understand biases by allowing for a deeper understanding of how vocal features are perceived; thereby, contributing to discussions of unconscious beliefs and how to reduce their impact on behaviors in organizations.

Conclusion

Understanding the ascription and actuality routes to leader outcomes is of both theoretical and practical significance. We provide evidence that individuals' vocal delivery is an important element to consider in the study of leader emergence processes, and support previous findings that competencies are important to leader effectiveness. Thus, this study advances knowledge of the complex process of talent management and provides practical insights for improving the identification of high-potentials and associated leadership development programs.

Appendix A. VoiceVibes analytics procedure

While the exact algorithms are proprietary, for this paper, the creator of VoiceVibes described the basic analytics procedure used to create the "vibes"[4] tested in the program. To develop the predictive models for the vibes, paraverbal components of speech (e.g., pitch, volume, pausing, pace) were extracted and correlated with the perceptions (ratings) they elicited in listeners. These components provide access to the implicit affect communicated by the speaker (Bessenoff & Sherman, 2000; Richeson & Shelton, 2005; VoiceVibes, 2019). VoiceVibes used machine-learning techniques to train models using 2,400 samples of speech made by 40 speakers (20 male and 20 female) in a controlled recording environment. The semantically complete speech samples of neutral topics were then evaluated by 360 individual raters. Raters were asked to quantify the presence of each vibe conveyed in each sample of speech. Eighteen-hundred of the samples were used as a training set for developing machine learning models. This was followed by independent validation of the predictions by a third party with the remaining 600 samples. The labels of the vibes themselves

[4] Specifically, the vibes assessed were: captivating, confident, dynamic, personable, authentic, persuasive, assertive, clear, organized, boring, arrogant, push, condescending, unapproachable, nervous, timid, ditsy, belligerent and detached.

were linguistically analyzed to ensure they had a common meaning to listeners. For each of the 20 vibes, the accuracy of the machine prediction of the mean human rating ranged from 90 to 100%.

The "strength of speech opening" metric was developed based on input from 10 communication coaches who identified the importance of strength of opening in engaging an audience. A probabilistic model using the presence of the captivating vibe and the absence of the boring vibe was used to model the ascription of strong strength of opening on a 0 to 10 scale.

Appendix B. Model results for correlated random effects model, random effects model, and final model

	Correlated random effects model		Random effects model		Final model	
	β	*p*-value	β	*p*-value	β	*p*-value
Leader effectiveness regressed on						
Female	0.097	0.237	0.097	0.234		
Age	−0.320	0.000	−0.320	0.000	−0.299	0.000
Education	−0.044	0.589	−0.044	0.589		
Duration	−0.058	0.429	−0.057	0.437	−0.046	0.510
Vocal delivery	−0.109	0.198	−0.109	0.195	−0.069	0.369
Leader competency	0.292	0.000	0.292	0.000	0.308	0.000
Leader emergence regressed on						
Vocal delivery	0.247	0.001	0.189	0.014	0.250	0.000
Leader competency	0.030	0.700	0.026	0.739	0.028	0.720
Female	0.171	0.037	0.143	0.059		
Age	0.005	0.946	−0.019	0.797	−0.021	0.764
Education	0.069	0.349	0.049	0.449		
Duration	0.202	0.007	0.211	0.000	0.216	0.000
Duration (cohort mean)	0.026	0.762				
Vocal delivery (cohort mean)	−0.111	0.138				
Female (cohort mean)	−0.138	0.061				
Age (cohort mean)	−0.031	0.650				
Education (cohort mean)	−0.070	0.382				
Leader competency (cohort mean)	0.004	0.964				
Leader competency regressed on						
Female	0.011	0.890	0.011	0.890	0.022	0.787
Vocal delivery regressed on						
Female	0.399	0.000	0.399	0.000	0.394	0.000

Notes. The correlated random effects model (CRE) includes the cohort means of all regressors and controls. The random effects model (RE) reflects a model in which the cohort means are removed due to nonsignificance. The final model reflects a model in which Female and education were removed from the random effects model due to nonsignificance.

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