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Original Article

Voice pitch predicts electability, but does not signal leadership ability

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ABSTRACT

Voice pitch, the perceived "highness" or "lowness" of a voice, influences how humans perceive and treat each other in various ways. One example is the selection of leaders. A growing number of studies, both experimental and observational, show that individuals with lower-pitched voices are more likely to win elected office. This leads to the yet untested question of whether individuals with lower voices are actually better leaders. That is, is voice pitch a reliable signal of leadership ability? Here we address this question with an observational study of the vocal pitch and leadership ability of elected officials, and an experiment where subjects were asked to respond to persuasive political policy statements made by speakers with different pitched voices. Both studies lead to the same conclusion: voice pitch does not correlate with leadership ability.

1. Introduction

Animal vocal signals contain information about the signaler, such as its motivation and ability to defend resources, its health, or its genetic quality. These signals are typically reliable, in the sense that some feature of the signal's form accurately represents some intrinsic quality or state being advertised by the signaler (Maynard Smith & Harper, 2003; Searcy, Anderson, & Nowicki, 2006). Reliability is enforced by signal production costs that make bluffing too costly for individuals of low quality or motivation (Grafen, 1990; Zahavi, 1975), and physical constraints that link a signal feature with a physical characteristic of the signaler such that the signal cannot be faked (Davies & Halliday, 1978; Reby & McComb, 2003). In general, listeners (i.e., signal receivers) are selected to pay attention to the information contained in signals and to adjust their own behavior accordingly because doing so will increase their own evolutionary fitness. For example, research with songbirds shows that the number of quiet songs sung by a competing male reliably signals the likelihood that he will physically attack his opponent (Akcay, Anderson, Nowicki, Beecher, & Searcy, 2015; Searcy et al., 2006). In this case, both the signaler and signal receiver benefit from the information exchange because both can avoid a potentially costly fight if they are not equally motivated to, or equally able to defend whatever resource is being contested.

While verbal communication (i.e., language) separates human and non-human animals, humans are also affected by non-verbal vocal signals. One example is voice pitch. Voice pitch is the perceived "highness" or "lowness" of a voice as influenced by fundamental frequency (F_0), "the number of vibrations per second made by the vocal folds [i.e., vocal cords] to produce a vocalization" (Tusing & Dillard, 2000, p. 150). F_0 is measured in Hertz (Hz), whereby lower values indicate a lower sounding voice. Longer and thicker vocal folds produce a lower voice. Vocal fold size is determined by the size of the larynx (i.e., voice box) in the throat. Taken together, the larger the larynx, the longer and thicker the vocal folds, the lower the pitch of the voice. Voice pitch is on average twice as high in women as in men because the male body contains more testosterone, which in puberty enlarges the larynx (Titze, 1994). Typical male voices range in pitch between 85 and 180 Hz, and typical female voices range between 165 and 255 Hz (Baken, 1987; Titze, 1994).

Voice pitch influences how speakers are perceived on a variety of dimensions, including attractiveness (Feinberg, Jones, Little, Burt, & Perrett, 2005), physical strength (Puts, Apicella, & Cárdenas, 2012), and social dominance (Puts, Hodges, Cardenas, & Gaulin, 2007; Tigue, Borak, O'Connor, Schandl, & Feinberg, 2012). Recently, it has also been shown that voice pitch influences the selection of leaders (Anderson & Klofstad, 2012; Gregory & Gallagher, 2002; Klofstad, Anderson, & Nowicki, 2015; Klofstad, Anderson, & Peters, 2012; Klofstad, 2016; Laustsen, Petersen, & Klofstad, in press; Tigue et al., 2012). For example, Klofstad (2016) presented experimental subjects with pairs of male and female voices that were manipulated digitally to vary in pitch, and found that men and women prefer to vote for male and female candidates with lower-pitched voices. This finding replicates in real elections. For example, in an observational study of the 2012 U.S. House of Representative elections Klofstad (2016) shows that candidates with lower voices won a larger vote share when facing male opponents. Tigue et al. (2012) show that candidates with lower voices are preferred because they are perceived as having greater physical prowess and integrity.

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Klofstad, Anderson, and Nowicki (2015) and Klofstad, Anderson, and Peters (2012) find that candidates with lower voices are preferred because they are perceived as stronger and more competent.

While it has been demonstrated that individuals with lower voices are more successful at winning elected office because they are perceived as superior leaders, it has not yet been tested whether they are actually better leaders. Otherwise stated, is voice pitch a reliable signal of leadership ability? Individuals with higher testosterone levels (as demonstrated by their deeper voices) are more aggressive, both physically and socially (Archer, 1991; Mazur & Booth, 1998; Puts et al., 2012). Higher testosterone has also been linked to the propensity to make hasty, intuitive judgments (Nave, Nadler, Zava, & Camerer, 2018). As such, from one perspective a leader with a lower voice might be a more forceful advocate on behalf of his or her constituents. However, given that modern political conflict is more a clash of complex ideologies than a contest of physical dominance, individuals with more testosterone and lower voices may be overly aggressive, more prone to making snap judgments, and thus less adroit at political decision-making.

Here we address this question with an observational study and an experiment. The observational study correlates a measure of the voice pitch of Members of the U.S. Congress with a measure of their leadership ability to test whether Members with lower pitched voices are more effective leaders. The experiment required subjects to listen to recordings of policy advocacy statements delivered by speakers with differently pitched voices to test whether speakers with lower voices are more persuasive. The observational study shows that Members of Congress with lower voices are not more effective leaders, and the experiment shows that speakers with lower voices are not more persuasive policy advocates. Taken together, the two studies suggest that voice pitch is not a reliable signal of leadership ability.

2. Study 1: observational study of members of the U.S. Congress

2.1. Prediction

If voice pitch contains information about leadership ability, individuals with lower-pitched voices will show evidence of being more effective elected officials.

2.2. Data

2.2.1. Leadership ability

Leadership ability is measured based on a power ranking of the Members of the 109th U.S. Congress created by Knowlegis (cqrollcall.com/knowlegis). The power ranking was created with measures collected and analyzed in 2005 by a team of Knowlegis researchers comprised of former congressional staff members, academics, political consultants, and professional data analysts. The measures used in the power ranking include:

- "Position": seniority, prestige of committee assignments, positions of leadership
- "Influence": influence on the legislative agenda and outcomes of votes
- "Legislative Activity": passage of legislation, shaping of legislation through amendments
- "Sizzle/Fizzle": subjective criteria based on factors such as the legislator's background, relationships with other individuals in positions of power, popularity, and scandals

These measures were used by Knowlegis to create a power score for each Member (House: N = 437, min = 0.6, max = 97.3, $\bar{x}$ = 15.4, SE = 0.4; Senate N = 99, min = 11.0, max = 96.8, $\bar{x}$ = 34.9, SE = 1.7). The House dataset includes N = 5 non-voting Members from Puerto Rico, Guam, the U.S. Virgin Islands, America Samoa, and the District of Columbia. Additionally, the House dataset does not include N = 3 Members who took office after the power ranking data were collected: Representatives Bilbray (R-CA), Sekula-Gibbs (R-TX), and Sires (D-NJ). Senator Corzine (D-NJ) resigned in 2006 and was replaced by Senator Menendez (D-NJ); neither is included in the Senate data set. Members, separately by chamber, were ranked relative to each other based on their power scores, with a lower valued rank indicating a more powerful Member. A more detailed description of the power index methodology, as documented by Knowlegis, is provided in the online supplement. The power index is no longer available online from Knowlegis, but the data are available from the authors by request. We have also published these data publically at dataverse.harvard.edu. Knowlegis only published the power scores and rankings, not the raw data used to make them.

2.2.2. Voice pitch

Recordings of each Member's voice were made from YouTube and C-SPAN online archive videos. Each video was played and a voice clip simultaneously recorded as a .wav file using Audacity (v. 2.1.0; audacity.sourceforge.net), which acquires the sound file via the computer's sound card as the video is played. The highest quality 3 s of audio from each recording, based on aural and visual inspection with Audacity, was selected for analysis. These .wav files are posted publically at dataverse.harvard.edu.

Voice pitch is determined by the physiology of the speaker's throat (Baken, 1987; Titze, 1994; Tusing & Dillard, 2000), and the ability to modulate one's voice is limited by that physiology. However, voice pitch can modulate based on the emotional state of the speaker (Aronovitch, 1976; Banse & Scherer, 1996; Kuroda, Fujiwara, Okamura, & Utsuki, 1976; Scherer, 1981; Wittels, Johannes, Enne, Kirsch, & Gunga, 2002), and different topics and audiences might evoke different emotions from the speaker (though this proposition has not been tested). As such, to reduce the potential for measurement error three recordings were made for each Member, and the voice pitch of each Member is measured as the grand mean F_0 of the three recordings.

The "Get Pitch" command in Praat (v. 6.0.24; Boersma & Weenink, 2013) was used to measure the mean F_0 of each recording. In line with recommended settings for pitch analysis in Praat (Boersma & Weenink, 2013), the pitch of the female voices was measured within a range of 100–600 Hz, and for male voices within a range of 75–500 Hz. All other system settings in Praat were set to their defaults. Female Members had higher pitched voices than male Members in both the House (female Members: N = 54, $\bar{x}$ = 198 Hz, SE = 2 Hz; male Members: N = 383, $\bar{x}$ = 144 Hz, SE = 2 Hz; $t_{435} = 12.69$, $p < 0.001$) and the Senate (female Members: N = 14, $\bar{x}$ = 187 Hz, SE = 8 Hz; male Members: N = 85, $\bar{x}$ = 133 Hz, SE = 2 Hz; $t_{97} = 4.38$, $p < 0.001$).

2.3. Method of analysis

The Member of Congress is the unit of analysis. Analyses were conducted using SPSS (v. 22; ibm.com). The data are treated as a within subjects design, whereby the leadership ability of each Member is compared to his or her own voice pitch.

2.4. Results

As shown in Table 1, there is no discernible correlation between a legislator's voice pitch and his or her leadership ability, as measured by the Knowlegis metric. As women have higher pitched voices than men (Titze, 1994), a more in-depth multivariate regression analysis of the power score and power rank measures was conducted with an indicator of the legislator's sex, their voice pitch, and the interaction of the two as the independent variables (Table 2). The statistically insignificant *Female*voice pitch* coefficients in all four models presented in Table 2 indicate no difference in the relationship between voice pitch and leadership ability between male and female legislators. Moreover,