

Convergence research on the speaker's voice perceived by listener, and suggestions for future research application

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Abstract

Although research on the leader's or speaker's voice has been continuously conducted, existing research has a single point of view. Sound analysis of voice characteristics has been studied from engineering perspectives, and leadership trait theory has been studied from a business perspective. Convergence studies on leader voice and member cognition are being attempted today. Convergence research on voice has a positive effect on refinement of voice analysis, diversification of voice use, and establishment of voice utilization strategy.

This study explains the current flow of research on convergence between speaker's voice and listener's perception, and suggests a direction for the future development of voice fusion research. Furthermore, in connection with AI in the 4th industrial age, new attempts for voice research are sought. First, advances in AI focus on strategically generating the voices needed for individual situations. Second, the voice corrected in real time will support the leader and speaker to utilize the desired voice type. Third, voices through AI based on big data will affect the cognition, attitude and behavior of individual listeners who members, customers, and students in more diverse situations. The purpose and significance of this study is to suggest the way to research the leader's voice recognized by members, and to suggest a method that can be applied in various situations.

Key words: *voice, convergence research, future research, listener perception*

1. INTRODUCTION

The human voice contains a variety of information [1]. Depending on the speaker's different voice characteristics, the influence the listener receives may vary [2, 3]. Studies have been conducted on the influence of the speaker's voice. Existing studies focus on analyzing the voice or on the influence of the speaking leader. These studies have been studied in terms of engineering or business administration. For example, from the perspective of business administration, the leadership trait theory has tested the influence of a leader's husky voice on members [2, 4]. This view does not conduct an engineering analysis of the leader's voice characteristics. It merely explains whether the voice can influence the motivation of members or their perception of the leader. Likewise, engineering studies also have limitations. The researcher arbitrarily defines the characteristics of the voice operationally and conducts engineering analysis [5, 6]. A single dimension study

has clear limitations. Hence, recently scholars have begun to conduct research by merging the management perspective and the engineering perspective. For example, the voice of one leader may be perceived differently by various people. Existing studies explain the relationship between leader voice characteristics and member cognition [7]. Also, when hearing similar speeches from different leaders who have different voice characteristics, members have different perceptions of their voices [8]. This result explains that beyond the relationship between the leader and the members, the voice itself can influence the cognition of the members. Another study demonstrated that when a speaker changed his or her voice to be precisely different, the listener's perception also changed [9]. This result suggests that the change of voice can change the cognition of the members. Recent studies are attempting various convergence studies from the perspective of engineering, business administration, and social studies. However, there are insufficient studies to apply the research results on the voice to real life or to use it in more diverse situations. In addition, a more multifaceted approach is needed to create various opportunities using the voices of the 4th industrial age. Today's Covid-19 crisis has forced organizations to use online communication [10]. In the post Covid-19 era, all organizations, including businesses and schools, will use online communication more [11]. Online meetings, online lectures, and metaverses do not all involve face-to-face meetings. In this virtual space, the influence of the voice will be greater. This is because the voice can influence the perception, attitude, and behavior of members and listeners. By studying various voice strategies from various angles, it will be possible to increase the effectiveness and efficiency of online communication in the post Covid-19 era.

The purpose of this study is to make various suggestions for future voice research and utilization strategies. EEG changes, real-time corrected voices, analysis of various situations using big data and voice strategies suitable for each situation will be utilized in various fields such as health, leadership, education, elections, advertisements and the like.

2. LITERATURE REVIEW AND STUDY CASE

2.1 Voice

A voice is a sound produced by trembling that comes out through resonance in the human vocal cords. In humans, the brain gives commands to specific muscles and vocal organs to produce a voice. Air originating from the lungs and rising through the vocal organs and articulation organs drop the vocal cords. This tremor generates sound waves through the echoes of the vocal cords to form the voice [12]. Human voice characteristics contain various information [1]. Among the voice characteristics, the traits that humans can change arbitrarily include pitch, formant, and speed [7]. The formant is the resonance frequency at which the sound generated from the vocal cords comes out through the vocal cords. Vocal characteristics related to formants include phonological and various other information [13]. Pitch is the speed at which the vocal cord vibrates between the opening of the vocal cord muscle and the next opening. Males and females have different pitches, and by changing the pitch, a changed voice can be created [13]. Velocity refers to the degree to which speech and syllables come out in voice over a certain period of time. The deception of the voice is related to authenticity, appeal, and persuasive power [14].

2.2 Listener's perception

Representative cognitive factors of the listener for the voice include eloquence, amiableness, authenticity, clarity, and absorption. Eloquence enhances the effectiveness of verbal communication to the extent that it is considered to be fun, fluent, and good at speaking [7, 9, 15]. Amiableness is the degree to which a person

prefers a voice, and a pleasant and positive voice creates a positive impression and helps to form a positive relationship [7, 15]. Authenticity is the degree to which an individual's inner experience and external expression match. When authenticity is high, the listener feels more authentic [7, 16]. Clarity is the degree to which people can understand easily, and clarity of pronunciation and expression makes it easier to understand the speaker's intentions [9, 17]. Absorption is related to the tendency of people to concentrate more or to remember better, depending on the characteristics of their voice [7, 17, 18].

2.3 Study case 1

Early convergence studies investigated whether the engineering analysis of the voice is related to the psychological and cognitive dimensions [7]. These attempts have significance in proving the relationship between engineering analysis and statistical analysis. According to the results of the study, it was found that workers of a company with a manager's specific voice spectrum were more aware of authenticity, clarity, and absorption. In addition, it was found that eloquence and amiableness were low for the leader's voice with this characteristic [7]. These results suggest that the cognition of members is affected by the speaker's voice characteristics.

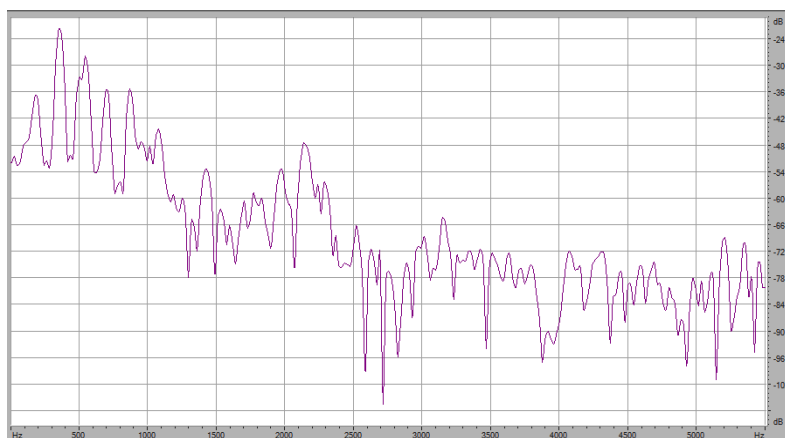


Figure 1. Leader voice spectrum [7], p.873

2.4 Study case 2

Existing studies have investigated the relationship between one leader's voice and several members' cognition. The limitation of this study is that it cannot explain whether members perceive the various voice characteristics of leaders differently. Therefore, another study engineered the voices of three leaders, each with different characteristics. As a result of the study, there were differences in the perception of members according to different voice characteristics. For example, both authenticity and absorption of a specific leader's voice were found to be high. On the other hand, the manager's voice showed higher amiableness, clarity, and eloquence than other managers, but relatively low authenticity and absorption [8]. These studies explain that there are differences in cognition according to voice characteristics. However, there is also a limitation in that the existing prejudice or relationship with the speaker or leader can affect the cognition of the listener or members.

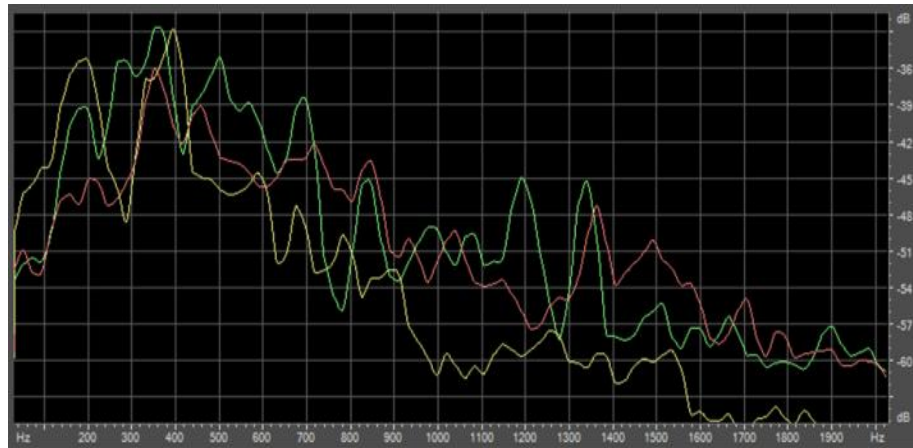


Figure 2. Speech spectrum analysis of three leaders [8], p.44

2.5 Study case 3

To complement the limitations of existing studies, other studies have demonstrated whether cognition changes when the voice of the same person is changed. In this study, candidates gave speeches by changing their voices, and differences in voices were analyzed by engineering approach. Afterwards, as a result of empirical analysis of the difference in voter perception before and after voice change, the difference was found to be significant. More specifically, when the voice changed, amiableness and authenticity were increased, and clarity and absorption were decreased [9].

The results of this study mean that, in addition to the influence of existing preconceived notions or relationships on the speaker, only the voice can influence the listener's cognition. Thus, it has been demonstrated that varying voice characteristics can have different effects on member cognition.

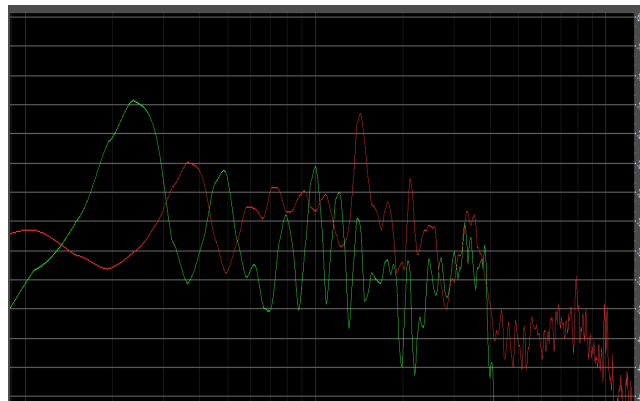


Figure 3. Analysis of different voices of the same election candidate, [9], p.724

2.6 Study case 4

Recent research on voices explains whether changes in cognition through voice can also influence listeners' attitudes and behaviors. It has been demonstrated that voice characteristics such as pitch harmonics, formant transition section, and speech rate increase trust in a leader through mediating effects on member cognition such as eloquence, amiableness, authenticity, clarity, and absorption [19]. The fact that these voice characteristics influence the listener's attitude through cognition means that voice characteristics can elicit or reduce certain behaviors. Therefore, it was suggested that future research needs to proceed with the study of

voice characteristics that can influence specific attitudes and behaviors.

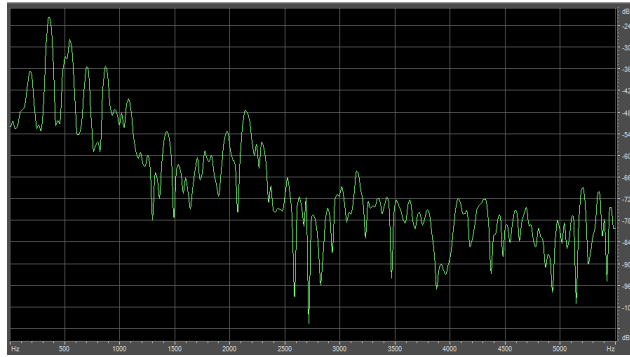


Figure 4. Spectrum analysis of leader(a) voice [19], p. 4856

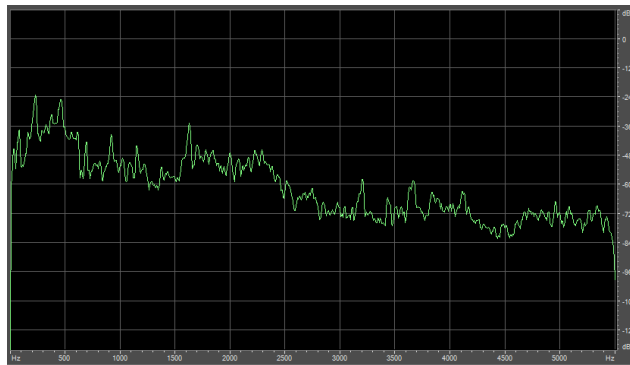


Figure 5. Spectrum analysis of leader(b) voice [19], p. 4857

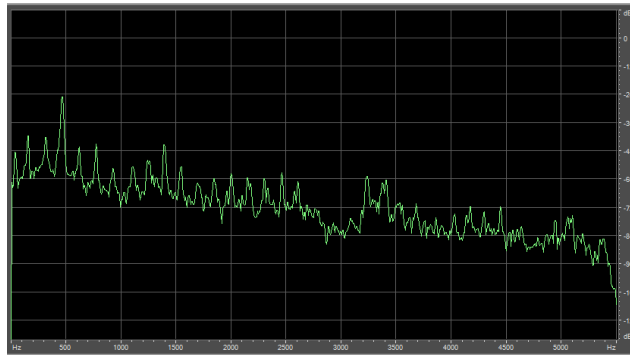


Figure 6. Spectrum analysis of leader(c) voice [19], p.4858

3. FUTURE RESEARCH DESIGN AND SUGGESTION

In the post Covid-19, it will become more common for leaders to communicate one-to-many online. In this environment, various studies are being conducted to improve the quality of online communication [20-22]. The significance of this study is to present a new perspective on a communication research filed. Voice research can be studied by fusion with various disciplines including engineering. For example, similar to voice, it will be possible to verify the influence of facial expressions or gestures. And, just like analyzing a voice in an engineering way, it will be possible to analyze the speaker's actions with AI or big data to explain the relationship with other variables. It also emphasizes the importance of the online environment from a

contextual point of view. It suggests that characteristics such as voice can be interpreted differently depending on the situation, beyond simply the different situations of companies, schools, and elections.

3.1 Situation analysis through big data

The contingency-situational theory assumes that there is not always one right leadership or method [4] Like leadership required in various situations is different, the voice that is appropriate for each situation will be different. Voice research needs to be conducted by setting various situations based on big data. Big data analysis of these situations is needed to find a voice suitable for each situation. For example, advertising, elections, lectures, and everyday conversation are all different situations. More specifically, in advertising, the characteristics of products and services to be promoted, the type of target consumer group, advertising media and time period, company strategy and market share can be situational factors. If big data analysis is used to identify the individual characteristics of these various situations, the analysis of situational elements and conditioning effects of voice research will be enriched. Therefore, voice-related studies should be conducted on the premise of setting more diverse situations and analyzing them with big data.

3.2 Relevance to behavior and attitude

The basic concept of voice research involves how the speaker who hears the voice perceives and is influenced by the voice. When an individual is affected, it means that his or her attitude and behavior can change. Combining fusion research on voice with the cognitive dimension presupposes that a specific behavior can be elicited or reduced through this cognition. Therefore, it is necessary to explore how voice research can influence human attitudes and behaviors. For example, a study could be conducted to increase the purchase intention of consumers who heard a specific voice, or to reduce the frequency of risky behavior by those who heard a warning voice. Voice research will not only find the characteristics of the voice or investigate the relevance to cognition, but ultimately, it will be necessary to verify the influence on the change of human behavior.

3.3 EEG research

The speaker's voice can be a positive or negative sound depending on how the listener perceives it. Therefore, the evaluation of the voice has to be determined through the perception of the listener. The influence of the voice is basically related to the cognition, attitude, and behavior dimensions. In addition to cognitive science and psychology, voice research can be conducted in more diverse ways. A typical field is the study of brain waves. The challenge of proving EEG changes according to voice in addition to psychological and environmental factors will explain the influence of voice more accurately.

3.4 Real-time monitoring

The use of voice research results is to influence the listener's behavior through a voice suitable for each situation. Voice characteristics can be changed for education and training. However, it is difficult to maintain suitable voice characteristics and adapt them to various situations. If the optimal voice is found through the study of the characteristics of each situation, the study of the voice appropriate to the situation, and the study of the listener's behavior, the speaker should actively use this voice. At this time, specific technology needs to be

developed to maintain the technically optimal voice. Voices can be modified, especially for online-based communication or when using a microphone. Basically, it is necessary to develop a technology that modulates an optimal voice from real-time monitoring that informs the speaker when a sound different from the appropriate voice is produced. This technology will assist the speaker to achieve the desired result through the optimal voice.

3.5 Create voice

In the case of online-based communication, it is possible to influence the listener through the voice of AI rather than a human. The speaker's voice created by AI will affect the listener only with the content and voice of the speaker, excluding prejudices, stereotypes, and the influence of relationships. Such a voice will convey the speaker's words and content more accurately and clearly. Also, people will have a more appropriate influence with an accurate and calculated voice. Sound made by AI can be used for announcements in public places, explanations of specific products, and the like. Furthermore, it will be used in situations such as education and formal speeches. Therefore, studies need to focus on directly producing a voice suitable for individual situations.

4. CONCLUSION AND IMPLICATIONS

Research on the voice has been focused on engineering voice analysis. In the field of business administration, the influence of leader voice traits on members has been described [23]. Convergence research has been conducted recently in this single-dimensional study. Early fusion studies analyzed voice characteristics and demonstrated whether they were relevant to listener cognition [24,25]. These beginning studies suggested the development of measurement tools and the possibility of statistical fusion of engineering analysis results and questionnaire analysis results. Subsequent research analyzed cognitive differences according to different voice characteristics. It has been found that the speaker's voice characteristics can have distinctly different effects on the listener's cognition. Next, a more in-depth study was conducted. First, the listener's preconceived notions of the speaker were controlled. Cognitive changes according to changes in the voice of the same person were verified. It has been proven that changing the voice of the same person can change the listener's perception. Furthermore, recent research has demonstrated that cognition influenced by voice can elicit changes in attitudes or behaviors.

The process and mechanism of these studies suggest the direction for future voice-related convergence studies. Based on the flow of existing studies, this paper proposes the topics of voice research needed in the 4th industrial age and post Covid-19 era.

First, the analysis of various situations will find the voice characteristics necessary for each situation. Situations based on big data will lead to successful communication through the most appropriate voice characteristics. For example, depending on the characteristics of a school class, different voices can be created to enhance the learner's immersion. Differential voice utilization strategies according to this situation will be used in a wide range of fields.

Second, the study of voices will influence certain behaviors and attitudes. Therefore, if the listener's actions are elicited according to the speaker's intention, the effectiveness of communication will be improved. For instance, when advertising a smartphone as a target for seniors, it is possible to increase the purchase intention by creating a trustworthy voice.

Third, it can converge with other academic fields, such as EEG research. These attempts entail changes in

human behavior, cognition, and psychology. Therefore, convergence research with more diverse fields can be carried out. For example, changes in EEG through voice may be utilized in health care areas such as dementia and psychological anxiety.

Fourth, real-time correction will help people to keep their voice most suitable at all times. People can rely on this technology for real-time communication, such as a lecture at a school or a speech at an election. Also, online communication will always be able to maintain optimal voice characteristics based on this technology.

Fifth, voice-making technology suggests that more diverse sounds can be created through AI or machines rather than humans. In the post Covid-19 era, people will increase the frequency of online-based communication. In online advertisements or online speeches, people will create a clearer and more necessary voice. The voice produced in this way will have a greater influence on the speakers.

The purpose of this study is to grasp the flow of existing voice research and to suggest a new direction. Various attempts other than those presented in this paper may be challenged. Continuous interest in voice research, various attempts, and grafting of new perspectives will lead to the development of new academic fields and the production of various theories.

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