Introduction/Background

For years, one of the key components of a voice examination has been taking acoustic measurements of the patient’s voice. The reasoning behind this has been that these values could be compared to the normative data in order to determine how the patient’s voice is differing from what is expected of a vocally healthy individual. This in turn helps inform the speech pathologist as to what is happening with the patient’s voice either organically or functionally, helps them decide which techniques may be utilized in therapy, and gives them information to relay back to the referring doctor.

Although this normative acoustic data often plays such a vital role in voice examinations, it is often accepted without considering the populations it was drawn from. America continues to become more ethnically and culturally diverse, so this data needs to be representative of our shifting demographics. Patients could be wrongly diagnosed and improperly treated for a voice disorder because the acoustic characteristics of their voice didn’t match those of a population that differs significantly from their own.

According to ASHA’s Preferred Practice Patterns (2004), comprehensive assessments should be “sensitive to persons from all culturally and linguistically diverse backgrounds.” Therefore, it is our ethical duty as speech language pathologists to utilize data that will represent people from all cultures and ethnicities.

The goal of this systematic review was to investigate the normative acoustic voice data of people from different racial and cultural backgrounds and how it compared to the generally accepted norms. Through this, it was hoped that either the existing norms would be validated or enough evidence would be found to encourage further study into the topic.

Methods

For my systematic review, a literature review was conducted on March 2016.

- Databases searched: PubMed, CINAHL, Google Scholar, and ComDisDome
- Keywords used: “voice,” “acoustic,” “norms,” “cultural” and “race”

A large number of articles were found dealing with acoustic norms of the voice, but few focused on variations due to culture or race. After reviewing and appraising the articles, 10 were used in the systematic review while two were rejected.

The initial inclusion criteria included

- Being published after the year 1996
- Reporting or synthesizing original data
- Discussed acoustic norms of the voice among various cultures and races

These criteria were selected in order to include the most recent, high-quality research related to the topic.

Guidelines were as set forth in established appraisal checklists.

- 2005 Oxford Randomized Control Trial appraisal checklist
- 2013 Support Unit for Research Evidence (SURE) appraisal checklist

The literature search strategy:

**Search strategy**

- Keywords: “voice,” “acoustic,” “norms,” “cultural” and “race”
- Databases searched: PubMed, CINAHL, Google Scholar, and ComDisDome

Initial search of databases: 49 results

Review abstracts of 49 results

Included: 12 articles

Excluded: 37 articles

Full appraisal of the 12 articles

Excluded: 2 articles

Final inclusion: 10 articles

Conclusions

Based on the findings, it was hard to draw a distinct conclusion. While a small majority of the articles found that there were acoustic differences between voices of different ethnicities, not all of the differences were significant.

It was of note that the articles included are of adequate to high quality. However, the literature on this subject is still extremely limited, as evidenced by the use of only 10 articles. Once there is more research on the subject to be found in the literature, it would be possible to find a more concrete evidence concerning the potential issue.

Citation

Andrianopoulos et al., 2001 (2 studies) Significant difference in formant structures. Fo, jitter, shimmer and other acoustic spectra across Caucasians, African Americans, Hindi Indian speakers, and Mandarin Chinese speakers.

Felippe et al., 2006 Fo, jitter, shimmer, and NHR in Brazilian men and women differ from established literature

Jones & Mayo, 2001 African Americans have lower mean reading Fo and greater variability in reading Fo

Natour et al., 2011 Formant frequencies across vowels in Jordanians are similar to other races, yet consistently tend to be lower

Natour et al., 2009 Fo during sustained /a/ similar between Jordanian and Caucasian adults. However, speaking Fo was found to be significantly higher in Jordanian women

Sapienza, 1997 No significant difference between African Americans and Caucasians in Fo and SPL

Wang & Huang, 2004 No significant difference between Mandarin Taiwanese speakers and Caucasians in Fo

Xue et al., 2006 When assessing formant frequencies among Caucasian, African American, and Chinese males, the formant frequencies of the Caucasians and African Americans tended to be significantly higher than those of the Chinese

Xue & Fucci, 2000 No significant differences between elderly Afro-American and Euro-American speakers across acoustic parameters

Implications for Clinical Practice

- Due to differences in acoustic characteristics of speakers from different cultural and ethnic backgrounds, it is important to use normative data that was normed on the patient’s cultural or ethnic group.
- Articles also pointed to importance of sex and age when applying norms. Acoustic parameters besides fundamental frequency and pitch range can be affected by these factors.

Limitations of the review include:

- Lack of literature on the subject
- Small sample sizes may not reflect the population due to limited randomization
- Variation in language spoken between compared races
- Inconsistency in software and equipment used to acquire acoustic signal and data
- Variation in normative data the studies used for comparison

Future studies should address these weaknesses, although significant variation of microphones and their input signals is especially difficult to account for.

Although there is no consensus, there seems to be enough evidence that there are acoustic differences between different races and cultures to warrant further research. By putting more time and money into this area of study, we can come up with the high-quality research necessary to reach a consensus. With this consensus, we will be able to provide the best care possible for patients presenting with vocal complaints regardless of their background.

References


