THE ELEMENT OF VOCAL DISGUISE IN
SOCIOPHONEIC DECEPTION:
A REPORT ON ONGOING RESEARCH

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Introduction

THE PURPOSE OF THIS PAPER is to report my current findings within my
M.A. (Linguistics) research, which focuses on vocal disguise within forensic
linguistics. Specifically, I aim to answer the question of what individuals are
most likely to do with their voice when they do not want to be recognized by a
listener. Beyond this, I am interested in whether specific sociolinguistic
characteristics – gender and place of origin – have an effect on the disguise
choices that individuals make.

In the following sections, I provide some background on the study of
voice disguise, summarize the data collection process and methodology of my
project, and finally, offer a brief explanation of my results to date.

Background

Over the last 45 years, there has been an increasing amount of research into what
it means to disguise one's voice. A disguised voice, such as that used by the
perpetrator of a crime (Dumas 1990; French 2013; Hollien and Majewski 1977),
might be achieved through simple changes to a speaker's inherent vocal
properties like pitch range, phonation type\(^1\), and degrees of nasality. Another
way to disguise one's voice is to alter the socially learned properties of one's
accent by imitating features of a foreign accent. The range of accent-related
options that speakers might choose from, as well as the range of variation that
exists between speakers in the production of a disguised voice has not been
subjected to a systematic study. In this project, I will investigate vocal disguise
using the variationist sociolinguistic framework (Labov 1966; Tagliamonte
2007) by viewing disguise as a form of style-shifting (Eckert and Rickford
2001): a situational change in the grammatical, phonological, phonetic and
lexical properties used by a speaker.

First, I will examine a set of vowel properties speakers alter when they
disguise their own voices. Second, to determine sociolinguistic factors that

\(^1\)Phonation is the type of sound produced by one's vocal folds, such as
whispering, yelling, or speaking normally.
might govern or influence phonetic shift between normal speaking styles and
disguised voices, I will consider the role that a speaker's gender plays in the
selection of a voice disguise: do males alter the same phonetic features that
females do? Third, I plan to study how regional dialect variation is involved in
disguising one's voice: do speakers of the same variety of English alter similar
phonetic properties when asked to disguise their voices, and do speakers of
different varieties select different properties? For the purposes of this paper, I
will focus on results relating only to the first question: what vowel properties do
speakers tend to alter when they are disguising their voice?

This study will contribute to our understanding of forensic linguistic
theories regarding vocal deception with respect to the use of accent as a
disguise. As well, it will enhance connections between the realms of forensic
linguistics and sociolinguistics, in that it will consider vocal disguise as a form
of situational style-shifting.

Before I turn to my study, several terms require definition. First and
foremost, I use the term "modal" interchangeably with the words "normal," or
"typical." That is, modal articulation is the form of articulation that a speaker
uses most often when speaking normally, in a day-to-day setting. Similarly,
modal voice and modal phonation are the speaking voice and phonation that a
speaker would use in a typical setting. On the opposite end of the voice
spectrum lies voice disguise. In this study, voice disguise assumes that an
individual will change the modal qualities of their voice in order to become less
identifiable by a listener.

**Style-shifting and pitch**

Much of the current research in vocal disguise touches on pitch change. For
example, De Decker (2015: 4) found that in his style-shifting study, 42% of the
shifts observed in vowels between non-quoted and quoted speech involved a
shift in F0. If we are to think of vocal disguise as a form of style-shifting,
which my research aims to support, then it is plausible that a shift in pitch would
also be observed in data between modal and disguised voices.

Masthoff (1996) also presents some interesting findings related to pitch
in his article on vocal disguise: of the individuals who chose to disguise their
voice, 31% raised their pitch and 23% lowered their pitch; the only form of
disguise which was more common was whispering (1996: 165). Interestingly,
Masthoff found that only males raised their pitch during disguise, while only
females lowered their pitch (1996: 166).

Finally, Zhang (2007: 156) found that while using an Automatic
Speaker Recognition program, lowering of pitch was the voice modification

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2 Within phonetics, a type of acoustic measurement used to determine the pitch
of one's voice.
third most likely to result in incorrect recognition (55% correct recognition), where whispering was lowest (0% correct recognition), followed by chewing gum (45% correct recognition).

**Methodology**

My study consisted of 21 participants (13 women, 8 men) who took part in a vocal disguise experiment. One of the participants, Speaker 019, did not speak clearly enough for her recording to be analyzed and was excluded from the data analysis. Recruitment was completed through several means: posters were placed around the Memorial University campus, announcements were made via social media, and in-person recruitment was carried out through classroom visits.

Once enough participants were gathered, meetings were set according to participants' convenience. They were instructed to meet at Memorial's Speech Sciences and Language Acquisition Lab (SSLAL) at the designated time. Upon their arrival, participants were told to read and fill out two forms: a consent form and a brief survey indicating their gender, age, and place of origin.

The recording process was as follows: participants were brought into a sound attenuated room in the SSLAL. They were seated in front of a recorder (Audio Technica AT831b condenser microphone and Marantz PMD 670 solid state recorder, sampled at a frequency of 22kHz and 16-bit depth to uncompressed WAV format). Participants were shown a printed version of "Comma Gets a Cure" (Honorof, McCullough and Somerville 2000) and asked to read the text twice straight through: the first time in their normal speaking voice, and the second time in a disguise of their own choosing. They were told that the disguise could be as simple or as elaborate as they wanted, but that it was to remain the same from the beginning to the end of their reading. Should a participant make a mistake while reading, they were told to go back a couple of words and continue reading. Participants were given two to three minutes to briefly familiarize themselves with the passage and were asked if they had any questions. The recording then took place. Once both recordings were completed, the researcher (author) returned to the room and turned off the recorder, and if the participant had no questions regarding their involvement, they were free to go.

Recordings were transferred from the recorder to a MacBook Pro. Each sound file was renamed to ensure both anonymity and organization (e.g. Speaker_001). Each recording of the text was broken down into individual sentences, and timestamps were added for each version of the participants' readings.

Vowel analysis focused on 15 vowels (represented by Wells' (1982) keywords THOUGHT, TRAP, STRUT, SCHWA (comma in Wells 1982), LOT, PRICE, DRESS, FACE, KIT (no stress), KIT, FLEECE (no stress),
FLEECE, GOAT, FOOT, GOOSE) and 5 properties: pitch, duration, intensity (loudness), F1\(^3\) frequency, and F2\(^4\) frequency. Values were obtained for each participant's vowel productions using automatic scripts that were run through Praat, a computer program for phonetic research (Boersma and Weenink, 2010). Both the disguise and non-disguise condition were statistically compared through the use of within-subjects t-tests for each acoustic and vowel normal/disguise pair via R, a statistical analysis program widely used in linguistic research (R Core Team, 2015). The condition (normal vs. disguise) served as the Independent Variable.

**Results**

Table 1 Breakdown of Shifts in Disguise

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Lexical Set</th>
<th>Pitch</th>
<th>Duration</th>
<th>Intensity</th>
<th>F1</th>
<th>F2</th>
<th>TOTAL</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>EH1</td>
<td>DRESS</td>
<td>13</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>42</td>
<td>11.7%</td>
</tr>
<tr>
<td>AH0</td>
<td>SCHWA</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>36</td>
<td>10.0%</td>
</tr>
<tr>
<td>IH1</td>
<td>KIT str.</td>
<td>12</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>30</td>
<td>8.3%</td>
</tr>
<tr>
<td>AA1</td>
<td>LOT</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>8</td>
<td>5</td>
<td>27</td>
<td>7.5%</td>
</tr>
<tr>
<td>AY1</td>
<td>PRICE</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>26</td>
<td>7.2%</td>
</tr>
<tr>
<td>JH0</td>
<td>KIT</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>26</td>
<td>7.2%</td>
</tr>
<tr>
<td>IY0</td>
<td>FLEECE</td>
<td>8</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>8</td>
<td>25</td>
<td>7.0%</td>
</tr>
<tr>
<td>AO1</td>
<td>THOUGHT</td>
<td>9</td>
<td>6</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>24</td>
<td>6.7%</td>
</tr>
<tr>
<td>EY1</td>
<td>FACE</td>
<td>9</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>23</td>
<td>6.4%</td>
</tr>
<tr>
<td>UW1</td>
<td>GOOSE</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>8</td>
<td>23</td>
<td>6.4%</td>
</tr>
<tr>
<td>AE1</td>
<td>TRAP</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>23</td>
<td>6.4%</td>
</tr>
<tr>
<td>IY1</td>
<td>FLEECE str.</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>19</td>
<td>5.3%</td>
</tr>
<tr>
<td>AH1</td>
<td>STRUT</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>14</td>
<td>3.9%</td>
</tr>
<tr>
<td>OW1</td>
<td>GOAT</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>14</td>
<td>3.9%</td>
</tr>
<tr>
<td>UH1</td>
<td>FOOT</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>7</td>
<td>1.9%</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>119</td>
<td>64</td>
<td>58</td>
<td>55</td>
<td>63</td>
<td>359</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td></td>
<td>33%</td>
<td>17.8%</td>
<td>16.1%</td>
<td>15.3%</td>
<td>17.5%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 shows the rate at which each vowel category and acoustic property (pitch, duration, intensity and F1 and F2) exhibited a statistically significant difference (p < .05) across the two conditions. As is depicted in the table, the type of disguise most used by participants was alteration of pitch (33%). This result supports findings put forth by De Decker (2015), Masthoff (1996), and Zhang (2007), suggesting that pitch alteration is one of the most commonly used forms of vocal disguise.

If we are to think of vocal disguise as a form of style-shifting, then this result correlates well with De Decker's 2015 findings. It seems that individuals are more likely to shift their pitch when they are taking part in in a form of

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\(^3\)Refers to the height of the tongue in the mouth.

\(^4\)Refers to how far back or forward the tongue is in the mouth.
speech that requires them to deviate from their modal voice, be that in a
quotative form\(^5\) or in disguise mode.

Unlike Masthoff (1996), my results do not show a clear divide across
gender. Of my participants, four lowered their pitch in their disguise mode (two
females and two males), while nine tended to raise their pitch (five females and
four males) supporting Masthoff’s finding that it is more likely an individual will
raise their pitch than lower it when partaking in a disguise condition.

Further analysis will aim to discover whether one's gender or place of
origin has an overall effect on how one chooses to disguise their voice. Potential
patterns found in duration, intensity, F1, and F2 will be considered, as well. I
will also analyze the disguises of each participant impressionistically to see if
any patterns emerge in chosen disguise forms (e.g. taking on a foreign accent,
whispering, etc.).

This study will add to the growing field of forensic linguistics, and help
to strengthen connections between forensic linguistics and sociolinguistics. My
data will be added to an online corpus (in progress) so that it may be shared and
help other researchers who are interested in the parameters of vocal disguise,
particularly when voice identification is not necessary. Most importantly, my
research will add knowledge and understanding to what is considered a small
but emerging specialty within the field of linguistics.

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\(^5\)The form of speech used when an individual quotes another individual in
conversation, such as 'And Mike said, "I love it!"'
References


