The Effects of Articulation on the Perceived Loudness of the Projected Voice

Brett R. Myers, M.A., CFY-SLP
Eileen M. Finnegan, Ph.D., CCC-SLP

Purpose
To determine if the level of articulatory precision is related to the level of perceived loudness of speech in actors during a staged reading.

Introduction
Stage performers—and other professionals who must deliver their voices to a large group—strive to speak loudly and clearly to achieve optimal projection. Previous studies (Schulman, 1989; Dromey & Ramig, 1998; Wohlert & Hammen, 2000; Mclean & Tasko, 2003) have shown that loud speech is characterized by greater articulatory excursions than normal speech. This relationship has also been explored in studies of muscle tension dysphonia (Dromey et al., 2008), dysarthria secondary to Parkinson’s disease (Tjarden & Wijland, 2004; Sajari et al., 2007; Neel, 2009; Kim & Kuo, 2012), and clear speech for impaired listeners (Pichney, Durlich, & Rauda, 1985; Caisse et al., 2005; Brandt, Krau, & Hayes, 2003). These works have shown that loud speech has secondary benefits in articulation. The current study proposes that the inverse relation is also true: that articulatory precision may positively influence perceived loudness.

Methods
Actor Participants:
- Amateur actors (N = 8)
- 3 male, 5 female
- Age range: 22 to 54 (M = 29)
- Training range: 0 to 7 years (M = 3.2)
- Examples: firsts, seconds, sixteenths, seventeenths, tracts, didn’t, sympathetic, extraterritorialism, characteristic

Performance Conditions:
- Normal reading of King Lear monologue
- Bite block
- Over-articulation

Judge Participants:
- Graduate students (N = 20)
- 3 male, 17 female
- Age range: 22 to 37 (M = 25.7)
- CSD Education: 2 to 4.5 years (M = 3.2)

Listening Task:
- Randomized paired stimuli
- Comparison trials:
  - “Which sample sounds louder?”
  - “Which has better articulation?”
  - “Which is better projected?”
- Participants able to repeat stimuli
- Participants able to indicate that two stimuli sound the same

Participants practiced over-articulation of words that contained consonant clusters.

Examples:
- firsts, seconds, sixteenths, seventeenths, tracts, didn’t, sympathetic, extraterritorialism, characteristic

Participants practiced over-articulation of phrases and aimed to link speech sounds together.

Examples:
- grab it, give away, breathe in, arrange everything, smooth surface, keep this, stand back, leave soon

Participants practiced over-articulation of the monologue by highlighting the consonants throughout the speech.

Results
Acoustic Findings
The results showed no significant effect of condition on mean vocal intensity, $F_{1,14} = 2.84, p = 0.09$. Computerized Speech Lab (CSL) was used to measure mean vocal intensity during the performance conditions for each speaker. A one-way repeated measures ANOVA was carried out to determine the influence of articulation condition on mean intensity (dB) level of each stimulus sentence for each speaker.

Mean Intensity Levels

<table>
<thead>
<tr>
<th>Condition</th>
<th>Intensity (dB)</th>
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</thead>
<tbody>
<tr>
<td>Normal</td>
<td>69</td>
</tr>
<tr>
<td>Bite Block</td>
<td>70</td>
</tr>
<tr>
<td>Over-Articulation</td>
<td>73</td>
</tr>
</tbody>
</table>

Conclusions
There were significant differences between articulatory conditions in perceptual ratings of articulation, loudness, and projection, even though acoustic findings did not demonstrate a significant difference between conditions regarding mean SPL. In this study, the only manipulated variable was articulatory style (i.e., normal, bite block, over-articulation). Perceptual ratings confirmed that these styles of articulation were indeed distinct on the articulation parameter. Although loudness was not directly manipulated, the judges rated the over-articulation condition as being markedly louder and better projected. Based on these results, we can infer that articulation treatment may enhance the benefits of voice therapy. Resonant voice strategies often incorporate speaking with a forward focus, which can be achieved by awareness of anterior oral vibrations and articulatory gestures. Future studies may focus on clinical populations, generalizing the strategies to conversation, and determining the magnitude of loudness differences between conditions. This is a preliminary study that merely begins to advocate for including articulation therapy as a component of voice care.

Quotations
If vowels are a river and consonants are the banks, it is necessary to reinforce the latter lest there be floods.
—S. M. Volkonski, “Sound and Silence”

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References


