Humidification Reduces the Negative Vocal Effects of Superficial Vocal Fold Dehydration

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INTRODUCTION
The adverse consequences of superficial vocal fold dehydration on voice production are documented. As it is difficult to avoid dehydrating environments such as mouth breathing or low ambient humidity, an investigation of the potential methods to reverse the detrimental voice effects associated with superficial vocal fold drying is necessary.

Humidification, or an increase in ambient humidity, is a simple, cost-effective method commonly recommended by voice clinicians to prevent or reduce superficial vocal fold drying. However, the utility of humidification to reverse dehydration-induced vocal decrement has yet to be systematically investigated. Consequently, the objective of the current study was as follows:

Objective: To quantify whether the negative voice effects of superficial vocal fold dehydration could be reversed using humidification.

The effectiveness of humidification was tested in an experimental group with a history of vocal fatigue and a control group. Individuals with a history of vocal fatigue were included as an experimental group because they are believed to be at higher risk for the development of voice problems as well as potentially more susceptible to the adverse phonatory effects of dehydration.

PARTICIPANTS
- Healthy adults (N = 20 males, N= 20 females)
  - Perceptually normal speech and voice
  - Normal laryngeal appearance on rigid videostroboscopy
  - Normal respiratory function on spirometry
- Subject Groups
  - Experimental (N = 20): Positive for vocal fatigue
  - Control (N = 20): Negative for vocal fatigue

PROCEDURES
- Single experimental session
  - 2-hours mouth breathing low humidity (<30%)
    - Post Dehydration
  - 5-minute break
    - Post Break
  - 2-hours mouth breathing high humidity (>60%)
    - Post Humidification
- PTP and PPE were collected at:
  - Baseline
  - Post Dehydration
  - Post Break
  - Post Humidification

VOICE MEASURES
- Phonation Threshold Pressure (PTP)
- Minimum lung pressure required to initiate and sustain vocal fold vibration
- Collected at 10th (PTP10) and 80th (PTP80) percent pitches of each subject’s maximum phonation frequency range
- Perceived Phonatory Effort (PPE)
- Participants’ perceived ease of phonation
- Collected via visual analog scale

RESULTS

<table>
<thead>
<tr>
<th>Group</th>
<th>Baseline M(SD)</th>
<th>Post Dehydration M(SD)</th>
<th>Post Break M(SD)</th>
<th>Post Humidification M(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTP10</td>
<td>4.47(1.04)</td>
<td>5.38(1.25)</td>
<td>5.00(1.14)</td>
<td>4.88(1.49)</td>
</tr>
<tr>
<td>PTP80</td>
<td>6.69(2.33)</td>
<td>7.52(2.35)</td>
<td>7.00(1.49)</td>
<td>6.55(1.94)</td>
</tr>
<tr>
<td>PPE</td>
<td>6.29(1.88)</td>
<td>6.02(2.00)</td>
<td>5.97(2.23)</td>
<td>5.59(2.35)</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTP10</td>
<td>4.19(0.94)</td>
<td>4.58(1.28)</td>
<td>4.66(1.24)</td>
<td>4.31(1.26)</td>
</tr>
<tr>
<td>PTP80</td>
<td>5.78(2.22)</td>
<td>6.31(2.35)</td>
<td>6.00(2.14)</td>
<td>5.49(2.12)</td>
</tr>
<tr>
<td>PPE</td>
<td>5.85(2.25)</td>
<td>5.94(1.96)</td>
<td>5.92(2.03)</td>
<td>5.51(2.16)</td>
</tr>
</tbody>
</table>

Table 1. PTP and PPE means (M) and standard deviations (SD) for the Experimental and Control groups. PTP (cm H2O). PPE (inches).

- PTP
  - Significant effect for time at PTP10 and PTP80 (p < .02). PTP significantly increased Post Dehydration. PTP decreased toward baseline Post Humidification.
  - No significant effect for group (p > .02).
- PPE
  - No significant effects for time or group (p > .02).

CONCLUSIONS
- PTP significantly increases following a superficial vocal fold dehydration challenge. These increases revert to baseline with humidification.
- Beneficial effects of humidification were observed in subjects with a history of vocal fatigue and controls.
- Results may have implications for use of increased ambient humidity to counter the negative vocal effects of dehydration in everyday environments.
- Significant increases in PTP were not accompanied by changes in subject perceived vocal effort (PPE).
- Benefits of PPE training?

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REFERENCES