Biofeedback Treatment of Paradoxical Vocal Fold Motion and Respiratory Distress in an Adolescent Female

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**Purpose of Study**

The purpose of this investigation was to evaluate the impact of EMG biofeedback treatment on subjective reports of pain and adaptive functioning, in a 16 year old female with PVFM.

**Introduction**

*Paradoxical Vocal Fold Motion (PVFM)*

- Paradoxical Vocal Fold Motion (PVFM) involves excessive muscle tension and causes the vocal folds to involuntarily adduct during inhalation, thus restricting the airway opening. This condition occurs in approximately 2.3% of the population.
- Symptoms include: throat and chest pain, labored breathing, vocal fatigue, and feelings of being choked.
- The etiology of PVFM is unknown, but precipitating factors often include: exercise, reflux, post nasal drip, and inhaled irritants.
- Treatment of PVFM has typically focused on progressive muscle relaxation training or controlled breathing exercises in an indirect effort to relax the throat muscles.

**Biofeedback**

- Biofeedback involves the application of operant conditioning to gain control of visceral, somatomotor, or central nervous system activities.
- Use of biofeedback for PVFM offers more direct impact and the possibility of differential control of excessive involuntary muscle activity.
- Electromyographic biofeedback has been used to successfully treat vocal cord disorders such as hyperfunctional dysphonia.
- There are currently no reported applications of biofeedback with PVFM.

**Methods**

**Participant**

- 16 year-old, caucasian female
- 2 year history of diagnosed PVFM
- Diagnosis confirmed via visual inspection through fiber-optic laryngoscopic exam by an otolaryngologist.
- Previous treatment attempts over the past 12 months involved breathing exercises recommended by a speech therapist.

**Dependent Measures**

**Electromyographic measures**

- Data were recorded in microvolts (μV) and collected continuously throughout each biofeedback session.

**Results**

**Pain**

- Pain ratings in baseline showed daily pain episodes with moderate-severe ratings (i.e., pain ratings of 4 or above) occurring 3-4 times per week.
- By the 6th biofeedback session, the participant reported zero pain episodes per week.

**Adaptive Functioning**

- Prior to treatment the participant missed 25% of all school days due to pain associated with PVFM.
- By the 6th biofeedback session, no school absences were reported.
- Parent’s reports on the MPI indicated significant pain interference during baseline (i.e., average of 5, with 0 indicating no interference and 6 indicating extreme interference).
- Parent’s scores on the MPI were reduced to zero at the conclusion of treatment.

**Discussion**

- EMG biofeedback was found to be an effective means of gaining control over muscle tension near the vocal cords in an adolescent female.
- Overall, baseline levels of muscle tension were reduced over 60% with corresponding reductions in episodes of respiratory distress and chest pain, and improvement in adaptive functioning.
- Biofeedback is an operant technology that can make important contributions not only to the behavioral health of children, but to their physical health as well.

**Limitations**

1. The generalizability of these results to other individuals with PVFM is unknown due to the single-case nature of this study.
2. Changes in adaptive functioning may reflect nonspecific effects derived from the intensive nature of services rather than anything unique to biofeedback.
3. The sample of women used for the normative comparison was small and observed muscle tension levels may not have appropriately represented “typical” levels.

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**Dependent Measures (continued)**

**Pain measures**

- Pain was recorded throughout baseline and treatment using a visual analogue scale ranging from 0-10, with 0 indicating no pain, 5 indicating moderate pain, and 10 indicating severe pain.

**Adaptive functioning**

- The participant reported anecdotal evaluations of her adaptive functioning before and following treatment.
- The parents reported the extent to which pain interferes with functioning in areas such as school, sleep, recreation, family events, and social relationships.
- The participant’s mother completed a modified version of the Multidimensional Plan Inventory (MPI; Kerm, Turk, & Rudy, 1985).
- The MPI asks parents to report the extent to which pain interferes with functioning in areas such as school, sleep, recreation, family events, and social relationships.

**Experimental Design**

- Changing criterion design.
- Criterion goals were determined based on the following rules:
  1. Initial criterion was set at two microvolts lower than the average in baseline (i.e., 10 μV).
  2. A new criterion was set when the participant achieved three consecutive sessions at or below the current criterion.
  3. Criterion goals were set 2 microvolts lower than the previous criterion.
  4. If two or more consecutive sessions were above the current criterion level, the criterion was raised one microvolt.
- Treatment continued until the participant met typical levels of muscle tension for that location.

**Procedures**

- Biofeedback training occurred on average once per week over the course of 10 weeks.
- During the initial pre-treatment baseline, following a 10-minute habituation period, EMG measures of muscle tension were recorded when no visual feedback was presented to the participant.
- Two sessions of pre-treatment data were collected.
- During treatment sessions, each visit began with a 5-minute resting baseline (i.e., no feedback), followed by two 10-minute biofeedback sessions with a short 5-minute break between sessions.
- Participant viewed a visual representation of her muscle tension (i.e., a moving vertical green bar with a horizontal line indicating the criterion for the session).
- No specific instructions were given other than to “try to relax the muscle tension near your vocal cords to below the criterion line on the computer screen, using the feedback to guide you.”

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