
Respiratory muscle strength training is a paradigm that has been used for numerous years with a variety of populations including but not limited to spinal cord injury, chronic obstructive pulmonary disease, multiple sclerosis, Parkinson's disease, voice disordered, sedentary elderly, and healthy young. The respiratory muscle strength program discussed here is an expiratory muscle strength training and uses a pressure threshold device with a regimented treatment protocol. The primary purpose of the expiratory muscle strength training program is to promote strength in the expiratory muscles. The training protocol occurs five times per day, 5 days a week, and consists of ~15-20 minutes per day of training by the user at home. The device threshold is changed weekly by a clinician to maintain a threshold load of 75% of an individual's maximum expiratory pressure. The threshold setting of the device is always based on the individual's recorded maximum expiratory pressure generated into a digital pressure gauge. Results of 4 weeks of expiratory muscle strength training protocols indicate up to a 50% improvement for healthy subjects, those with multiple sclerosis, and those with spinal cord injury. The potential transfer of expiratory muscle strength to functional outcomes is discussed, as well as how strength-training paradigms may influence cortical plasticity.


Perception of breathy voice quality appears to be cued by changes in the vowel spectrum. These changes are related to alterations in the intensity of aspiration noise and spectral slope of the harmonic energy [Shrivastav and Sapienza, J. Acoust. Soc. Am., 114 (4), 2217-2224 (2003)]. Ten young-adult listeners with normal hearing were tested using an adaptive listening task to determine the smallest change in signal-to-noise ratio that resulted in a change in breathiness. Six vowel continua, three female and three male, were generated using a Klatt synthesizer and served as stimuli. Results showed that listeners needed as much as 20-dB increase in aspiration noise to perceive a change in breathiness against a relatively normal voice. In contrast, listeners needed approximately an 11-dB increase in aspiration noise to discriminate breathiness against a severely breathy voice. The difference limens for breathiness were observed to vary across the six talkers. Voices having aspiration noise that was predominantly in the high frequencies had smaller difference limens. No significant differences for male and female voice were observed.

The results of an expiratory muscle strength training (EMST) program is described in the rehabilitation of mixed dysarthria in a patient with Lance-Adams syndrome secondary to a motor vehicle accident (MVA) with associated traumatic brain injury (TBI). A pretest-posttest design was employed. Following EMST, maximum phonation duration, intelligibility scores of 14-word sentences, and Communicative Effectiveness Survey (CES) scores increased. Three months after the discontinuation of EMST, maximum phonation duration had decreased but remained increased in comparison to pretreatment performance, while intelligibility scores dropped below baseline level. CES scores continued to increase following the discontinuation of treatment. These data suggest that EMST was associated with a therapeutic effect for this patient, as evidenced by improved performance measured pre- and posttreatment.


This longitudinal study determined the effects of vocal training (VT) on respiratory kinematics and muscle activity during singing tasks. Four voice students, 3 females and 1 male, were recorded during singing tasks once a semester for 3 consecutive semesters. Respiratory kinematic measures included lung volume, rib cage (RCE) and abdominal excursions (ABE). Surface electromyographic measures included burst duration (BD) and peak amplitude (PA) of the pectoralis major, rectus abdominis and external oblique muscles. Descriptive statistics revealed that RCE and ABE increased from the 1st to the 2nd semester, but decreased from the 2nd to the 3rd semester of VT. Overall, mean BD decreased from the 1st to the 2nd semester and increased from the 2nd to the 3rd semester. Mean PA increased from the 1st to the 2nd semester and decreased from the 2nd to the 3rd semester of VT. RCE and muscle force generation of the above muscles increased as the demand level and the length of the phonatory tasks increased. Interpretation of the results suggests that the respiratory system is highly responsive to VT, after only 3 semesters of training.


Respiratory symptoms are recognized as sequelae of motor dysfunction in idiopathic Parkinsons disease (IPD) and these symptoms have the potential to cause problems with swallow, cough, voice and speech. Specifically, maneuvers that require rapid activation and coordination of upper airway and chest wall musculature become progressively impaired as motor dysfunction progresses during the natural course of the disease. This study reports on the maximum inspiratory and expiratory pressures produced by 28 participants (average age 64) diagnosed with moderate to severe IPD (average stage 2.5 with a range of 2.0-3.0). All measures were collected during the "medication on" state. Outcomes of a specific respiratory muscle strength training
technique for improving maximum expiratory pressure are reported for three of the patients in this study. Techniques that focus on strengthening the respiratory muscles in patients with IPD (other than with low load breathing exercises), have not been previously reported. The results of this pilot study demonstrate that respiratory muscle weakness may be an important factor in the respiratory complications in IPD and that respiratory muscle strength training has the potential to improve expiratory muscle strength for this population. This improvement has the potential to positively impact high forced respiratory activities, such as forced breathing maneuvers, swallow, cough and speech functions that require greater magnitude and duration of expiration.


This study was designed to examine the relationship between the Voice Handicap Index (VHI) and acoustic measures of voice samples common in clinical practice. Fifty participants, 38 women and 12 men, ranging in age from 19 to 80 years, with a mean age of 49 years, served as participants. Of these 50 participants, 17 participants could be included in the acoustic analysis of voice based on measures of error calculated with the TF32 software. All participants completed the VHI and provided voice samples including three trials of the sustained vowel /A/ at a comfortable loudness level as well as a connected speech sample consisting of the Zoo Passage. Acoustic measures were made with TF32 and Cool Edit software and included fundamental frequency, jitter %, shimmer %, signal-to-noise ratio, mean root-mean-square intensity, fundamental frequency standard deviation, aphonic periods, and breath groups. Results indicate that these measures were not predictive of overall VHI score, and no cohesive or predictable pattern was identified when comparing individual measures with overall VHI or with each subscale item. Likely contributions to this lack of correlation and subsequent clinical implications are discussed, as well as the direction for further research.