

# Expiratory Muscle Strength Training

for Parkinson Disease





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**W**hile much attention to the deficits caused by Parkinson disease (PD) deal with its impact on walking and balance, PD can also affect other critical functions such as breathing, voice production, richness of voice, clarity of speech, cough and swallow. The same types of disrupted movements that affect the arm and leg muscles, resulting in slower, less accurate, more rigid, weaker or uncoordinated muscle actions, also cause disruptions to breathing, voice, speech, cough and swallowing. Many of the same muscles that are also used to produce voice and speech are used for eating and swallowing, particularly those that control the functions of the lips, tongue, palate, pharynx and larynx. The physical changes to these muscles can affect a person's ability to chew and swallow in an efficient and safe way.



These documented changes occur in all stages of PD and can negatively impact health and quality of life. In fact, aspiration pneumonia, caused by foreign material entering the airway, has been considered one of the leading causes of death in PD (Fernandez & Lapane, 2002; Gorell, Johnson, & Rybicki, 1994). Therefore, early intervention is vital and may result in a better response to therapy, altering the trajectory of the disease process over time.

Swallow therapies include strategies to compensate for difficulties, and exercises that work on actively changing the process of swallow (i.e. muscle strength and coordination). There are challenges when implementing these techniques, for example, one may not be able to define the degree to which the muscle is working and the implementation can be difficult with some patients struggling with complex steps.





We have been using a therapy technique called expiratory muscle strength training (EMST) to study whether muscle strengthening can improve functions like breathing, cough, voice/speech and swallow. EMST helps the muscles involved with swallowing become active. The intended result is to combat the slow, rigid and weak musculature associated with swallow in PD.

The technique uses an experimental pressure threshold device to accomplish the strength training. The device requires patients to develop an expiratory pressure while blowing forcefully. The EMST device can be calibrated up to a pressure range of 150 cmH2O allowing for the pressure load to be varied as the strength of the muscles improves. This is similar to increasing the weight you are lifting during exercise, as the muscle gets stronger. We determine strength improvement by measuring maximum expiratory pressure and the activity of the muscles involved in swallowing and breathing.

The device is patent-pending and was invented by several researchers at the University of Florida. There is an ongoing treatment study in which patients with PD use the device at home for 4 weeks, 5 days a week. Patients are trained on how to use the device by a licensed speech pathologist and they train with the device for approximately 20 minutes per day. One goal of this study is to determine how the device's training affects the safety and efficiency of swallow in patients with PD, and any subsequent changes on quality of life. Additionally, we are studying whether the effect is lost after discontinuing the therapy for

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several months, and if the effect is not lost, how much of the positive effect remains. We will be reporting results of the clinical trial with this device in the near future.

We have evidence to support that our expiratory-based therapy program will likely have a rehabilitative effect on the swallow mechanism as it increases the activity of the submental muscles in the neck (Wheeler, Chiara, & Sapienza, in press). Recently, using techniques that allow us to

see the swallow process as it happens (videofluoroscopy) and track how much the muscles are working during the use of the device (electromyography), we have discovered that the therapy makes the hyoid bone elevate. The movement of the hyoid bone during swallowing is very important because it helps close off the respiratory airway protecting it from foreign material traveling the wrong way, and helping to open the sphincter of the esophagus (stomach tube) which then allows food to enter the stomach.

Patient reports have been mostly positive up to this point. Many report the training is easy to complete, not very time consuming, and they appreciate the opportunity to actively engage in their therapy process. This is essential in that the relationship between patient motivation and outlook, along with the appropriateness of a selected intervention, can be one of the most telling predictors of therapy outcomes. ■



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