

Effects of Two Types of Tongue Strengthening Exercises in Young Normals. (Lazarus et al. 2003)

Background The tongue plays a key role in the propulsion of solids and liquids through the oral cavity, pharynx and into the esophagus.

The literature indicates that, 1) strength training in the limbs can increase muscle bulk and neural activation of muscles; 2) muscle training can increase maximal isometric muscle force in young and elderly normal individuals; 3) muscle strengthening exercises improve limb strength in patients with neuromuscular disease.

Strength training applied to the tongue should therefore improve muscle strength of the tongue which may benefit swallow function.

Study Design Pilot study

Methods 31 healthy subjects, ages 20-29 (mean age of 26). 23 Females and 8 Males.

No subject had any history of neurological disease, head and neck surgery or injury that may impact tongue function. In addition, no subject had any tongue piercing.

These 31 participants were randomly assigned to one of 3 groups:

1. No exercise
2. Exercise group receiving tongue strength with a tongue depressor
3. Exercise group receiving tongue strength using the IOPI¹

Tongue strength and endurance were assessed at baseline and again at 1 month post-baseline. This assessment was completed using the IOPI and included 2 measures:

1. Maximal isometric pressure generation
2. Submaximal pressure generation = 50% of max

For maximal tongue strength tasks, the subjects pressed the tongue against the bulb (IOPI) as hard as possible for 3 seconds in 3 trials with a 2 min rest

¹ IOPI = Iowa Oral Performance Instrument. Measures tongue pressure using an air filled bulb that is placed on the tongue blade, between the tongue and hard palate. This bulb is connected by way of plastic tubing to a pressure biofeedback device that measures the pressure change in the tubing. The user is alerted to successful achievement by a series of lights changing from red to green, as well as with numbers.

between trials.

For tongue endurance tasks, the subjects were trained to exert sub max effort (50% of max) to maintain the LED at a level set by the evaluators at 50% of max; the subjects were told to hold this level with the tongue press for as long as possible and this was timed. Subjects were allowed to deviate to 40%, which would be one light above or below the set target. Trials continued until the subject could no longer maintain the lights within the set target (50% of max) as per the lights/feedback. Subjects completed 3 trials of endurance testing with a 2 min break between trials. Endurance was the longest period of time the subject could hold the 50% of max target.

The exercise protocol: 5 days/week for 1 month; 5x/day in 10 reps/time

Subjects randomly assigned to the strengthening task group using the IOPI, were told to press against the bulb of the IOPI as hard as they could for 2 seconds, on the left and right of the tongue, as well as on elevation and protrusion. They used the feedback on the IOPI to measure how hard they were pressing against the bulb. This group was not given any instruction in the endurance task.

Subjects randomly assigned to the strengthening task group using the tongue depressor, manually resisted against the depressor. It is unclear if these participants targeted the same areas of the tongue as the IOPI group.

Subjects in both groups were given instruction on these tasks and kept a written log of exercise completion. They were given written instructions as well. The log was shared with the evaluator at the 1 month post eval.

Results

There were no significant differences between the group who used the IOPI and the group who used the tongue depressor in mean max tongue strength and endurance at baseline and at follow up. There was also no difference in the change from baseline to follow up in these two groups. Thus, the authors chose to combine these two groups for further statistical analysis.

The no-exercise group demonstrated no change in mean maximal tongue strength from baseline to one month post eval.

The 2 exercise groups demonstrated a significant change in mean maximal tongue strength from baseline to one month post eval.

Statistical analysis of the treatment group subjects showed that those who demonstrated the lower max tongue strength at baseline demonstrated greater improvement in tongue strength at the one month post eval.

No differences were seen with regards to endurance

Discussion

The 2 exercise groups demonstrated similar change as a result of the exercise program, suggesting that it is the resistive exercise protocol that impacts the system, not necessarily the device or tool. The authors were surprised that the group using the IOPI did not demonstrate greater gains, given the inclusion of the biofeedback. This was maybe due to the fact that the participants in these groups were young, normals; the inclusion of biofeedback may benefit those patients who are impaired in their resistive exercise program.

The finding that the subjects who showed less maximal tongue strength at baseline made greater gains in tongue strength suggests that those patients who are debilitated and impaired stand to make the most gains with a resistive exercise program.

The lack of change in endurance measures may be due to the fact that the subjects in the exercise groups did not practice endurance tasks in their protocol. This finding suggests that a maximal strengthening program may not carry over to produce endurance gains.

Strengths of this study include the fact that the 31 subjects were randomized to one of the three groups. The number of participants is also noteworthy for a pilot study. The authors make no suggestion about carryover to swallow function as this was not tested in this study.

Weaknesses in the study include the fact that this was not a blinded study; the evaluators were not blinded to which groups the participants were in, which could lead to some bias in the evaluation of results. It is unclear if the subjects using the tongue depressor targeted the same areas of the tongue as those using the IOPI.

Take Home Message: Resistive isometric exercise of the tongue increases muscle strength in normal subjects and may benefit weakened tongue muscles in even greater measure.

Reference

Lazarus C, Logemann JA, Huang CF, and Rademaker AW. Effects of two types of tongue strengthening exercises in young normals. *Folia Phoniatr Logop* 55: 199-205, 2003.