Impact of Anterior Head Weight Training on the Endurance of Deep Neck Flexor Muscles: An Observational Cohort Study in Healthy Adults.

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Background/Purpose

- The deep neck flexor (DNF) muscles have received a lot of research over the past several years due to the impact on neck pain and disability.
- Spine related disorders (lower back and neck pain) was the highest healthcare expense in 2016 (out of 154 conditions) at $134.5 billion.
- Assessing the endurance has been well studied by several authors.
- The Craniocervical flexion test has been established as the primary training for the DNF muscles.
- Training the DNF muscles has historically been done in a supine, thus there is little to no functional carry over with this training approach.
- Using an anterior head weight as a DNF training tool is a novel approach.
- Anterior head wt (Halo Posture device) induces a moment arm of force acting on the head/neck during ADL's. This is based on the work of Panjabi and the spinal neutral zone.

PURPOSE: To see if wearing an anterior head weight with erect posture could change the endurance of the deep neck flexor muscle group in subjects without neck pain. This will open the door for future research in symptomatic subjects.

Subjects/Methods

- 27 healthy male and female PT students were recruited to participate in the study (2 males did not complete the study) for a total of 25 who completed the study (13 females/12 males)
- DNF strength was assessed using a reliable timed chin-tuck test as previously described by Domenech.
- Subjects performed two DNF strength tests 5 minutes apart at baseline and post-intervention and the average recorded.
- Subjects wore the anterior head weight (2# for FM, 3# for M) 3 days per week for a total of 6 weeks starting at 4 minutes and ending at 14 minutes.
- The average head weight is 10-13# and thus the device is 20-30% of the head weight which has been shown to constitute a low load and thus would be effective in training the DNF for endurance.
- This training occurred while the students were sitting in class during lectures and taking notes.
- To ensure proper posture during the training an external biofeedback postural device (Upright Go-postural training device) was attached to C7/T1 region of the spine and vibrated when posture was being lost to ensure proper erect posture during the training.

https://www.lakkyphysio.co.uk/neck-pain-upper-back-stiffness
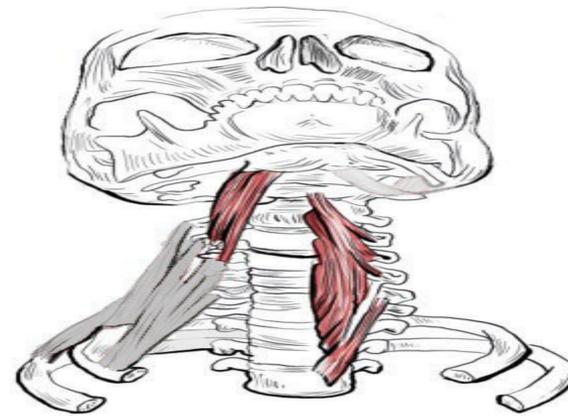
Halo posture device

Upright Go Postural Training device

Results

- Our prospective observational study included 13 females and 12 males ranging from ages 23-30.
- The mean baseline DNF endurance was 16.24 ± 9.58 seconds compared to the mean post-training score of 33.09 ± 18.6 seconds.
- A paired two-tailed t-test found a significant difference between baseline and post-treatment means (p=.000) with an increase of approximately 16.85 seconds on the DNF endurance test.

	Pre (Mean and SD)	Post (Mean and SD)	P value
DNF Test (seconds)	16.23 ± 9.58	33.09 ± 18.60	6.73E-05 (p=.000)
Effect size	1.139636		

Discussion/Conclusion

- Wearing a simple anterior head weight may improve the muscular endurance of the DNF.
- Such a novel intervention could have great therapeutic benefit for the general population with regards to their cervical spine muscular endurance.
- Limitations: A larger sample size is needed and the population of subjects need to include symptomatic patients. Tester needs blinded to data collection.
- This study can serve as a baseline for further investigation and grounds for measuring the minimal detectable change and interrater reliability/ intrarater reliability.
- Future studies would include the use of anterior head weight during the day within a home environment of both symptomatic and asymptomatic patients to more closely related to functional head and neck motions during ADL's

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