Examine the influence of a 3-week NeckX strengthening program on neck muscle strength, when compared with an isometric strength program

Independent Research
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Introduction: Neck muscle strength is important for injury mitigation in most sports and activities and recent evidence suggests that improved neck strength might reduce the severity of concussion events. Strength training of the neck muscles most commonly involves isometric exercises in a neutral head position, with dynamic exercises less common. The NeckX device is intended to provide dynamic resistance through the full range of neck motion, to improve neck muscle strength through this full range.

Purpose: To determine the influence of dynamic neck strengthening, through the full range of motion, using the NeckX resistance band program, when compared with a traditional isometric neck strengthening program in neutral spine

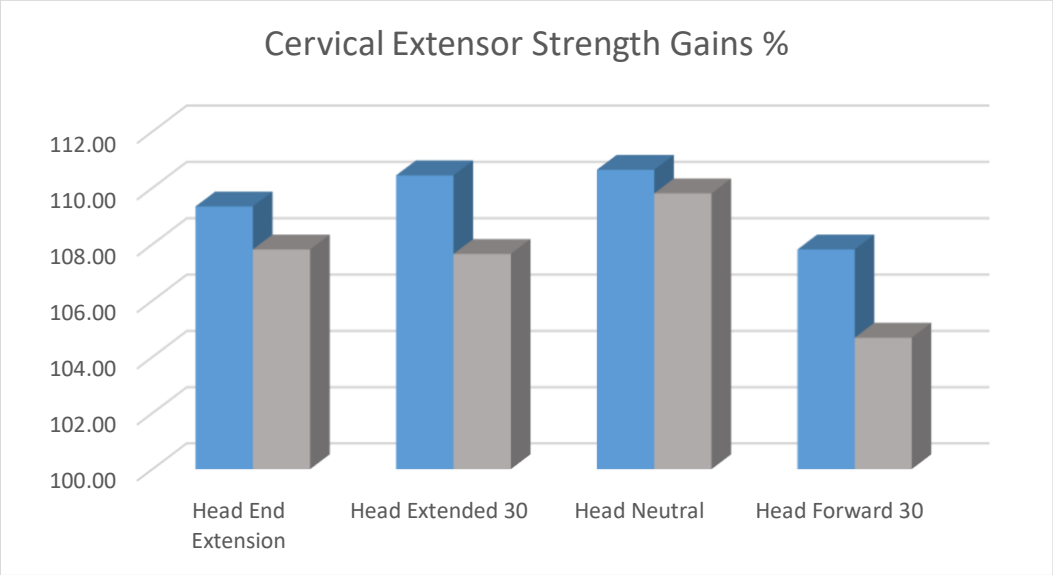
Procedures: A small sample of four males and four females, untrained, between the ages of 21 and 28 participated. The subjects were randomly assigned to either 1) the isometric program or 2) the NeckX program (Figure 1). Both programs lasted 3-weeks, with training sessions every other day (approximately 3-days each week), consisting of 3-sets of 6-repetitions, with 6-second holds for the isometric group or 3-sets of 8-12 repetitions for the NeckX group. All cardinal plane motions were targeted (i.e., flexion/extension, lateral flexion each direction, rotation each direction). Strength was measured using a hand-held force dynamometer, measuring maximum isometric strength in the following neck positions: Neck Extensors tested in slight flexion, neutral, slight extension, and full extension; Neck Flexors tested in slight extension, neutral, slight flexion and full flexion; Neck Lateral Flexors tested in lateral flexion away from target muscle, neutral, and lateral flexion toward targeted muscle; Neck Rotators tested in rotation toward, neutral, and rotation away.

Data Analysis: Data were analyzed to calculate means with standard deviation. Percent gain was estimated by comparing the pre-intervention measures with the post-intervention measures. Values exceeding 100% represent muscle strength gains.

Results: All participants experienced neck muscle strength gains. Strength gains in the neutral head position were comparable between the isometric group and the NeckX group (Extensors: isometric = 9.12 $\pm$ 0.74% NeckX = 10.64 $\pm$ 0.52%; Flexors = 9.38 $\pm$ 0.04% Isometric and 12.40 $\pm$ 4.58% NeckX; Rotators = 11.15 $\pm$ 0.42% Isometric and 10.50 $\pm$ 5.80% NeckX; and Lateral Flexors = 8.02 $\pm$ 3.07% and 7.46 $\pm$ 0.25% NeckX). The NeckX provided slightly greater neck strength gains in all positions outside of the neutral spine including slight extension, full extension, slight flexion, full flexion, rotation to either side and lateral flexion to either side. Figures 2-5 below illustrate these differences.

Discussion/Relevance: The NeckX provided strength gains through the full range of motion, better than standard isometric exercises. While the isometric exercises matched the gains of the NeckX in a neutral spine position, the NeckX appears to outperform standard isometrics when considering strength gains away from the neutral spine, including end range positions for flexion and extension. The NeckX has the potential to provide full range of motion strengthening to the muscles of the cervical spine. Further research is needed with a larger sample size, including a sample of individuals experiencing neck difficulties. In addition, future research might look at the role of neck strengthening with the NeckX and the incidence of concussive events in athletes.

Figure 1. Example of subject applying NeckX for resistance to neck rotation



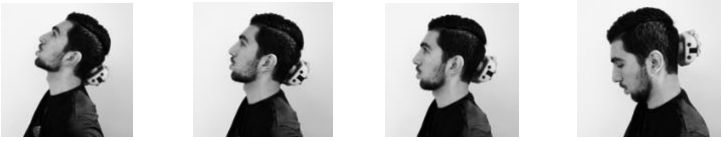
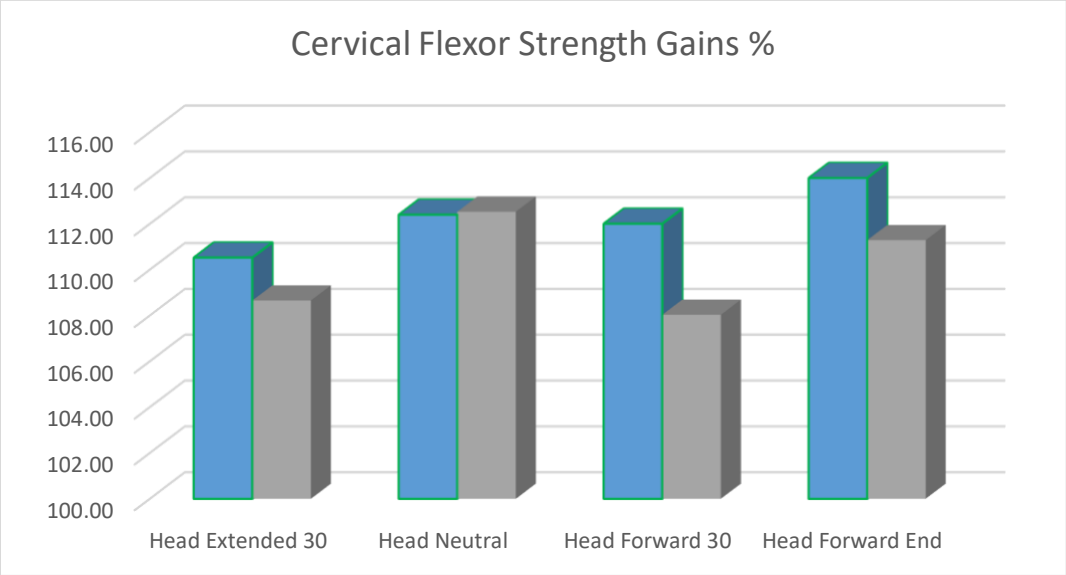


Figure 2: Cervical Extensor Muscle strength gains (NeckX = blue, Isometric = gray)



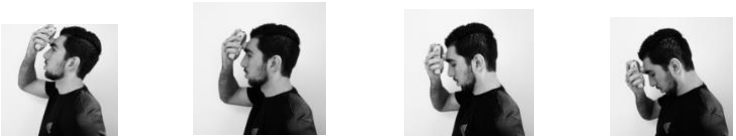


Figure 3: Cervical Flexor Muscle strength gains (NeckX = blue, Isometric = gray)

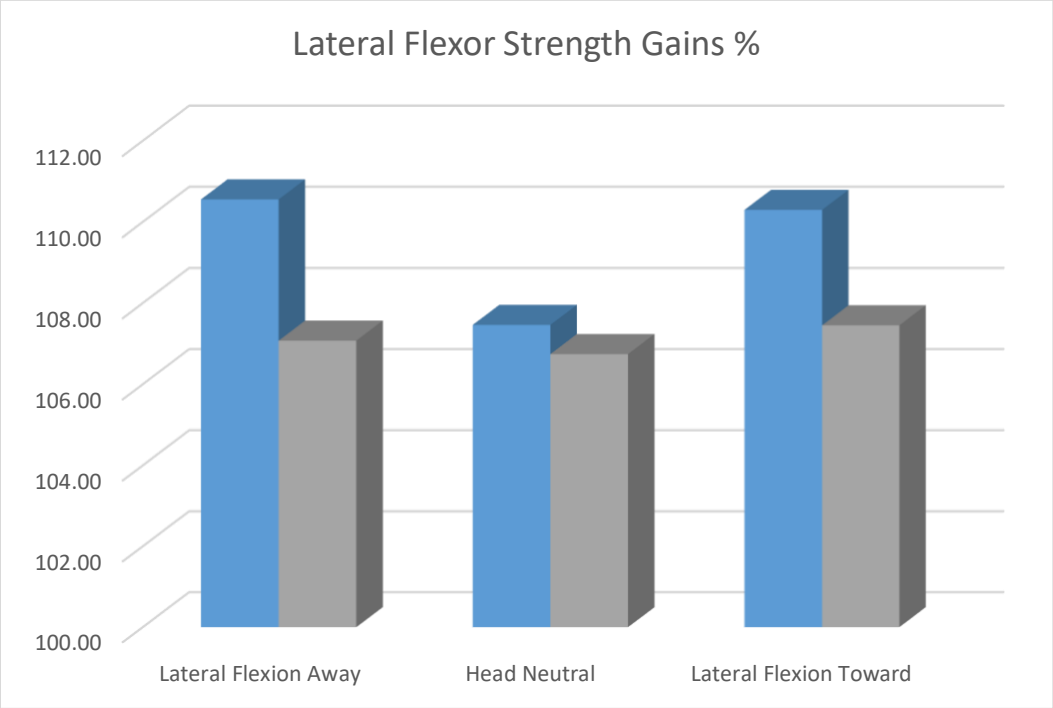


Figure 4: Lateral Neck Flexor Strength gains (NeckX = blue, Isometric = gray)

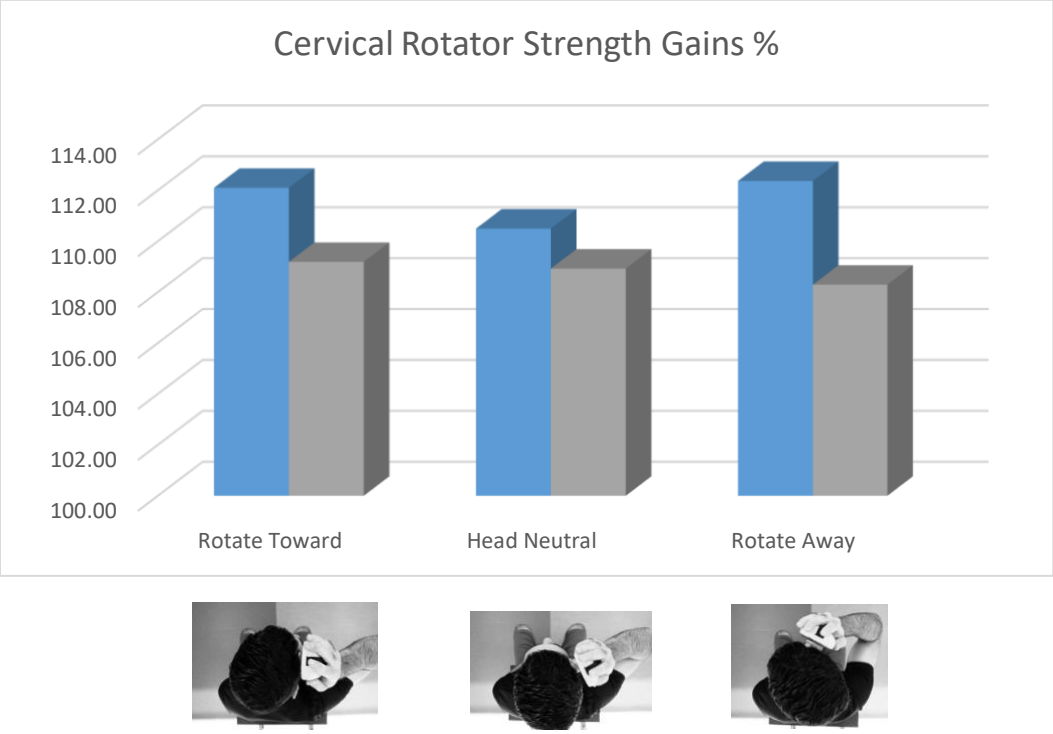


Figure 5: Cervical Rotation Muscle Strength gains (NeckX = blue, Isometric = gray)