ABSTRACT

An increase in neck strength can result in a reduced peak head acceleration during a forceful impact. It has been theorized that a reduction in head acceleration may significantly reduce the likelihood of sustaining a concussion. If neck strength has a role in concussion prevention, reasonably athletes with a history of concussion would exhibit lower levels of neck strength than those without a concussion history. It is unclear whether a relationship exists between neck strength and a history of sustaining a concussion.

METHODS

A cross-sectional study design was used to compare subjects. Athletes with a recent concussion comprised the Concussion group. Athletes with no history of concussion matching Concussion group subjects based on anthropometric and playing position characteristics comprised the Control group.

Maximum isometric neck strength was measured using a Biodex 3 isokinetic dynamometer with a modified head harness to record subjects’ peak torque generated in each position: 1) prone (flexion), 2) supine (extension), and 3) lateral (lateral flexion right/left) positions.

A multiple analysis of variance (MANOVA) was used to analyze neck strength group differences and a series of covariate analyses (ANCOVA) were used to investigate between-group differences with body weight, neck length, neck girth, and ROM as covariates. Alpha level was set at p<0.05.

RESULTS

No significant differences between Concussion and Control group subjects were observed for isometric neck strength for flexion (p=0.83), extension (p=0.82), right lateral flexion (p=0.51), or left lateral flexion strength (p=0.79).

Covariance analyses revealed no significant group differences with covariates of body weight (p=0.44), neck length (p=0.50), neck girth (p=0.34), flexion ROM (p=0.90), extension ROM (p=0.78), right lateral flexion ROM (p=0.61), and left lateral flexion ROM (p=0.54).

The results of this study suggest that isometric neck strength does not play a major role in football-related concussions among high-school athletes with or without adjusting for body weight, neck length, neck girth, or cervical range of motion. Reduced statistical power due to small sample sizes of the Concussion and Control groups might have contributed to the observation of non-significant findings. Differences in neck strength might not have been observable due to the subjects’ age, lack of strength training history, and undeveloped musculature. Practical applications: Despite the current study findings on the lack of relationship with concussion, neck strength plays a major role in reducing chronic neck pain and preventing cervical injuries. Cervical resistance training is recommended to football players at all levels. Further in-vivo research is needed to investigate the potential relationship of neck strength and susceptibility of concussion using eccentric neck strength measures in older and well-trained players.

INTRODUCTION

• An increase in neck strength can result in a reduced peak head acceleration during a forceful impact.
• It has been theorized that a reduction in head acceleration may significantly reduce the likelihood of sustaining a concussion.
• If neck strength has a role in concussion prevention, reasonably athletes with a history of concussion would exhibit lower levels of neck strength than those without a concussion history.
• It is unclear whether a relationship exists between neck strength and a history of sustaining a concussion.

PURPOSE

To investigate the potential differences in isometric neck strength in flexion, extension, and lateral right/left flexion between a group of concussed high school football players and a matched group of high school football players with no history of concussion.