Background Blind Football has the highest rate of injury of any Paralympic sport. Head injuries, including concussion, represent a large proportion of these injuries. Blind athletes are less able to anticipate impacts. It has been shown in other sports that athletes with greater neck strength are better able to resist head impacts in a laboratory, and that they are less likely to sustain a concussion.

Objective To establish whether isometric neck strength influenced head impact forces in Blind Football.

Design Observational study.

Setting International Blind Football training and matches over six-months.

Patients (or Participants) England Blind Football squad (7 males, mean age 28.6y)

Interventions (or Assessment of Risk Factors) Isometric neck strength was measured once during preseason using a handheld dynamometer. Head impact data was recorded using a head mounted accelerometer and gyroscope (GForce Tracker) attached to player’s mandatory blindfolds.

Main Outcome Measurements Head impact location (front, back, left or right) was recorded. Linear regression was performed to compare mean linear acceleration and rotational velocity to isometric cervical strength (flexion, extension, left back, left or right) with movements paired to the impact direction they oppose.

Results A total of 212.5 player hours were recorded (192.5 hours in training and 20 hours in matches). Increased cervical strength was associated with reduced mean linear acceleration ($R^2 = 0.1912$, $p = 0.020$) when comparing opposing movement or between number of impacts ($R^2 = 0.4354$ $p = 0.1068$).

Conclusions Elite Blind Football players with greater cervical strength were subject to head impacts with smaller linear acceleration. This is consistent with existing research in able-bodied athletes and provides an additional factor of the live acceleration. This is consistent with existing research in able-bodied athletes and provides an additional factor of the live acceleration.
PLAYING THE GAME OR GAMING THE SYSTEM: ARE US LOWER DYNAMIC NECK STRENGTH IS ASSOCIATED WITH HISTORY OF CONCUSSION IN VARSITY FEMALE SOCCER PLAYERS

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10.1136/bjsports-2021-IOC.299

Background There is mounting evidence that dynamic neck strength may play a role in protecting against concussion. It is also well established that athletes with a prior history of concussion are at higher risk than those with no prior history.

Objective To assess if there is a difference in dynamic neck strength between athletes with a self-declared history of concussion (HxC) and athletes with no history of concussion (Non-HxC). Secondly, to determine if dynamic neck strength can be used as a predictor for previous concussion history through a receiver operating characteristic curve (ROC) and hence, be used as a proxy for future concussion risk.

Design Observational cohort design

Setting Varsity female competitive soccer players

Participants 28 athletes (average age 19.4 years, range 18–21), separated by self-declared history of concussion (HxC n=10 and Non-HxC n=18)

Assessment Dynamic neck strength was calculated as the peak Rate of Force Development (RFD) in pounds-force per second (lbf * s⁻¹) achieved during 50 revolutions on the TopSpin360 neuromuscular neck-training device.

Results RFD for HxC was 3.85 lbf * s⁻¹ (95% CI 2.53 - 5.17 lbf * s⁻¹) while RFD for Non-HxC was 7.14 lbf * s⁻¹ (95% CI 5.17 - 9.12 lbf * s⁻¹) Independent samples t test p = 0.012. ROC cut-off value of 4.5 lbf * s⁻¹ provides a sensitivity of 72% and specificity of 80% for detecting those with a history of concussion.

Conclusions In this pilot study of varsity female soccer athletes, those with a history of concussion demonstrate significantly lower dynamic neck strength measurements compared to teammates with no history of concussion. Knowing that HxC athletes are at higher risk of future concussion, the ROC cut-off value of 4.5 lbf * s⁻¹ provides a starting point for future studies using dynamic neck strength values for assessing baseline concussion risk in athletes.