Heading and Soccer: Should We Be Concerned?

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Questions

• How often are concussions/mild traumatic brain injuries (mTBI) due to headers?

• Is it likely that one header result in a concussion/mTBI?

• Can repetitive head to soccer ball hits cause trauma over time?

• Would headgear help?
Research on Headers

• Video recordings from 313 matches played in the Norwegian and Icelandic seasons in 2000 were screened for hits to the head that caused interruption in play

• Of the 192 incidents, the most common playing action was the “heading dual”

• 41% of cases the elbow/hand/arm at hitting injured player’s head
  • majority elbow being used actively or above shoulder level

• 32% of cases, the head hitting the injured player’s head

• 13% of cases, the foot

• Stricter rules on use of elbow should be considered to possibly reduce risk of head injury

More research on headers

• Case control study of head and neck injuries from 20 FIFA tournaments from 1998-2004

• Of medical reports provided by team physicians describing 248 head/neck injuries, video recordings of 163 of the events was reviewed

• Results:
  • Contusions 53%
  • Lacerations 20%
  • Concussions 11%

• The commonest causes of injury involved aerial challenges (55%) and the use of the upper extremity (33%) or head (30%).

• The unfair use of the upper extremity was significantly more likely to cause an injury than any other player action.

Risk factors for concussion in soccer players

• 201 soccer players at a canadian university completed self-reported questionnaire

• 62.7% of the soccer players had experienced symptoms of a concussion during the previous year.

• Approximately 20% of those players had been diagnosed with concussion during the season.

• Variables that increased the odds of suffering a concussion during the previous year for soccer players included position, a past history of a recognized concussion while playing soccer, and being female.

  • Goalies were the most common position affected.

Isolated header unlikely to cause concussion

- Prospectively studied seven men’s and women’s varsity soccer teams in the ACC during two seasons to document concussion incidence.
- 29 diagnosed concussions, 17 (men) 12 (women)

CAUSES:
- opponent’s head (8, 28%)
- elbow (4, 14%)
- knee (1, 3%) or foot (1, 3%)
- the ball (7, 24%)
- None resulted from intentional heading of the ball

Repetitive Headers a risk?

• 37 amateur soccer players, completed a questionnaire to quantify heading in the prior 12 months and lifetime concussions.

• Diffusion-tensor magnetic resonance (MR) imaging at 3.0 T was performed
  
  • Fractional Anisotropy (FA) was measured… an algorithm used to evaluate the white matter fiber tracts

• Cognitive function was measured by using a computerized battery of tests (psychomotor speed, attention, executive function, and memory) and configured and supervised by a neuropsychologist.

• Heading was associated with lower FA at three locations in temporo-occipital white matter with a threshold that varied according to location (885–1550 headings per year) \( (P < .00001) \)

• Lower levels of FA were also associated with poorer memory scores \( (P < .00001) \), with a threshold of 1800 headings per year.


- serum analysis of concentrations of two biochemical markers of brain tissue damage, **S-100B** and **NSE** (neurone-specific enolase) in male soccer players

- Blood samples were taken in players before and after a competitive game and the numbers of headers and of trauma events during soccer play were assessed

- Both S-100B and NSE were significantly raised in serum samples obtained after the game in comparison with the pre-game values

- Only changes in S-100B concentrations (post-game minus pre-game values) were statistically significantly correlated to the number of headers

- Concentrations of S-100B also had some correlation with the number of other trauma events ($r=0.453$, $p = 0.02$)
Headgear?

- Cross-sectional study on soccer club players in Oakville, Canada

- Self-reported questionnaire

- 47.8% had experienced symptoms of a concussion during the current football year. 26.9% of athletes who wore headgear (HG) and 52.8% of those who did not wear headgear (No-HG) had concussions.

- More than one concussion was experienced by 50.0% of the concussed HG athletes and 69.3% of the concussed No-HG group.

- While the use of football headgear may decrease the risk of sustaining these injuries.

Headgear?

- Soccer headgear is not supported and needs randomized control studies to show benefit


- Women exhibited 10% greater head accelerations (20.2 g versus 18.2 g) when wearing the Head Blast

• Use of the unprotected head to control and advance the ball is a skill that obviously places the player at risk of head injury.

• A player's history of concussive episodes is a more likely explanation for any cognitive deficits.

• While it is likely that the subconcussive impact of purposeful heading is a doubtful factor in the noted deficits, it is unknown whether multiple subconcussive impacts might have some lingering effects.

• Proper instruction in the technique is critical because if the ball contacts an unprepared head (as in accidental head-ball contacts), the potential for serious injury is possible.

Questions Answered

- How often are concussions/mild traumatic brain injuries (mTBI) due from headers?
  - If you mean from the “heading dual”, YES.

- Is it likely that one header result in a concussion/mTBI?
  - No… not a purposeful header.

- Can repetitive head to soccer ball cause trauma over time?
  - Though it is likely that recurrent concussions have sequelae, it is not clear whether or not repetitive heading does.

- Does headgear help?
  - There is conflicting literature, and a need for future randomized control studies.


