Do Soccer Header Bands really protect you from injury?

This is a much talked about topic where most people seem to have an opinion one way or another, nothing in between.

A variety of medical organizations, among them the American Academy of Pediatrics (AAP), have defined Soccer as a contact sport which as it turns out it is one of the few contact sports played by US youth that doesn’t require the use of protective head gear. Research reports from the US Centers for Disease Control and Prevention (CDC) and the AAP have identified the most common types of injuries occurring during either practice or in games. Lower limb injuries (ankles and knees) are the most common followed by shoulder injuries which accounts for as much as 80% of all injuries. Head and facial injuries come in third at around 20%. In fact, a recent study looking at sports related emergency department visits (2001-2005) has shown that the percentage of all youth soccer injuries (ages 5-18) that are head injuries is very similar to that found in American football (6.2% versus 6.3%)5. Of the head injuries the most typical occurrence is due to head to head or head to ground/goal post contact with as much as 20% leading to a concussion. Little information is available about the consequences of repeated heading of the ball however; at least one study has provided some very interesting information. The study showed that, for an elite adult competitive team of women soccer players, repeated heading of the ball was associated with increases in blood proteins (i.e. markers) associated with inflammation and mild injury to the brain6. The more headers taken by the player the higher the level of these markers. The consequences of repeated inflammation/mild injury to the brain are uncertain especially as it relates to repeated headers in soccer7,8. By analogy though, we do know that repeated head injury in boxing and American football can and does lead to an ever decreasing ability to think and remember things9,10. In addition, a recent pilot study of 10 male collegiate soccer players that repeatedly headed the ball has shown that areas of the brain likely to be impacted by repeated heading were shrunken as compared to non-playing males of about the same age11. In contrast however, other studies of professional soccer players have demonstrated conflicting results with respect to mental skills12.

A study of youth soccer players in Ann Arbor, Michigan noted a small decline in verbal learning as well as increased reports of headaches in relation to the number of head impacts while another study of adult amateur soccer players found a variety of cognitive problems related to the number of soccer related concussions13-15. Medicine is just now beginning to understand the consequences of mild head injury and whether repeated injury can create problems long term. Current evidence indicates that the response by the brain to injury becomes more severe and lasts longer with each repeated injury. In other words there may be a cumulative effect due to repeated injury. There is also some work in the medical literature demonstrating that second injuries within a short amount of time (second impact syndrome) can lead to brain swelling which may have lethal consequences25-28. While a second impact relationship to brain swelling remains controversial, the animal research literature documents that second injuries indeed elicit more severe reactions by cells in the brain to injury which is likely clinically relevant15,29-31. Lastly, but certainly not least, there is increasing evidence linking repeated minor head injury (i.e. concussion) with age related dementia and Alzheimer’s disease32. This is an area of continued investigation.
There have been several mechanical studies looking at the ability of various header bands to limit the forces applied to the head as a result of a strike by a soccer ball.\textsuperscript{17-23} The gist of these studies is that the bands do appear to diffuse the force of the impact so that the energy of the “hit” is not concentrated as much in one spot. Other studies have demonstrated that diffusing forces applied to the head can limit injury. More recent research has suggested that women have more head movement after striking the ball than men and that wearing headgear may make matters slightly worse.\textsuperscript{18} Their discussion suggested that greater head movement was due to neck weakness and overconfidence when striking the ball. No data was available to clearly support this conclusion however the differences were real.

The real question of whether header bands actually prevent or limit injury has seen only limited testing in a scientific manner. Most recently, Delaney et. al. published the results of a study evaluating the effectiveness of header bands in protecting against concussion. They studied 278 Canadian, teenaged, competitive soccer players and demonstrated that the use of header bands by either sex decreased the risk of concussion \textsuperscript{16}. Also, being female had an inherent additional risk for concussion which has been supported by other studies. Although not the perfect study, it is the first of its kind to directly test the ability of head gear to limit concussion.

In other sport areas, such as American football, the efficacy of head protection has been demonstrated \textsuperscript{24}. The mechanical studies mentioned above also demonstrated that header bands were only effective in higher velocity impacts suggesting that they might not work with the lower forces seen in heading the ball. Also, inflation pressure and ball size (i.e. mass) have a bearing on impact forces \textsuperscript{21}. These authors do suggest, which is supported by their data, that the bands might be effective in protecting against the higher impact forces due to head to head or head to ground/goal post kinds of contact.

Younger Soccer players and heading the ball: Younger children should train using smaller balls with slightly lower pressures and avoid high speed contact with direct kicked balls or corner kicks. Why? The whiplash effect of the head rebounding after a ball strike can indeed have negative consequences. When the head rebounds the brain inside sloshes around causing injury. Young children do not typically have the neck and shoulder strength and coordination to support their head during a ball strike. This is why strength and technique is so important (i.e. rigidly supporting the neck and head) and is difficult for younger players with less developed shoulder and neck muscles to accomplish.

We would suggest that, at least for youth soccer players, the potential protection from head to head or head to ground/goal post (i.e. higher impact forces) far outweighs any functional limitation or discomfort in play and/or cost. Indeed a number of professional US women players have been seen using them (e.g. Shannon McMillan and Joy Fawcett) and have reported ease of use and little to no impact on how they played the ball with their head. To quote the New York Times, Sept. 16, 2003, "When the 2003 Women's World Cup begins on Saturday, eight players from around the world will be wearing a new piece of equipment…"; referring to header bands. Several youth soccer clubs in the US have been actively distributing protective head bands and at least one club has mandated header band use in their youth programs \textsuperscript{33}. At least one public school soccer team has mandated header band use as well \textsuperscript{34}.

Bottom Line? Header bands do diffuse the higher forces likely to be seen when players have contact with the ground/goal posts, the bony surfaces of other players, or very high velocity balls and may therefore protect somewhat from injury. There is a growing body of evidence that suggests that the use
of some types of header bands can limit injury to the head and face and lower the risk of concussion. Current research does not imply that the header bands function in a way that would protect players from repeated normal velocity headers. The specific consequences of repeated headers is currently unknown and is an area in need of more definitive research. The current evidence does suggest that adequate training in heading technique, good proprioceptive skills, and improved core and upper body strength can also go a long way towards preventing or limiting the consequences of a blow to the head.

We acknowledge that the “direct” evidence that header bands will protect from impact injury is limited and specifically less so from repeated heading of the ball. Anecdotally, some have even suggested that wearing a header band will provide an unwarranted level of confidence causing the athlete to become more of a “risk taker” however we have found no real evidence for this.

This is an individual decision that must necessarily be made by the player and their family. The key is to become as informed as possible. A history of repeated mild head injury/concussion suggests that this may be a problem over time and perhaps the use of header bands, regardless of their proven level of effectiveness, may provide a certain level of protection. This decision, of course, should be made in consultation with your primary care physician or other medical specialist trained in assessing these kinds of injuries.

Disclaimer: The authors do not represent or have any financial relationship with any sports equipment manufacturer and do not promote the use of any specific brand of head gear.

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REFERENCES


FIGURE LEGENDS

1. Figure 1: professional ball players (Tobias & Heyer) colliding while heading the ball; http://student.bmj.com/issues/03/10/editorials/images/view_2.jpg, Student British Medical Journal (BMJ)
2. Figure 2: “US women’s soccer team was down to 10 players for about 10 minutes and N. Korea took a full advantage of that, scoring 2 goals. Abby Wambach came off the field after colliding with a Korean player. She sustained an open wound injury in the back of her head and she went to the lock-room to get stitches.” http://socceroverload.com/usa-ties-north-korea-2-2/
3. Figure 3: Youth soccer players attempting to head the ball; http://www.brainpads.com/index.php/Technology/soccer.htm
4. Figure 4: Joy Fawcett, US Women's National Team Member, Gold Medal Olympian, World Cup Winner, Member of the San Diego Spirit, WUSA Founding Player.
5. Figure 5: Shannon MacMillan, She was one of the founding members of the WUSA's San Diego Spirit and also played as a member of the US Women's National Team that won the Gold Medal at the 1996 Summer Olympics as well as the 1999 Women's World Cup.