[Athletic Training]

Concussion History and Knowledge Base in Competitive Equestrian Athletes

Heather N. Kuhl, PsyD, LMFT,[†] David Ritchie, PsyD,[‡] Angela C. Taveira-Dick, PhD,^{*,†} Katie A. Hoefling, MS,[†] and Stephen A. Russo, PhD[†]

Background: Head injuries are responsible for the majority of serious equestrian sports injuries and deaths. Because of significant health risks to equestrians, education regarding the prevention of head and brain injuries is essential.

Hypothesis: A significant number of riders have experienced a concussion, and few have knowledge of concussion.

Study Design: Cross-sectional study.

Level of Evidence: Level 2.

Methods: Ninety-four riders competing, riding, or attending equestrian events at the Palm Beach International Equestrian Center in Wellington, Florida, from January to April 2010 were surveyed. Measures of central tendency were utilized to evaluate response patterns.

Results: Almost half of equestrian riders (44%) experienced concussions during their careers. Those riders who suffered a brain injury were likely to return to riding without seeking medical clearance. Almost 40% of riders were never educated regarding concussions, while 15% received education from their trainers.

Conclusion: Education of riders, parents, and horse trainers is needed to raise awareness of concussions and reduce the likelihood of subsequent injuries.

Keywords: concussion; equestrian sports; head injuries; education

Equestrian sports draw millions of participants and spectators worldwide. In the United States alone, at least 30 million Americans ride horses competitively.¹⁴ Although horses that compete in equestrian sports are often intensively trained and highly disciplined, their behavior can still be unpredictable. In addition, a number of other factors, such as a rider's experience and body position on the horse, equipment malfunction, and surface abnormalities, contribute to a high rate of injury during equestrian competitions.⁴

Head and brain injuries are responsible for the majority of serious equestrian injuries and deaths,^{1,3,8,11,13-16} with the rate of concussion estimated to be between 3% and 91%.⁴ According to these estimates, equestrians appear to be experiencing substantial threat. The risk of concussion and fatal injuries in horseback riding are comparable with high-impact sports, such as football, soccer, rugby, and motorcycle and auto racing.^{4,6,11,19} These numbers may be inaccurate due to underreporting.

Many riders choose not to seek medical attention following a concussion because they do not want to appear

weak or injured, they may not recognize the severity of concussive injuries, or they desire to remain in competition.² Underreporting, as well as failure to seek care, makes establishing the true prevalence of brain injury in equestrian sports difficult. Equestrian culture encourages riders to immediately get back onto their horses following a fall; the majority of trainers and riders fail to adequately evaluate a concussive brain injury.⁴ Premature "return to play" decisions may subject riders to unnecessary risk for further injury.⁴

METHODS

Study approval was granted by an institutional review board at Nova Southeastern University, and informed consent was obtained from all participants. A survey was developed to inquire about a rider's firsthand experience with concussive injuries as well as to assess his or her general knowledge of clinical management of brain injury (eg, headache, disorientation, amnesia). Riders' helmet practices, awareness

From the [†]Nova Southeastern University, Fort Lauderdale, Florida, and [‡]University of Colorado School of Medicine, Denver, Colorado

*Address correspondence to Angela C. Taveira-Dick, PhD, Nova Southeastern University, 3301 College Avenue, Fort Lauderdale, FL 33314 (e-mail: angelataveira79@gmail.com).

The authors report no potential conflicts of interest in the development and publication of this manuscript.

DOI: 10.1177/1941738113508073

© 2013 The Author(s)

of US Equestrian Federation concussion guidelines, return-to-play decisions following a concussion, general knowledge of concussive injuries, and personal experience with concussion were recorded (see Appendix 1, available at <http://sph.sagepub.com/supplemental>).

Participants

This study comprised 94 equestrian riders (27 men, 67 women) between 18 and 87 years of age. The majority of respondents rode for more than 15 years ($n = 72$). Amateur or professional participants were recruited from the Palm Beach International Equestrian Center in Wellington, Florida, over a 4-month period. Participants completed a multisectional questionnaire regarding their experiences and general knowledge of concussions and/or head injuries (Appendix 2). Sixty-four riders were amateurs, and 30 were professionals: 56 jumpers, 72 hunters, 14 dressage, and 1 polo player. Many participants competed in multiple disciplines (Appendix 3).

Data Analysis

Descriptive statistics (ie, means, frequencies, percentages) were utilized within the current study design to quantify responses across participants for comparative purposes between groups as described above. Measures of central tendency were used to evaluate response patterns.

RESULTS

All participants had experienced a fall as well as multiple symptoms of head injury (Table 1). Approximately 45% ($n = 42$) reported having sustained a concussion following a fall. Experience level did not influence the rates of concussion; 48% of professionals and 44% of amateurs had brain injuries. Of those that had a concussion, 78% ($n = 33$) were never educated about head injury. When asked about the amount of time off following a concussive injury, 37 of 42 participants responded. Over 51% ($n = 19$) took less than 5 days off from riding, and several riders ($n = 3$) did not take any time off after a brain injury. Of the remaining respondents, 30% ($n = 11$) took between 14 and 21 days off from riding, and 8% ($n = 3$) took more than 30 days off following a brain injury. Fewer than 30% changed their riding style or approach to concussion management.

Seventy-two percent of riders determined their own readiness to return to riding (28% by horse trainers and 12% by parents). The return-to-play decision was made by a medical professional in less than one-third of cases; in 9%, the rider determined when to return to riding.

Riders who sustained concussions reviewed a list of common concussion symptoms and ranked the symptoms in order of importance when deciding to return to horseback riding. Of the 23 symptoms ranked—including loss of consciousness ($n = 37$), amnesia ($n = 30$), blurred vision ($n = 29$), poor balance ($n = 28$), memory problems ($n = 28$), and vomiting ($n = 28$)—loss of consciousness was rated as the most important.

Table 1. Symptoms following a fall off a horse

Symptom	No.	%
Neck pain	60	63.8
Headache	53	56.4
Dizziness	41	43.6
Poor balance	26	27.7
Poor concentration	23	24.5
Loss of consciousness	22	23.4
Fatigue	22	23.4
Irritability	22	23.4
Feeling slowed down	19	20.2
Numbness/tingling	18	19.1
Feeling mentally foggy	16	17.0
Memory problems	16	17.0
Sensitivity to light	15	16.0
Nausea	15	16.0
Blurred vision	14	14.9
Sensitivity to noise	13	13.8
Drowsiness	12	12.8
Vomiting	10	10.6
ringing in ears	10	10.6
Amnesia	10	10.6
Sadness/depression	8	8.5
Trouble sleeping	8	8.5
I have never fallen off a horse	0	0

Fifty-eight percent of riders strongly agreed that it was necessary to wear an ASTM/SEI-approved helmet when jumping (ie, American Society for Testing and Materials/Safety Equipment Institute); 7.5% of riders did not think that it was necessary for activities other than jumping. Sixty-five percent of riders were unsure if concussion guidelines existed, and 13% of riders did not know of concussion guidelines.

Forty-five participants were educated about concussions by a doctor or psychologist, while 32% were educated by their parents or trainers. Thirty-three percent thought that riders could get back on a horse after experiencing dizziness or

disorientation following a fall, while over 30% thought that it was acceptable to ride on the same day of a concussion. When asked if repeated head injuries could result in lasting impairments, 88% agreed or strongly agreed. Seventy-six percent believed that concussions can increase susceptibility to brain injury. Twenty-seven percent believed that work or academics was likely to worsen concussion symptoms. Forty-seven percent disagreed or strongly disagreed that management of concussion should be more conservative for a child (Appendix 2).

DISCUSSION

Concussions are a leading cause of disability to horseback riders.^{2,5,8-10,12,13,16,18,20} More than half of this study's participants reported a history of concussion.

Equestrian athletes were either misinformed or unaware of the potential negative consequences of concussive injuries. A significant portion of participants had little education on head injuries. Horse trainers and parents may notice signs or symptoms of a concussion and can model appropriate safety practices. Proper education is needed about medical care and informed decisions regarding return to play.

An effective education program should teach trainers and riders the importance of informed medical decisions to minimize the risk of additional injury or complications. Properly fitted approved helmets (ASTM/SEI) have significantly reduced the number of head injuries.^{2,5,10,17} A majority of serious injuries occur because many riders do not wear helmets.^{2,3,7,10} In 80% of these cases, riders were not wearing protective headgear at the time of injury.¹⁰ Educating riders about proper use of protective headgear is a crucial step toward preventing and/or reducing the severity of brain injury in equestrian sports.

Limitations to this study included the relatively small sample size ($n = 94$) and a disproportionate number of white women ($n = 57$).^{9,12-14,16}

The retrospective nature of the study presents a major challenge to appraisal of accuracy of the data submitted. The survey was not a standardized psychological assessment; therefore, the validity has not been established. The survey

relied on self-reporting of events, and consequently, diagnosis and determination of injury was not assessed.

CONCLUSION

Equestrians are at high risk for concussive injury and are in need of education efforts to address these deficiencies. Parents and trainers should be aware of the risks, signs, symptoms, guidelines, and appropriate management of concussion.

REFERENCES

1. Ball CG, Ball JE, Kirkpatrick AW, Mulloy RH. Equestrian injuries: incidence, injury patterns, and risk factors for 10 years of major traumatic injuries. *Am J Surg*. 2007;193:636-640.
2. Bixby-Hammet DM. Horse related hospital emergency room admissions, 2008. *Equestrian Med Safety Assoc*. 2008;22(3):1-15.
3. Bixby-Hammet DM, Brooks WH. Common injuries in horseback riding: a review. *Sports Med*. 1990;9:36-47.
4. Broshek DK. Concussion diagnosis and management. *Am Med Equestrian Assoc*. 2001;12(4):1-4.
5. Chitnavis JP, Gibbons CL, Hirigoyen M, Lloyd Parry J, Simpson AH. Accidents with horses: what has changed in 20 years? *Injury*. 1996;27:103-105.
6. Condie C, Rivara FP, Bergman AB. Strategies of a successful campaign to promote the use of equestrian helmets. *Pub Health Reports*. 1993;106:121-126.
7. Frankel HL, Haskel R, Digiacomo C, Rotondo M. Recidivism in equestrian trauma. *Am Surg*. 1998;64:151-155.
8. Hobbs GD, Yealy DM, Rivas J. Equestrian injuries: a five-year review. *J Emerg Med*. 1994;12:143-145.
9. Jagodzinski T, DeMuri GP. Horse-related injuries in children: a review. *Wisconsin Med J*. 2005;104(2):50-55.
10. Kriss TC, Kriss VM. Equine-related neurosurgical trauma: a prospective series of 30 patients. *J Trauma*. 1997;43:97-99.
11. Lindsay KW, McLatchie G, Jennett B. Serious brain injury in sport. *Br Med J*. 1980;281:789-791.
12. Lloyd RG. Riding and other equestrian injuries: considerable injury. *Br J Sports Med*. 1987;21:22-24.
13. Masters RG. Equestrian injuries: a review. *Clin J Sports Med*. 1991;1:123-126.
14. McCrory PM, Turner M. Equestrian injuries. *Br J Sports Med*. 2005;48:8-17.
15. Moss PS, Wan A, Whitlock MR. A changing pattern of injuries to horse riders. *Emerg Med J*. 2002;19:412-414.
16. Nelson DE, Bixby-Hammett D. Equestrian injuries in children and young adults. *Am J Dis Child*. 1992;146:611-614.
17. Nelson DE, Rivara FP, Condie C. Helmets and horseback riders. *Am J Prev Med*. 1994;10:15-19.
18. Nelson DE, Rivara FP, Condie C, Smith SM. Injuries in equestrian sports. *Phys Sportsmed*. 1994;22:53-60.
19. Watt GM, Finch CF. Preventing equestrian injuries: locking the stable door. *Sports Med*. 1996;24:187-197.
20. Whitlock MR, Whitlock J, Johnston B. Equestrian injuries: a comparison of professional and amateur injuries in Berkshire. *Br J Sports Med*. 1987;21:25-26.