

# Getting Back on the Horse: Sport-Specific Return to Play in Rodeo Athletes After Concussion Injury

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**Context:** Despite a high incidence of injury in their sport, rodeo athletes have been underrepresented in the concussion literature. No standard postconcussion protocols are available across rodeo organizations for evaluating fitness to return to competition.

**Objective:** To review the literature on concussion in rodeo, examine published guidelines, and offer an active return-to-play (RTP) protocol specific to rodeo athletes.

**Background:** Unique barriers complicate the management and treatment of rodeo athletes with concussion, such as the solo nature of the sport, lack of consistent access to health care professionals, and athletic conditioning that often occurs outside of a traditional gym-based exercise regimen. In addition, the rodeo culture encourages a swift return to competition after injury.

**Description:** Best practices for managing concussion are removal from activity, proper diagnostic evaluation, and gradual return to sport, with medical clearance when an athlete is symptom free and able to tolerate cognitive and physical exertion. An RTP protocol for rodeo events needs to capture

the distinctive features and challenges of the sport and its athletes.

**Clinical Advantages:** Rodeo athletes would benefit from an RTP protocol that can be initiated by an athletic trainer or medical professional in the acute stage of injury, integrates exercise into activities of daily living, and is appropriate for athletes who travel frequently. At the organizational sport level, a formal RTP protocol could enhance consistency in medical-clearance techniques among providers responsible for the return to sport of rodeo athletes.

**Conclusions:** Rodeo athletes represent a sport population that has received little formal guidance on the diagnosis, management, and RTP after concussion. A sport-specific RTP protocol sensitive to the particular culture of these athletes is an important first step in protecting the health and safety of rodeo athletes after a concussive injury.

**Key Words:** sport-related concussion, mild traumatic brain injury, concussion management

## Key Points

- Rodeo athletes have received little formal attention regarding concussion diagnosis, management, and recovery despite a high incidence of injury in the sport.
- Barriers to educating and treating rodeo athletes due to the unique features of the sport include its solo nature, frequent travel, and lack of consistent access to health care professionals.
- Sport-specific return-to-play guidelines may help protect the health and safety of rodeo athletes postconcussion.

Concussion is a complex pathophysiologic process that changes the way the brain normally functions. The injury can be caused by a bump, jolt, or blow to the head or body. Clinical recovery from concussion typically involves gradual diminution in the intensity and frequency of cognitive, behavioral, and emotional symptoms over the first month after injury.<sup>1</sup> The epidemiology of concussion in rodeo athletes is difficult to ascertain, and a number of variables are unique to the sport of rodeo. Frequently cited estimates<sup>2–5</sup> indicate that concussions account for approximately 8% to 15% of all rodeo injuries. However, rodeo has no central reporting organization, which makes it challenging to accurately track athletes' injuries. Athletes may also travel 100 000 miles and compete in 125 rodeos per year to make the National Finals competition, resulting in a lack of continuity of medical care.<sup>6</sup>

Environmental factors in rodeo events such as the event, animal, and arena may each contribute to the mechanism of injury.<sup>6</sup> In addition, the compensatory structure of rodeo encourages participation despite injury and contributes to the underreporting of symptoms, given that missing an event means forfeiting entry fees as well as potential earnings. In 2004, the First International Rodeo Research and Clinical Care Conference<sup>7</sup> convened and published guidelines and recommendations for concussion diagnosis, management, and treatment in the rodeo athlete. These recommendations were (1) a physician's medical release to return to sport, (2) participation restricted for a minimum of 1 week for riders who sustained loss of consciousness, and (3) the athlete must be asymptomatic and have completed graded exercise testing before returning to rodeo. This was an important collaboration among multiple Canadian, international, and American professional rodeo associations as well as intercollegiate and high school associations.

**Table 1. Stage of Active Exertion Postconcussion: Rodeo**

Stage <sup>a</sup>	Goal(s)	Activity Recommendations
1: Light activity	Recovery	Stationary bicycle, walking, neck stretching, light chores (feeding animals, animal grooming)
2: Light aerobic activity	Increased heart rate	Increase heart rate with longer duration; walking, add balance challenge (single leg, tandem stance), exercise ball or barrel and roll back and forth with eyes focused, visit work site for social interaction
3: Sport-specific exercise	Add movement	20-min conditioning, core exercises, practice roping, goat or calf tying with a dummy, light movement on training simulator, practice mounting and dismounting animal
4: Noncontact training	Exercise, coordination, cognitive load	Conditioning >30 min, drills, progression of speed on animal, counting time on animal or other cognitive activity, practice form on animal or training simulator
5: Full participation after medical clearance	Restore confidence & skills assessment	Any activity on the back of an animal; must complete this stage before a rodeo competition

<sup>a</sup> Adapted from McCrory et al.<sup>1</sup>

These management recommendations were applied to professional rodeo athletes and select collegiate and high school associations. Notably, a large proportion of rodeo athletes are not represented in these management recommendations, such as athletes who do not compete at the professional level (ie, smaller local and youth rodeo participants).

The best clinical practice for concussion management should consist of education before a sport season on concussion signs and symptoms, acute identification and proper diagnosis of athletes, a multidisciplinary approach to treatment, and a gradual increase in cognitive and physical activity<sup>1</sup> to ensure a safe return to rodeo. In contrast to this ideal standard of care, a recent survey<sup>8</sup> of professional rodeo athletes demonstrated that 30% had never received concussion education. Furthermore, in this same small sample, 32% reported having hidden concussion symptoms to continue participation, and 63% of those who sustained a concussion in 1 rodeo season indicated they did not seek medical treatment.<sup>8</sup>

Unique barriers to educating, managing, and treating rodeo athletes with concussion include the solo nature of the sport, a lack of consistent access to or follow-up with health care professionals, and a culture that encourages a swift return to competition. We propose a return-to-play (RTP) protocol after acute concussion for rodeo athletes that is sensitive to the training, personal characteristics, and barriers to injury management faced by these athletes. A key feature of the protocol is a method of standardizing communication among athletic trainers regarding the specific stages of RTP achieved in an individual athlete, given that athletes may encounter multiple health care professionals as they travel between rodeos. A second feature is the integration of exercises that are more appropriate to and congruent with the lifestyle of the rodeo athlete. These exercises should be sensitive to both the culture of the rodeo athlete and the athlete's specific area of competition. For example, male rodeo athletes compete in rough stock events (bull riding, bareback, and saddle bronc) and timed events (steer wrestling, team roping, and tie-down roping). Female athletes compete in the high-speed, agility-based event of barrel racing. The athletic ability required for these events differs, so any RTP protocol should address rodeo athletes' specific skill sets.

The proposed RTP protocol would also allow for improved tracking of recovery (ie, a method of reporting the stages achieved to date without symptom provocation) to aid in final medical clearance by appropriate health care providers. Last, with initial guidance from a certified athletic trainer, an athlete would be able to independently participate in the RTP stages as he or she travels among performances and reports progress to health care professionals involved in administering final graded exercise techniques and medical-clearance decisions.

## PROTOCOL DESCRIPTION

The stages of RTP are adapted from the consensus statement<sup>1</sup> developed at the 2016 conference on concussion in sport held in Berlin (Table 1). Activity suggestions are also guided by recent literature<sup>9</sup> on the benefits of active rehabilitation postconcussion. A period of symptom-limited activity in the first 24 to 48 hours is recommended, with a gradual increase in light physical activity.<sup>1</sup> All stages are adapted for easy integration into activities of daily living; many rodeo athletes do not participate in traditional gym-based exercise programs but rather are involved in farming or other outdoor activities as a form of exercise. Rodeo competition involves intermittent periods of high-intensity performance, similar to sports with interval training rather than prolonged cardiovascular activity.<sup>2</sup> The stages also reflect options for integrating interval-training activities with the customary activities of daily living. Provocation of symptoms at each stage may be assessed using commercially available graded symptom checklists.

### Stage 1: Light Activity

The goal of the first stage is to gradually increase activity (Table 1). Light activity can have positive effects on mood and emotional functioning, sleep, headache, and other types of physical pain postconcussion, particularly in previously active individuals.<sup>10–13</sup> Physical activity may also serve as a barometer of physiological recovery.<sup>10,11</sup> The rodeo athlete is advised to take walks, feed animals, brush horses, clean horse pens, or perform other light-activity chores. The athlete may choose to record symptoms and monitor heart rate after activity to provide qualitative and quantitative information on his or her progress.

**Table 2. Stage 3: Sport-Specific Exercise Examples**

Roping Events	Steer Wrestling	Rough Stock	Barrel Racing
<ul style="list-style-type: none"><li>• Rope from ground</li><li>• Standstill on horse: rope stationary dummy, then progress to mechanical dummy</li><li>• Practice dismount from standstill on horse for tie down</li><li>• Rope small calf or goat from the ground</li></ul>	<ul style="list-style-type: none"><li>• Practice hand placement on a stationary dummy from the ground</li><li>• Technique on stationary dummy</li><li>• Imagery of dismount and technique</li></ul>	<ul style="list-style-type: none"><li>• Sit on barrel: add head movement</li><li>• Training simulator: technique and slow movements</li><li>• Imagery of rides on barrel or training simulator (time, 8 s)</li></ul>	<ul style="list-style-type: none"><li>• Imagery of pattern: sit in saddle on a barrel</li></ul>

## Stage 2: Light Aerobic Activity

In the second stage, the goals are to increase the athlete's heart rate with longer-duration activities, add balance, and attend to the athlete's emotional health (Table 1). The athlete may extend the duration of walks, for example. Using a barrel or exercise ball, the athlete can roll back and forth with eyes on a focal point to strengthen balance and ocular function. To address emotional health, rodeo athletes should visit their work site for social interaction. They may choose to observe colleagues' rodeo performances. Simple strategies such as wearing sunglasses or a hat for photophobia or ear plugs for phonophobia during social interaction may reduce symptom exacerbation and overstimulation.

## Stage 3: Sport-Specific Exercise

When the athlete is able to tolerate light aerobic activity without symptom provocation, he or she should supplement with sport-specific exercises and add movement (Table 2). All athletes would benefit from a 15- to 20-minute conditioning exercise and core work for warm-up. Depending on the specific event, the athlete may practice roping a stationary dummy and work his or her way up to a mechanical dummy to improve reaction time and hand-eye coordination. The athlete can practice goat or calf tying from a stationary position using a dummy, roping, wrestling a stationary dummy, and mounting and dismounting from a standstill. Rough stock athletes may engage in light movement on a training simulator (eg, Mighty Bucky, Carthage, TX) slowly and then gradually increase speed followed by intensity. Barrel racing should focus on imagery at this stage and not on horseback riding.

## Stage 4: Noncontact Training

When the athlete can tolerate sport-specific exercises without symptom provocation, he or she can advance to

noncontact training (Table 3). This stage includes conditioning for more than 30 minutes, technique-specific drills for the event, and progression of speed on his or her horse. The athlete can begin riding the horse and roping at this stage. He or she will need to progress from standstill dismounts to a moderate speed. This can be achieved by using older or slower livestock or a mechanical dummy. Before beginning practice on a live animal, steer-wrestling athletes should practice dismounts from the horse onto a dummy. Rough stock riders can progress to full speeds on a training simulator. Barrel racers may begin riding their horses and work on controlled technique, progressive speed, and any drills related to the barrel pattern (no full-speed practice).

## Stage 5: Full Participation

The athlete must obtain medical clearance before participating in stage 5. When medical clearance is obtained, the athlete can practice without limitations, including all speeds on horseback. Athletes should reintroduce live animals for roping, wrestling, and rough stock events. The goals of this stage are to increase confidence in technique without restriction and with proper medical-clearance documentation and to prepare for competition and performance.

## DISCUSSION

Rodeo possesses a rich cultural history and values, and its athletes have been described as cultural icons.<sup>14</sup> Aside from the bravado inherent to the sport, rodeo athletes have unique qualities and experience different challenges than athletes in other organized and team-sport environments. Concussion recognition, diagnosis, and treatment have evolved over the past 15 years, yet little evolution has occurred in the treatment of concussion in rodeo athletes. In part, this is because rodeo athletes operate in an unusual structure regarding the level of sport organization, leader-

**Table 3. Stage 4: Noncontact Training**

Roping Events	Steer Wrestling	Rough Stock	Barrel Racing
<ul style="list-style-type: none"><li>• Progression of speeds on horse: begin at a walk, mechanical dummy or slow calves/steers</li><li>• Progression of speed for dismounts and tying calves</li><li>• Practice with partner (team roping)</li></ul>	<ul style="list-style-type: none"><li>• Dismount horse onto a stationary dummy (NO live steer or other animal)</li><li>• Progression of speeds on horseback</li></ul>	<ul style="list-style-type: none"><li>• Progression on a training simulator: work up to full speeds and technique</li><li>• NO live bulls or broncs</li></ul>	<ul style="list-style-type: none"><li>• Progression of speeds on horseback</li><li>• Drills and technique: 1 barrel at a time to controlled pattern work</li><li>• NO full-speed barrel pattern</li></ul>

ship, and medical care. In the sport-concussion literature, available recognition and treatment strategies, active rehabilitation techniques, and recommendations for the safe return to sport are primarily derived from expert consensus and research based on organized team-sport participation. Implementation of a structured RTP protocol, with features and exercises specific to rodeo athletes, may be one step in promoting their safe return to sport.

Currently published guidelines<sup>7,15</sup> recommend removing an athlete from competition immediately if a concussion is suspected, allowing return only with written clearance from a physician, and only providing clearance once the athlete is asymptomatic and able to tolerate graded exercise testing. These general guidelines were published more than 10 years ago and lack specific recommendations for recovery management. Our suggested protocol scaffolds on the existing literature as a framework for a stepwise increase in activity and event-specific rehabilitation techniques for rodeo athletes. Consistent with current best practices for clinical management of concussion, we also recommend adding objective measures, such as an examination of vestibular-ocular function, balance, and cognition, whenever possible.<sup>16,17</sup> Ideally, objective measures would be administered by certified athletic trainers for all rodeo participants at baseline preseason, acutely post-injury, and before clearance to RTP. Implementing such measures would require support at the national organizational level for rule changes, and the national organizations would need to provide resources and training on such protocols. These objective measures reduce, but do not eliminate, the need to depend on the athlete's self-perception and reporting of symptoms when making RTP decisions.

Implementation of a systematic RTP protocol may also help break down the unique barriers to educating and treating rodeo athletes and may extend to protecting youth rodeo athletes. All states have laws to protect youth athletes from concussive injury. Specific requirements vary by state. However, most of the laws share common elements, including requirements for the education and training of athletes, parents, and coaches; removal from participation if a concussion is suspected; and medical clearance for RTP. Variability exists among states on elements such as which medical professionals can provide clearance, at what age medical clearance is required, and which activities are covered by the law.<sup>18,19</sup> Implementing a sport-specific RTP protocol at the youth rodeo level and in accordance with concussion laws may have immediate and long-term benefits. Immediate benefits include safely returning youth athletes after a stepwise activity progression and symptom assessment before medical clearance. Long term, if youth rodeo athletes are introduced to proper concussion management and appropriate RTP protocols at a young age, the cultural expectations of how concussion management and recovery should proceed may shift. For example, evidence<sup>20</sup> indicates that if a bull rider uses a helmet at a young age, the practice becomes customary and may encourage helmet use throughout the athlete's career. A sport-wide educational program specific to youth rodeo would also be in order.

Limitations of the current protocol include the lack of scientifically validated, sport-specific physical-exertion protocols postconcussion. The current protocol stages are

suggestions based on our experience with rodeo athletes, ranging from youth to professional, and our current knowledge of progressive stages for RTP. Another limitation is the lack of a central injury-reporting mechanism in rodeo to integrate such RTP protocols. This systemic concern must be addressed at the organizational level. For example, Justin Boots (Fort Worth, TX) sponsors mobile sports medicine trailers at Professional Rodeo Cowboys Association events and provides free medical care for injured athletes. Increasing the presence of athletic training and medical staff in the model of mobile medicine is a desirable area for program development. Last, we foresee that athletes will self-direct some of the RTP stages during their travel between performances. This show of independence is inherent in the rodeo culture. Allowing and accounting for this tendency toward independence would likely improve compliance and reduce self-monitoring of symptoms and use of inappropriate techniques. However, we emphasize that this protocol should be conducted under the guidance of a trained medical professional and is not a substitute for a medical evaluation or clearance to return to rodeo. To date, rodeo athletes, particularly youths and those not involved in professional organizations, have not received any formal guidance on concussion-recovery strategies. This protocol reflects an immediate and actionable step in presenting an organized approach for safe RTP in the rodeo athlete.

## CLINICAL ADVANTAGES

We propose a novel active RTP protocol for the rodeo athlete. Once initiated by an appropriate medical professional, this protocol can integrate exercise into activities of daily living. Rodeo athletes typically travel independently, do not have a coaching staff to track injury, and may not have access to consistent medical providers while traveling between performances.<sup>4</sup> The proposed protocol has 3 primary adaptations to account for these factors. First, the protocol is written in lay terms to enhance communication between the athlete and medical staff because the athlete may encounter different providers if he or she travels during recovery. Second, the activity suggestions are more congruent with the exercise regimen of the rodeo athlete, which often occurs outside a traditional gym-based or athletic training-guided program. Third, reintegration of activity with livestock is unique to rodeo. The unpredictable nature of sport with an animal adds a layer of complexity specific to rodeo and equestrian sports. This must be accounted for in the RTP of rodeo athletes because they risk reinjury, not only from their own controlled sport technique but also from environmental factors such as animal behavior. Also, the protocol could be distributed and downloaded easily via rodeo Web sites to reach the cadre of medical professionals who treat these athletes as well as the many rodeo organizations nationwide and worldwide.

Sport- and event-specific recommendations for rodeo also provide clinical advantages from an athletic-conditioning perspective. Rodeo athletes' training and characteristics differ from those encountered in other sports.<sup>2</sup> Meyers and Laurent<sup>2,3</sup> reviewed the sport science of rodeo and characterized the physical, physiological, and psychological aspects of rodeo athletes. The authors described the unique skill set and physical status of the competitors.



Rodeo requires skill, agility, and strength to compete with large livestock. The specific rodeo events further differentiate the physical requirements associated with rodeo activities. Given their short duration, rodeo events are thought to primarily involve anaerobic activity. Practice typically includes aspects of physical interval training. The risk of injury through high-velocity collisions, falls, and animal-related incidences further differentiates rodeo from other team and individual sports.

## CONCLUSIONS

We propose a management and RTP protocol for acute concussion in rodeo athletes that is sensitive to the training, personal characteristics, and barriers to injury management they face. Changes at the organizational level are required to protect the health, safety, and career longevity of the rodeo athlete. Ideally, suggestions on recovery from concussion in rodeo would be preceded by an educational program to enhance awareness of signs and symptoms. Athletes should be educated with more modern messaging, including the importance of seeking medical attention, that conveys the treatable nature of concussion and informs them about the probability of faster recovery from concussion with immediate removal from competition after injury.<sup>1,21</sup>

Changes at the organizational and policy levels have been effective in reducing concussions in other sports.<sup>22</sup> At the organizational level, the rodeo leadership should consider financial incentives to encourage reporting of concussions. For example, a refund of entrance fees, rather than loss of current and future earnings, may encourage concussion reporting. Policies should include mandatory removal from competition, appropriate evaluation, and adherence to an RTP protocol before medical clearance for all levels of rodeo athletes. Finally, research on the culture of concussion reporting in rodeo, specific mechanisms of injury within each event, and strategies for improved organizational policies specific to rodeo is warranted to protect and progress concussion recognition, reporting, and rehabilitation in rodeo athletes.

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