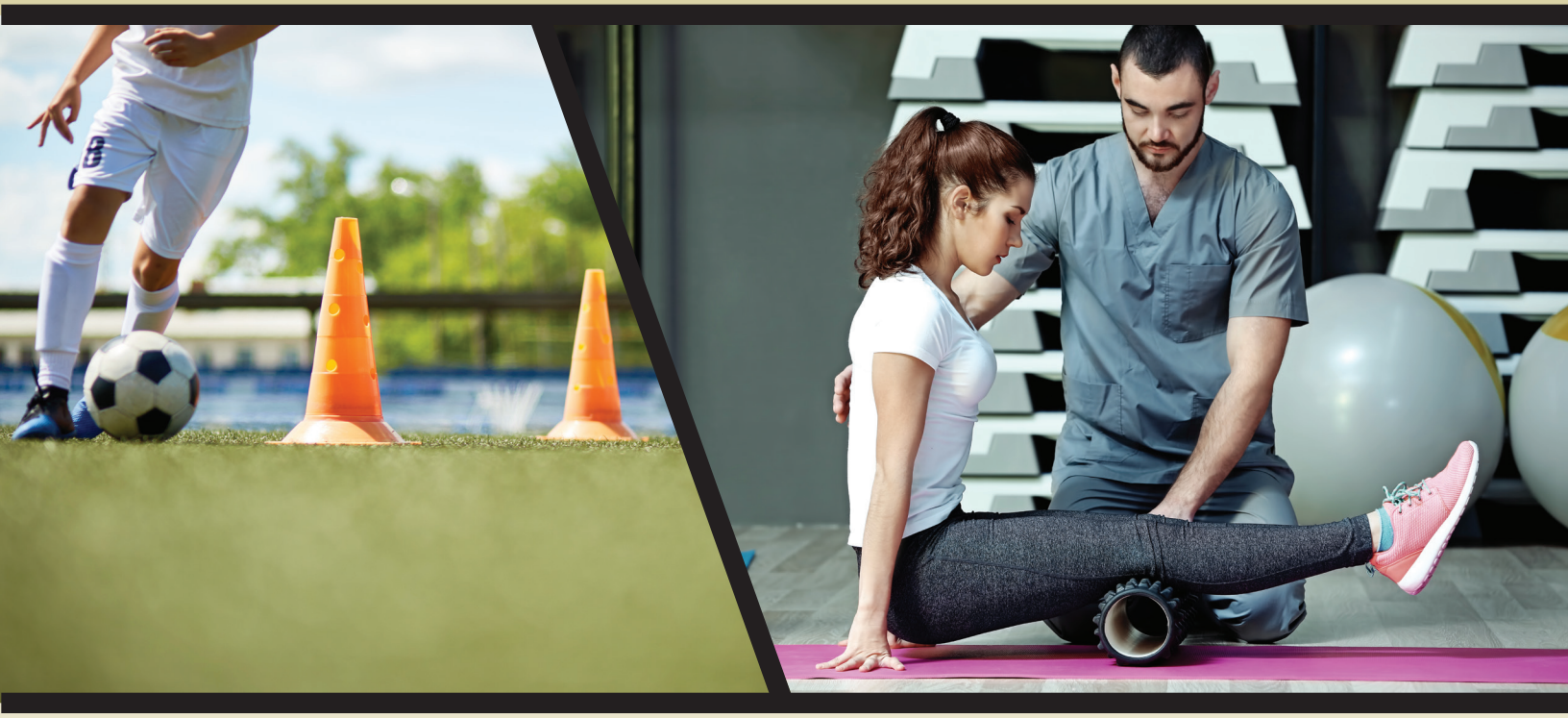
The Role Physical Therapists **Play** *in* **Post-Concussion Rehabilitation** *and the* **Return to Play** *Protocol for Athletes*

By Daniel Kane, PT, DPT



The treatment of sports-related concussions has been a hot topic for the past several years and continues to spark discussion as recommendations change. Many New Jersey physicians are familiar with the return to play protocol that has been implemented by the New Jersey Department of Education, as a result of 2010 legislation (P.L. 2010, Chapter 94). As a result, physicians are used to working closely with athletic trainers in area schools. However, physicians are not always aware of the role physical therapists can play in implementing the protocol and the ways that their involvement can benefit young athletes.

In the past, cognitive rest was the main feature of concussion treatment, including the "avoidance of excessive neurometabolic processes associated with cognitive activities."[1] However, the latest research shows that prolonged rest can actually "lead to physical deconditioning, metabolic disturbances, and secondary symptoms such as fatigue and reactive depression." In 2012, studies in animals showed that while exercise during the first week of a concussion can impair recovery, exercise 14 to 21 days after concussion improves cognitive performance and can decrease depression.[2] The return to play protocol uses this information to move the concussed athlete back to health and active play with the input of a supportive concussion management team, which ideally includes the physical therapist.

SEVEN STAGES OF THE RETURN TO PLAY PROTOCOL FOR CONCUSSIONS

Once a concussion diagnosis is confirmed, the athlete is removed from participation in sports. When the athlete is symptom-free for at least 24 hours, he or she can begin the return to play protocol, a program that must be implemented and supervised by a healthcare professional.

Stage 1: Physical and Cognitive Rest. This step requires removal of the injured athlete from sports, gym and all

exertional activities, and possible removal from school or modified school attendance. Television, video games and cell phones are avoided during this time, along with an overall avoidance of any activities that reproduce symptoms.

Stage 2: Light Aerobic Exercise. This stage involves light aerobic exercise at less than 70 percent of maximum heart rate. (The maximum heart rate is 220 minus the athlete's age.) The athlete typically does 20 to 30 minutes on a bike, ARC trainer or elliptical machine with heart rate monitoring throughout.

The physical therapist is involved throughout all of the stages. The athlete typically is seen in an outpatient physical therapy clinic during stages two through five.

Stage 3: Increased Cardiovascular Training. This stage involves increased cardiovascular training, including a repeat of light aerobic exercise from the previous day, as well as the introduction of moderate activity, including jogging, sprinting and jumping and light weight lifting for a duration of 35 to 45 minutes at an intensity of 80 to 85 percent of the maximum heart rate. No change-of-direction drills are included at this stage.

Stage 4: Strenuous Cardiovascular Training. This stage involves strenuous cardiovascular training and introduces strenuous exercise, such as agilities, plyometrics and change-of-direction drills, and then progresses to heavier weights. These activities are performed at 90 to 95 percent of maximum heart rate for 45 to 60 minutes. Sport-specific drills are avoided at this stage.

Stage 5: Sport-Specific Exercise. This stage introduces sport-specific drills that reproduce the demands of a practice or game. They might include sprinting, cutting, dribbling, shooting, plyometrics and advanced resistance training at an intensity of 90 to 95 percent of maximum heart rate. Head and body contact activities are avoided at this stage.

In general, stages two through five are performed in four subsequent days. Each step throughout the protocol is designed to gradually increase the heart rate and blood flow to the brain to ensure that symptoms do not reappear. If symptoms arise at any time, the athlete must rest for 24 hours and then resume activity at a level one step below where the symptoms occurred. Once an athlete has passed through stage five, the physical therapist remains in contact with the physician, athletic trainer and parents as needed.

Stage 6: Contact Practice. This stage can occur only following medical clearance from a healthcare professional trained in concussion management. In New Jersey, the medical clearance has to come from the physician who referred the athlete to physical therapy. Once the physical therapist signs off on the completion of stages two through five, the athlete can return to the field for contact practice with oversight from the athletic trainer and team physician. The athlete is then able to participate in a recommended 50 percent of practice, with progress to full practice depending on the severity and length of symptoms. Headers should be kept to a minimum and major collisions should be avoided.

Stage 7: Full Return to Sport. After successful completion of all the previous stages without the return of symptoms, and with full medical clearance, the athlete can return to full practice and game play.

Seven Stages of Return to Play Protocol for Concussions

Stage 1: Physical and Cognitive Rest
Stage 2: Light Aerobic Exercise
Stage 3: Increased Cardiovascular Training
Stage 4: Strenuous Cardiovascular Training
Stage 5: Sport-Specific Exercise
Stage 6: Contact Practice
Stage 7: Full Return to Sport

PHYSICAL THERAPIST TREATMENT DOMAINS IN POST-CONCUSSION SYNDROME TREATMENT

Ninety percent of concussions resolve within a 10-day period; the remaining 10 percent of concussions have persistent signs

and symptoms beyond two weeks.[3] The three treatment domains in the physical therapist's conceptual model for treating these post-concussions (as illustrated in Figure 1) include 1) cervical and musculoskeletal rehabilitation, 2) physical exertion progression and 3) vestibular-ocular rehabilitation.[4]

Cervical and Musculoskeletal Rehabilitation

Cervical and musculoskeletal rehabilitation focuses on headache and neck pain, as well as possible muscle tightness or spasm—all common post-concussion syndrome complaints. The therapist can perform manual physical therapy (soft tissue mobilization to upper trapezius/cervical paraspinals/levator scapulae) and manual stretching (upper trapezius/levator scapulae). The physical therapist can also address inherent muscle weakness that may have contributed to concussion susceptibility. Athletes perform TheraBand rows to improve rhomboid and other periscapular (trapezius/serratus anterior/levator scapulae) strengthening. These exercises improve cervical and scapular stability.

Physical Exertion Progression

Physical exertion rehabilitation includes light to moderate aerobic exercise, such as using an exercise bike, ARC trainer or ReACT trainer. With this type of rehab, the athlete can exercise at 50 to 60 percent of maximum heart rate, even when diagnosed with post-concussion syndrome.

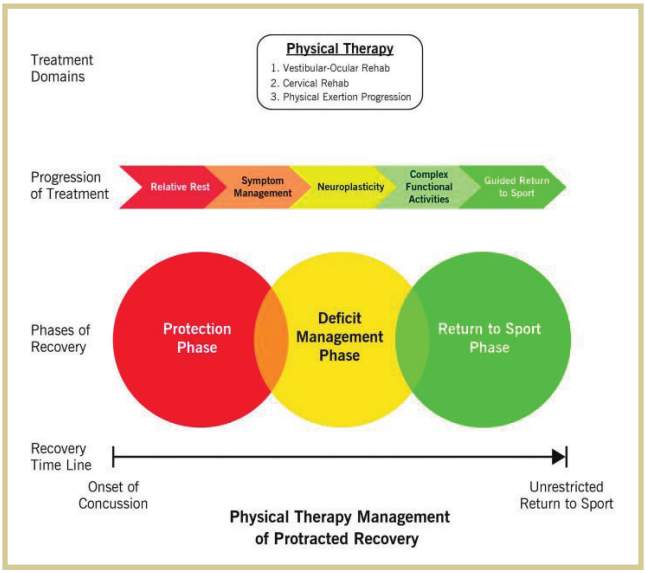
Vestibular-Ocular Rehabilitation

Research has shown that physical therapists can be especially helpful with vestibular-ocular rehabilitation in patients with post-concussion syndrome. A study performed in 2017 showed sub-maximal cardiovascular exercise, cervical spine and vestibular-ocular rehabilitation decreased Post Concussion Symptom Scale (PCSS) scores significantly and decreased Balance Error Scoring System (BESS) scores by 53 percent.[5] A randomized controlled trial also showed that cervical and vestibular therapy decreased time to return post-concussion players to sport.[6] Vestibular-ocular rehabilitation consists of tests and treatments such as smooth pursuits, saccades, convergence, vestibular-ocular reflex and the visual motor sensitivity test. These treatments help decrease prolonged symptoms of dizziness, nausea, fogginess and vomiting, which helps put the athlete back on track for the return to play protocol.

CONCLUSION

Physical therapists play an integral role on the concussion team: performing the return to play protocol in their clinics and progressing patients through a conceptual model that takes into account the recovery timeline, phases of recovery, progression of treatment and the treatment domains of cervical and musculoskeletal rehabilitation, physical exertion progression and vestibular-ocular rehabilitation.[4] They also play an important role in helping patients with post-concussion symptoms return to play. When referring to a physical therapist, it is beneficial to identify someone who has knowledge of the return to play protocol, as well as someone who knows about vestibular-ocular rehabilitation.

Figure 1. Physical Therapy Conceptual Model



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The physical therapist is an important member of the entire concussion team that should include the physician, athletic trainer, athlete/patient and parents, who all work together to ensure the best outcomes.

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