What Is Post Concussive Syndrome (PCS)?

Breaking down PCS terms: a *syndrome* is a set of medical signs and symptoms that are correlated and often associated with a particular disorder. A *concussion* is a type of traumatic brain injury (TBI) caused by a fall, car accident, sports injury, or a blow or jolt to the head that causes the brain to move rapidly back and forth inside the skull. This movement can cause the brain to bounce or twist, leading to chemical changes in the brain and sometimes damaging brain cells. PCS is a complex disorder characterized by various symptoms, including headaches, dizziness and balance issues, fatigue, sensitivity to light, difficulty concentrating, memory problems, slowed thinking or mental fog, irritability, depression, anxiety, and sleep disturbances. These symptoms can last for weeks or even months after the initial injury that caused the concussion.

To be clear, not everyone who has a concussion develops PCS. Risk factors in the general population may include older age, prior concussion, or a history of anxiety or depression. An article published in *The Journal of Head Trauma Rehabilitation* found females are twice as likely to experience PCS as males (Covassin, 2019). This is due to hormonal differences, neck strength and biomechanics, and an increased likelihood of reporting symptoms. It is important to note that PCS is much more prevalent among those who engage in sports, professionally or otherwise. Approximately 10–20% of adults with concussion go on to develop PCS, though estimates vary with some studies reporting higher rates when even mild residual symptoms are counted. Fortunately, most concussion patients do improve over time, with approximately half being fully recovered by three months and the majority by one year. That said, a subset of patients (roughly 10–15%) continue to have significant symptoms beyond a year.

What Happens in and Around the Brain During PCS?

PCS in adults is a multifactorial experience with overlapping pathophysiological mechanisms rather than a single structural injury. Most commonly, there is brain inflammation, inflammation in the posterior cervical muscles, cognitive difficulty, and nerve pain, involving both central and peripheral mechanisms. After the initial concussion, a transient neurometabolic crisis occurs (an “energy deficit” in the brain), and in some patients this physiological disturbance doesn’t fully normalize for weeks, contributing to prolonged symptoms. The initial biomechanical forces (the brain bouncing inside the skull) disrupt neuronal membranes, axonal transport, and neurotransmitter balance, leading to a cascade of metabolic and neuroinflammatory changes. In most patients, these changes resolve within weeks, but in some, persistent symptoms continue due to a combination of ongoing central nervous system dysfunction and secondary contributors such as cervical musculoskeletal injury and psychological stress factors.

Neck muscle dysfunction is highly prevalent in patients with persistent PCS. Ninety percent of persistent PCS patients experience neck pain or some form of neck-related symptoms. When the posterior neck muscles are injured, the associated soft tissues can generate ongoing nociceptive (sharp, aching, throbbing—and the most common form of pain) input, perpetuating pain, muscle spasm, and autonomic dysregulation (disruption of heart rate, blood pressure, temperature control, and digestion, among other nervous system functions). This cervicogenic (neck) component is a major risk factor for delayed recovery and can amplify or mimic central post-concussive symptoms.

Cognitive difficulties in PCS are very common and thought to result from a combination of neurochemical and microstructural brain changes, as well as secondary effects of pain, sleep disturbance, mood disorders, and reduced activity. Interestingly, many patients express subjective cognitive complaints which often exceed objective deficit measures. Additionally, patients who have a history of anxiety, depression, ADHD, PTSD, or migraines are more likely to experience exacerbated subjective complaints than those without pre-existing comorbidities.

Vestibulo-Ocular (Balance and Vision) Factors

Because concussions often involve whiplash forces, cervical spine injuries can occur and are often compounded by vestibular and oculomotor disturbances (injury to inner ear balance organs or their neural connections). Common symptoms include dizziness, poor balance, visual strain, and nausea. These peripheral sources can add to the symptom complex even when the brain injury itself has largely physiologically recovered. Therefore, identifying and treating cervical and vestibular components is essential to symptom resolution.

Athletic Sports

Post-Concussive Syndrome is most likely to occur in sports where concussions are frequent, particularly contact and collision sports. Athletes in all age ranges—from childhood school sports and professional sports to top-tier athletes—are included. Sports with a high likelihood of PCS include: American football (linemen and wide receivers are especially vulnerable), ice hockey, soccer, boxing/MMA, rugby, basketball, lacrosse, wrestling, cheerleading, skiing, and snowboarding.

Sports Acupuncture, Dry Needling, and PCS

Sports acupuncture and dry needling are increasingly recognized as adjunct treatments within individualized, multimodal rehabilitation for PCS and offer patients hope for additional care. Meta-analyses on sports acupuncture show statistically significant, though modest, improvements in pain and function at immediate and short-term follow-up compared to sham or

inactive treatments. Dry needling randomized trials and systematic reviews demonstrate clinically meaningful improvements in pain and pressure pain thresholds, especially when targeting active rather than latent trigger points. The benefits are most pronounced in the short term, usually up to 1–2 months. Noteworthy research includes findings on chronic post-traumatic headaches (Herrmann, 2025), which were reduced in frequency and intensity by modulating pain perception and reducing inflammation through the release of endorphins and activation of brain regions involved in pain regulation. Dizziness (Georgoudis, 2018) points around the neck, ears, and scalp can improve blood flow and nerve signaling, which help with balance and vertigo symptoms and help reduce pain catastrophizing. Finally, psychological imbalances, along with sleep and fatigue issues (Georgoudis, 2018), show improvement in mental health scores, influence neurotransmitters like serotonin, dopamine, and GABA, and reduce overactivation of the stress response, which improves mental clarity by increasing cerebral blood flow and reducing inflammation.

Recent Professional Athlete Highlights with Sports Acupuncture

Elite athletes and professionals across many sports have integrated sports acupuncture into their injury recovery. Some of these athletes include:

Brian Hoyer – NFL quarterback
After suffering his second concussion (Nov 16 and Dec 13, 2015), he started acupuncture and continued treatments 3–4 times from mid-November through late December and felt good enough to resume limited practice (Rieken, 2015).

Shea Ili – Melbourne United
Following two concussions and persistent vestibular dizziness, Ili took advice from teammate Matthew Dellavedova and incorporated acupuncture, neck massage, and strengthening into his rehab plan, alongside targeted vestibular exercises. He credits the combined approach with getting him “back on track” and able to play without restrictions.

Taylor Twellman – MLS New England Revolution
In retirement interviews with NIH / MedlinePlus, Twellman listed acupuncture (in addition to oxygen therapy and osteopathic manipulation) as part of the multimodal regimen that eased his chronic headaches and pressure symptoms.

The above list highlights acupuncture’s continued role in a professional athlete’s road to recovery from PCS. In addition to sports acupuncture, there are home therapies that help complement needling sessions and enhance recovery:

Complementary Suggestions

These strategies focus on restoring neurological balance, reducing symptoms, and avoiding symptom triggers. These tips are especially important in the first few days after a concussion. If you suspect you've had a concussion, the first step is to always be medically evaluated at the emergency room or urgent care. If you've hit your head, see a doctor immediately. Once cleared by a qualified emergency medicine professional, current general guidance is a brief period (24–48 hours) of relative rest, followed by a gradual, stepwise return to activity as tolerated. Early initiation (within 24–72 hours) of sub-symptom threshold aerobic exercise, tailored to your symptoms and heart rate, is supported by moderate-quality evidence and may reduce symptoms and the risk of PCS. Interestingly, current guidance does not recommend prolonged strict rest, also known as “cocooning.” The best rule of thumb is: if you try an activity and it causes distress, stop or reduce the activity until the symptoms go away. Too much brain work too fast makes your recovery much longer.

Cognitive Rest: Limit screen time from TV, phone, and computer; avoid multitasking and overstimulation. Tip: after a few days, use the 20-20-20 rule for screens—every 20 minutes, take a 20-second break to look 20 feet away.

Prioritize Sleep: Keep a consistent sleep schedule in a dark, cool, quiet sleep environment.

Nervous System Regulation: Practice deep breathing, progressive muscle relaxation, guided meditation, or use a weighted blanket.

Light Physical Activity: Take gentle walks and do low-impact movement.

Anti-Inflammatory Nutrition: Eat omega-3s such as salmon, walnuts, and flaxseed; reduce sugar and processed foods; include antioxidant-rich foods like berries and leafy greens; stay hydrated (dehydration can worsen headaches and fatigue).

Sensory Regulation: Use blue-light blocking glasses; wear noise-reducing headphones.

Massage and Soft Tissue Work: Consider massage and gentle acupuncture for inflamed neck muscles. This approach addresses musculoskeletal contributors to PCS and may reduce the risk of chronic symptoms.

Cognitive Support Activities (as long as they don't cause symptoms): Do short memory games, sudoku, or puzzles in moderation.

Conclusion

Sports acupuncture and dry needling present promising adjunct therapies for managing the persistent and often frustrating symptoms of PCS. The needling process helps reduce pain, regulate sleep and mood, and improve cognitive function through its effects on neurovascular and neurochemical systems. This makes needling a valuable tool in the treatment arsenal. It is a low-risk, well-tolerated option that can often enhance recovery when used alongside standard medical care.

Curated, compiled and written by Dr. Nathan J. Heide, DAOM, MBA, LAc and Rebecca Carsten to offer an insightful overview of the subject matter.

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