The Effects of Stick Handling on Wrist Fatigue in those with Carpal Tunnel Syndrome

Andrew Hu, Ryan Krohto, Jared Schiffer, Michael Piscatelli

Background:

Carpal Tunnel Syndrome (CTS) is the entrapment and inflammation of the median nerve as it passes through the carpal tunnel and is the most common nerve entrapment condition affecting 3-6% of adults. This entrapment causes pain, altered sensation, and decreased strength in the hand and wrist leading to difficulty with fine motor movements and grasping objects. CTS can be caused by trauma to the wrist, but is most prevalent in individuals completing repetitive wrist motions daily, women who are pregnant, and in individuals with other conditions that create inflammation, specifically in the wrist. In the sport of hockey, players utilize their wrist muscles constantly during stickhandling to maintain possession and shooting, which in turn causes a higher prevalence rate among them. The current literature focuses on CTS' effects on fatigue rate and firing patterns on the wrist and hand musculature in the general working population and is limited in athletes such as in hockey players. With CTS, fatigue in the muscles of wrist and hand occurs faster, and in this study we are comparing the rate of fatigue in a healthy hockey player and one with a diagnosis of CTS.

Case Description:

The two subjects are both 23 year old males who have played hockey for 15+ years and have ample experience and practice stickhandling. One of the subjects has had a diagnosis of CTS for 8 years while the other subject has never had any issues with either wrist or hand. The subject with CTS experiences discomfort, altered sensations, and impaired strength and endurance in bilateral hands and wears night splints on both their wrists to help control these symptoms.

Methods:

The study was performed to test the hypothesis that a hockey player with CTS would experience a higher rate of fatigue than a healthy counterpart. During a two hour period, a single blind study was initiated with a healthy hockey player and one with CTS who were each blinded to the other's results and performance. First, the subjects performed ten (10) peak torque contractions of the wrist flexors and extensors on a biodex machine. Immediately after, the subjects stickhandled in the horizontal plane reaching an excursion of 18 inches at a rate of 130 beats per minute until they could not go any longer. The subjects then immediately performed another ten peak torque contractions of the wrist flexors and extensors. After completion, the wrist flexion and extension fatigue rate was calculated for both individuals.

Results:
The results of the study showed the subject with CTS had a shorter time to fatigue while stickhandling and had a significantly higher fatigue rate in wrist flexor and extensor musculature compared to the healthy individual.

Discussion and Conclusion:
The study was shown to correlate with the hypothesis that stated the fatigue rate is higher in those with CTS compared to those without the condition. However, it was shown that people with CTS had higher peak forces due to increased work of the wrist flexors over time secondary to the decreased sensory input. Therefore, this means that people with CTS may grip harder to compensate for the decreased sensation to feel different objects. Also along with fatigue, body compensations were observed in the shoulder and trunk to prolong the duration of stick handling which correlated with the fatigue rate of the wrist musculature. From the study, it is clear that people with CTS fatigue quicker, however it does not affect strength significantly. This means that CTS is an endurance issue, not strength, and treatments should be modified accordingly.

References:

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