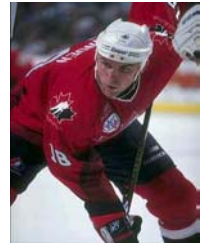




**Hand Muscle Patterns In Hockey Skills - December 7, 2006**  
**sEMG Series – Trevor Linden, NHL Player, Vancouver Canucks**



By Dr. Terry Zachary

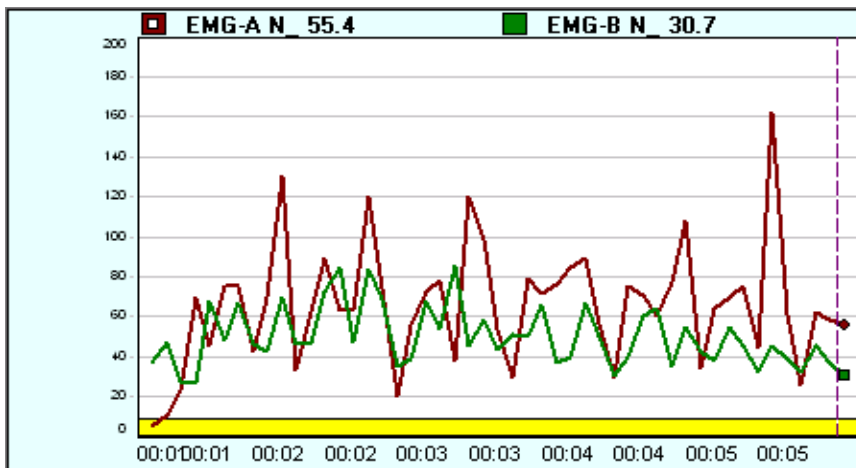
**Abstract:**  
**Finger Extensor Muscle Training In Hockey**

Surface electromyography (sEMG) was used in order to study hand muscle activity patterns during various hockey skills performed by a professional hockey player. The degree of contribution of the **finger extensor (opening) muscles (represented by green signals)** is of special interest, as they are generally omitted in hockey athlete preparation. This omission can lead to physical imbalance and increased injury potential. The participation of the **finger flexor (gripping) muscles (represented by red signals)** has historically been acknowledged and accepted. Finger muscle strength and balance affects the hand, wrist, forearm and elbow (as hand muscles cross all of these joints).

According to Janet G. Travell, M.D. and David G. Simons, M.D., "Strong agonist-antagonist interactions are needed between the flexors and extensors of the hand and fingers to produce forceful hand-grip. Powerful flexion of the distal phalanges requires strong activity also of the finger extensors."

**Patterns to follow show that finger extensor muscles are active during the performance of all hockey skills, and thus should be considered in the upper extremity training and/or rehabilitation protocols of all hockey athletes.**

**1. Stick Handling**



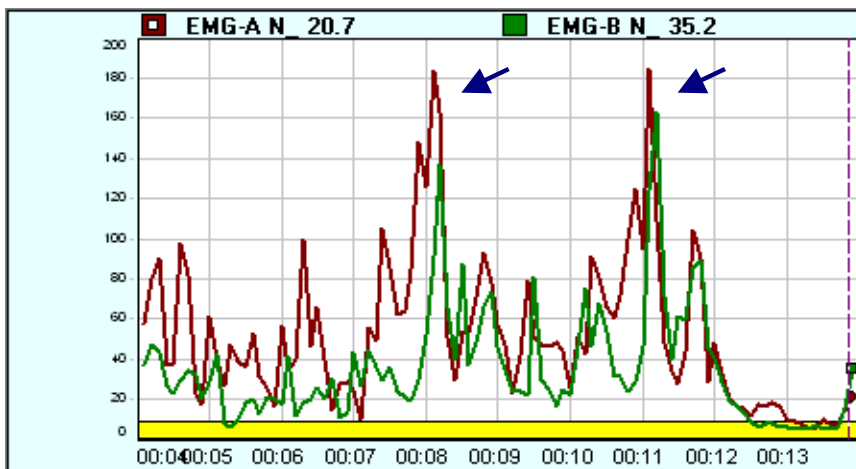
**Discussion:**

Notice the constant **finger flexor muscle activity (in red)** during stick handling.

Notice also the constant activity of the **finger extensor muscles (in green)**.

This pattern illustrates that both the **finger extensor** and **finger flexor** muscles are constantly active during the skill of stick handling in hockey.

**2. Wrist Shot**



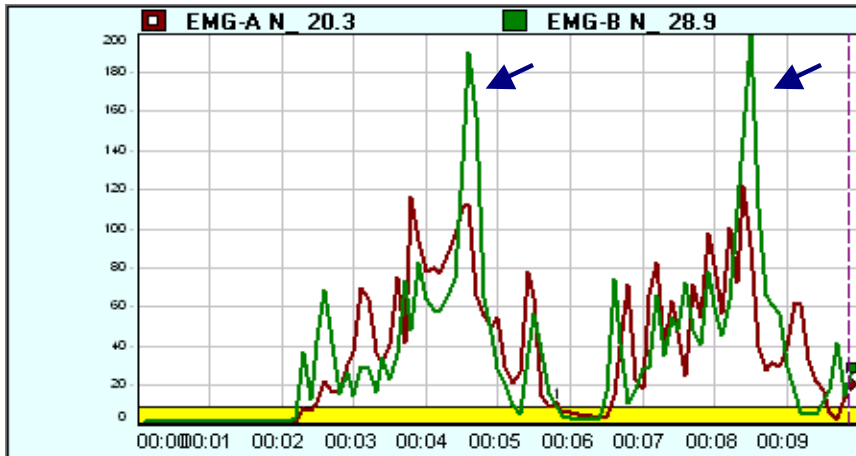
**Discussion:**

Notice the **finger flexor muscle activity (in red)** as the hockey player performs a wrist shot.

Notice also the stabilizing activity of the **finger extensor muscles (in green)** as the hockey player performs a wrist shot.

Notice how both the **finger extensor** and **finger flexor** muscles show a **spike (arrow)** in activity as the athlete performs the wrist shot. *In any athletic endeavor, finger extensor muscles fire to support finger flexion (gripping, grasping, etc.).*

### 3. Snap Shot



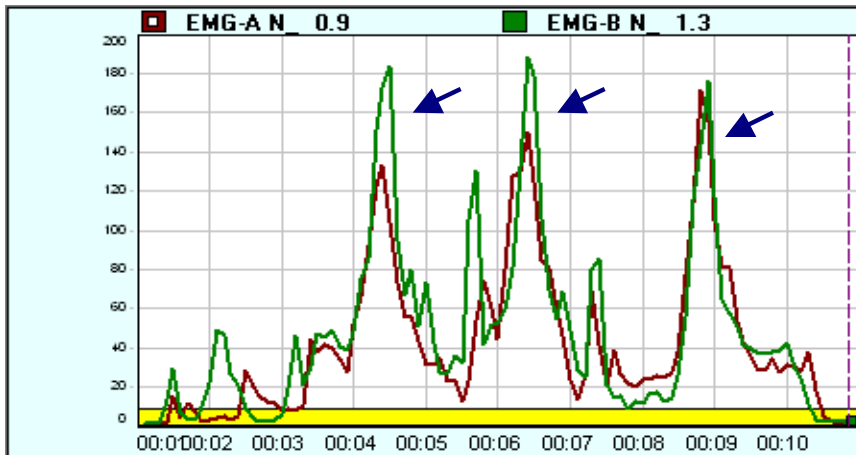
#### Discussion:

Notice the moderate **finger flexor muscle activity (in red)** as the hockey player performs a snap shot.

Notice also that the **finger extensor muscles (in green)** are especially active (**arrows**) as the hockey player performs the snap shot.

This pattern suggests excessive **finger extensor** activity along with moderate **finger flexor** muscles activity during the hockey snap shot.

### 4. Slap Shot



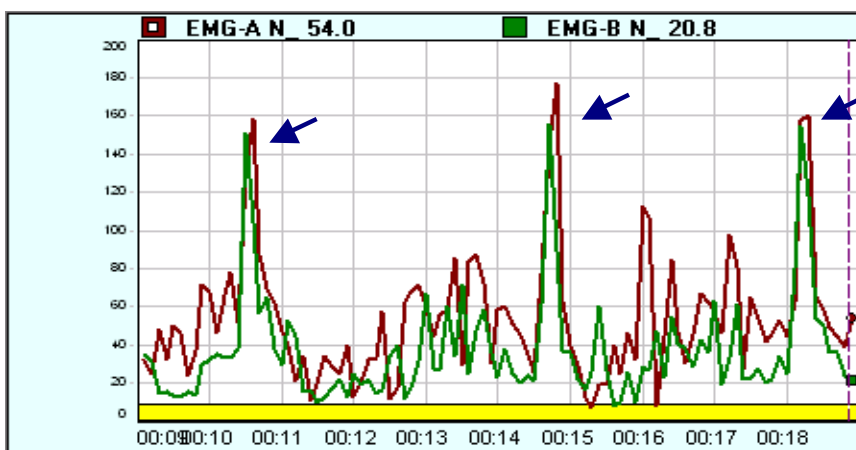
#### Discussion:

Notice the excessive **finger flexor muscle activity (in red)** as the hockey player performs a slap shot (**arrows**).

Notice also the excessive **finger extensor muscle activity (in green)** as the hockey player performs a slap shot (**arrows**).

This pattern suggests that both the **finger extensor** and **finger flexor** muscles are excessively active during the hockey slap shot.

### 5. Backhand



#### Discussion:

Notice the excessive **finger flexor muscle activity (in red)** as the hockey player performs a backhand (**arrows**).

Notice also the excessive **finger extensor muscle activity (in green)** as the hockey player performs a backhand (**arrows**).

This pattern suggests that both the **finger extensor** and **finger flexor** muscles are excessively active during the hockey backhand.

## **Conclusions:**

1. Finger flexor and finger extensor muscles are active during all hockey skills studied.
2. Finger flexor and finger extensor muscles should be trained to prepare hockey players for performance, as well as to prevent overuse injuries to the *hand, wrist, forearm and elbow*.
3. Finger flexor and finger extensor muscles should be considered in the rehabilitation of all hand, wrist, forearm and elbow injuries in order to prepare the hockey player for reintroduction to hockey performance, as well as to prevent re-injury.
4. Finger extensor muscles participate in a stabilizing role in support of gripping actions. Extensor tendonitis (wrist/elbow) is risked when extensors are repetitively overused without preparation.
5. Finger extensor muscles are especially called upon to stabilize the grip action due to the high torque of modern fibre hockey sticks. Injuries to the hand, wrist, forearm and elbow (especially the extensor side) are becoming more common.
6. Finger flexor and extensor muscle training is recommended for hockey players.
7. Follow up studies are required to further test and document current findings.