MUSCLE ACTIVATION PATTERNS DURING AN ICE HOCKEY SLAP SHOT

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INTRODUCTION: The ability to shoot the puck with maximum velocity and accuracy is one of the key components to optimal hockey performance. Of the many types of shots in hockey, the most powerful is the slap shot. A successful slap shot requires a combination of strength, speed, precise timing, and the proper stick choice (Pearsall et al., 2000; Fergenbaum et al., 2004). The slap shot consists of four key events - start, top of swing, impact and end. The muscle activation patterns during each of these phases are essential in designing training programs to improve shot velocity (Pan et al., 1998) and may vary as a function of skill level (Woo, 2004). As such, the purpose of this study was to use three-dimensional kinematics and electromyography (EMG) to conduct a preliminary analysis of the muscle activation patterns during each phase of the slap shot in male, recreational and elite hockey players.

METHOD: Participants consisted of 5 male recreational and 5 male elite hockey players. Prior to testing, participants will perform handgrip dynamometer and bench press strength tests. Each wore their own skates and gloves and was allowed to warm-up until they felt comfortable, at which time 5 trials were recorded. Each trial consisted of a standing slap shot; successful trials were defined by hitting a target (~3 m away) and the verbal approval of the participant. Surface bipolar electrodes were placed bilaterally on the following muscles: pectoralis major, trapezius, anterior deltoid, external obliques, latissimus dorsi, triceps, biceps, wrist flexors, and wrist extensors. Electrode leads were attached to a portable data logger (Biomation, Mega Electronics Ltd), sampling at 1000 Hz, and worn in a belt pack. Resting noise was recorded in each muscle prior to testing and filtered out of each signal. Three-dimensional kinematics of the stick shaft and blade were obtained via the Ultratrak electromagnetic tracking device (Ultratrak, Polehumus Inc), to accurately determine the various phases of the shot. Spatial coordinate positions were obtained at a frequency of 120 Hz with 5 electromagnetic sensors placed on the stick; four equidistant along the shaft and one on the tip of the blade. The s ystem was located on a platform, covered with polyethylene sheets, and measuring a spherical area with a radius of 2.5m. An electric circuit was between the puck and the stick synchronized the instant of puck contact in the kinematic and EMG data, while a radar gun was used to determine puck velocity.

RESULTS AND DISCUSSION: It is expected that the slap shot will demonstrate a sequential muscle activation pattern similar to those discussed in qualitative descriptions of the movement (Emmert, 1984). The slap shot's power is expected to be generated primarily by latissimus dorsi, external obliques, and pectoralis major.

CONCLUSION: The goal of the present study is to determine muscle activation patterns during a slap shot; thus, the results can serve to validate qualitative and anecdotal observations of the slap shot (e.g. Emmert, 1984). Such knowledge can aid in designing skill-specific training programs and provide insight into injury patterns and prevention in ice hockey (Irshad, 2001).

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