EFFECT OF TAPING ON SHOULDER KINEMATICS IN ELITE COLLEGIATE THROWING ATHLETES

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INTRODUCTION

Overhead throwing athletes generally have reduced range of upper arm internal rotation and increased range of external rotation in their dominant arm [1]. This range has been attributed to tightness of the posterior capsule and humeral torsion, as a result of bone remodelling [1,2,3]. A recent study of asymptomatic junior tennis players found that the passive rotation range of the dominant shoulder was decreased relative to the non-dominant arm and this range was increased with the application of shoulder taping [4]. However, it is not known whether shoulder taping influences upper arm motion during dynamic throwing.

The aim of this study was to investigate the effects of shoulder taping on upper arm kinematics and range of motion in elite overhead athletes during a seated throw.

METHODS

Ten elite collegiate athletes (6 females, 4 males) were recruited for the study. Subjects were seated on a chair and threw a handball as hard as possible into a large net. The use of a seated throw isolated the movement of the shoulder. An 8-camera Vicon Motion Capture system recorded markers placed on the upper limb and trunk during each of the throwing conditions at a rate of 120 Hz. Trials were repeated three times with and without tape, and the taping condition was randomly assigned. A kinematic model of the upper limb was scaled and inverse kinematics used to estimate the motions of the trunk (3 degrees of freedom [dof]), shoulder (3dof), and elbow (2 dof) using OpenSim software (OpenSim, Stanford CA). Kinematic variables were determined at full cocking phase (point at which the elbow begins forward translation) and at ball release. Ball velocity was measured by tracking the center of two markers attached to the ball. An injury questionnaire was administered to obtain relevant shoulder injury history from each subject.

RESULTS AND DISCUSSION

Ball velocity was not affected by the application of tape, with mean velocity of 15.4 ± 0.27 m/sec. Shoulder kinematics were variable across subjects, with peak external rotation of 85˚± 49˚ and internal rotation of 15˚± 40˚ at ball release (Figure 1). Taping the shoulder had little effect on peak external rotation of the upper arm. However, taping reduced peak shoulder flexion from 129˚ to 100˚ (p=0.054) which also limited internal rotation of the upper arm at ball release, from 15˚ to 7˚ (Figure 1). This effect was not statistically significant due to the large variation across subjects although it should be noted that this variation meant that taping had a large effect on some subjects and no effect on others. This variation also meant that taping had a large effect on some subjects and not on others. From our cohort of ten subjects, two had current shoulder pain, but were asymptomatic at the time of testing and three had previous shoulder problems (>12 months ago). Tape seemed to affect these subjects in different ways. The two subjects with shoulder pain demonstrated large range of internal rotation, which was not observed with passive testing. A qualitative assessment of these individuals revealed that tape limited the amount of internal rotation in these subjects more than those who had never been injured.

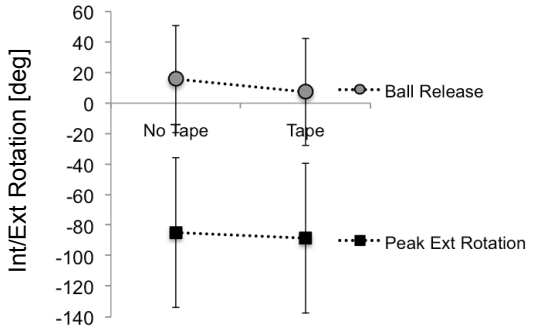

Figure 1: Effect of taping on upper arm internal/external rotation range of motion during a throw. Angles represent peak external rotation of the upper arm and ball release.

Taping the anterior aspect of the shoulder aims to influence the motion of the humerus to alter the stresses placed on the supporting tissues of the glenohumeral joint. Clinical evidence suggests that patients with shoulder pain respond positively to the application of tape and these data support the notion that taping can influence throwing kinematics. It is not clear what the underlying mechanism is for these changes, although one hypothesis is that the tension placed on the skin surrounding the shoulder has a proprioceptive effect and provides a heightened 'awareness' of shoulder motion. Further work to evaluate shoulder muscle activity in a larger cohort of athletes is currently underway.

CONCLUSIONS

Taping applied to the shoulder alters humeral flexion and internal rotation at ball release during a seated throw. Whether or not these changes are enough to reduce pain in athletes who are symptomatic will be the focus of further work.

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