LUMBAR MOTION DURING PITCHING IN PROFESSIONAL BASEBALL PLAYERS

Christopher McKenzie and Ajit Chaudhari
The Ohio State University, Columbus, OH, USA
E-mail: Christopher.Mckenzie@osumc.edu Web: sportsmedicine.osu.edu

INTRODUCTION

The stress placed upon a pitcher’s throwing arm has been the subject of many previous research studies [Aguinaldo 2007, Escamilla 2007, Feltner 1986]. Some of these studies have focused solely on the throwing arm, while others have suggested an influence by the lower body on the loads in the throwing arm [Matsuo 2001]. However, the effect in which core stability has on controlling the lumbar spine’s range of motion during a pitch has not been examined. Core stability is needed to optimize the transfer of forces generated from the lower extremities to the upper extremity during a pitch [Putnam 1993]. Core stability also may be necessary to minimize the distal joint loads experienced during the throwing motion [Kibler 2006].

Lumbar rotation utilized during the throwing motion may affect joint stresses experienced at the throwing arm. To date, little is known about how the lumbar spine moves during the baseball pitch. Lumbar movement first needs to be quantified before attempting to identify what effect it may have on the throwing shoulder. The purpose of this study was to identify the movement of the lumbar spine during baseball pitching among professional baseball pitchers.

METHODS

Eighteen healthy professional baseball pitchers volunteered to participate in this study. Subject’s ages ranged from 21 to 25 years. Signed informed consents were collected before the testing.

Figure 1. Typical curves for pelvis alignment towards home plate (top), lumbar rotation (middle), and lumbar flexion (bottom) during a pitch from the stretch.

A magnetic motion analysis system (Polhemus FasTrak) was utilized to collect lumbar data during the pitching motion. Sensors were attached at the sacrum and the spinous process of the first lumbar spine on each subject. After a normal warm-up routine, each subject threw six fastballs, three from the wind-up and three from the stretch position. Only the stretch pitches were analyzed in this study. Pitches were performed off a standard mound to a catcher located 18.4 meters away from the pitching rubber.

Lumbar rotation and flexion were calculated based on the relative orientations of the lumbar sensor with respect to the sacrum sensor. The angular motion of the pelvis in the horizontal plane was also calculated. The minimum flexion (Fig. 1A) and total range of motion for lumbar rotation (Fig. 1B-C) were identified during the cocking
and acceleration phases of the throwing motion [DiGiovine 1992]. This motion began upon the initiation of forward progression of the pelvis, and ended at the instant when the pelvis faced home plate (Fig. 1D). Average values were calculated for each pitcher.

**RESULTS AND DISCUSSION**

The minimum lumbar flexion point ranged from -22° to 13° (Fig. 2, x-axis). The minimum lumbar rotation point ranged from -29° to 7° (Fig. 2, points on y-axis). Pitchers rotated through a net range of motion of 4° to 30° (Fig. 2, bars on y-axis).

Lower values of lumbar flexion and lumbar rotation are indicative of a more open position during the pitch. In a more open position, lower body motion precedes upper body motion. As they reach the limits of their flexibility, the anterior shoulder and medial elbow are subject to increased stretch, which could lead to higher peak loads on the joint structures.

Variations in the total range of lumbar rotation were identified among the subject population. It remains unknown what the optimal lumbar rotation range of motion is for the baseball pitcher, but a smaller range of motion may enhance the transfer of forces generated by the lower body to the throwing arm and reduce joint stresses in the shoulder and elbow.

This ongoing study will assess the relationship between the observed motions in these pitchers and the injuries they experience during the 2007 baseball season.

**SUMMARY/CONCLUSIONS**

This study represents the first work examining lumbar motion in baseball pitchers to the authors’ knowledge. The considerable variability observed in minimum lumbar flexion, minimum lumbar rotation, and lumbar range of motion across the observed population may indicate different injury risk through the baseball season. Future studies will attempt to identify this relationship.

**REFERENCES**


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