Mid Atlantic Regional Chapter
of the
American College of Sports Medicine

Annual Scientific Meeting, November 1st – 2nd, 2019
Conference Proceedings
International Journal of Exercise Science, Volume 9, Issue 8

Lower Body Kinematics Do Not Differ Between Flat Ground and Mound Baseball Throwing

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It is well known that a throwing program is essential for baseball pitchers to build up their arm strength and stamina. Many research studies have been conducted to determine the best way to perform a throwing program, but no definitive answer for how to properly conduct such a program has been determined. Many programs are designed and implemented on flat ground, however, a training program utilizing a mound enables a pitcher to push off and generate downward force prior to throwing the ball and provides a better transfer to real game situations. Long tossing from a mound has the potential to simulate in-game throwing and could better prepare a pitcher to pitch during a game. **PURPOSE**: The purpose of the study was to determine if lower body kinematics differed between throwing off flat ground and throwing off a mound. **METHODS**: Six healthy individuals (20Y±1.26) with previous pitching experience were recruited for this study. Subjects had 38 retro-reflective markers placed in various anatomical locations to quantify lower extremity kinematics during the throwing motion using a motion capture system. Subjects completed 10 total throws, five from flat ground, and five from a mound at a throwing distance of 67 meters. Pelvic rotation angular velocity, trunk rotation angular velocity, and stride length were calculated and analyzed with PitchTrak software. A dependent t-test was used to compare the flat ground and mound conditions for each dependent variable. **RESULTS**: There were no differences between the flat ground and mound throwing conditions for pelvic rotation angular velocity (Flat Ground 715.17±306.88, Mound 640.97±155.80, $p > .05$), trunk rotation angular velocity (Flat Ground 888.63±84.57, Mound 857.33±120.45, $p > .05$), and stride length (Flat Ground 73.47±9.50, Mound 73.83±10.32, $p > .05$). **CONCLUSION**: Lower body kinematics did not differ between long tossing off a mound or flat ground. Due to this, coaches may implement flat ground throwing programs without any negative consequences to pitching mechanics. Consequently, they may also implement throwing programs from a mound to simulate pitching in a game without any increased risk of potential injury.

Supported by Research as a High Impact Practice Grant 841024