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Performance Changes in a Division III Female Field Hockey Program Over a Competitive Season

Jacqueline Feliciano
Ohio Wesleyan University

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Jackie Feliciano
Ohio Wesleyan University, Delaware, OH

Ohio Wesleyan University
DEPARTMENT OF
Health and Human Kinetics

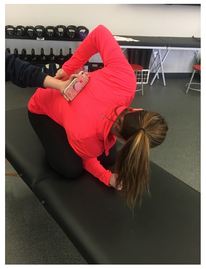
INTRODUCTION & PURPOSE

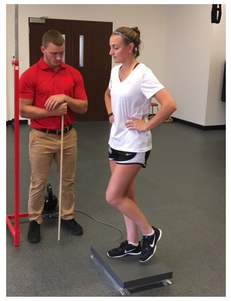
- Field hockey is one of the world's most popular sports, and is growing rapidly within the United States. Women's field hockey has grown roughly 12% between 1989 and 2003, with the largest growth occurring among Division III programs nationwide (Dick, 2007). However, despite its growing popularity in the United States, there is very limited descriptive injury analysis done on the athletes who participate in this sport. There is also little to no information regarding the overall effects that a competitive season has on the athletic performance and functional movement on collegiate female field hockey athletes. Field hockey can cause imbalances because of repetitive motions and overuse of specific muscles. Understanding the role of muscle imbalances and how they can alter movement and sport performance can guide strength coaches and other training professionals in the development of safe, biomechanically-based training programs to improve durability and performance across a season.
- The purpose of this study was to investigate changes that occur in functional movement, balance performance, and power output throughout a collegiate field hockey season. We tested the hypothesis that decreases in functional movement, balance, and power would be noticed after a collegiate season; and specifically greater differences would be noticed in those athletes who played more minutes throughout the season.

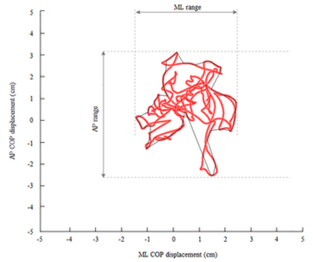
METHODS

- Day one of testing was dedicated to power and balance performance.
- Participants performed a five-minute warm up jog at a self-selected pace, followed by a series of low to moderate intensity dynamic stretches commonly found in many athletic settings. Once the participants were ready, they performed three maximal vertical jumps on a portable force plate (Bertec- 4060-05, Columbus, OH) and a VerTec jump-measuring device was used to record jump height, eccentric and concentric rate of force development (RFD), ground reaction force (GRF), power, and overall energy generation. Then each participant was instructed to stand on one leg in the center of the force plate, and balance with eyes closed for 30 seconds on each leg, recording center of pressure (COP) excursion, COP medial/lateral velocity, and COP anterior/posterior velocity.
- Day two was dedicated to functional movement assessments.
- All participants were individually screened in random order in the Selective Functional Movement Assessment, Functional Movement Screen deep squat, the Y-balance anterior reach test, and a lumbar-locked thoracic rotation test. The examiner for all subjects was a certified FMS^{TM}, SFMA and YBT practitioner, with over 5 years of experience screening individuals.
- The lumbar-locked rotation scores were obtained with athletes kneeling on an examination table, with hips sitting back on their heels. One elbow was placed between the knees, with the forearm outstretched flat on the table. The opposite hand was placed on the lower back. A handheld inclinometer was placed perpendicular to the spine between the inferior angles of the scapula. Participants were instructed to rotate their torso as far as possible toward the sky, while maintaining contact of the forearm with the table. Once maximum rotation was achieved, their angle of rotation was recorded. This was done two times for each side and the best angle was recorded.
- This process was repeated two days after their competitive season ended.

TESTING







RESULTS

- The most reported injury was an ACL tear (56%), followed by ankle injuries (22%), turf toe (22%), and foot injuries (11%). Nine athletes reported experiencing an injury in the last 4 years in their lower extremities.
- Peak concentric rate of force development (RFD) between those who reported previous injuries and those who did not was significantly different ($t(9.21) = 2.914$, $p = 0.017$, $d = 1.37$). There were no significant changes in power performance throughout the competitive season.
- There were significantly moderate correlations between playing time and energy generation ($r(16) = .573$, $p = 0.032$) and jump height ($r(16) = 0.695$, $p = 0.006$).
- The following were statistically significant:
  - **medial/lateral velocity (left: $t(13) = -4.537$, $p = 0.001$, $d = 1.43$, right: $t(13) = -6.342$, $p < 0.05$, $d = 2.08$) and anterior posterior velocity (left: $t(13) = -9.846$, $p < 0.05$, $d = 3.01$, right: $t(13) = -10.945$, $p < 0.05$, $d = 3.85$)**.
  - **center of pressure excursion (left: $t(13) = -7.185$, $p < 0.05$, $d = 2.20$, right: $t(13) = -7.853$, $p < 0.05$, $d = 3.12$). No differences were noted in balance performance between right and left legs.**
  - **Lumbar locked thoracic rotation assessment in both right ($t(11) = 3.281$, $p = 0.007$, $d = 0.932$), and left ($t(11) = 3.605$, $p = 0.004$, $d = 0.99$) after a competitive season.**
- There was no significant imbalances between thoracic ROM in the left and right sides, changes in total SFMA, FMS^{TM} deep squat, or YBT scores.

SUBJECTS

- Eighteen healthy female collegiate field hockey athletes were recruited to participate (age= 19.3 ± 1.2 years, playing experience= 7.8 ±2.3 years).
- Each participant received an email with a detailed description of the study, and completed an athletic and injury history questionnaire.
- The primary positions of the 18 participants enrolled in this study were: goalkeepers (n=2), defenders (n=5), midfielders (n=7), and forwards (n=4).
- A university institutional review board approved this study, and all participants provided informed consent prior to testing.

CONCLUSIONS

- This study determined that balance performance and thoracic ROM significantly decrease after a competitive season of Division III collegiate field hockey.
- Power performance, FMS^{TM} deep squat, SFMA, and YBT anterior reach scores did not change throughout the season.
- This data extends the knowledge of the effects a competitive season has on the functional movement, balance and power performance in collegiate female field hockey athletes.

PRACTICAL APPLICATIONS

- A collegiate field hockey season results in neuromuscular fatigue and potentially a decrease in athletic performance. This is critical knowledge for coaches and athletes attempting to increase or maintain overall performance throughout the length of a competitive season. These findings provide support for regularly incorporating balance and stability exercises into a strength and conditioning program for field hockey players to increase proprioceptive awareness, which would also likely improve athletic performance while potentially decreasing the risk of lower extremity injuries.
- This data also suggests the strain of this repetitive motion throughout the season leads to significant decreases in spinal ROM. Incorporating thoracic ROM interventions should be utilized throughout the season by incorporating mobility training into the strength and conditioning program. Although this study did not track lower back injuries or pain symptoms, decreases in spinal ROM may lead to lower back pain.