The Relationship among Trunk Strength, Trunk Power, and Knee Kinematics during a Stop Jump-Cut Maneuver


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BACKGROUND

• Core strength and stability are advocated by healthcare professionals and strength and conditioning specialists to optimize performance and reduce the risk of injury/re-injury, including non-contact anterior cruciate ligament (ACL) injury
• Little research exists examining how components of core stability are related to lower extremity kinematics, particularly those that have been identified as related to ACL injury risk
• Understanding these relationships may provide insight into which components of core stability should be included when designing training and intervention programs

EXPERIMENTAL DESIGN AND METHODS

• Isokinetic trunk flexion/extension (TFlex/TExt) and right/left trunk rotation (RTR/LTR) strength
• Five reciprocal concentric-concentric contractions at 60°/s
• Trunk power assessed using the front abdominal power throw (FAPT) and side abdominal power throw (SAPT) (FIGURES 1 and 2)

POURPOSE

• To determine the relationship among trunk strength, trunk power, and knee kinematics during a stop jump-cut maneuver (SJCM)

SUBJECTS

• 53 healthy, physically active college-aged males (n=25) and females (n=28) participated
• Age: 22.0 ± 2.1yrs, Height: 172.5 ± 8.4cm, Mass: 71.6 ± 10.4kg
• No previous history of low back pain/injury that limited activities of daily living (ADLs) or athletics for greater than one week
• No musculoskeletal injury to the lower extremity within the past six months that limited ADLs or athletics for greater than one week
• Currently free from low back, hip, knee, and ankle injury
• No history of knee ligament injury or low back/lower extremity surgery

MAIN OUTCOME MEASURES

• Average peak torque (APT) was calculated for TFlex, TExt, RTR, and LTR
• Average distance was calculated for FAPT and SAPT
• Knee kinematics included knee valgus angle at initial contact (KVIC), total knee valgus excursion (TKVE), and knee flexion angle at initial contact (KFlexIC)

RESULTS

STRENGTH AND KNEE KINEMATICS (TABLE 1)

• All strength measures were significantly correlated with TKVE and KFlexIC

POWER MEASURES AND KNEE KINEMATICS (TABLE 2)

• FAPT was significantly correlated with TKVE

STRENGTH AND POWER MEASURES (TABLE 3)

• All strength measures were significantly correlated with the FAPT
• Left SAPT and right SAPT were significantly correlated with TFlex and RTR, respectively

SUMMARY AND CONCLUSIONS

• Trunk strength is important in reducing total knee valgus motion and increasing knee flexion angle at initial contact during a SJCM
• These findings substantiate the relationship between trunk strength and knee kinematics, supporting the importance of including core strengthening in injury prevention/rehabilitation programs

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