The Relationship between Trunk Kinematics and the Dynamic Postural Stability Index

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BACKGROUND

- Inability to maintain trunk position during landing tasks has been established as a risk factor for lower extremity (LE) injury
- Risky movement patterns negatively affect the ability to maintain or return the body’s center of mass over a base of support during dynamic tasks
- Decreased trunk forward flexion
- Increased trunk lateral flexion (LF)
- Establishing the relationship between trunk kinematics and dynamic postural stability is an important first step in determining the role of trunk kinematics on balance during sport-specific activities

PURPOSE

- To determine the relationship between trunk kinematics and the Dynamic Postural Stability Index (DPSI) during forward (FJL) and sideways (SJL) jump landings

SUBJECTS

- 20 healthy and physically active males (n=11) and females (n=9) (TABLE 1)
- No musculoskeletal injury to the back or LE in previous six months
- No complaint back or LE pain at time of enrollment
- No history of back or LE surgery
- No history of knee ligament injury
- No neurological impairments
- No concussion in the past three months

MAIN OUTCOME MEASURES

- Trunk kinematics and ground reaction forces
- A passive marker set in combination with a motion capture system and force plate was utilized for data collection
- Trunk kinematics were collected at 250Hz; ground reaction forces at 1500Hz
- Jump Landings (JL)
- Minimum of three practice trials and five successful test trials were collected for each JL
- FJL (FIGURE 1) was assessed at 40% of subjects' height with a 30.48 cm hurdle at the midpoint of the distance
- SJL (FIGURE 2) was assessed at 33% of the subject's height with a 15.24cm hurdle at the midpoint of the distance
- Subjects jumped off two-feet, landing on only the dominant leg, and maintained balance for five-sections following landing

STATISTICAL ANALYSIS

- All data were assessed for normality
- Pearson correlation coefficients were calculated between the DPSI outcome measures and trunk kinematics
- Significant level was set at p<0.05 a priori

RESULTS

FJL:
- Significant correlations were observed between component scores in the APSI direction when compared to trunk kinematics (TABLE 2)

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<th>Table 2. APSI – Pearson Correlation Coefficients</th>
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<td>Spine FFE at IC</td>
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<tr>
<th>Table 3. MLSI – Pearson Correlation Coefficient</th>
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<tr>
<td>Spine LF TE</td>
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<td>Thorax LF TE</td>
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<td>Thorax FFE TE</td>
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- DPSI composite scores did not yield significant correlations when compared to trunk kinematics
- No significant correlations were observed between component scores in the VSI direction and trunk kinematics

SJL:
- No significant correlations were observed between the DPSI composite scores or any directions of component scores when compared to trunk kinematics

SUMMARY AND CONCLUSIONS

- These results illustrate that during FJL decrements in DPSI are related to increased movement away from a neutral spine position, including FFE and LF
- Identification of these characteristics may help guide future research to determine the relationship between these trunk kinematics and proper landing mechanics
- Once this relationship has been properly established the role of trunk kinematics on balance during sport-specific tasks may be addressed

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