The relationship between strength, speed-strength and performance in change of direction tasks

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Change of Direction (COD) Performance

Sprint ability
Strength
Power
Jump ability
Reactive strength
Mechanics

Brughelli et al., 2008
How can performance in COD tasks be enhanced in rugby union players?

Literature review

Chapter 2: Physical characteristics and performance in change of direction tasks: a brief review and training considerations

Cross-sectional research

Chapter 3: Study 1 - The relationship between multidirectional jumping and performance in change of direction tasks

Chapter 4: Study 2 – The relationship between performance in multidirectional jumping and change of direction tasks in individual- and team-sport players

Chapter 5: Study 3 – The relationship between performance in multidirectional jumping and change of direction tasks in individual- and team-sport players
## Experimental research

| Chapter 6: Study 4 | The influence of eccentric strength training on performance in change of direction tasks in adolescent rugby union players |
| Chapter 7: Study 5 | The acute influence of accentuated jump training on performance in change of direction tasks in adolescent rugby union players |

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## Chapter 8 - Practical applications and conclusions
COD assessment and ‘global’ COD performance?

Physical characteristics associated with faster performances in COD tasks?

Appropriate training approaches?

Findings

- Force capacity (Sheppard et al., 2014; Suchomel et al., 2016)
- No. Task - specific and individual - specific (Davids et al., 2007)
- Force capabilities (Dobbs et al., 2016; Iacono et al., 2017)
  - Tasks requiring 90° to 180° direction changes
  - Tasks requiring 0° to 90° direction changes

- General and Sport -/Position - specific COD tasks (Davids et al., 2006; Bartlett, 2007; Holmberg, 2009)
  - Video analysis, and Posture, Placement and Intention

Figure 2.1. Continuum of mechanical determinants of changing sprint direction.

Bartlett, 2007; Holmberg, 2009)
COD and Multidirectional Jumping (MDJ) Tasks

Bourgeois et al., 2017 (JSCR)

Reliability \((n = 20)\) and Kinetic Analysis \((n = 19)\)

- **Performance measures**
  - COD: approach time, exit time and total time
  - MDJ: approach time, jump distance

Findings

- All measures (except LT2.5 time) were reliable
- MDJ predicted COD performance
- COD plant-step kinetics distinguished FAST and SLOW performances
- MDJ plant-step kinetics and jump distance distinguished FAST and SLOW performances

Task-specific kinetics

- **COD plant-step kinetics** distinguished FAST and SLOW performances
  - \(F_y\) and \(F_z = 180^\circ\) performance
- **MDJ plant-step kinetics** and SLOW performances
Strength, Speed-strength and Performance in COD Tasks

Cross-section Analysis of Football Code Athletes ($n = 12$)

- 180° and 45° COD performance
  - Sprint times
- CMJ and DJ (unilateral; vertical, horizontal and lateral)
  - Displacements and stance-phase kinetics
- Isometric and isokinetic unilateral strength

Findings

- CMJ and DJ *impulse and vertical take-off velocity* correlated with 180° and 45° COD performance

- *Vertical and horizontal CMJ and DJ* measures shared task-specific association

- *Eccentric force* during CMJ and DJ correlated with COD performance

- *45° COD tasks superior* in distinguishing Forwards and Backs
Effects of a Six-week Strength Training Programme on COD Performance in Youth Rugby Athletes Bourgeois et al., 2017 (Sports)

Strength Training Intervention

- **Eccentric phase-emphasis condition** (EPE, weeks 1 to 6, \( n = 12 \))
  - Posttest 1 (week 7), Rest (weeks 8 and 9), Posttest 2 (week 10)
  - Washout period (weeks 11 to 13)
- **Conventional condition** (weeks 15 to 20, \( n = 6 \))
  - Posttest 1 (week 21), Rest (weeks 22 and 23), Posttest 2 (week 24)

**Performance measures**

- **Strength**: relative isometric unilateral peak force production
- **COD**: approach time, exit time and total time

**Findings**

- **Strength Benefits**
  - EPE = (s) decrease \( \rightarrow \) (m,l) increase; CON = (l) increase \( \rightarrow \) (s,l) decrease

- **COD Benefits**
  - 180° = EPE total time greater benefit; 45° = EPE and CON deleterious SLOW experienced greater benefit

**Mode-specific response**

- EPE = (s) decrease \( \rightarrow \) (m,l) increase; CON = (l) increase \( \rightarrow \) (s,l) decrease

**SLOW experienced greater benefit**
Short-term Accentuated Jump Training and Performance in COD Tasks in Adolescent Rugby Union Players

Jump Training Intervention

- **Accentuated jump condition** (AJT, weeks 1 to 4, \( n = 8 \))
  - Posttest 1 (week 5), Washout period (weeks 6 and 7), Posttest 2 (week 8)
- **Control condition** (CON, weeks 1 to 4, \( n = 8 \))
  - Same as above

Performance measures

- **JUMP**: CMJ, DJ and MDJ displacements and stance-phase kinetics
- **COD**: approach time, exit time and total time

Findings

- **JUMP benefits**
  - \( (m-vl) \) HCMJ, VDJ and MDJ displacement; \( (m,l) \) CMJ and DJ impulse, vertical take-off velocity and flight time
- **COD benefits**
  - \( 180 = (m-vl) \) approach and exit time benefit; \( 45 = \) same benefit

**ACUTE response observed**

**SLOW experienced greater benefit**
PRACTICAL APPLICATION

- Consider **sport-** and **position-specific** criterion COD task(s)
  - Posture, Placement and Intention; Individual-specific changes; *Time?*

- **MDJ** can be used to **train, assess and predict** 180° and 45° COD performance
  - Sufficient familiarisation; establish reliability

- Mechanical determinants are **task-specific**
  - ≥ 90° → Fy and Fz; ≤ 90° → Fx and Fz
  - **MDJ GCT:** distance reactive index?

- **Mode-specific** response to strength training
  - Conventional: more acute
  - Eccentric-phase emphasis: retention and development; ≤ 90° COD tasks?

- **10 sessions** of accentuated jump training influenced jump and COD measures
  - **DJ** measures most improved
  - Accentuated jump training beneficial post-COD-step task(s)?
QUESTIONS