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Background

- Asymmetry and effects on human performance
  - Side-to-side comparison of the quantity of a variable = between-limb symmetry analysis
    - (Clark & Mullally 2019; Clark & Clacher 2020)
  - Symmetry: when the variable is equal in magnitude in both limbs
    - (Clark & Mullally 2019; Clark & Clacher 2020)
  - Asymmetry: when the variable is unequal in magnitude in both limbs
    - (Clark & Mullally 2019; Clark & Clacher 2020)
Background

- Asymmetry and effects on human performance
  - Gait (walking) between-limb asymmetry has been studied for decades - amputees
    - (Lamoreux 1971)
  - Lower-limb motor performance asymmetry in sports medicine has also been studied for decades – knee ligament injury
    - (Daniel et al 1982)
  - Lower-limb asymmetry and athletic performance in uninjured individuals – linear running efficiency
    - (Belli et al 1995)

Background

- Asymmetry and effects on human performance
  - Side-to-side asymmetry of single-leg motor performance (e.g. strength, dynamic balance, power) linked to deterioration of running change-of-direction performance in uninjured games-players
  - Most performance asymmetry research to date in elite male and female athletes
  - No performance asymmetry research in uninjured amateur adult female games-players
Aim and Null Hypothesis

- **Aim**
  - To determine the relationships between:
    - Triple hop for distance (THD) absolute-asymmetry (THD-AA) and Illinois agility test (IAT) performance in amateur adult female netball players
    - Single hop for distance (SHD) absolute-asymmetry (SHD-AA) and IAT performance in amateur adult female netball players

- **Null Hypothesis**
  - There would be no significant relationship between the THD-AA and IAT or between the SHD-AA and IAT

Methods

- **Cross-sectional study**
  - One English amateur club
  - London and South East Regional League
  - Surrey County League

- **23 adult female players volunteered**
  - Age 28.7±6.2yr; height 171.6±7.0cm; mass 68.2±9.8kg

- **Data collected in one session**
  - Outdoor training site (concrete netball court)
Methods

- **Triple hop for distance:** sagittal plane single-leg repeated deceleration-acceleration performance

- **Single hop for distance:** sagittal plane single-leg power and dynamic balance performance

Clark & Mullally 2019; Noyes et al 1991

Methods

- **Illinois agility test:** running repeated change-of-direction

Getchell 1979; Vescovi et al 2011
Methods

- Data management
  - Triple hop for distance, single hop for distance: cm
  - Limb symmetry index (LSI, %)
    - (right mean ÷ left mean) × 100
  - Absolute-asymmetry (%)
    - 100 – LSI (-ve signs removed)
  - Illinois agility test: s

- Data analysis
  - Normality assessment
    - Histogram inspection, Shapiro-Wilk
  - Spearman’s correlation ($r_s$)
  - Coefficient of determination ($r_s^2$)
  - Alpha set a priori at 0.05

Results

- Raw data and relationships
  - Absolute-asymmetry variables not normally distributed ($P < 0.01$)

- THD absolute-asymmetry vs. Illinois Agility Test
  - $r_s = 0.54$
  - $r_s^2 = 0.29$ (29%)
  - $P = 0.01$

- SHD absolute-asymmetry vs. Illinois Agility Test
  - $r_s = 0.31$
  - $r_s^2 = 0.10$ (10%)
  - $P = 0.07$

| Table 1. Descriptive Statistics ($n = 23$) |
|------------------------------------------|---------------------------------|-----------------|
| Illinois Agility Test                    | Triple Hop for Distance        | Single Hop for Distance |
| Test (s)                                 | A-A (%)                        | A-A (%)          |
| Minimum                                  | 17.8                           | 0.2             |
| Maximum                                  | 22.9                           | 15.8            |
| Median                                   | 19.6                           | 3.3             |
| Mean                                     | 19.5                           | 4.4             |
| Standard Deviation                       | 1.4                            | 3.9             |

$s =$ seconds
A-A = absolute-asymmetry
SD = standard deviation
Results – Sensitivity Analysis

- THD absolute-asymmetry vs. Illinois Agility Test \((n = 23)\)
  - \(r_s = 0.54\)
  - \(r_s^2 = 0.29\) (29%)
  - \(P = 0.01\)
- THD absolute-asymmetry vs. Illinois Agility Test \((n = 19)\)
  - \(r_s = 0.62\)
  - \(r_s^2 = 0.38\) (38%)
  - \(P = 0.00\)

Conclusion

- As triple hop for distance absolute-asymmetry increased, Illinois agility test performance deteriorated (i.e. performance time also increased)
- To enhance repetitive running change-of-direction performance in amateur adult female netball players, training efforts may need to consider mitigating right-left asymmetries in sagittal plane single-leg repeated deceleration-acceleration performance as represented by the triple hop for distance


Thank You