Background

- Measures of kinematics and gross motor function in pre-school children are of potential clinical relevance, but until now large scale studies into this area have not been feasible.
- Recent developments within the field of markerless motion capture have made large scale investigations into this research area possible and feasible.
- The aim of this study was to examine the instrumental and biological variability of kinematics and gross motor function measures captured using markerless motion capture equipment in a sample of pre-school children.

Methods

- 79 children (mean age in years: 5.1 (SD 0.8)) from 4 different kindergartens were included.
- Each child was instructed to perform two squats, two standing broad jumps, and walk 2x8 meters.
- The test session was repeated one week later.
- All movements were captured using markerless motion equipment.
- The equipment used was a Captury Live system with eight tripod-mounted Blackfly 808x608 optical cameras connected via ethernet to a consumer grade PC with an NVIDIA GeForce GTX 1070 GPU.
- The analysis of instrumental and biological variation was conducted by calculating: limits of agreement, intraclass correlations of absolute agreement, and smallest detectable change.

Results: Instrumental Variation

- The scaling and jump length variables had acceptable levels of both intraclass correlations and smallest detectable change.
- All kinematic variables had high test-retest variation – regardless of the level of instrumental variation. This suggests, that the biological variation of kinematics from jumping pre-school children is very high.
- The potential clinical relevance of these kinematic measures is, therefore, questionable.

Methods

- The longest jump was used as a scaling variable for: both scaling variables, jump length, knee flexion, all ratio variables, frontal plane knee deviation, and frontal plane knee angle.

Results: Biological + Instrumental Variation

- All estimated intraclass correlations were good or excellent.
- The smallest detectable change were unacceptably high for the variables: hip flexion, ankle dorsiflexion, knee flexion, and frontal plane projection angle.
- The smallest detectable change had acceptable levels for: both scaling variables, jump length, knee flexion, all ratio variables, frontal plane knee deviation, and frontal plane knee angle.

Conclusion

- The scaling variables and jump length measures were found to have acceptable levels of both instrumental and biological variation and can, therefore, be considered reliable.
- All kinematic variables had high test-retest variation – regardless of the level of instrumental variation. This suggests, that the biological variation of kinematics from jumping pre-school children is very high.
- The potential clinical relevance of these kinematic measures is, therefore, questionable.