Central Lancashire Online Knowledge (CLoK)

Title	The influence of cardan rotation sequence on 3-D kinematic parameters and planar cross-talk during maximal out of hand rugby kicking [BASES 2013 Conference Abstract]
Type	Article
URL	https://clok.uclan.ac.uk/11511/
DOI	##doi##
Date	2014
Citation	Sinclair, Jonathan Kenneth orcid iconORCID: 0000-0002-2231-3732, Atkins, Stephen, Taylor, Paul John orcid iconORCID: 0000-0002-9999-8397 and Hobbs, Sarah Jane orcid iconORCID: 0000-0002-1552-8647 (2014) The influence of cardan rotation sequence on 3-D kinematic parameters and planar cross-talk during maximal out of hand rugby kicking [BASES 2013 Conference Abstract]. Journal of Sports Sciences, 32 (sup1). s4-s116. ISSN 0264-0414
Creators	Sinclair, Jonathan Kenneth, Atkins, Stephen, Taylor, Paul John and Hobbs, Sarah Jane

D&W-SKf$_4$ -BF% and Reilly-BF% equations. D&W-SKf$_4$ -BF% may not be suitable for the estimation of body fat in Gaelic games populations and requires further investigation.

Reference

Reilly, T., & Collins, K. (2008). Science of Gaelic sports: Gaelic football and hurling. *European Journal of Sport Science*, *1*, 84–94.

★★★

Changes in anthropometric characteristics of elite inter-county Gaelic football players between the pre-season and mid-season

M. SHORTALL[1], D.A. DORAN[2] & D.K. COLLINS[1]

[1]*Institute of Technology, Tallaght, Dublin, Ireland and* [2]*LJMU, Liverpool, UK*

Background: At the elite level, team preparation and game demands of Gaelic football are comparable to other professional team sports. The anthropometric characteristics of various Gaelic football populations have been reported but there is little information on modern elite Gaelic footballers (Reilly & Collins, 2008).
Purpose: The aim of the current study was to investigate changes in the anthropometric characteristics of elite Gaelic footballers between the pre-season and the national league competition (mid-season).
Methods: Measures of skin-fold thickness (SFT) and body mass (BM) were recorded in 21 male inter-county players (age 178.0 ± 22.1 cm) on three separate occasions (pre-season, early season and mid-season) with no less than 8 weeks between each test. SFT was determined at 8 sites (bicep, tricep, sub-scapula, iliac crest, supra-spinale, abdomen, front thigh and medial calf) using Harpenden skin-fold callipers. Body fat % (BF%) was estimated using the equation of Reilly et al. (2009). Analysis of variance (ANOVA) was used to determine changes over time and positional differences between goalkeepers, defenders, midfielders and forwards.
Results: BM did not significantly change during the study period (88.9 ± 23.6 kg, 85.0 ± 7.3 kg, 85.0 ± 7.1 kg). Total SFT at 8 sites did not decrease significantly from pre-season to early season but did decrease significantly ($P = 0.011$) from pre-season to mid-season (96 ± 26.9 mm vs. 85.4 ± 19.4 mm vs. 75.2 ± 19.6 mm). BF% decreased significantly between pre-season and mid-season ($P = 0.041$), but not between pre-season and early-season (12.4 ± 2.2%

vs. 11.9 ± 1.7% vs. 10.9 ± 1.7%). BM, SFT and BF% did not differ between defenders, midfielders and forwards. Goalkeepers had significantly higher BM than defenders ($P = 0.006$) and forwards ($P = 0.007$) but not midfielders, and significantly higher SFT ($P < 0.001$) and BF% ($P < 0.001$).
Discussion: Elite inter-county Gaelic football players are heavier and have less fat mass than has been previously described (Reilly & Collins, 2008). In regard to position, the anthropometric characteristics are relatively homogenous. Contemporary data on the fitness profiles of inter-county Gaelic football players is required to put the current data into context.

References

Reilly, T., & Collins, K. (2008). Science of Gaelic sports: Gaelic football and hurling. *European Journal of Sport Science*, *1*, 84–94.
Reilly, T., George, K., Marfell-Jones, M., Scoot, M., Sutton, L., & Wallace, J. A. (2009). How well do skinfold equations predict body fat in elite soccer players. *International Journal of Sports Medicine*, *30*, 607–613.

★★★

Poster – The influence of cardan rotation sequence on 3-D kinematic parameters and planar cross-talk during maximal out of hand rugby kicking

J. SINCLAIR★, S. ATKINS TAYLOR & S.J. HOBBS

School of Sport, Tourism and the Outdoors, University of Central Lancashire, Preston, UK
★JKSinclair@clan.ac.uk

The cardanic/Euler technique is widely utilised for 3-D kinematic analyses. Cardan/Euler angles are obtained by means of a sequential series of three rotations 1; whereby the segment of interest is translated about the first axis by an angle A, then about a rotated axis by an angle B and then finally about a twice rotated axes by an angle C 1, 2. However cardan angles are sequence dependant, and planar cross-talk can influence the non-sagittal profiles. An *XYZ* sequence of rotations is currently recommended, although it has been proposed that when calculating non-sagittal plane angles, this may not be appropriate. This study examines the influence of the six available cardan sequences on 3-D kinematics during maximal out of hand rugby kicking.

Kinematic data from the stance and kicking limbs were obtained using a 10 camera motion analysis system as participants completed maximal rugby kicks. Repeated-measures ANOVA's were used to compare hip, knee and ankle joint kinematics from both stance

and kicking limbs. Intra-class correlations were used to relate sagittal and coronal/transverse plane waveforms in order to identify evidence of planar cross-talk.

The results indicate that in the transverse and coronal planes, the *YXZ* and *ZXY* sequences significantly influenced the peak angle and range of motion values. Utilisation of *YXZ* and *ZXY* sequences were associated with the strongest relationships with the sagittal plane for the hip, knee and ankle, while the *XYZ* sequence was found to be associated with the lowest relationships.

The findings suggest that altering the sequence of rotations does not affect the resultant kinematic parameters in the sagittal plane. However, the coronal and transverse plane parameters were shown to be significantly influenced, when using the *YXZ* and *ZXY* sequences. Observation of the knee joint kinematic profiles of the kicking limb in both the coronal and transverse also suggested that Gimbal lock is present in the *YXZ* and *ZXY* sequences. Finally, the intra-class correlation analysis supports the discrete variable analysis in that the *YXZ* and *ZXY* sequences were associated with the greatest extent of planar cross-talk while the *XYZ* sequence was associated with the lowest. It appears therefore that for the quantification of 3-D lower extremity kinematics during maximal out of hand kicking, the *XYZ* sequence is most appropriate.

⋆⋆⋆

No title

J. SINCLAIR⋆, P.J. TAYLOR &
S. ANDREWS

School of Sport, Tourism and the Outdoors, University of Central Lancashire, Preston, UK
⋆JKSinclair@clan.ac.uk

Although the influence of barefoot and barefoot-inspired footwear on the kinetics of running has been examined previously in relation to conventional footwear, there is currently a paucity of research examining the efficacy of footwear, particularly barefoot and barefoot-inspired models at different velocities. Therefore the aim of the current investigation was to examine the influence on barefoot, conventional and barefoot-inspired footwear at three different velocities.

Ten male runners age 20.42 ± 3.55 years, height 178.75 ± 5.81 cm and body mass 76.58 ± 6.52 kg volunteered to take part in this study. Participants ran at 1.25, 3.5 and 5.0 m · s^{-1} in three different footwear barefoot, vibram five fingers (barefoot inspired) and saucony pro grid guide (conventional) over an embedded in the floor force plate operating at 1000 Hz (Kistler, Kistler Instruments Ltd., Alton, Hampshire, UK) in a 22 m biomechanics laboratory. A tri-axial (Biometrics ACL 300, Gwent, UK) accelerometer sampling at 1000 Hz was utilised to measure axial accelerations at the tibia. The device was mounted on a piece of lightweight carbon-fibre material using the protocol outlined by Sinclair et al. (2010, 2013). Key parameters of impact peak, average loading rate, time to impact peak, instantaneous loading rate and peak tibial acceleration were extracted for statistical analysis. To examine the influence of footwear and velocity of each dependent measure, 3 (shoe) × 3 (velocity) repeated measures ANOVA's were utilised with significance accepted at the $P \leq 0.05$ level. Significant interaction effects were further evaluated by performing simple main effect examinations on each level of the interaction with Tukey's planned comparisons.

The results show significant ($P \leq 0.05$) footwear and velocity main effects for average loading rate, time to impact peak, instantaneous loading rate and peak tibial acceleration. In addition, significant interactions were also observed for the average loading rate, time to impact peak, instantaneous loading rate and peak tibial accelerations. The follow-up analyses on these interactions suggest at each velocity condition (i.e. walk, jog and run) that the barefoot condition was associated with significantly greater impact parameters compared to the conventional and barefoot-inspired shoes. Similarly, the barefoot-inspired shoes were associated with greater impact kinetics compared to the conventional shoes. In addition, it was also found that at each footwear condition that impact parameters were significantly greater at the running velocity in comparison to both jogging and walking.

The observations from the current investigation suggest that barefoot running irrespective of locomotion velocity is associated with significantly greater impact kinetics compared to both barefoot inspired and conventional footwear. The results also show that running in barefoot and barefoot-inspired footwear at higher velocities may place runners at increased risk from injury.

⋆⋆⋆

The effect of caffeine ingestion on coincidence anticipation timing during 60-min submaximal cycling

MIKE SMITH, MICHAEL J. DUNCAN, JOANNE HANKEY & ELIZABETH BRYANT

Coventry University, Coventry, UK

The impact of extended bouts of exercise on an individual's ability to execute cognitive tasks has long been of interest to sport scientists and researchers interested