angles were computed relative to the proximal segment using an *X-Y-Z* (flexion, abduction, rotation) Cardan sequence and again using *Y-Z-X*, *Z-X-Y*, *X-Z-Y*, *Y-X-Z*, and *Z-Y-X* rotation sequences.

It was found (Figure 1) that there were major deviations in orientation angles as a function of the Cardan sequence used. The flexion-extension angles were robust for all Cardan sequences except the *Y-X-Z* rotation, and so this sequence would not be suitable for use. Deviations appeared in all of the *Y* and *Z* orientations as a function of rotation sequence, with some being offset while others varying as a function of kick progression. As there is no gold standard for judging the best Cardan sequence, and as 3D studies in the literature most commonly use the *X-Y-Z* sequence, it is proposed that this sequenced be used as a *de facto* standard for future studies.

OC45

Effects of ankle bracing on 20-m sprint time, jump height, and basketball-specific agility test performance in male basketball players

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While ankle braces have been reported as an effective method of restricting ankle injuries in basketball (Hawkey & Cloak, 2007: *Journal of Sports Sciences*, *25*, 239–240), their effect on basketball-specific performance remains equivocal (Papadopoulos *et al.*, 2005: *The Foot*, *15*, 1–6). The aim of the current study is to establish the effects of a semi-rigid ankle brace on basketball-specific performance: 20-m sprint, jump height test, and agility test.

With institutional ethics approval 10 male national league basketball players (mean age 22, $s = 2.7$ years, mean height 1.82, $s = 0.06$ m and mean weight 740.7, $s = 100$ N) completed three trials in two experimental conditions (unbraced and braced) in three different performance tests: 20-m sprint, jump height test, and a basketball-specific agility test (Beriau *et al.*, 1994: *Journal of Athletic Training*, *29*, 224–230). During the braced condition both ankles were braced using a semi-rigid Aircast^{TM} ankle brace, chosen due to its popularity amongst basketball players (Sacco *et al.*, 2004: *Sociedade Brasileira de Medicina do Esporte*, *10*, 453–458). Performance times for the agility tests and 20-m sprints were recorded using timing gates (Brower Timing Systems, UT, USA). Jump height performance was assessed using a digital jump mat (Probotic Inc, USA). All trials were randomised to reduce any order effects.

Repeated measures ANOVA indicated no significant difference $F(1,10) = 0.520$, $P = 0.599$, $\eta^2 = 0.00$), between 20-m sprint times in the braced (3.15 s) and non-braced (3.13 s) conditions. No significant difference ($F(1,10) = 0.697$, $P = 0.505$, $\eta^2 = 0.01$) was found for agility test performance in the braced (21.68 s) and non-braced (21.72 s) conditions. Jump test values were found to be significantly different ($F(1,10) = 4.71$, $P = 0.015$, $\eta^2 = 0.54$) between the braced (0.58 m) and non-braced (0.59 m) conditions.

Results suggest that the application of an Aircast^{TM} ankle brace has no significant effect on basketball-specific agility performance and straight-line sprint speed but does significantly decrease jump height performance. With some performance unaffected by wearing a brace, and evidence supporting the use of bracing to reduce injury, it is still advisable for basketball players to wear braces during basketball activities. However, further longitudinal field studies are still required to assess the long-term injury and performance implications of wearing braces during basketball training and competition.

OC46

The effects of gender and ACL reconstruction on lower extremity coupling variability during performance of randomly cued cutting techniques

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Recently, it has been suggested that movement variability – particularly coordination variability – can be functional in reducing the risk of injury. Pollard *et al.* (2005: *Journal of Applied Biomechanics*, *21*, 143–152) reported that females demonstrate lower coordination variability than males during performance of an unanticipated cutting movement. Furthermore, a history of lower extremity injury has been shown to effect lower extremity coordination variability during running (Heiderscheit *et al.*, 2002: *Journal of Applied Biomechanics*, *18*, 110–121). Therefore, the purpose of this study was to evaluate both the effect of gender and history of ACL injury on lower extremity joint coupling variability during performance of an unanticipated cutting technique.

With approval from the University's ethics committee, 8 female basketball players (age 21.6 ± 1.41 years, height 1.70 ± 0.08 m, mass 64.6 ± 7.3 kg), 8 male basketball players (age 22.9 ± 2.95, height 1.90 ± 0.19 m, mass 77.1 ± 11.7 kg) and 6 additional female basketball players with a history of unilateral ACL reconstruction (ACLr; age

29.4 ± 8.92 years, height 1.70 ± 0.05 m, mass 67.5 ± 9.62 kg) provided written, informed consent. During performance of seven unanticipated cutting tasks, three-dimensional joint and segment kinematics were recorded using an eight digital-camera motion capture system (Motion Analysis Corp., Santa Rosa, CA, USA) sampling at 240 Hz. Between groups differences in joint and segment coupling variability were evaluated with between group ANOVAs. Furthermore, the explained variance (η^2) for each joint coupling was calculated to demonstrate the magnitude of differences between the three groups.

In support of Pollard *et al.* (2005), females demonstrated reduced variability in two joint couplings (hip abduction-adduction/knee rotation variability ($P = 0.03$, $\eta^2 = 0.55$) and hip rotation/knee abduction-adduction ($P = 0.01$, $\eta^2 = 0.61$). These differences may be associated with female increased risk of ACL injury (Pollard *et al.*, 2005). Female athletes' movement patterns may not be variable enough to adapt to environmental constraints during basketball play resulting in ACL injuries. Males displayed the most flexible movements in all couplings. Interestingly, the ACLr group demonstrated variability that was greater than females but less than males in the majority of couplings. This study warrants further investigation into the effects of gender and ACL reconstruction on lower extremity joint coordination variability, and its implications to female injury.

OC48

Training range of motion and muscle hypertrophy as determinants of muscle architecture and movement capacity

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Muscle architecture is a major determinant of force generation capacity. However, little is known about the factors that most influence it and the time-course of its adaptation in humans. This study examined the influence of the training range of motion, contraction mode, and movement velocity on its adaptive response and assessed its temporal response through a period of high-resistance training and subsequent detraining.

With institutional approval, 21 men and women with no history of strength training performed concentric- or eccentric-only isokinetic knee extensor training for 10 weeks before completing a 3-month detraining period; a control group of 9 subjects did not train. At weeks 0, 5, and 10 and after the detraining period, knee extensor strength and the torque-angle relationship (isokinetic dynamometry), muscle hypertrophy (T_2-weighted MRI and B-mode ultrasonography) and architecture (ultrasonography) were assessed.

The training resulted in significant gains in concentric (20.2%; $P < 0.001$) and eccentric (37.4%; $P < 0.001$) strength, which did not revert to baseline after detraining. There was a significant shift in the torque-angle relationship toward longer muscle lengths after 5 weeks and no further shift after 10 weeks but a smaller shift again after detraining. The training resulted in a considerable increase in vastus lateralis (VL) physiological cross-sectional area (7.9%; $P < 0.01$) and whole quadriceps muscle volume (10.2%; $P < 0.001$). VL fascicle length (FL) was increased after 5 weeks (4.7%; $P < 0.05$) with no difference between the training groups. No further increase was found at 10 weeks, although a small increase (2.5%; NS) was evident after the detraining period. Similarly, fascicle angle (FA) changes were not different between the groups but increased at 5 (11.0%) and 10 weeks (17.9%; $P < 0.01$) in VL only and remained above baseline after detraining (13.2%; $P < 0.05$). Thus, there was a differential temporal response of FA and FL.

The similar increase in FL observed between the training groups, along with the finding that the temporal responses of VL FL and shifts in the torque-angle relationship were the same, is suggestive of the training range of motion, rather than the contraction mode or velocity being the predominant influencing factor for FL change in humans. It is also indicative of muscle force-length properties being strongly influenced by FL. The clear association between FA and muscle thickness is indicative of FA change being driven by space constraints in the hypertrophying muscle rather than it being an independent anatomical adaptation to the training load. These findings have implications for both athletic and rehabilitation populations.

Children and Physical Activity

OC49

Predictors of childhood overweight, obesity, and physical activity during the school day

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Growing trends in overweight and obesity (OWOB) amongst children have become a global public health concern. These rises have been greatest in areas of socio-economic deprivation. Increasing levels of physical activity (PA) may help to prevent overweight and obesity. Schools provide ideal environments for the delivery of interventions to help children achieve