Modifying spike jump landing biomechanics in female adolescent volleyball athletes using video and verbal feedback

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Background

❖ Female participation in sport has increased dramatically in the last 30 years
❖ Female athletes are 2-8 times more likely to suffer an injury to the anterior cruciate ligament of the knee compared to males[1]
❖ Common mechanisms for ACL injury include sudden deceleration, pivoting on a planted foot, and landing from a jump
❖ Compared to males, females land from a jump in a more upright position with less trunk, hip and knee flexion and an increased valgus knee position [2]

Figure 1: Common landing biomechanics demonstrated by female athletes. Upright landing posture with small knee, hip and trunk flexion angles (left). Valgus (knock-kneed) landing (right).

Purpose

❖ To improve the landing biomechanics of adolescent female volleyball players by providing video and verbal feedback

Methods

❖ Nineteen adolescent female volleyball athletes were recruited for this study
❖ Intervention group
- Filmed performing five volleyball spikes
- Each athlete was provided with individualized verbal and video feedback regarding her landing biomechanics and then immediately filmed for a second time
- Successive filming sessions were carried out after two weeks and four weeks to assess whether any changes in landing biomechanics occurred, and whether that change was maintained over time

❖ Control group
- Filmed at the beginning and the end of a four week time period, with no feedback provided

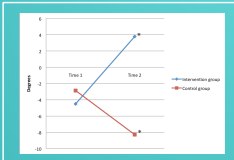

Figure 2: Comparison of trunk flexion between groups after four weeks (above).
Comparison of joint kinematics between groups at week 1 & week 4 (right).

Variable (degrees)	Control Group Week 1 Mean (SD)	Control Group Week 4 Mean (SD)	Int. Group Week 1 Mean (SD)	Int. Group Week 4 Mean (SD)	P value
Maximum right knee flexion	62 (16)	60 (8)	66 (7)	85 (23)	0.04
Maximum left knee flexion	65 (14)	66 (12)	71 (10)	86 (24)	0.2
Maximum right knee valgus	-8 (9)	-12 (9)	-4 (6)	-6 (8)	0.91
Maximum left knee valgus	3 (6)	11 (8)	2 (7)	6 (9)	0.41
Maximum right hip flexion	42 (29)	38 (14)	42 (12)	69 (30)	0.05
Maximum left hip flexion	45 (26)	35 (11)	44 (12)	68 (34)	0.046
Maximum trunk flexion	6 (16)	0.5° (8)	-1 (7)	14° (14)	0.016*

The negative sign (-) denotes trunk extension and knee valgus

Results

❖ No significant differences were found between the control and intervention groups at the beginning of the study
❖ Athletes in the intervention group landed with significantly more trunk flexion after four weeks compared to the control group
❖ Athletes in the intervention group showed a tendency to land with increased hip and knee flexion after four weeks
- At both initial ground contact and the position of maximum flexion
- Flexion angles increased by up to 30˚, but did not reach statistical significance

Figure 3: Frontal view of one subject before (left) and after (right) video & verbal feedback.

Practical Implications & Future Direction

❖ Video & verbal feedback may be an effective, inexpensive method of improving jump landing biomechanics
❖ This may help athletes avoid joint positions that could lead to injury, and specifically ACL injury
❖ The role of the trunk in improving jump landing biomechanics requires further investigation, as does the longer term effect of providing feedback to female athletes
❖ The effect of feedback on injury rates is also a topic for further study

References
1. Hewett, T. et al. (2005). Biomechanical measures of neurological control and valgus loading of the knee predict ACL injury risk in female athletes. *The American Journal of Sports Medicine, 33(4), 492-501.*
2. Ireland, M.L. (1999). Anterior cruciate ligament injury in female athletes; epidemiology. *Journal of Athletic Training, 34(2), 150-154.*

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