limbs indicates that participants generally utilized a balanced EA strategy. While sagittal plane hip EA was greater in the dominant limb, it is likely that the magnitude of this difference is not clinically relevant. These results suggest that healthy individuals utilizing higher risk landing strategies during DLJLs do so bilaterally.

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Influence of Whole Body Vibration on Knee Mechanics during a Drop Jump Maneuver

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(No relationships reported)

Whole body vibration (WBV) is a training modality that involves an individual positioning themselves on a platform that provides vibrations at set or varied frequencies and amplitudes to the body. Research has shown changes in force production following WBV. A common method used to assess this has been through jump performance. Considerable evidence has illustrated its effectiveness at improving jump height, however the ability to absorb the eccentric forces when landing from a jump and potentially preparing to initiate another movement are unknown. Landing mechanics have previously been linked to injury risk.
PURPOSE: The purpose of the study was to (a) identify the effects of WBV on ground reaction forces (GRF), loading rates, valgus knee angles, frontal plane knee moment and jump height, and (b) compare these responses between men and women.
METHODS: Nine men and ten women completed the study. Ten, 1-minute vibrations (2mm, individualized frequency) were administered. Subjects completed drop jumps from a 0.6m height prior to, immediately after and at 10 and 20 minutes post-vibration. All dependent measures were obtained using an AMTI force platform and 12-Vicon motion capture system. Data were analyzed using RM-ANOVA with significance set at $p \leq 0.05$.
RESULTS: No significant changes in GRF or loading rate were found across time or gender. A significant main effect was found for valgus knee angle across time ($p=0.011$). Follow-up pairwise contrasts illustrated an increase at all three times post vibration (-9.18, -10.03, -10.15, -10.36, for pre, post, 10min & 20min post, respectively). Women had a significantly greater overall knee moment than men (0.32 vs. 0.79 Nm/kg) ($p=0.038$), and men jumped higher than female participants (0.41 vs. 0.29m) ($p<0.001$).
CONCLUSIONS: Findings from this study indicated that, compared to baseline, subjects landed with significantly greater knee valgus angles following WBV. Although females have been shown to have a higher degree of valgus knee angle during landings it is important to note that we observed no effect of gender. Since it has been demonstrated that a knee in a valgus position while landing increases the potential risk for anterior cruciate ligament injury, caution should be taken when combining WBV and jump training protocols.

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Relationships Between Quantitative And Qualitative Measures Of Jumping In Typically Developed Preschoolers

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(No relationships reported)

Preschool period is critical in developing fundamental motor skills, such as jumping. Relations between quantitative and qualitative measures in jumping were seldom found.
PURPOSE: To determine the correlations between quantitative measures of standing long jump (SLJ) and vertical jump (VJ) and qualitative scores of gross motor development in preschoolers.
METHODS: A video-based motion capture system was used to obtain the quantitative measures including takeoff angle (TOA), takeoff velocity (TOV), trunk inclination angle (TIA), trunk extension range (TER), slopes of angle-angle plots in lower limbs (hip-knee plot (SHK), hip-ankle plot (SHA), and knee-ankle plot (SKA)) during pre-takeoff and jump performance (distance or height). Preschooler Gross Motor Quality scale (PGMQ) was used to obtain the qualitative scores of horizontal jumping (L3 score) and gross motor development (PGMQ score). Correlation analysis between variables used Spearman's rho, and statistical significance was set at 0.05.
RESULTS: Many quantitative measures in both SLJ and VJ were correlated to the PGMQ score, indicating these parameters could represent certain features of motor development. TIA in SLJ and VJ was respectively high and moderate correlated to the L3 score. TOA and jump performance were correlated to the L3 score only in SLJ, but TER only in VJ, suggesting different features and strategies between SLJ and VJ.
CONCLUSION: Selective quantitative measures in SLJ and VJ were related to the qualitative scores in preschoolers. Trunk movement and slope of hip-ankle plot during pre-takeoff were important parameters correlated to motor development.
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Table 1 Correlations between variables.

SLJ	TOA	TOV	TIA	TER	SHK	SHA	SKA	Performance
PGMQ	-.440	.484*	-.549*	.505*	-.407	-.634*	-.263	.563*
L3	-.505*	.385	-.712*	.374	-.279	-.405	-.161	.473*
VJ		TOV	TIA	TER	SHK	SHA	SKA	Performance
PGMQ		.635*	-.535*	.610*	-.270	-.464*	-.449	.534*
L3		.232	-.536*	.688*	-.352	-.164	-.118	.158

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Gender Differences In Single-leg Squat Kinematics Of Healthy Young Adults

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(No relationships reported)

There is some evidence to suggest that certain lower limb movement patterns during functional activities increase the risk of lower limb injuries, such as non-contact anterior cruciate ligament (ACL) tears. Further, the prevalence of such risky movement patterns appears to be greater amongst women than it is for men; an observation that is commensurate with ACL injury rates. Despite widespread use of the single-leg squat (SLS) test in musculoskeletal screening, a comprehensive gender comparison of trunk, pelvis, and lower limb 3D kinematics is yet to be described.
PURPOSE: To determine gender differences in SLS kinematics in healthy young adults.
METHODS: We recruited 60 healthy men and women between the ages of 20 and 40 years. Participants had 32 retroreflective markers attached to their trunk, pelvis, and lower limbs before performing three SLSs on an AMTI force plate while 3D kinematic data was simultaneously collected with a ten-camera VICON motion analysis system (Oxford Metrics, UK). Squat depth was standardised by asking participants to achieve 75 degrees of knee flexion using real time kinematic feedback. One-way ANOVA was used to make gender comparisons of kinematic parameters.
RESULTS: 30 men (25.6 ±4.8 years) and 30 women (25.1 ±3.8 years) volunteered to participate. Men were taller (1.78 ±0.08 m vs. 1.68 ±0.06 m) and heavier (77.3 ±12.0 kg vs. 59.7 ±8.2 kg) than women. Angles for peak hip external rotation (-13.4 ±5.4 deg vs. -10.0 ±4.4 deg, $p=0.02$), peak hip internal rotation (-2.7 ±5.3 deg vs. 3.9 ±6.1 deg, $p=0.01$), hip adduction range (12.1 ±5.0 deg vs. 17.5 ±6.9 deg, $p=0.01$), and hip rotation range (9.9 ±3.1 deg vs. 13.6 ±3.5 deg, $p=0.01$) were smaller for men than for women. Likewise, distance of mediolateral knee motion (173 ±46 mm vs. 205 ±59 mm, $p=0.05$) was shorter for men than for women. Kinematics at the trunk and pelvis did not differ between the sexes ($p > 0.05$).
CONCLUSION: Gender differences in SLS kinematics of healthy young adults appear to apply only at the hip and knee and not at the trunk or pelvis.

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Gender and Load Effects on Frontal Plane Kinetics during Single-Leg Drop Landings

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(No relationships reported)

Trunk loading during landing alters the lower extremity biomechanical risk factors associated with anterior cruciate ligament injury.
PURPOSE: To investigate the effects of gender and load on frontal plane kinetics during drop landings.
METHODS: Twenty-two (14 F; 8 M) recreational athletes (21±1 yrs) gave voluntary informed consent and performed single-leg drop landings on the dominant leg during unloaded and loaded (5% body mass) conditions. A weight belt distributed the load in three different conditions relative to the dominant leg: ipsilateral (IPSI), contralateral (CON) and symmetrical. A 10 camera Motion Analysis system (500 Hz) and two Kistler force plates (2000 Hz) collected 3D coordinate and ground reaction force (GRF) data. Inverse dynamics methods computed the resultant joint force (RJF) and torque (RJT) at the ankle, knee and hip. Data were normalized using the subject's weight (GRF and RJF) or the product of their height (ht) and weight (RJT). Mixed design (2x4) ANOVAs determined the effects of gender and load. A Bonferroni adjustment maintained the experiment-wide error rate at $p<0.05$ for all statistical comparisons.
RESULTS: No variable exhibited a gender by load interaction or a main effect for gender. The average normalized mediolateral GRF and the RJFs at the ankle and knee exhibited main effects for load ($p<0.05$). The CON condition exhibited the largest magnitude forces (GRF = 0.07±0.07 BW; Ankle = -0.49±0.15 BW; Knee = -0.18±0.09 BW) and the IPSI condition the smallest (GRF = 0.04±0.06 BW; Ankle = -0.43±0.16 BW; Knee = -0.15±0.07 BW) (positive forces are medial). The average normalized RJTs at the ankle, knee and hip were in the abduction direction and also exhibited main effects for load ($p<0.05$). The CON condition had the largest magnitude RJTs (Ankle = 0.05±0.02 BW.ht; Knee = 0.05± 0.03 BW.ht; Hip = 0.11±0.04 BW.ht,) and the IPSI condition the smallest (Ankle = 0.04± 0.02 BW.ht; Knee = 0.04± 0.03 BW.ht; Hip = 0.09±0.03 BW.ht).
CONCLUSION: Ipsilateral loading moves the body's center of mass (CM) toward the landing leg reducing the magnitude of the average medial GRF applied to the foot and resulting in smaller average medial RJFs applied to the distal end of the shank and thigh. In turn, smaller abduction RJTs need to be produced by the muscles of the lower limb to control frontal plane leg motion.