Concurrent validity of inter-limb symmetry measures in different test types

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Summary

Limb symmetry is frequently used in sports science to assess injury risk and performance[1]. Limb symmetry index (LSI) of 80–90% is a common threshold for return-to-sport decisions. This study evaluated the inter-limb asymmetry (ILS) method across different tests in 11 uninjured male participants, including squat, countermovement, and drop jumps, open-chain knee extensions, and closed-chain leg presses. ILS was calculated using peak load ratios between limbs. Results showed moderate intra-test correlations for closed-chain leg press (r=0.57±0.23) and open-chain knee extension (r=0.43±0.19), but low correlations for jumps (r=0.30±0.38), indicating high variability in functional tasks. Additionally, open-chain knee extension had weak negative correlations to jump tests. The findings highlight low concurrent validity between tests, suggesting that test selection should align with sport-specific task demands. Isoinertial tests like jump tests are recommended for continuous monitoring, as they better reflect the dynamic requirements of most sports.

Introduction

Limb symmetry in function or performance is used in sports science and medicine to assist in assessing injury risk and performance. A quadriceps LSI threshold of 80-90% (ILS=10-20%) is often used as a requirement for return-to-sport after injury in clinical practice although the concurrent validity to athletic movements of the measure may be questioned.

Methods

Eleven uninjured male participants (mean age 25.5 years) performed jumps, open-chain isokinetic/isometric knee extensions, and closed-chain leg press tests. ILS was calculated for all tests.

$$\text{ILS} = \left(\frac{LOAD_{Right}^{Peak}}{\left(LOAD_{Right}^{Peak}+LOAD_{Left}^{Peak}\right)}\right) - 0.5$$

Pearson's correlation coefficients relationship between test and test categories for ILS.

Results and Discussion

Pearson´s correlation coefficients between different tests for ILS were calculated. For ILS, r-values ranged from 0.56 to 0.98. Intra-test-category r-values were highest for closed chain leg press 0.57±0.23 (0.04-0.93) followed by open chain knee extension 0.43±0.19 (0.11-0.98) and jumps 0.30±0.38 (-0.35-1.00). Open chain knee extension ILS showed a moderate relationship to closed chain leg press ILS, r= 0.57±0.23 (0.04-0.93) and had an average low negative correlation to jumps ILS, -0.06±0.28 (-0.56-0.67).

Any test assessing readiness after injury must have a high concurrent/predictive validity for the specific sport or activity task demands. In general, ILS demonstrates low concurrent validity between tests. In addition, intra-test correlations of jumps were low, demonstrating high variability in ILS during functional tasks.

Most sports performances involve the task constraint of acceleration of center of mass in an isoinertial environment [2] suggesting that isoinertial tests may have better concurrent validity than isometric and isokinetic tests. Selecting a test with similar task constraints as the relevant sports movements is vital to assess readiness when returning to a specific sport.

Conclusions

This study emphasizes the need to use a test that has a high concurrent validity to the task demands for which readiness is assessed due to the low concurrent validity between tests. Jump tests appear to be the most reasonable choice when assessing readiness, but the type of jump test needs to be matched to the sports dominant task constraints. Further research is required to explore how varying magnitudes of deviation from an individual´s baseline ILS affect injury risk and performance.

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References

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