Musculoskeletal and Torque Asymmetries in NCAA Division I Softball Athletes

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PURPOSE & METHODS

To compare bone, body composition, and leg torque production in NCAA Div. I Softball players.

- Softball athletes (n=20) and sex, age (±2 yrs), and weight (±2.5 kgs) matched controls (n=20) were included
- DXA and dynamometry at (60/120/180) were completed
- Hamstrings:Quadriceps ratios were calculated for 60˚/sec (strength) and 180˚/sec (power)
- Baseline and lean mass corrected independent *t*-test; Cohens *d* effect sizes; α=0.050.

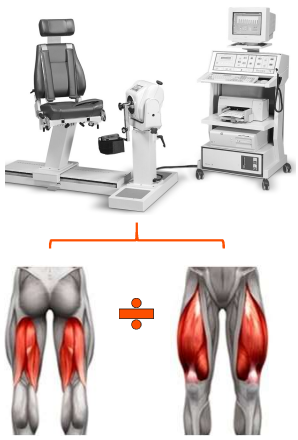
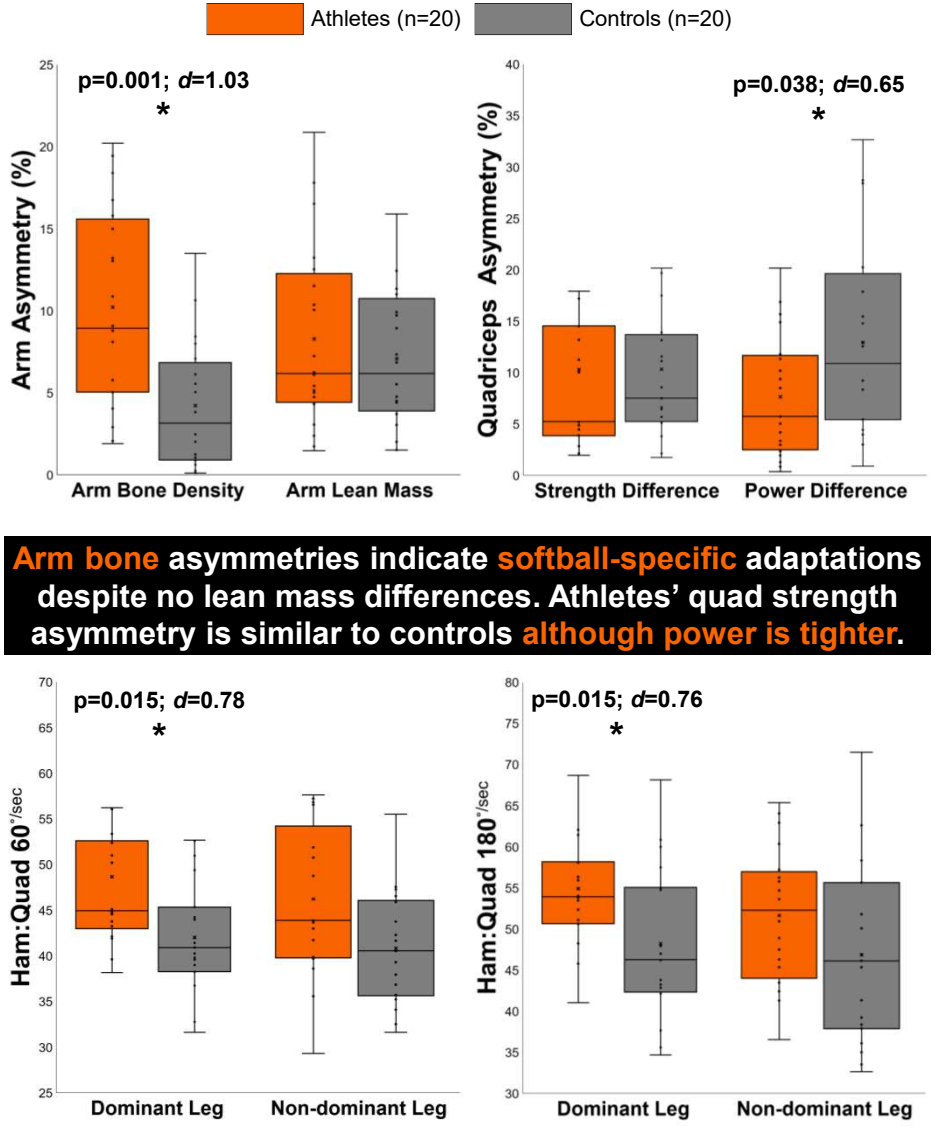


Table 1. Anthropometrics and questionnaires responses.

Measures	Softball (n=20)	Controls (n=20)	Ind. *t*-test p	*Effect Size d*
Age (years)	20.0 (1.7)	20.2 (1.0)	0.739	0.11
Weight (kg)	72.2 (7.3)	71.5 (7.2)	0.783	0.09
Height (m)	1.6 (0.3)	1.6 (0.8)	0.643	0.15
Res. Training	3.5 (1.1)	3.8 (1.9)	0.611	0.16
Plyo. Training	**1.9 (1.8)**	**0.0 (0.0)**	**<0.001**	**1.20**

Data are shown as mean (SD). **Abbreviations**: Res: Resistance Training frequency (days/wk); Plyo: Plyometric Training frequency (days/wk). Effect sizes are Cohen's *d*.

PRIMARY RESULTS



Arm bone asymmetries indicate softball-specific adaptations despite no lean mass differences. Athletes' quad strength asymmetry is similar to controls although power is tighter.

Athletes had better strength and power H:Q ratios compared to controls but fell below optimal levels for ACL injury risk.

PRACTICAL APPLICATIONS & CONCLUSIONS

1. **Softballs' explosive throwing motion results in significant arm bone, but not muscle, asymmetries.**

2. **Softballs' bilateral power torque production asymmetry is tighter than controls while strength is similar.**

3. **Softballs' H:Q indicate better hamstring development than controls but athletes were still at risk for ACL injuries.**

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REFERENCES

1. Carbuhn, A. F., Fernandez, T. E., Bragg, A. F., Green, J. S., & Crouse, S. F. (2010). Sport and training influence bone and body composition in women collegiate athletes. *The Journal of Strength & Conditioning Research*, *24*(7), 1710-1717.
2. Czeck, M. A., Raymond-Pope, C. J., Stanforth, P. R., Carbuhn, A., Bosch, T. A., Bach, C. W., ... & Dengel, D. R. (2019). Total and regional body composition of NCAA Division I collegiate female softball athletes. *International Journal of Sports Medicine*, *40*(10), 645-649.
3. Rosene, J. M., Fogarty, T. D., & Mahaffey, B. L. (2001). Isokinetic hamstrings: quadriceps ratios in intercollegiate athletes. *Journal of athletic training*, *36*(4), 378.
4. Mudd, L. M., Fornetti, W., & Pivarnik, J. M. (2007). Bone mineral density in collegiate female athletes: comparisons among sports. *Journal of athletic training*, *42*(3), 403.

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