Body composition asymmetries in university ice hockey players and their implications for lower back pain and lower limb injury

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Introduction

Lateral dominant sports, such as ice hockey, have been associated with an increased presence of functional asymmetries as compared to bilateral sports[1]. Right to left asymmetry has also been linked to lower back pain (LBP)[2], suggesting morphological asymmetry may play a role in the susceptibility to injury.

Male and female field hockey players were both found to have significant right to left asymmetries in bone mineral density and lean body mass (LBM) while differences in fat mass was only reported for female players[3,4]. A study quantified changes in whole body and regional body composition using dual-energy X-ray absorptiometry (DEXA) in collegiate ice hockey players, revealing various statistically significant tissue gains and losses throughout the season, however, side-to-side asymmetries were not examined[5]. Thus, to our knowledge, no study has investigated side-to-side asymmetries in body composition in male and female ice hockey players.

Quantifying side-to-side asymmetries in body composition in ice hockey players and their possible associations with injury may provide athletic trainers and strength conditioning coaches with valuable information with regards to injury-prevention programs, as well as targeted rehabilitation and training to optimize performance.

Objectives

1) To investigate and compare body composition asymmetries in male and female university-level ice hockey players.

2) To examine if the degree of right-left asymmetry in body composition is associated with LBP and lower limb injury (LLI).

Methodology

Body composition assessments were acquired using dual-energy X-ray absorptiometry (DEXA) in 32 ice hockey players (14 males, 18 females) from Concordia University varsity teams during the preseason. Parameters of interest included bone mass, lean body mass (LM), and fat mass, for the right and left sides and body segments (arm, leg, trunk, total) separately. Data on LBP and LLI was obtained using a self-reported questionnaire.

The difference between right-left values for each body composition parameter was tested using paired student t-test (those with normal distribution) and Wilcoxon Signed rank tests (for non-normal distributions). Logistic regression was used to assess the associations between degree of body composition asymmetry with LBP and LLI.

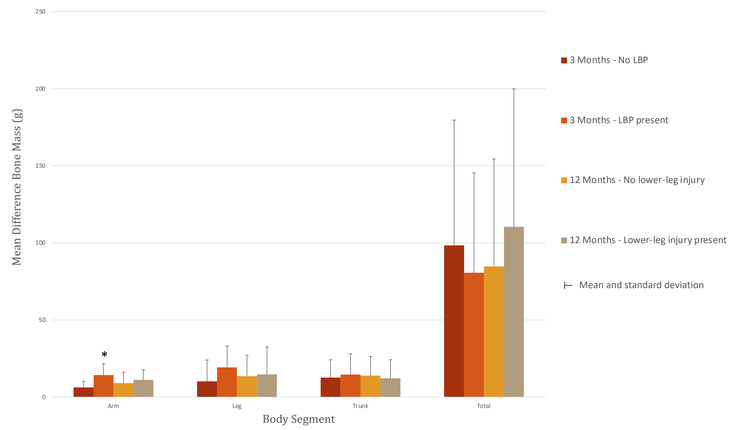

Figure 1. Implications of Right to Left Asymmetries in Bone Mass on LBP and LLI

Results

Our findings revealed significant side-to-side asymmetry in arm and total bone mass in females, with higher values on the right side (p=0.03 and p=0.002, respectively)(Table 1). Both males and females also had significantly greater trunk lean body mass on the left side (p=0.01 and p=0.002, respectively)(Table 1).

Players with greater right-left differences in arm bone mass were more likely to have a history of LBP in the past 3-months (p=0.011). No other significant association between the degree of asymmetry with LBP and LLI.

Table 1. Anthropometric parameters and right to left asymmetries for male and female ice hockey players.

	Males			Females		
	Right	Left	p-value	Right	Left	p-value
Bone Mass (g)						
Arm	298.40 ± 40.98	286.51 ± 42.18	0.05	189.14 ± 21.81	184.28 ± 18.41	0.03
Leg	696.55 ± 100.31	704.56 ± 109.14	0.29	509.69 ± 48.69	508.52 ± 53.20	0.65
Trunk	602.29 ± 98.83	600.32 ± 88.58	0.75	449.32 ± 44.67	444.46 ± 46.56	0.14
Total	1875.03 ± 273.04	1855.53 ± 236.56	0.37	1460.16 ± 153.89	1368.42 ± 151.12	0.002
LBM (g)						
Arm	4763.43 ± 407.41	4704.75 ± 416.96	0.34	2771.06 ± 421.72	2743.67 ± 395.99	0.34
Leg	11918.99 ± 1030.76	11982.17 ± 1182.79	0.60	8344.39 ± 985.28	8352.65 ± 998.13	0.90
Trunk	15746.96 ± 1187.36	16123.34 ± 1027.53	0.01	11390.89 ± 1431.55	11641.88 ± 1426.35	0.002
Total	34264.32 ± 2513.33	34551.97 ± 2426.18	0.12	24303.28 ± 2879.22	24042.78 ± 2613.43	0.13
Fat Mass (g)						
Arm	834.08 ± 228.28	810.32 ± 234.52	0.21	964.73 ± 271.05	966.02 ± 272.66	0.93
Leg	2453.16 ± 524.62	2494.61 ± 597.95	0.22	3386.01 ± 980.63	3351.18 ± 951.86	0.30
Trunk	3600.30 ± 1277.65	3598.08 ± 1295.45	0.97	3821.91 ± 1156.62	3819.31 ± 1139.97	0.93
Total	7372.01 ± 1959.20	7363.38 ± 2097.96	0.92	8643.47 ± 2336.20	8483.56 ± 2197.18	0.004*

* = Wilcoxon Signed Ranks Test

	Male	Female	Difference	p-value & 95% CI
Bone Mass (g)				
Arm	11.78 ± 7.77	7.98 ± 5.83	3.80	0.13 [1.19, 8.79]
Leg	22.52 ± 16.25	7.12 ± 8.00	15.40	0.004 [5.45, 25.35]
Trunk	17.78 ± 13.61	10.03 ± 10.01	7.75	0.07 [0.77, 16.27]
Total	57.14 ± 55.18	117.57 ± 77.97	60.43	0.016 [12.29, 108.56]
LBM (g)				
Arm	202.42 ± 110.39	100.80 ± 64.80	101.62	0.008 [29.72, 173.52]
Leg	335.252 ± 286.70	187.87 ± 179.81	147.38	0.11 [34.89, 329.65]
Trunk	509.52 ± 295.19	299.73 ± 241.97	209.79	0.04 [9.27, 410.31]
Total	592.66 ± 342.98	648.97 ± 341.83	56.31	0.65 [192.82, 305.44]
Fat Mass (g)				
Arm	54.53 ± 48.92	48.96 ± 37.42	5.57	0.73 [28.02, 39.17]
Leg	108.40 ± 63.35	123.98 ± 67.11	15.58	0.51 [32.10, 63.26]
Trunk	171.56 ± 150.41	98.80 ± 71.47	72.76	0.11 [18.98, 164.50]
Total	264.21 ± 164.21	183.29 ± 205.98	80.92	0.23 [52.74, 214.58]

Table 2. Differences in body composition asymmetries between male and female ice hockey players.

Discussion

Quantifying side-to-side differences in body composition is critical as the presence of asymmetries has not only been linked with increased risk of injuries[6], but also LBP[7-9]. Our results revealed significant asymmetry in trunk LBM in females and males, both having higher values on the left side (p=0.002 and p=0.01 respectively), a finding that corroborates with previous studies in field hockey players[3,4]. This finding likely reflects the specific rotational demands of the hips required when playing ice hockey, increasing the stress and mechanical load on the hips and pelvis.

While our findings revealed a significant association between LBP and greater arm bone mass differences (p=0.011), contrary to our hypothesis we found no association between the degree of lower leg asymmetry and LBP. We found no significant associations between LLI and the degree of asymmetry in body composition, despite both males and females showing significant asymmetry in trunk LBM

Clinical Relevance

The present study provides novel data regarding the presence of laterality in body composition in university level ice hockey players. The assessment and quantification of body composition asymmetry in ice hockey players provides invaluable information that can be used by athletic trainers and strength and conditioning coaches for injury prevention programs, targeted rehabilitation, and training to optimize performance and prevent injuries in ice hockey.

Future Directions

All measurements were obtained during the pre-season, and thus possible temporal changes in body composition during the competitive season or the effect of training regimen were not examined. Future longitudinal studies are warranted to extend our findings and further examine the presence of body composition asymmetry in ice hockey players and their possible implications for injury.

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