WHAT FITNESS VARIABLES CHANGE FROM DRYLAND TRAINING IN DEVELOPING ALBERTA YOUTH ALPINE SKI RACERS?

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Introduction

Alpine skiing requires a large aerobic base to support the necessary anaerobic power, muscular strength, complex motor skills and co-ordination.[1,2] The four disciplines of Slalom, Giant Slalom, Downhill, and Super Giant (SG) have on hill differences related to racer speed, distance between the gates, and length of the course. Differences in physiological and anthropometric related parameters of racers who are specialists in one of the above disciplines have recently been reported in the literature. Smaller, leaner males were more successful in the Slalom event (had lower FIS points), while skiers with more body fat did better in downhill events and were the heaviest of all four disicplines.[3,4] Males in general had lower percent body fat then females (8-10% vs. 20-22%).[5] In summary, body composition appears to be an important factor in contributing to success in an alpine discipline. There currently is limited, published data on the characteristics of developing alpine ski racers in Alberta and there is no recorded data that investigates whether young racers experience success because of a given body composition.

Purpose

This primary research aimed to describe baseline fitness characteristics in young Alberta ski racers prior to the summer dry land program. A secondary objective was to investigate body composition differences by sex and age class category (K2; FIS).

Setting

Human Performance Laboratory (HPL), U. of C, Alberta.

Methodology

All measurements prior to the summer dry land program were completed in one day at the University of Calgary. Significance was set at *p* value = 0.051.

1. Height (HT, cm), Weight (WT, kg), calculated BMI, Waist Circumference (WC, cm), Grip Strength (R, L and combined total), Push-ups (Pups number), Sit and Reach (cm), and Vertical Jump Height (VJ, cm) were performed by certified exercise physiologists (CEP) using CPAFLA guidelines.

2. Maximal oxygen consumption (VO_2max, $ml \cdot kg^{-1} \cdot min^{-1}$) was calculated from the last stage completed during the Leger 20m shuttle run.

3. Agility was completed using the Illinois Agility run test -Hastad & Lacy (1994) protocol. Only the "right" test was used for K2 while both left and right was completed for FIS.

4. Percent Fat and Fat Free mass were determined by Whole-body DEXA scan (Hologic QDR 4500A scanner, Hologic Inc, Waltham, MA).

Both K2 (13-14 years; n=15) and FIS (15+ years; n=9) level Alberta Alpine ski racers were recruited from clubs in the province of Alberta. Participant characteristics are in Table 1.

Table 1. Participant Characteristics Mean (SD).

	Sex	N=24	Age (yrs)	Weight (kg)	Height (cm)	WC (cm)
K2	F	6	13.2 (0.8)	46.7 (7.2)	160.8 (3.2)	63.2 (3.9)
	M	9	12.9 (0.9)	49.9 (11.7)	161 (10.5)	67.7 (6.9)
FIS	F	4	16 (0)	60.2 (8.8)	168.8 (5.6)	71.2 (2.8)
	M	5	15.6 (0.5)	65.6 (6.0)	175.6 (4.6)	72.9 (4.6)

Statistical Analysis

Two sample t-tests were completed within each age class category (K2 or FIS) by sex for all interested variables. Figures 1 and 2 for VO_2max and percent fat mass, respectively, depict mean values for each category. Significant differences (**p<0.001, *p<0.05,) are highlighted between males and females. Mean testing results by age class category and sex are outlined in Table 2 for all variables

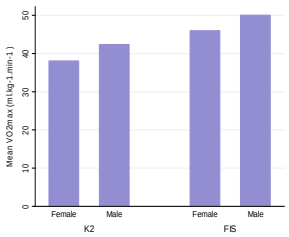

Fig. 1. Mean VO_2max by Sex

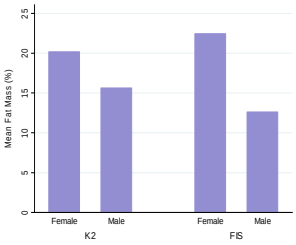

Fig. 2. Mean % Fat Mass by Sex

Results

Sex did not significantly affect the maximum oxygen consumption (VO_2max corresponding to the Léger test score) for K2 racers (40.7±5.4 $ml^{-1}kg^{-1}min^{-1}$; p=0.13), but it did significantly influence the VO_2max of FIS racers (n=3; F=46.0±0.90, M=50.1±1.02 $ml^{-1}kg^{-1}min^{-1}$; p=0.04). In addition, percent fat mass was not significantly dependent on sex for K2 racers (17.5±1.3 %; p=0.08), but it was for FIS racers (M=12.6±2.6, F=22.5±1.3 %;

p<0.001). Sex did not significantly affect other standardized tests completed: push-up number (K2 =14.4±8.37; FIS=22±8.2), sit-and-reach distance (K2=31.3±7.6; FIS=42.2±5.3 cm), vertical jump height (K2=37.2±8.1; FIS=46.3±9.2 cm), combined grip strength (K2=61.0±18.4; FIS=80.0±19.6 cm) and the Illinois Agility (right) test (K2=19.2±1.7; FIS=18.0±0.8).

Table 2. Fitness Results tests by age class and sex.

Test/ Measure	Age Class	Sex	N	Mean (SD)	P-Value
$V0_2$ ($ml \cdot kg^{-1} \cdot min^{-1}$)	K2	F	6	38.1 (4.0)	0.1319
		M	9	42.4 (5.7)	
	FIS	F	3	46.0 (1.6)	0.0359*
		M	5	50.1 (2.3)	
Fat Mass (%)	K2	F	6	20.2 (3.9)	0.0823†
		M	9	15.7 (5.0)	
	FIS	F	4	22.5 (1.3)	0.0003**
		M	5	12.6 (2.6)	
Pups (#)	K2	F	6	14.3 (4.7)	0.9810
		M	9	14.4 (10.4)	
	FIS	F	4	24.3 (6.0)	0.5189
		M	5	20.4 (10.0)	
Sit-and-Reach (cm)	K2	F	6	35.4 (7.5)	0.0893†
		M	9	28.5 (6.8)	
	FIS	F	4	41.7 (4.0)	0.8236
		M	5	42.6 (6.6)	
VJ (cm)	K2	F	6	33.7 (4.0)	0.1822
		M	9	39.5 (9.5)	
	FIS	F	4	40.4 (4.6)	0.0604†
		M	4	52.1 (9.1)	
Combined GS (cm)	K2	F	6	52.6 (7.8)	0.1650
		M	9	66.3 (21.7)	
	FIS	F	4	70.3 (19.6)	0.2226
		M	5	87.0 (17.9)	
Illinois Agility (right, s)	K2	F	6	19.9 (1.0)	0.2128
		M	9	18.7 (2.0)	
	FIS	F	4	18.6 (0.6)	0.0229*
		M	5	17.5 (0.5)	

**p<0.001, *p<0.05, †=trend to significance

Summary

During pre-season measurement of young Alberta Alpine Skiers, sex differences did exist in aerobic capacity and body composition. Further data needs to be collected in these groups across Alberta. This would enable comparison across provinces and to analyze how pre- and post-season measurement scores affect race performance over time.

Conclusion

Future young athlete profiling would benefit from research of a longitudinal nature that tracks the fitness characteristics and body composition for both pre and post season by age, gender, province, and age class category. This information would shed light on body composition changes as skiers move through the levels of racing and whether these body composition changes contribute to success in an alpine discipline over time.

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