ANTHROPOMETRIC VARIABLES, AEROBIC FITNESS AND REACTION TIME IN CLUB LEVEL RUGBY PLAYERS AND TRAINED MEN

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ABSTRACT

Rugby is played in more than 100 countries, and professional rugby leagues exist all over the world. There are fifteen rugby player positions and they each require different skills and physiological demands. However, reaction time differences among these position-specific athletes, as well as differences in anthropometric and aerobic characteristics, are unclear. **PURPOSE:** To compare physiological ability, including anthropometric, VO2 max, and reaction time among different positions in college level rugby players as well as to compare rugby athletes to recreationally trained men. **METHODS:** Thirty-six active males ages 18-35 years, including 19 rugby team players (8 rugby forwards and 11 rugby backs) and 17 trained males participated in this study. Body composition and anthropometry measurements included: height, weight, body fat, and lean muscle mass. Aerobic capacity tests were performed on a calibrated treadmill and data were measured via a metabolic cart. Choice reaction time was measured with an audio-visual reaction time testing device. **RESULTS:** Weight and percent fat were significantly ($p<0.05$) higher for rugby forwards (102.14 ± 13.63kg; 26.06 ± 8.65 %) compared to rugby backs (76.67 ± 11.94kg; 13.45 ± 5.05%) and trained males (80.58 ± 13.39kg; 17.42 ± 5.69%). Absolute VO2 max was also significantly ($p<0.05$) higher in rugby forwards (4.36 ± 0.62 l/min) compared to rugby backs (3.63 ± 0.45 l/min) and trained males (3.69 ± 0.52 l/min). Rugby players had significantly ($p<0.05$) faster reaction times (0.28 ± 0.02 to 1.07 ± 0.09 sec) compared to trained males (0.31 ± 0.03 to 1.10 ± 0.09 sec). **CONCLUSIONS:** Higher body fat, body mass and absolute aerobic capacity appear to benefit club level rugby forwards. Club level rugby players demonstrated faster reaction times compared to trained males. **PRACTICAL APPLICATIONS:** Rugby players appear to have faster reaction time than trained men. Participating in club level rugby may enhance both aerobic performance and reaction time over typical recreational activities. Furthermore, rugby clubs can use this data to recruit athletes based on size and aerobic performance as well as reaction time.

INTRODUCTION

Rugby is a full contact sport and is played from elementary school to professional level in more than one-hundred countries [1]. Rugby players have a high level of physical demands; they need to develop their physiological qualities in aerobic fitness, muscular power, speed, and agility [2]. Studies have shown that the rugby players can perform certain match-play activities during the game, determined by their playing position. For example, forwards are more involved in physical collisions and tackles than backs [3]. Also, it has been shown that forwards require a greater ratio of high-intensity activity and cover greater distances during the game than backs [4]. Previous studies have found that the physiological talent and ability differences among playing positions of youth rugby players [5] and adult players [5-7]. Limited research has been conducted on the sport regarding positional requirements [1]. Prior studies mention talent identification in youth rugby players [5].

METHODS

Table 1. Subjects characteristics

Group	Forward (n=8)	Back (n=11)	Rugby (n=19)	Trained males (n=17)
Age (yrs)	19.75 ± 1.49	20.18 ± 1.54	20 ± 1.49	23.71 ± 2.63
Height (cm)	182.14 ± 8.85	179.87 ± 7.26	180.83 ± 7.81	176.13 ± 5.99
Weight (kg)	102.14 ± 13.63	76.67 ± 11.94	87.39 ± 17.84	80.58 ± 13.39

Body composition & anthropometry :

BOD POD® S/T 2002a; Life Measurement, Inc., CA. BIA InBody 720 (Biospace Co., Ltd.).

BOD POD® S/T 2002a

Aerobic capacity tests

True One 2400; Parvo-Medics, Inc., Provo, UT

Woodway treadmill; USA, Inc., Waukesha, WI

Choice reaction time

Makoto II Arena; Makoto USA, Centennial, CO, USA.

RESULTS

Table 2. Anthropometric, Forward (n=8), Back (n=11), and Trained males (n=17); F = Different from Forwards; B = Different from Backs; R = Different from Rugby; N = Different from Trained males.

Variable	Group	Mean ± SD	Group differences
Weight (kg)	Forward	102.14 ± 13.63	B, N
	Back	76.67 ± 11.94	F
	Rugby	87.39 ± 17.84	
	Trained males	73.87 ± 9.24	F
BODPOD Percent Fat (%)	Forward	26.06 ± 8.65	B, N
	Back	13.45 ± 5.05	F
	Rugby	18.76 ± 9.17	
	Trained males	17.42 ± 5.69	F
BODPOD Fat free Mass (kg)	Forward	74.86 ± 7.96	B, N
	Back	65.98 ± 7.69	F
	Rugby	69.72 ± 8.82	
	Trained males	63.04 ± 6.29	F
BIA Percent Fat (%)	Forward	25.95 ± 8.44	B, N
	Back	12.65 ± 5.24	F
	Rugby	18.25 ± 9.41	
	Trained males	12.80 ± 4.94	F
BIA Fat free Mass (kg)	Forward	74.96 ± 7.12	N
	Back	68.35 ± 6.49	
	Rugby	71.13 ± 7.37	
	Trained males	64.89 ± 8.69	F
BIA Visceral Fat Area (cm^2)	Forward	125.8 ± 37.74	B, N
	Back	61.38 ± 25.05	F
	Rugby	88.51 ± 44.39	
	Trained males	60.39 ± 21.53	F

FFM= Fat Free Mass; SMM= Skeletal Muscle Mass; ICW= Intracellular Water; PBF= Percent body fat; Visc Fat= Visceral Body Fat; significant interaction between groups at $p < 0.05$; All data are reported as mean ± standard deviation.

Table 3: VO2 max, Forward (n=8), Back (n=11), and Trained males (n=17 ; F = Different from Forwards; B = Different from Backs; R = Different from Rugby; N = Different from Trained males.

Variable	Group	Mean ± SD	Group differences
VO2Max L min (liters/ min)	Forward	4.36 ± 0.62	B, N
	Back	3.63 ± 0.45	F
	Rugby	3.94 ± 0.63	
	Trained males	3.69 ± 0.52	F
VO2Max ml kg min	Forward	42.90 ± 4.51	B, N
	Back	47.77 ± 2.91	F
	Rugby	45.72 ± 4.33	
	Trained males	49.61 ± 6.65	F
VO2Max MPH VO2max	Forward	8.69 ± 1.09	B, N
	Back	9.52 ± 0.40	F
	Rugby	9.17 ± 0.85	
	Trained males	9.67 ± 0.80	F
Breath VT L/min	Forward	3.32 ± 0.38	B, N
	Back	2.69 ± 0.51	F
	Rugby	2.95 ± 0.55	
	Trained males	2.56 ± 0.66	F
Breath VT Percent (%)	Forward	72.25 ± 5.80	N
	Back	67.09 ± 6.88	
	Rugby	69.26 ± 6.80	
	Trained males	63.86 ± 4.53	F

HR = Heart Rate; VT = ventilatory threshold; significant interaction between groups at $p < 0.05$; All data are reported as mean ± standard deviation.

Table 4: Choice reaction time, Forward (n=8), Back (n=11), and Trained males (n=17) ; F = Different from Forwards; B = Different from Backs; R = Different from Rugby; N = Different from Trained males.

Variable	Group	Mean±SD	Group differences
Visual RT	Forward	0.92 ± 0.06	
	Back	0.84 ± 0.07	N
	Rugby	0.88 ± 0.08	N
	Trained males	1.04 ± 0.27	B, R
Audio RT	Forward	0.93 ± 0.08	
	Back	0.84 ± 0.08	N
	Rugby	0.88 ± 0.09	
	Trained males	0.96 ± 0.14	B
One Tower Fifteen RT	Forward	0.55 ± 0.05	
	Back	0.50 ± 0.04	N
	Rugby	0.52 ± 0.05	
	Trained males	0.56 ± 0.05	B,
Two Tower Fifteen RT	Forward	0.85 ± 0.09	
	Back	0.84 ± 0.09	N
	Rugby	0.84 ± 0.08	N
	Trained males	0.92 ± 0.09	B, R
Three Tower Fifteen RT	Forward	1.06 ± 0.08	
	Back	1.01 ± 0.08	N
	Rugby	1.03 ± 0.08	
	Trained males	1.11 ± 0.07	B
Two Tower Thirty RT	Forward	0.85 ± 0.06	
	Back	0.82 ± 0.10	N
	Rugby	0.83 ± 0.09	N
	Trained males	0.94 ± 0.11	B, R
Three Tower Thirty RT	Forward	1.07 ± 0.09	
	Back	1.02 ± 0.09	N
	Rugby	1.04 ± 0.09	N
	Trained males	1.14 ± 0.11	B, R

RT= Reaction Time; significant interaction between groups at $p < 0.05$; All data are reported as mean ± standard deviation.

CONCLUSIONS

Higher body fat, body mass and absolute aerobic capacity appear to benefit club level rugby forwards. Club level rugby players demonstrated faster reaction times compared to trained males.

PRACTICAL APPLICATIONS

Rugby players appear to have faster reaction time than trained men. Participating in club level rugby may enhance both aerobic performance and reaction time over typical recreational activities. Furthermore, rugby clubs can use this data to recruit athletes based on size and aerobic performance as well as reaction time.

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