

# ANTHROPOMETRIC FEATURES OF UKRAINIAN NATIONAL WOMEN'S TEAM IN BIATHLON

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**Introduction.** One of the factors determining skills of athletes in certain sport is body build features. In different kinds of sport body build indices have certain correlations with sport results. Specific of sport influences the sportsmen body build features [2]. Studying morphologic features of the rank sportsmen gives morphologic portrait of athlete in the certain sport and provides coaches and physical culture specialists with necessary somatic selection criteria for the certain sport [7]. But modern sport and mass physical culture require more and more methods of studies concerning prediction of sport results [6] Therefore, in our work we searched for morphological parameters, obtained by direct measurement and calculated from them, to improve the results of biathlon athletes. The method of correlation analysis is often applied that gives possibility to determine degree of influence between tested parameters [5].

**Purpose of research** is to determine correlations between body weight, height and somatic indices in rank sportsmanship group and basic group of physical culture.

**Object and methods of research.** Object of the research was 15 women. The first group consisted of 5 sportswomen (18-23 years old) members of the Ukraine women's national team in biathlon. It includes Master of Sport of International Class, European champions, World Cup winners. The second group consisted of 10 students (18-23 years old) of basic group physical culture from Sumy State University. The researches were made at the training camp at Sumy State University.

Anthropometric study was made according to V.V.Bunak schemes [1] applying some modifications of P.P.Shaparenko. [4]

Statistical analysis of the results was carried out using the program Excel [3] The reliability of data differences was assessed using Student's test, considered accurate probability of error less than 5% ( $p \leq 0,05$ ).

Close correlations between studied parameters were indicated by following scale V.M.Zatsiorsky, Sport Metrology, 1982 [8]:  $r=0,09-0,19$  shows very weak correlation; при  $r= 0,2-0,49$  – weak correlation;  $r=0,5-0,69$  average correlation;  $r=0,7-0,99$ - strong.

## Results of research and their discussion

As it follows from the results of research the sportsmen body length in the second group is larger if to compare with the first group at 0,73% ( $p<0,05$ ).

The length of body frame in the first group is larger if to compare with the first group at: 0,78% ( $p<0,05$ ), the lower segment of the body - 0,97 % ( $p<0,05$ ), wrist length - 0,51% ( $p<0,05$ ), hip length- 1,33% ( $p<0,05$ ), foot length- 0,89 ,( $p<0,05$ ), shoulder breadth – 2,21% ( $p<0,05$ ), wrist breadth- 2,23 ( $p<0,05$ ), diameter of the hip distal epiphysis 2,41% ( $p>0,05$ ), Transverse diameter of the shin distal epiphysis 1,37 ( $p<0,05$ ), foot breadth - 0,44% ( $p<0,05$ ), body weight - 0,17% ( $p<0,05$ ) (Table 1).

Table 1

Body build parameters of archery university team and comparison group

Somatic Characteristics	Statistic Indices			
		Min-Max	M±m	σ
Weight	Sportsmen	55-66	59,6±2,21	4,882622
	Students	49,25-79	59,04±3,31	7,752477
Height	Sportsmen	160,4-174,2	165,12±2,45	5,04119
	Students	158,1-174,4	167,16±2,46	5,066991
Length of body frame	Sportsmen	88,2-91,1	89,12±0,22	1,0245
	Students	84,2-92,6	88,36±0,35	2,749618
Lower segment of body	Sportsmen	80,7-98,4	87,42±3,1	6,837368
	Students	73,6-89,8	84,78±2,95	4,285277
Length of wrist	Sportsmen	16,24-17,5	16,856±0,22	0,453105
	Students	14,32-17,09	16,197±0,31	0,860698
Length of hip	Sportsmen	35 -44,8	38,56±1,53	3,631859
	Students	27,9-39,7	36,31±1,49	3,104014
Length of foot	Sportsmen	23,61 -25,5	24,386±0,3	0,901701
	Students	22,4 -24,87	23,941±0,31	0,91209
Breadth of shoulder	Sportsmen	5,87-6,45	6,05±0,22	0,293394
	Students	5,02-6,27	5,744±0,29	0,412794
Breadth of forearm	Sportsmen	5,21-5,575	5,398±0,1	0,155068
	Students	4,77-5,24	5,041±0,05	0,153196
Breadth of wrist	Sportsmen	6,93-8,93	8,168±0,09	0,781643
	Students	6,82-7,86	7,349±0,2	0,425357
Hip epiphysis	Sportsmen	8,95-9,63	9,274±0,1	0,291314
	Students	8,14-9,71	8,8695±0,2	0,478991
Shin epiphysis	Sportsmen	6,17 -7,75	6,716±0,24	0,541465
	Students	5,51-6,74	6,3863±0,15	0,32096
Breadth of foot	Sportsmen	7,62 -9,545	8,685±0,32	0,619459
	Students	7,95-9,59	8,558±0,24	0,44808

Studying correlations of body weight with anthropometric indices it was determined strong statistic correlations in the first group with: body length - ( $r = 0,7568$ ), upper segment of the body ( $r = 0,811$ ), length of forearm ( $r = 0,902$ ), circumference of shoulder in quiet position ( $r = 0,866$ ), circumference of shoulder in tension position ( $r = 0,72$ ), buttock circumference ( $r = 0,701$ ), circumference of hip ( $r = 0,701$ ), circumference of shin ( $r = 0,831$ ).

Negative correlation is found with breadth of forearm ( $r = -0,946$ ), breadth of foot ( $r = -0,710$ ), right hand dynamometry ( $r = -0,795$ ).

Average correlation is determined with: lower segment of the body ( $r = 0,58$ ), total length of upper extremity segments ( $r = 0,69$ ), length of hip ( $r = 0,687$ ), length of shin ( $r = 0,517$ ), hip distal epiphysis ( $r = 0,552$ ), circumference of shin in narrow part ( $r = 5,545$ ), forearm ( $r = 0,655$ ), left hand dynamometry ( $r = 0,640$ ).

It must be admitted that with weak statistic correlations body weight correlate with shoulder length ( $r = 0,43$ ), foot length ( $r = 0,210$ ), distal epiphysis of shin ( $r = 0,2860$ ). Negative correlation is observed with circumference of foot стопи ( $r = -0,427$ ), middle segment of body ( $r = -0,216$ ), shoulder length ( $r = -0,252$ ).

Studying the correlations between body height and anthropometric indices it was determined strong statistic correlations in the first group: with body length ( $r=0,765$ ), upper segment of body ( $r=0,9509$ ), lower segment of body ( $r=0,949$ ), length of forearm ( $r=0,958$ ), total length of upper extremity segments ( $r=0,9669$ ), , length of hip ( $r=0,9877$ ), length of shin ( $r=0,8876$ ), foot length ( $r=0,7371$ ), shin distal epiphysis ( $r=0,750$ ), left hand dynamometry( $r=0,823$ ). Negative correlation is observed with forearm breadth ( $r=-0,780$ ), right hand dynamometry ( $r=-0,7064$ ).

Negative average correlation is found in the first group between height and middle segment of body ( $r=-0,6684$ ).

Weak correlation is observed between height and: shoulder length ( $r=0,4365$ ), wrist length ( $r=0,476$ ), hip distal epiphysis ( $r=0,4275$ ), shoulder circumference ( $r=0,3479$ ), buttock circumference ( $r=0,2898$ ) hip circumference ( $r=0,2554$ ), shin circumference ( $r=0,4055$ ), foot circumference ( $r=0,2648$ ).

In the second group it is observed strong statistic correlations between body weight and: foot breadth ( $r=0,8377$ ), circumference of shoulder in quiet position( $r=0,888$ ), circumference of shoulder in tension position ( $r=0,890$ ), buttock circumference ( $r=0,7772$ ), circumference of hip ( $r=0,8133$ ), circumference of shin ( $r=0,80850$ ), forearm circumference ( $r=0,8299$ ).

Average correlations are found with shoulder breadth ( $r=0,5254$ ), hip distal epiphysis ( $r=0,6425$ ), left hand dynamometry ( $r=0,540$ ). Negative correlation is observed with shoulder length ( $r=-0,564$ ).

Weak correlations are found with total length of upper extremity segments ( $r=0,2654$ ), length of body frame ( $r=0,412$ ), middle segment of body, hip length ( $r=0,308$ ), shin length ( $r=0,2976$ ), wrist breadth ( $r=0,3831$ ), shin breadth ( $r=0,3218$ ), circumference of shin in narrow part ( $r=0,3951$ ). Negative correlation is observed with circumference of foot ( $r=-0,3106$ ).

In the second group it is observed strong statistic correlations between height and body length ( $r=0,7202$ ), lower segment of body ( $r=0,8008$ ), length of wrist ( $r=0,8499$ ), length of hip ( $r=0,7065$ ), total length of upper extremity segments ( $r=0,8160$ ), length of shin ( $r=0,7815$ ), foot length ( $r=0,7372$ ), forearm breadth ( $r=0,78079$ ), wrist breadth ( $r=0,7249$ ). Average correlations are found with upper segment of the body ( $r=0,6518$ ) shoulder breadth ( $r=0,6114$ ), hip distal epiphysis ( $r=0,5823$ ), shin distal epiphysis ( $r=0,6579$ ), circumference of forearm ( $r=0,4783-0,651$ ), foot breadth ( $r=0,5841$ ).

Weak correlations are found with middle segment of body ( $r=0,2740$ ), shoulder length ( $r=0,3339$ ), forearm length ( $r=0,2295$ ), circumference of shin in wide part ( $r=0,2904$ ).

Weak correlations are found with buttock circumference ( $r=-0,2612$ ),

There are no correlations observed in the second group between weight and length of forearm ( $r=0,01$ ), length of wrist ( $r=-0,02$ ). And in the first group there are no correlations between body length and circumference of forearm ( $r=0,017$ ), in the second group circumference of shoulder in quiet position ( $r=0,07$ ), left hand dynamometry ( $r=0,027$ ) (Table 1).

*Table 2*

The correlation indices of weight and height with somatic parameters of sportswomen and students

Somatic Characteristics	Body weight		Body height	
	1	2	1	2
Length of body	0,756798	0,311203	0,756798	0,311203
Length of body frame	0,337448	0,412763	0,765892	0,720298
Upper segment of body	0,811174	-0,21724	0,950975	0,651807
Middle segment of body	-0,21641	0,343248	-0,66847	0,274003
Lower segment of body	0,583748	0,185973	0,949146	0,800849
Length of shoulder	-0,25255	-0,56473	0,436528	0,333978

Length of forearm	0,902161	0,012363	0,958279	0,22952
Length of wrist	-0,14898	0,022356	0,476003	0,849978
Total length of upper extremity segments	0,693774	0,265476	0,966912	0,816037
Length of hip	0,687081	0,308788	0,98776	0,706536
Length of shin	0,517763	0,297695	0,887603	0,781594
Total length of foot	0,210418	0,188095	0,737119	0,737271
Breadth of shoulder	0,223381	0,525437	-0,17065	0,611467
Breadth of forearm	-0,94672	0,196363	-0,78079	0,782925
Breadth of wrist	-0,63588	0,383142	-0,26293	0,724944
Hip epiphysis	0,552315	0,642576	0,427572	0,582347
Shin epiphysis	0,286107	0,321814	0,750388	0,657992
Breadth of foot	-0,71051	0,837782	-0,13062	0,58413
Circumference of shoulder in quiet position	0,866125	0,888197	0,347982	0,072967
Circumference of shoulder in tension position	0,720897	0,890788	0,110167	0,184605
Buttock circumference	0,701247	0,772883	0,289851	-0,26124
Circumference of hip	0,701472	0,813337	0,255498	-0,19705
Circumference of shin in wide part	0,831586	0,8085	0,405514	0,290426
Circumference of shin in narrow part	0,545484	0,395105	0,026054	0,10051
Circumference of foot	-0,42763	-0,31063	0,264807	-0,17015
Circumference of forearm	0,655386	0,829976	0,017853	0,478372
Right hand dynamometry	-0,79529	0,430514	-0,70647	0,121861
Left hand dynamometry	0,640183	0,540422	0,823023	0,02163

**Conclusions.** Many years of trainings and sport specialization as well as sports selection specify certain requirements for a sportsmen body build. Special features of biathlon sportswomen are large sizes of diameter of shoulder, hip, shin that show strong musculature as well as larger length of forearm, hip, wrist breadth, body length and lower segment of body. There also observed that indices of body length are lower than in control group.

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