BODY STRUCTURE AND COMPOSITION OF CANOEISTS AND KAYAKERS: ANALYSIS OF JUNIOR AND TEENAGE POLISH NATIONAL CANOEING TEAM

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ABSTRACT: The somatic build, biological age, general state of health, mental predisposition and physical fitness are the criteria for selection of individuals in competitive sport. The present study aims to analyze the differences in body structure and composition of canoeists and kayakers and derive conclusions regarding the criteria for selection of individuals in competitive sport. The research was conducted on a group of 32 men aged between 17 and 22: 16 kayakers and 16 Canadian canoeists of the junior and teenage Polish national canoeing team. Body composition was examined by means of bioelectrical segmental impedance. Body build type was determined using the anthropometric Heath-Carter method. Statistical analysis was performed using the Welch t-test. The examination of morphological features reveals significant differences in the studied parameters between the canoeists and kayakers. There are also significant differences between competitors of the Sydney 2000 Olympic Games and the studied group. We found that competitive kayakers should be taller than canoeists. The lower part of the body in kayakers is more developed than in canoeists and canoeists are more dehydrated than kayakers.

KEY WORDS: somatotype, body composition, kayakers, canoeists, canoeing.
Results and Discussion

The statistical analysis of the basic morphological features (Table 1) such as body height (BH), body mass (BM), and body mass index (BMI) reveals the following results. There are statistically significant differences between C and K and C and SP with respect to BH. The analysis of BM shows statistically significant differences between C and SP and K and SP. No statistical difference is observed between C and K. Statistically significant differences are observed between C and K and K and SP when analysing BMI.

The analysis of Table 1 makes it clear that kayakers in the Polish national team and participants of the Olympic Games are on average 8 centimetres taller than canoeists. It also shows that BM of junior competitors is significantly lower than observed for Olympic paddlers and that BMI of canoeists is of the same order as SP. The results of biotype analysis (Table 2) exhibit the following statistical differences. There is a clear statistical difference in the endomorph component between C and SP as well as K and SP. In the mesomorphic component statistically significant differences are visible between all the studied groups, and in the ectomorphic component statistically significant differences are observable between C and K and K and SP. Compared with K, the amount of mesomorphic element in C is higher. However, the mesomorphic element in SP is significantly higher than that observed for both C and K. The analysis of differences in the endomorphic element shows the lack of statistically significant differences between C and SP and significant differences between C and K and SP. It is striking that endomorphy is the lowest in the group taking part in the Olympic Games. We also observed specific differences between body composition of C and K (Table 3). There are statistical differences in LBM values of lower segments.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Canoeists (C) (n=16)</th>
<th>Kayakers (K) (n=16)</th>
<th>Sprint paddlers* (SP) (n=50)</th>
<th>Welch t-test result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body height (cm)</td>
<td>176.9 ± 6.9</td>
<td>184.9 ± 5.8</td>
<td>184.9 ± 6.0</td>
<td>*</td>
</tr>
<tr>
<td>Body mass (kg)</td>
<td>75.5 ± 8.0</td>
<td>78.1 ± 4.9</td>
<td>84.8 ± 6.2</td>
<td>x</td>
</tr>
<tr>
<td>Body mass index (kg·m⁻²)</td>
<td>24.1 ± 1.2</td>
<td>22.8 ± 0.9</td>
<td>24.9 ± 2.4</td>
<td>*</td>
</tr>
</tbody>
</table>

Note: * refers to p <0.05 for the t test.
Body structure and composition of canoeists and kayakers

TABLE 2. BODY BUILD TYPES IN THE STUDIED SPORTSMEN ACCORDING TO HEATH-CARTER METHOD

<table>
<thead>
<tr>
<th>Feature</th>
<th>Canoeists (C) (n=16) mean ± SD</th>
<th>Kayakers (K) (n=16) mean ± SD</th>
<th>Sprint paddlers* (SP) (n=50) mean ± SD</th>
<th>Welch t-test result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Endomorphy 2.7 ± 0.6</td>
<td>Mesomorphy 4.7 ± 0.5</td>
<td>Ectomorphy 2.2 ± 0.5</td>
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<td></td>
<td></td>
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<td></td>
<td>C/K</td>
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<td></td>
<td>C/SP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>K/SP</td>
</tr>
</tbody>
</table>

Note: *- refers to literature derived data, x refers to p < 0.05 for the Welch t test

DISCUSSION

The national team requires from sportsmen a high level of professionalism in respect of a given discipline. Satisfactory results in the international arena can be achieved only by individuals with a specific somatic and mental model. The fact that somatic structure is genetically conditioned can be used as a prognostic parameter [13, 14], indicating the chance for the desired further development of a subject. Research conducted on canoeists [15] and kayakers [12,16] contributed to the scientific definition of the required somatic model. The previous studies showed that canoeists are characterised by very strong skeletal build, tallness, large body mass, long upper limbs, muscularity of the chest and upper limbs and athletic build [17,18], having at the same time narrow hips and slim lower limbs [19]. Other experimental data [19,20] indicate that the best results are achieved by individuals who are 180-190 cm tall. The subjects analysed in the present study fulfil the desired characteristics. The mesomorphic element in both C and K of the Polish junior national team is significantly lower and the endomorphic element is significantly higher than that observed for competitors of the Sydney 2002 Olympic Games. The data indicate that both K and C are inferior to the Sydney competitors. The presented study also indicates that with a small percentage of fatty tissue, both kayakers and canoeists are characterised by high values of LBM and protein mass. This phenomenon is caused by the fact that training in both groups is aimed at improving strength and speed, which favours hypertrophy of muscle tissue [21]. A segmental analysis of body composition enables us to observe the differences between the upper and the lower parts of the body. With similar musculature of the upper limbs and trunk, kayakers are characterised by larger lean body mass in the lower limbs. This can be explained by the fact that there is a dependency between muscular work of the lower limbs and the frequency of paddle strikes. The present study also indicates adequacy of BMI and biotype for the prediction and analysis of fitness level prior to competition.

CONCLUSIONS

The study allowed us to draw the following conclusions: Competitive kayakers are and should be significantly taller than canoeists. Junior canoeists have a greater proportion of mesomorphic element and a smaller proportion of ectomorphic element than kayakers. Both groups are characterised by a similar proportion of endomorphic element. The lower part of the body in kayakers is more developed than in canoeists. The two groups differ in body composition. Canoeists were more dehydrated than kayakers. The differences between somatic parameters of juniors and Olympic Games competitors may be the result of age and fitness level.
REFERENCES


2. Origin Atos. [Internet]; [place unknown]; [cited 2008]; Available from: iyrnpjcjj.


