Original Article

Selection of girls for canoe slalom on the basis of morphological and functional indicators during puberty

DARYA OKUN[1], MARYNA KOROLOVA[2], SVETLANA STADNIK[3], VLADYSLAV ROZHKOV[4],
KATERYNA MULYK[5], TETIANA GRYNOVA[6], YULIYA KALMYKOVA[7], ANASTASIIA BONDAR[8],
IRYNA PETRENKO[9]
[1,2,3,4,5,6,7,8,9]Kharkiv State Academy of Physical Culture, Kharkiv, UKRAINE

Abstract:
The article presents the compliance of anthropometric indicators of athletes specializing in canoe slalom. The problem of orientation and selection has long since become an independent science. Predicting the possibilities of a child or adolescent, the coach sets himself the task of a reasonable search for talented individuals with the hope of successful, in the future a narrow specialization. The problem of improving sports orientation has now found great support from specialists of various profiles both in our country and abroad. Despite the abundant data available, the problem of selection and orientation of the most talented people as an independent direction is in the stage of constant search, improvement and further development.An anthropometric survey of girls aged 9–12 years old, who go in for rowing and canoeing, was carried out. The survey of girls aged 9-12 years old, who engaged in canoe slalom, allowed to form a kind of rower model based on anthropometric indicators.The age-related dynamics of the development of morphological and functional indicators of girls during puberty was revealed. Informative criteria for assessing young female athletes in the selection for canoe slalom are proposed.As an informative criterion for assessing young athletes in the selection in canoe slalom, it is advisable to use Popescu tests, which allow to determine the main parameters of a person. These include body length, torso and arm length, arm span, as well as for kayakers (sitting body length with arms outstretched,) and for canoeists (kneeling body length with arms outstretched).For canoe slalom, should select young athletes of taller stature and with a longer body (excess height is provided due to the length of the body).When selecting, you can also use relative indicators of morphological development: female kayakers should have a greater ratio of body length to the length of the upper and lower extremities, canoeists should have a greater ratio of arm length to body length and leg length to body length.It was found that the majority of the surveyed girls aged 9–12 years old belonged to the average (44.1%) and above average (50%) levels of morphological development.
Keywords: stature, training process, female athletes, rowing

Introduction
        The modern level of sports achievements requires the organization of purposeful training, the search for more and more effective organizational forms, means and methods of educational and training work, the selection of gifted boys and girls to replenish the ranks of young qualified athletesBonetti, D.L., & Hopkins, W.G. (2010), Darya Okun et al (2020),Ferrari, H. G., Messias, L. H. D., Reis, I. G. M., Gobatto, C. A., Sousa, F. A. B., Serra, C. C. S., &Manchado-Gobatto, F. B. (2017), Okun D.(2016).
        The purpose of sports activities is to achieve the best possible results for a particular individual. The growth of indicators in most sports, including rowing slalom, requires further search for reliable ways and means of assessing the individual capabilities of athletes The level of results in modern sports is so high that in order to achieve them, an athlete needs to have rare morphological data, a unique combination of a complex of physical and mental abilities at an extremely high level of development Harwood, C.G., &Knight, C.J. (2015).Such a combination, even with the most favorable construction of long-term training and the presence of all the necessary conditions, is very rare. Therefore, one of the central systems of training highly qualified athletes is the problem of sports selection of athletes Ferrari, H. G., Messias, L. H. D., Reis, I. G. M., Gobatto, C. A., Sousa, F. A. B., Serra, C. C. S., &Manchado-Gobatto, F. B. (2017), Macdermid, P. W., and Fink, P. W. (2017)Holt, N.L. et al (2019), Hunter, A. (2009), Mark A. Slavich, Brendan Dwyer, Lisa Rufer. (2018), RAKOVAC, M. et al (2011), Serra, C.S., &Gobatto, F. (2015).
        Among the indicators that determine the success of the performance in canoe slalom, one of the main places is occupied by the indicators of physique, which are taken into account in sports selection at different stages of long-term training. Indicators such as total body size, its proportions, physique features, significantly

Corresponding Author: DARYA OKUN, E-mail: dariaokun@gmail.com

----

affect physical performance, competitive activity, the choice of sports specialization. They have a high hereditary condition, which, along with taking into account psychological, physiological, biochemical factors, makes it possible to determine the prospects of athletesBílý, M., Süss, V., &Buchtel, M. (2010), Vedat, A. (2012), Rakovac, M. et all (2011), Messias, L. H.et al (2015), Macdermid, P. W., and Fink, P. W. (2017)Bílý, M., Baláš, J., Andrew, J. M., Darryl, J. C., Coufalová, K., &Süss V. (2010),Messias, L. H., Ferrari, H. G., Reis, I. G., Scariot, P. P., and Manchado-Gobatto, F. B. (2015), Messias, L. H.et al (2015), Harwood,C.G., &Knight, C.J. (2015), S. Yoshikawa et al., (2017).

In modern conditions of sports of the highest achievements, it is of particular importance to identify the most gifted, promising athletes, since record achievements are characteristic of athletes who have the most optimal indicators characteristic of this sport Hunter, A., Cochrane, J. &Sachlikidis, A. (2007), J. Hudson, J. R. Males, J. H. Kerr. (2019).

Purpose of the studyconsisted in certain leading morphological indicators in the structure of the training of young canoe slalom athletes.

Material & methods.

The study involved girls aged 9-12 years involved in canoe slalomand going in for sports for 1-2 years. A total of 118 young female athletes were examined.Studies were conducted at training facilities in the cities of Kharkov, Kiev and Nikolaevfrom 2016 to 2019.All studied athletes had admission to sports, the study was carried out at the beginning of the preparatory period.The research related to human use has been complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki.

The survey included anthropometric measurements of total, longitudinal, partial body dimensions (Popescu tests) and analysis of the components of body mass composition Ackland, T. R., Ong, K. B., Kerr, D. A., & Ridge, B. R. (2003).

Measurement of the longitudinal dimensions of the body was carried out with a Martin anthropometer according to the generally accepted method Akca, F., &Muniroglu, S. (2008). Body weight was determined using a medical scale with a division of 50 g. Popescu tests include the measurement of arm span (cm), the length of the body sitting with the arms upward (cm), the length of the body, kneeling with arms extended upward (cm) and the length of the trunk sitting up to the 7th cervical vertebra (cm). The wrist dynamometry of the strongest arm was also measured with a wrist dynamometer (kg) and vital capacity with a spirometer (ml).

Results and its discussion. When solving the primary task - the selection of the most promising athletes for rowing slalom from among those who are not involved in the assessment of the predisposition to engage in this sport, as well as the most promising athletes involved, it is necessary first of all to take into account stable indicators: body length (cm), length arms (cm), arm span (cm), body length with arms extended upwards, sitting (cm), body length, kneeling with arms extended upward (cm) and body length up to the 7th cervical vertebra (cm) Sigmund, M., et all (2016).

The indicators reflecting the differences in morphological and functional indicators among 9-year-old girls who engaged in canoe slalom are presented in Table 1.

Table 1

Main morphological and functional indicators of 9-year-old girls

№ i/o	Morphofunctional indicators	Girls kayak (n=18)		Girls, canoe (n=14)	
		$\overline{X} \pm \square$	Min–max	$\overline{X} \pm \square$	Min–max
1	Body length, cm	133,94±9,42	127,3-138,2	131,82±6,94	125,4-137,5
2	Body weight, kg	32,18±2,94	25,6-36,7	31,83±2,36	24,3-36,1
3	Arm length, cm	62,29±4,84	54,2-69,4	61,81±1,57	52,8-68,4
4	Arm span, cm	134,68±5,12	127,5-140,8	134,45±4,36	126,8-141,2
5	Sitting body length with arms outstretched, cm	111,05±4,02	105,8-117,5	-	-
6	Kneeling body length with arms outstretched, cm	-	-	127,74±3,94	121,3-135,4
7	Body length up to the 7th cervical vertebra, sitting, cm	40,78±1,92	35,8-46,8	39,75±3,23	34,9-47,2
8	Fat mass,%	11,75±1,85*	9,7-14,1	18,91±2,43*	12,5-23,3
9	Muscle mass, %	42,37±9,16*	38,6-46,5	37,72±6,49*	33,7-42,9
10	VC, ml	1762,63±0,31	1400-1800	1509,28±0,45	1350-1720
11	Hand dynamometry, kg	4,58±1,52	3,5-7,6	5,57±1,83	4,5-8,0

*Remark: t – Student's t test, *– p<0,05.*

The reliability of the differences was noted only in the indicators of relative fat mass) (11.75 ± 1.85 ÷ 18.91 ± 2.43%), the relative fat mass is the highest in female kayakers, The highest indicators of relative muscle mass (42.37 ± 9.16 ÷ 37.72 ± 6.49%) are female kayakers (p <0.05).

According to most indicators, female kayakers had advantages over their peers, female canoeists, but the differences between them are insignificant. In our opinion, this is due to the small sample, the unpopularity of rowing in these age groups. Table 2 presents the data of morphological and functional indicators of girls of 10 years of age, who engaged in canoe slalom.

Analysis of the data of morphological and functional indicators of 10-year-old girls engaged in canoe slalom showed that the greatest indicators in body length (142.87 ± 5.39 cm), arm length (63.18 ± 2.76 cm), arm span (148 , 37 ± 3.17 cm), body length up to the 7th cervical vertebra (48.35 ± 1.94), the differences are insignificant (P> 0.05). In terms of VC (2290.4 ± 0.39 ml), the differences are statistically significant (p <0.05), noted in girls specializing in canoeing. Girls-kayakers have the highest indicators of body mass, muscle mass, hand dynamometry.

Table 2

Main morphological and functional indicators of 10-year-old girls

№ i/o	Morphofunctional indicators	Girls kayak (n=16)		Girls, canoe (n=10)	
		$\overline{X}\pm\square$	Min–max	$\overline{X}\pm\square$	Min–max
1	Body length, cm	141,36±5,53	134,7-149,2	142,87±5,39	135,7-150,1
2	Body weight, kg	37,83±2,45	33,5-42,9	35,49±7,17	32,4-40,2
3	Arm length, cm	62,26±3,66	58,3-66,2	63,18±2,76	57,2-67,2
4	Arm span, cm	146,48±4,24	135,8-150,3	148,37±3,17	140,2-153,5
5	Sitting body length with arms outstretched, cm	110,64±3,73	102,3-117,8	-	-
6	Kneeling body length with arms outstretched, cm	-	-	146,18±3,43	142,8-151,7
7	Body length up to the 7th cervical vertebra, sitting, cm	47,83±2,92	45,3-51,7	48,35±1,94	42,8-53,4
8	Fat mass,%	18,18±2,18	12,8-23,4	19,76±1,27	14,2-23,6
9	Muscle mass, %	43,16±9,57	38,6-47,2	42,94±8,18	38,2-45,2
10	VC, ml	1742,61±0,35*	1530-1970	2290,4±0,39*	1900-2420
11	Hand dynamometry, kg	4,18±2,10	4,0-7,2	3,07±3,22	2,5-5,5

*Remark: t – Student's t test, *– p<0,05.*

The main morphological and functional indicators of 11-year-old girls engaged in canoe slalom are shown in Figure 1.
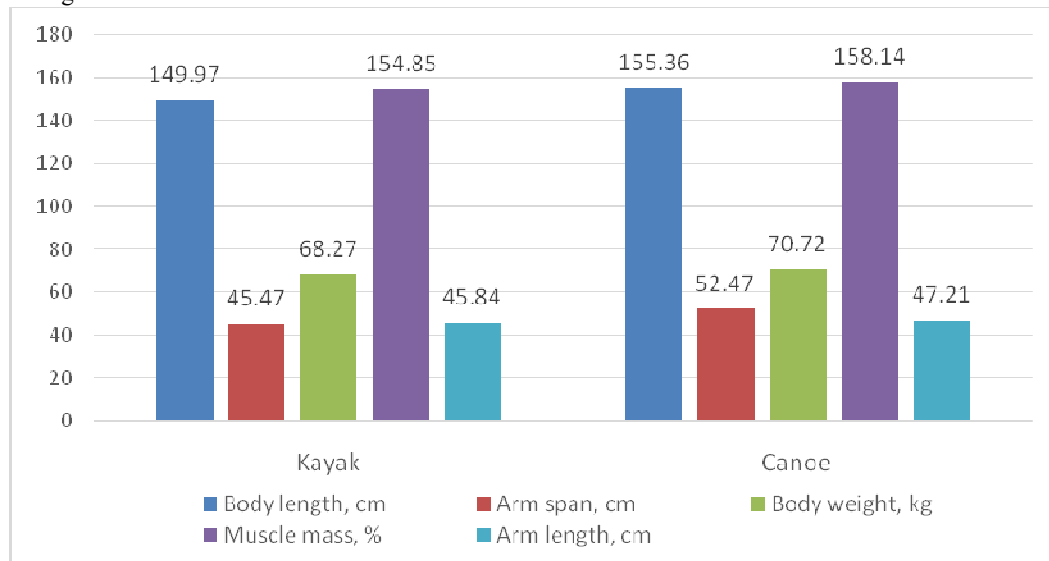

Figure 1. The main morphological and functional indicators of 11-year-old girls engaged in canoe slalom

The analysis showed that female canoeists in body length (155.36 ± 6.47 cm), body weight (52.47 ± 8.65 kg), arm span (158.14 ± 14.39 cm) and vital capacity lungs (2240 ± 356.85 ml) are superior to girls specializing in kayaking. The differences are statistically significant (p <0.05).

For all other morphological and functional indicators, female canoeists had advantages over their peers, kayakers, but the differences between them were insignificant (p> 0.05).

In fig. 2. The data of the main morphological and functional indicators of 12-year-old girls, who engaged in canoe slalom, are presented.
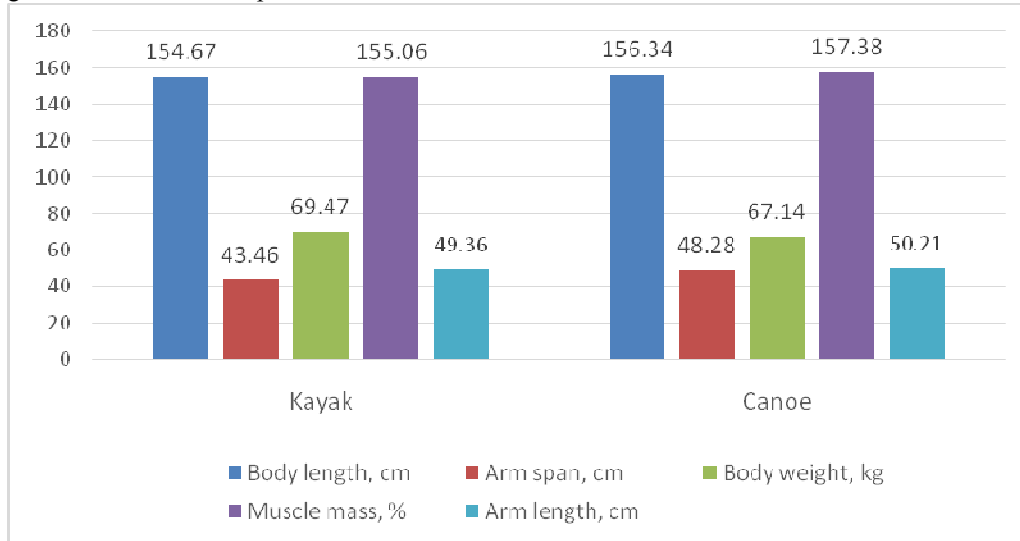

Figure 2. The main morphological and functional indicators of 12-year-old girls engaged in canoe slalom

When comparing the indicators of morphological and functional examination, it was found that the greatest values of length (156.34 ± 6.89 cm) and body weight (48.58 ± 5.38 kg) were observed in female canoeists, however, the differences were significant only in body weight (p <0.05). Partial predominance of female kayakers in arm length (69.47 ± 2.86 cm), fat mass (12.39 ± 4.81%) and lung capacity (2481 ± 263.88 ml) over girls specialized in canoe was revealed. Differences are significantly significant in terms of VC (p<0,05).

In terms of other indicators (arm span, body length up to the 7th cervical vertebra, sitting on the floor, muscle mass and hand dynamometry), girls-canoeists have a slight advantage over girls-kayakers. Differences are not statistically significant (p>0,05).

The assessment of the morphological and functional development of rowers was carried out using special scales for assessing the morphological and functional fitness of girls aged 9–12 years to rowing according to V.Yu. Davydova et al. [1]. The final assessment of the morphofunctional state was calculated as the average score from the sum of assessments for all signs of the scale.

The distribution of girls-rowers 9–12 years old by morphological development is shown in Figure 3.
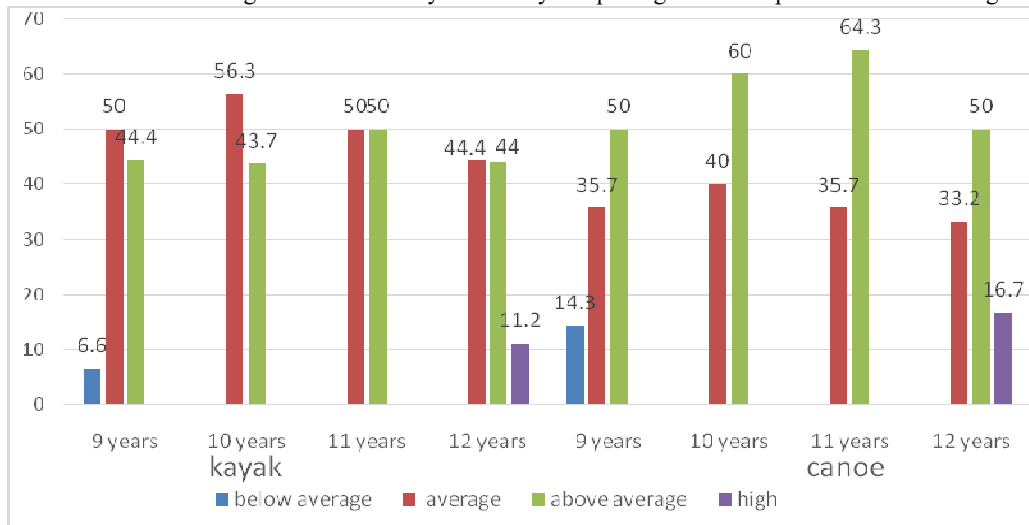

Figure 3Indicators of morphological development of girls 9-12 years old, specializing in canoe slalom (%)

Among girls kayakers 9 years old, 5.6% belong to below average, 50% - to average and 44.4% - to above average morphological and functional development. Among girls 10 years old, who go in for kayaking, 56.3% belong to the average and 43.7% to the above average morphological and functional development.

Among young female kayakers, 11 years old, 50% belong to the average and 50% to the above averagemorphological and functional development.

Among female kayakers 12 years old, 44.4% belong to the average, 44.4% - to the above average and 11.2% - to the high morphological and functional development.

Among female canoeists 9 years old, 14.3% belong to below average, 35.7% - to average and 50% - to above average morphological and functional development.

Among girls 10 years old, canoeing, 40% are of average and 60% of above average morphological and functional development.

Among girls-canoeists 11 years old, 35.7% belong to the average and 64.3% to the above average morphological and functional development.

Among young female canoeists 12 years old, 33.3% belong to the average, 50% to the above average and 16.7% to the high morphological and functional development.

In general, 2.5% of all surveyed girls belong to below average, 44.1% - to average, 50% - to above average, and 3.4% - to high morphological and functional development.

The assessment of the biological age level of young athletes was carried out according to N.T. Belyakova and T.S. Timakova [1]. The distribution of girls engaged in canoe slalom, depending on the amount of points of sexual development, is shown in Fig. 4.Most of the surveyed girls belong to the average type of biological development. (61%).
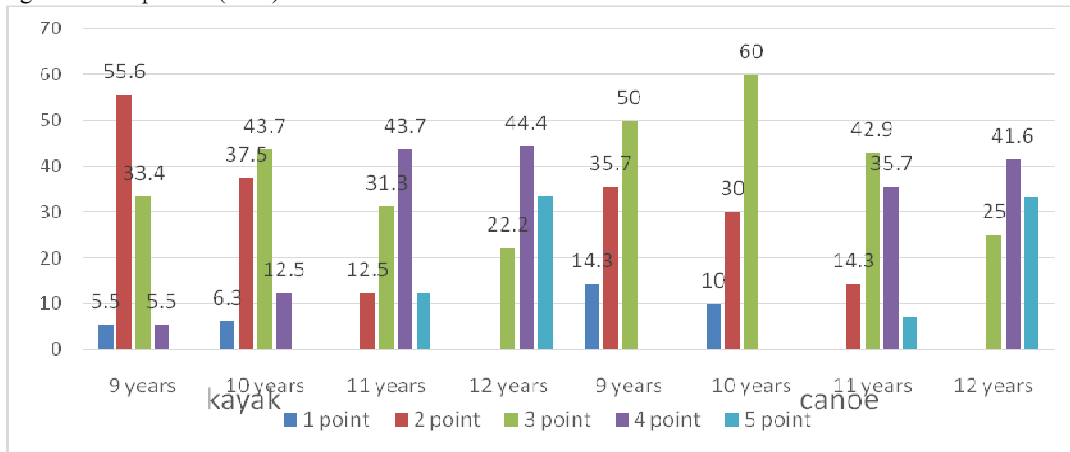

Figure 4.Distribution of girls aged 9-12 years specializing in canoe slalom, depending on the amount of points of sexual development(%)

Thus, it should be noted that canoe slalomathletes are characterized by a special, definite body type, which distinguishes them both from people who do not go in for sports, and from each other, which makes it possible to create morphological models for selection in each of these sports.

Conclusions.

Among the indicators that determine the success of athletes in the Olympic types of rowing sports, one of the main places is occupied by indicators of physique, functional readiness and genetic predisposition. Scientists and sports physicians have long understood that each person has an individual predisposition to successfully perform various types of physical activity and can only succeed in certain sports.

The survey of girls aged 9-12 years old, who engaged in canoe slalom, allowed to form a kind of rower model based on anthropometric indicators.

Revealed the age dynamics of the development of morphological and functional indicators of girls specializing in canoe slalom, 9-12 years old.

As an informative criterion for assessing young athletes in the selection in canoe slalom, it is advisable to use Popescu tests, which allow to determine the main parameters of a person. These include body length, torso and arm length, arm span, as well as for kayakers (sitting body length with arms outstretched,) and for canoeists (kneeling body length with arms outstretched).

For canoe slalom, should select young athletes of taller stature and with a longer body (excess height is provided due to the length of the body).When selecting, you can also use relative indicators of morphological development: female kayakers should have a greater ratio of body length to the length of the upper and lower extremities, canoeists should have a greater ratio of arm length to body length and leg length to body length.

It was found that the majority of the surveyed girls aged 9–12 years old belonged to the average (44.1%) and above average (50%) levels of morphological development.

---3501

JPES ®   www.efsupit.ro

DARYA OKUN, MARYNA KOROLOVA, SVETLANA STADNIK, VLADYSLAV ROZHKOV, KATERYNA MULYK, TETIANA GRYNOVA, YULIYA KALMYKOVA, ANASTASIIA BONDAR, IRYNA PETRENKO

References:

Ackland, T. R., Ong, K. B., Kerr, D. A., & Ridge, B. R. (2003). Morphological characteristics of Olympic sprint canoe and kayak paddlers. Journal of Science and Medicine in Sport, 6(3), 285–294

Akca, F., &Muniroglu, S. (2008). Anthropometric – somatype and strength profiles and on – water performance in Turkish elite kayakers. International Journal of Applied Sports Sciences, 20(1), 22–34.

Bílý, M., Baláš, J., Andrew, J. M., Darryl, J. C., Coufalová, K., &Süss V. (2010). Effect of paddle grip on segmental fluid distribution in elite slalom paddlers. European Journal of Sport Science, 13(3), 185–190

Bílý, M., Süss, V., &Buchtel, M. (2011). Selected somatic factors of white water canoeists. Journal of outdoor activities, 5(2), 30–42.

Bonetti, D.L., & Hopkins, W.G. (2010). Variation in performance times of elite flat-water canoeists from race to race. *International Journal of Sports Physiology and Performance*, 5(2), 210-217.

Darya Okun, Maryna Korolova, Svetlana Stadnik, Vladyslav Rozhkov, LarysaTaran, Maksym Mishyn, Irina Petrenko,Olena Tarasevich Physiological foundations of load modeling in the annual training cycle of highly qualified canoe slalom athletes Journal of Physical Education and Sport® (JPES), Vol.20 (5), Art 365, pp. 2681 - 2685, 2020 online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051

Ferrari, H. G., Messias, L. H. D., Reis, I. G. M., Gobatto, C. A., Sousa, F. A. B., Serra, C. C. S., &Manchado-Gobatto, F. B. (2017). Aerobic Evaluation in Elite Slalom Kayakers Using a Tethered Canoe System: A New Proposal. *International journal of sports physiology and performance*, 12(7), 864–871. United States. https://doi.org/10.1123/ijspp.2016-0272

Harwood, C.G., &Knight, C.J. (2015). Parenting in youth sport: A position paper on parenting expertise. *Psychology of Sport and Exercise*, 16, 24–35. doi: 10.1016/j.psychsport.2014.03.001

Holt, N.L., Tamminen, K.A., Black, D.E., Mandigo, J.L., & Fox, K.R. (2009). Youth sport parenting styles and practices. *Journal of Sport & Exercise Psychology*, 31, 37–59.

Hunter, A. (2009). Canoe slalom boat trajectory while negotiating an upstream gate. *Sports Biomechanics*, 8(2), 105-113.

Hunter, A., Cochrane, J. &Sachlikidis, A. (2007). Canoe slalom -competition analysis reliability. *Sports Biomechanics*, 6(2), 155-170

J. Hudson, J. R. Males, J. H. Kerr. (2019) Introducing a basic psychological performance demand model for sport and organisations. Coaching: An International Journal of Theory, Research and Practice 12:2, pages 147-161.

Macdermid, P. W., and Fink, P. W. (2017). The validation of a paddle power meter for slalom kayaking. *Sports Med. Int. Open* 1, E50–E57. doi: 10.1055/s-0043-100380

Mark A. Slavich, Brendan Dwyer, Lisa Rufer. (2018) An Evolving Experience: An Investigation of the Impact of Sporting Event Factors on Spectator Satisfaction. Journal of Global Sport Management 3:1, pages 79-98.

Messias, L. H. D., dos Reis, I. G. M., Ferrari, H. G., & de Barros Manchado-Gobatto, F. (2014). Physiological, psychological and biomechanical parameters applied in canoe slalom training: a review. *International Journal of Performance Analysis in Sport*, 14 (1), 24–41. Routledge. https://doi.org/10.1080/24748668.2014.11868700

Messias, L. H. D., Sousa, F. A. de B., Dos Reis, I. G. M., Ferrari, H. G., Gobatto, C. A., Serra, C. C. S., Papoti, M., et al. (2018). Novel paddle stroke analysis for elite slalom kayakers: Relationship with force parameters. *PloS one*, 13(2), e0192835. https://doi.org/10.1371/journal.pone.0192835

Messias, L. H., Ferrari, H. G., Reis, I. G., Scariot, P. P., and Manchado-Gobatto, F. B. (2015). Critical velocity and anaerobic paddling capacity determined by different mathematical models and number of predictive trials in canoe slalom. *J. Sports Sci. Med,* 14, 188–193.

Messias, L.H.D, Masselli dos Reis, I.G., Ferrari, H.G. &Manchado-Gobatto, F. (2014) Physiological, psychological and biomechanical parameters applied in canoe slalom training: a review. International Journal of Performance Analysis in Sport, 14, 24-41.

Okun D., Mulyk K. (2017) Investigation of the relationship between the indicators of physical preparedness and the basic technique elements of young water-slalom athletes. Slobozhanskyi herald of science and sport, 2017, No5(61), pp. 69-71

Okun, D. (2016) Comparative analysis of special preparedness young water-slalom. Slobozhanskyi herald of science and sport, 2016, No 1(51), pp. 38-40

RAKOVAC, M., SMOLJANOVIC, T., BOJANIC, I., HANAFIN, JA., HREN, D., THOMAS, P. (2011). Body Size Changes in Elite Junior Rowers: 1997 to 2007. CollegiumAntropologicum. Volume: 35, Issue: 1, Pages: 127 –131. ISSN: 0350-6134. RIDGE, B. R., BROAD, E., KERR, D. A. & ACKLAND, T. R.

3502---

JPES ®   www.efsupit.ro

(2007) Morphological characteristics of Olympic slalom canoe and kayak paddlers. European Journal of Sport Science, 7:2, 107-113, DOI: 10.1080/17461390701478357.

S. Yoshikawa *et al*., (2017) Whitewater Slalom Pseudo Experience Device using 3-DOF Motion Base and VR Goggles, *2017 Conference on Technologies and Applications of Artificial Intelligence (TAAI)*, Taipei, pp. 76-79, doi: 10.1109/TAAI.2017.46.

Serra, C.S., &Gobatto, F. (2015). Relationship between the developed force and strokes frequency in all-out 30 seconds tethered test applied to canoe slalom.

SIGMUND, M., ROZSYPAL, R., KUDLÁČEK, M., KRATOCHVÍL, J., SIGMUNDOVÁ, D. (2016). Influence of one-year sport activities on the changes in morphological parametres and somatotypes in the current junior members of the Czech national whitewater slalom team. Journal of Physical Education and Sport. Volume 16, Issue 1, Article number 20, Pages 118 –124.

VEDAT, A. (2012). Somatotypes of male whitewater canoe athletes of the Turkish National Canoe Team. Educational Research and Reviews. Vol. 7(24), pp. 526-531.

--3503

JPES ®   www.efsupit.ro