Activities in Physical Education and Sport
2016, Vol. 6, No. 1, pp.102-106

STUDY OF THE GENERAL AND SPECIAL VESTIBULAR STABILITY OF PADDLERS, AGE 12 - 18

(Research note)

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Abstract

Effectiveness of motor activity in rowing and canoeing is also determined by the functioning of the vestibular system. In the specialized scientific literature we find studies of the vestibular stability in sport, but few of them are connected with rowing sports. The aim of the study was to determine the level of general and special vestibular stability in young rowers. Contingent of the study were 81 competitors in rowing and canoeing at the age of 12-18 years. 6 test were performed during 30 seconds on force platform: double leg stance with eyes open, double leg stance with eyes closed, single leg stance with eyes open, single leg stance with eyes closed, balanced seat on the rowing (kayak) seat, imitative rowing on the rowing (kayak) seat. The parameters measured were: average deviation of the center of pressure (COP) and the maximal deviation of the center of pressure (COP). The survey provides comprehensive information on the development of general and special vestibular stability of rowers and canoe-kayak paddlers. There was no observed statistical significant differences in test results both age and gender. Finally, we cannot find influence of the level of vestibular stability on the sports performance on water, indicating that these parameters are not a factor in the performance formation.

Keywords: *rowing, canoe-kayak sprint, balance, COP, tests.*

INTRODUCTION

Increasing competition in rowing sports requires a constant search for new and effective means and methods for the training of young athletes. Preservation of dynamic balance on unstable surface is a specific component of physical activity in rowing and canoeing. Maintaining the balance is provided at the expense of constant monitoring and regulation of posture.

Integrated development of strength endurance and vestibular stability requires the inclusion in the training methodology of exercises that are performed on unstable surface (Treneva, 2012). In the specialized scientific literature we find studies of the vestibular stability in sport, but few of them were conducted with young paddlers of rowing and canoeing (Stambolieva, Diafas, Bachev, Christova & Gatev, 2012; Zenenin (Зеленин), 2013).

In this regard, there are a number of open questions as to establish the level of general and special vestibular stability in young paddlers to whose study we focused our creative searches.

The aim of the study was to determine the level of general and special vestibular stability of young paddlers.

METHODS

Object of the present research is the level of general and special vestibular stability.

Contingent of the study are 81 athletes in rowing and canoeing (juniors and girls) aged 12-18 years. In our study we used the following methods: method of literary and informational study; sports testing; methods of variance and correlation analysis of statistical treatment of results and theoretical analysis and synthesis.

To determine the level of vestibular stability was applied test battery that included the following tests:

1. Double leg stance with eyes open;
2. Double leg stance with eyes closed;
3. Single leg stance with eyes open;
4. Single leg stance with eyes closed;
5. Balanced seat on the slide (kayak seat);
6. Imitative rowing on the slide (kayak seat).

Tests were performed on tenzo platform, each of which had duration of 30 seconds. Tests 1 to 4 determine the level of general vestibular stability and tests 5 and 6 determine the level of special vestibular stability. Testing was conducted at the beginning of the preparatory period (September, 2014) of Pancharevo Lake, near Sofia city by students and lecturer from the National Sports Academy "Vassil Levski". Following parameters were measured: average deviation of the center of pressure (COP) and the maximum deviation of the center of pressure (COP).

To discover the age dynamics of parameters of the participants are divided them into three groups:

Group 1: 12-14 years old;
Group 2: 15-16 years old;
Group 3: 17-18 years old.

RESULTS AND DISCUSSION

Basic statistics indicator of the tests are shown on Table 1. Minimal, maximal and mean values are set as well as standard deviation, variation, skewness and kurtosis. On the Table 2, the same results are shown, divided by their gender.

To follow the dynamic of general and special vestibular stability indicators, according to age, we divide the athletes in three group. Table 3 shows their results. To describe the relationships between vestibular stabil-

Table 1. Statistical data from investigation conducted

	Descriptive Statistics, n=81						
	Min	Max	X	S	V	As	Ex
Height	140	192	172,49	10,55	6,12	-0,548	0,057
Weight	29	85	64,09	12,79	19,96	-0,434	-0,474
T1Avg	0,10	2,77	1,02	0,57	55,87	0,919	0,942
T1Max	0,54	10,42	4,87	2,46	50,61	0,122	-0,487
T2Avg	0,11	3,17	1,02	0,52	51,08	1,673	3,943
T2Max	0,24	11,40	4,85	2,27	46,78	0,508	0,061
T3Avg	0,21	8,25	1,94	1,26	65,01	2,895	11,183
T3Max	0,97	35,71	9,50	4,59	48,30	2,221	13,021
T4Avg	1,18	9,90	3,82	2,04	53,35	1,097	1,268
T4Max	3,15	31,71	12,08	5,05	41,84	1,141	3,520
T5Avg	0,27	9,82	0,98	1,08	110,43	7,204	58,854
T5Max	0,85	14,51	4,85	2,78	57,26	0,984	1,081
T6Avg	0,87	6,66	2,64	1,20	45,36	1,180	1,642
T6Max	3,40	34,73	7,88	4,75	60,21	3,293	14,705

Critical values when n=85 and α=0,05, As=0,522, Ex=1,034

Table 2. Comparison between men's and women's results

	Women n=27					Men n=54				
	X	S	V	As	Ex	X	S	V	As	Ex
Height	167,11	7,27	4,35	0,19	-1,08	175,19	10,95	6,25	-1,16	1,41
Weight	59,41	9,68	16,29	0,38	-0,21	66,43	13,57	20,43	-0,87	0,07
T1Avg	0,88	0,54	60,65	1,64	4,67	1,10	0,58	53,12	0,68	0,28
T1Max	4,16	2,13	51,18	-0,04	-0,21	5,22	2,56	49,02	0,05	-0,65
T2Avg	0,87	0,36	41,83	1,96	8,42	1,09	0,57	52,40	1,45	2,82
T2Max	4,11	1,98	48,12	0,58	0,99	5,22	2,33	44,66	0,42	-0,16
T3Avg	1,65	0,60	36,69	0,07	0,07	2,10	1,47	70,34	2,54	7,74
T3Max	8,94	2,87	32,11	-0,78	1,72	9,78	5,26	53,72	2,22	10,86
T4Avg	3,91	2,01	51,46	1,17	0,55	3,77	2,07	54,81	1,10	1,78
T4Max	12,66	5,30	41,84	1,93	5,57	11,79	4,95	42,02	0,71	2,52
T5Avg	0,73	0,38	52,58	1,16	0,67	1,11	1,29	116,12	6,29	42,80
T5Max	4,09	2,43	59,43	0,45	-1,02	5,24	2,88	55,01	1,11	1,23
T6Avg	2,50	0,93	37,15	0,43	0,21	2,71	1,32	48,49	1,21	1,30
T6Max	7,05	3,56	50,48	1,74	3,67	8,30	5,22	62,94	3,39	14,19

Critical values for women, when n=30 and α=0,05, As=0,854, Ex=1,665
Critical values for men, when n=55 and α=0,05, As=0,643, Ex=1,267

Table 3. Comparison between the three groups indicators

	Group 1 n=33			Group 2 n=32			Group 3 n=16		
	X	S	V	x	S	V	X	S	V
Height	165,45	9,89	5,98	176,06	7,96	4,52	179,88	7,73	4,30
Weight	55,30	12,30	22,24	69,22	10,17	14,70	71,94	6,64	9,23
T1Avg	1,00	0,49	49,01	0,85	0,56	65,49	1,42	0,60	42,35
T1Max	4,97	2,55	51,33	4,34	2,41	55,55	5,70	2,26	39,58
T2Avg	0,94	0,38	41,01	0,97	0,48	49,66	1,27	0,75	58,62
T2Max	4,52	2,16	47,86	4,78	2,16	45,29	5,69	2,61	45,88
T3Avg	1,66	0,76	46,03	2,04	1,42	69,42	2,34	1,67	71,36
T3Max	9,50	5,99	63,13	9,38	3,50	37,35	9,74	3,09	31,78
T4Avg	3,20	1,72	53,71	3,97	2,10	52,89	4,80	2,19	45,71
T4Max	10,68	4,07	38,12	12,42	4,73	38,10	14,32	6,67	46,60
T5Avg	0,91	0,40	43,96	1,14	1,70	148,71	0,81	0,27	33,65
T5Max	5,14	2,88	56,07	4,69	2,94	62,72	4,53	2,29	50,54
T6Avg	2,30	0,88	38,12	2,85	1,28	44,80	2,95	1,49	50,35
T6Max	6,57	2,56	38,91	9,00	6,63	73,61	8,42	3,28	39,00

Table 4. Correlations between the different indicator.

	Group	**Height**	**Weight**	**Exp**	**Res**	**T1Avg**	**T1Max**	**T2Avg**	**T2Max**	**T3Avg**	**T3Max**	**T4Avg**	**T4Max**	**T5Avg**	**T5Max**	**T6Avg**	**T6Max**
Group	**1**																
Height	**,551**	**1**															
Weight	**,539**	**,856**	**1**														
Exp	**,521**	**,299**	**,288**	**1**													
Res	**,549**	**,474**	**,544**	**,506**	**1**												
T1Avg	,205	**,296**	,205	**,246**	,036	**1**											
T1Max	,067	,134	,026	-,077	-,072	**,563**	**1**										
T2Avg	,214	,098	,078	-,132	-,067	,216	**,291**	**1**									
T2Max	,179	,147	,039	-,059	-,094	**,332**	**,712**	**,613**	**1**								
T3Avg	,207	,187	,159	-,039	,049	,146	,087	,144	,091	**1**							
T3Max	,014	**,292**	**,301**	,068	-,011	,222	,211	,020	,156	**,280**	**1**						
T4Avg	**,296**	,122	,093	**,245**	,066	,062	,198	,082	**,315**	**,258**	**,238**	**1**					
T4Max	**,271**	,170	,102	**,258**	,074	,163	,127	,076	,218	**,223**	**,264**	**,706**	**1**				
T5Avg	-,007	,082	,141	-,047	,098	,103	-,027	,094	-,051	,102	-,019	-,072	,055	**1**			
T5Max	-,089	,197	,175	-,021	-,106	,066	,004	,061	-,002	,143	,162	,081	**,237**	,110	**1**		
T6Avg	**,227**	**,376**	**,403**	,039	,157	,054	-,013	,108	,056	,023	,197	,144	,216	,143	**,340**	**1**	
T6Max	,182	**,345**	**,395**	,144	,206	,075	,070	,043	,146	-,030	,125	,134	,169	,071	**,317**	**,628**	**1**

Significant values when p≥95% are in bold.

ity, anthropometry and sport performance, we show correlation's analysis on Table 4.

From these results, we obtained data for the level of general and special vestibular stability of the young athletes - rowers and paddlers. But these data are pretty varied. Because of the big differences in age and gender of the investigation contingent, anthropometric data have wide range and deviation. SD for the rest data is smaller but variation index is much bigger. That shows dissimilar and unstable results. During data distributions, we observe right moved asymmetric curve of skewness (As>0) in all cases. Into anthropometric data, we can find opposite tendencies. We tested more men than women (27 women and 54 men), so the curve is with left moved asymmetry because of their bigger body size (height and weight). Most of the skewness indicators are above of the critical values (0,522 for group of 85 persons). That's mean that the empirical data are very asymmetric. The kurtosis indicators show high (Ex>0) and abnormal distribution of the results. They are significant higher than the critical values for this sample (n=85) - 1,034 for α=0,05.

When we divided tested athletes by gender, we observe big differences only in anthropometric results. Even the mean values of the tests used are slightly better in women's group (figure 1). It shows that the women have smaller COP deviation, compare by men.

The same big result's variation was observed during

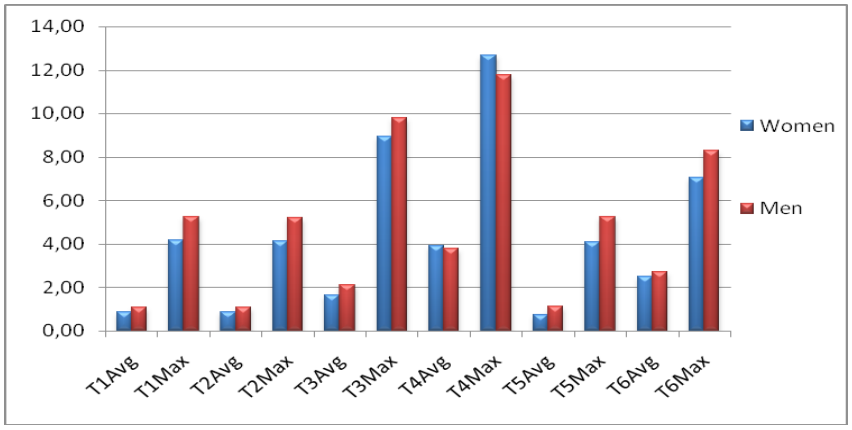

Fig. 1. Comparison of data for balance in women and man

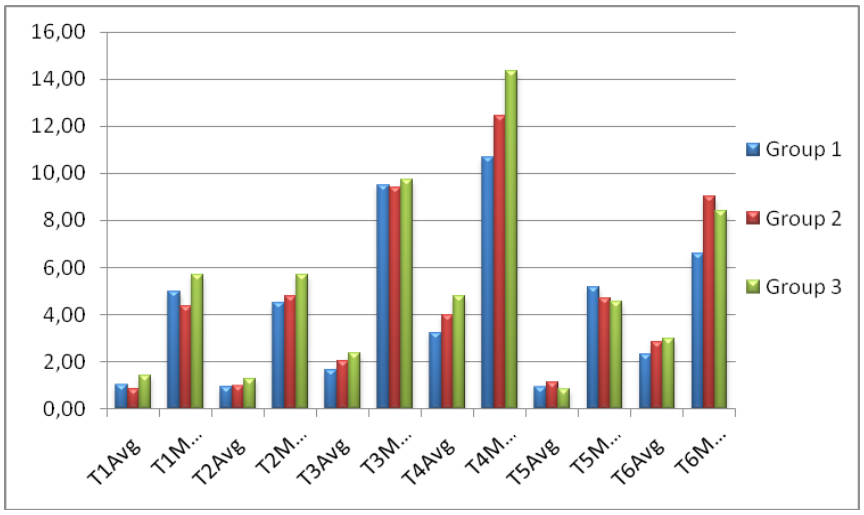

Fig. 2. Compare between vestibular stability indicators in different age groups

group dividing by age (v is from 4,3% up to 148,71% - table 3). Figure 3 shows mean values of the investigated indicators for each age group. This is attempt for understanding the age dynamics of the vestibular stability. The results are a bit surprised, because the mean values of the COP deviation in tests № 2, 3, 4 and 6 show decreasing in vestibular abilities, during age increasing.

During correlation data investigation, we did not found subordinations expected. Only few of the results obtained have statistical reliability, but they also show weak relations. Real dependence we observed only between height and weight and between age group and sports experience. The result received from vestibular stability tests don't correlate between both themselves and other tests.

CONCLUSIONS

Effective training program for children and juniors must take into account the psycho-physical age characteristics of each age range. Some authors (Ricotti, 2011) emphasize that training for balance at a certain age is of great importance for the development of sensor motor abilities, which is important for reaching high sports levels. The survey provides comprehensive information on the development of general and special vestibular stability of young rowers and kayakers. There was no statistical significant difference in test results both age and gender. Finally, we cannot find relations between the level of balance abilities and the sports performance on water. These facts indicate that these parameters are not a factor in the performance formation.

Future Directions: The aim of future investigations should be the problem with the relations missing between vestibular stability indicators and sport performance in water sports. The data obtained don't give us obviously information at this moment. Future investigations should include more athletes from wider age group. New methods and resources for developing of the vestibular stability should be found and approbated.

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