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LEVEL OF PHYSICAL AND PSYCHOMOTOR SKILLS IN CHILDREN PRACTISING CLIMBING IN THEIR EXTRACURRICULAR ACTIVITIES

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Abstract: *Our study examines physical and psychomotor development in 12-13-year-olds engaged in climbing extracurricular activities. 24 children from Brașov and Bacău were evaluated in 2023, by using Pearson correlation coefficients to analyse relationships between indicators. Strong linear correlations were revealed at the somatic development level, at the mental ability level as well as at the level of the motor capacity testing back, abdominal and limb strength. These outcomes can give insights into the integrated development of adolescents engaged in climbing activities.*

Key words: *level, physical development, psychomotor skills, climbing, extracurricular activities.*

1. Introduction

The implementation of enjoyable physical education activities, diversified and appreciated by students, "could be a solution to increase the interest of the young generation in physical activity" [10], which would lead to the improvement of physical, motor and mental capacities. Recently, it is easy to see that fewer and fewer children appear in organised spaces for physical activity. The rapid development of technology has had the negative effect of reducing the amount of movement among young people and, consequently, reducing their motor capacity and health. "Compulsory, extensive and alternative content leads the way to efficient adaptation to material and geographical environmental conditions" [12], while the lack of movement performance negatively influences the improvement of motor control [7], materialised in reduced motor behaviour. The performance of activities based on physical, practical activities "represents the stimulus with the highest value influencing normal morpho-functional development" [14].

Proprioceptive training, i.e. performing movements in different forms, mainly produces the organisation and reorganisation of motor engrams in the cerebral cortex which contributes to the improvement of movement capacity [3], to the increase of well-being and health.

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Exercise-based educational intervention programmes in children and teenagers with developmental motor coordination disorder (DCD) improve motor behaviour with direct effects on emotional and social well-being [20], which is also found in normal children. Direct reality and virtual reality are used in the training process in physical education and sport, which specialists consider to be effective in improving fine coordination [1], when it is well directed and localised. Climbing is a sport with positive effects on physical appearance, motor and mental capacity, and tree climbing improves stamina, body strength, sociability and promotes emotional expression [8]. A study highlighting the level of physical, motor and mental capacity of children practising climbing emphasises the role of climbing exercises in children's development, which justifies the idea that the teacher decides the content to be taught in order to achieve the competences set out in the school curriculum" [9].

2. Material and Methods

The aim of the study is to highlight the level of physical, motor and mental development of children who practise climbing. The aim of the analysis of the results recorded in the assessment tests was to highlight the premises of the research, supported by real arguments, and to verify the confirmation or rejection of the hypothesis that "children aged 12-13 who practise climbing have a level of physical, motor and psychological development that falls within the limits set by the literature".

The level of physical development was assessed by means of 2 measurements (height, weight) and the calculation of the Body Mass Index (BMI); the level of motor development was assessed by means of 6 samples: The level of motor development was assessed by means of 6 tests: trunk and leg raising from dorsal lying and face recumbency, trunk raising from right and left hand hanging, the values of which were compared with those of the National Evaluation System [16], the Stork/Gillet Balance Test [19] and the T Coordination Test (adapted for 12-14 year olds, following Tudor's model, presented for athletes over 19 years old, in 2013) and 2 tests to assess mental development, namely the Test of Focused Attention and the Distributive or Mobile Attention Test.

The data were processed using the 2016 EXCEL programme with SPSS, for Windows 20 (IBM; Chicago, IL). We selected arithmetic mean, median, maximum and minimum values, standard deviation, coefficient of variability and Pearson correlation as indicators for analysis.

3. Results

3.1. Analysis and interpretation of somatic development outcomes

The centralisation and processing of data on somatic development and attention span across six indicators can be found in Table 1.

The mean, which is the ratio between the sum of the individual values and their number, recorded a value of 1.62 m for height, 52 kg for weight and 20.00 for BMI, while the median, which is the index of central tendency, recorded a value of 1.61 cm for height, 52 kg for weight and 20.13 for BMI. However, there were large differences between the maximum and minimum values for height between 1.73

and 1.52 m, for weight between 61 and 45 kg and for BMI between 23.16 and 17.31.

Table 1

Somatic development assessment indicators in 12-13-year-old athletes included in theobservational focus group of males, females and the group as a whole

Statistical indicators	General Data				Attention	
	Age	**Height**	**Weight**	**BMI**	**Focused**	**Distributive**
Average	12.50	1.62	52.00	20.00	251.64	41.36
Median	13	1.61	52	20.13	252	40
V. max.	13	1.73	61	23.16	321	80
V. min	12	1.52	45	17.31	180	25
Standard deviation	0.60	0.06	5.17	1.65	37.86	12.97
Coefficient of variability	4.80	3.70	9.94	8.25	15.04	31.35

The coefficient of variability for age of 4.80, height of 3.70, and weight of 9.94 and BMI of 8.25 also underlines the homogeneity of the group, while the standard deviation for weight and BMI shows a large dispersion.

The high values of the coefficient of variability and the standard deviation are large, which underlines the fact that the group is not homogeneous, which is normal at this age when development is very different.

3.2. Analysis and interpretation of the results of the development of mental capacity

The parameters of mental ability assessed by two tests, the Attention Focus Test and the Attention Span Mobility Test, are shown in Table 1.

In the attention focus test, the arithmetic mean was 251.64, the median was 252, the maximum was 321, the minimum was 180, the standard deviation was 37.86 and the coefficient of variability was 15.04.

In the distribution of attention (mobility) the arithmetic mean was 41.36, the median was 40, the maximum was 80, the minimum was 25, the standard deviation was 12.97 and the coefficient of variability was 31.35.

3.3. Analysis and interpretation of the motor development results

The analysis of the results obtained by the group (M+F) at the level of motor skills assessment shows values that highlight their development (Table 2).

For the abdominal strength test, the arithmetic mean was 30.20 repetitions, the median was 30.5, the maximum was 47 repetitions, the minimum was 15 repetitions (boys), the standard deviation was 8.91 and the coefficient of variability was 29.40.

For back strength, the arithmetic mean was 40.41 repetitions, the median was 37.5, the maximum was 71 repetitions, the minimum was 25 repetitions (boys), the standard deviation was 15.47, and the coefficient of variability was 38.28.

Table2

Indicators of motor development assessment for 12-13-year-old athletes in the group of males, females and the whole group

Statistical indicators	Conditional capacity assessment tests (number of repetitions)					Coordination capacity assessment tests	
	Ab.	Bk.	Lt	Tr.		ST	TT
				R	L		
Average	30.27	40.41	55.00	2.50	1.77	7.95	17.45
Median	30.5	37.5	51.5	2	1	5.5	17
V. max.	47	71	89	9	6	27	22
V. min	15	25	30	0	0	3	16
S	8.91	15.47	20.96	2.32	1.82	6.18	1.77
CV	29.40	38.28	38.10	9.20	10.28	7.77	10.14

Legend: *Ab =abdomen, Bk =back, Lt = tip lifting, Tr = tractions, ST = Stork Balance Test, TT = T Coordination Test*

For lower limb strength assessed by the toe stand test, the results were 55.00 repetitions for the arithmetic mean, 51.1 repetitions for the median, 89 repetitions for the maximum, 30 repetitions for the minimum (girls), 20.96 for the standard deviation and 38.10 for the coefficient of variability.

Upper limb strength assessed by right arm pulls had an arithmetic mean of 2.50 repetitions, a median of 2, a maximum of 9 repetitions, a minimum of zero repetitions, a standard deviation of 2.32 and a coefficient of variability of 9. 20, and for the left arm pull test the arithmetic mean was 1.77 repetitions, the median was 1, the maximum was 6 repetitions, the minimum was 0 repetitions, the standard deviation was 1.82 and the coefficient of variability was 10.28.

The assessment of balance by the stall test showed a mean of 7.95 s, a median of 7.95, a maximum of 27 s, a minimum of 3 s (for boys), a standard deviation of 6.18 and a coefficient of variability of 7.77.

The results of the T-test, which assessed coordination, also showed values of 17.45 for the arithmetic mean, 17.00 for the median, 22 for the maximum value, 8 for the minimum value, 2.67 for the standard deviation and 10.14 for the coefficient of variability.

According to the values of the coefficient of variability, the group falls in the homogeneity score in the right hand pull test with a value of 9.20 and in the breech test with a value of 7.77, in the relative homogeneity score in the T-coordination test with a value of 10.14 and in the left hand pull test with a value of 10.28, in the relative heterogeneity score in the abdominal muscles with a value of 29.40 and in the heterogeneity score in the back strength test with a value of 38.28 and in the toe hold test with a value of 38.10. The standard deviation values also underline the high degree of dispersion in all the tests.

3.4. Determination of the Pearson correlation between the level of motor skills and the level of mental skills

In order to highlight the relationships between the indicators analysed, we calculated the Pearson correlation coefficient, the values of which are shown in Table 4. It can be seen that the results of this coefficient are positive and negative, with values between -1 and +1.

Table 3

Pearson's correlation coefficient of the results of the physical, moral and mental abilities

Correlations													
	A	H	W	BMI	Ab	Bk	Lt	Tr	Tl	ST	TT	FA	DA
A	1												
H	**.006**	1											
W	.139	.712**	1										
BMI	-.212	-.055	.566	1									
Ab	.322	.282	.296	-.354	1								
Bk	.476*	-.018	-.011	-.665*	.721**	1							
Lt	.620**	.003	.119	-.584*	.496*	.804**	1						
Tr	.223	.439*	.372	-.312	.673**	.387	.287	1					
Tl	.066	.254	.237	-.178	.610**	.280	.126	.915**	1				
ST	.394	.462*	.222	-.451	.531*	.389	.454*	.658**	.494*	1			
TT	-.149	.158	.148	.668*	-.098	-.143	-.016	-.069	-.010	-.164	1		
FA	.055	.064	.041	-.298	.155	.112	.220	.292	.366	.229	-.124	1	
DA	-.012	-.058	-.086	-.385	.143	.217	.325	.131	.185	.075	-.146	.838**	1
*. Correlation is significant at the 0.05 level (2-tailed).													
**. Correlation is significant at the 0.01 level (2-tailed).													

Legend: *A- age, H = height, W = weight, BMI = body mass index, Ab = abdomen, Bk = back, Lt = tip lifts, Tr = right arm tractions, Tl = left-arm tractions, ST = Stork Test, TT = T-test, FA = attention focus test, DA = distributive attention test.*

As for the Pearson correlation coefficient data for somatic development, it shows a strong linear correlation between weight and height where r=.712 and between BMI and weight where r=.566 and negative between BMI and age where r= -.212.

In motor development, Pearson correlation coefficient data show a strong linear correlation between back strength and abdominal strength where r=.721 and between tractions and back strength where r=.804, between right arm strength and abdominal strength where r=.673, between right arm strength and left arm strength where r=.915, between right arm strength and Stork Test where r=.658, between BMI and T-test where r=.668 and between distributive attention and focused attention where r=.838.

4. Discussions

Movement in physical education affects the maintenance and support of basic motor development and body coordination (2). The motor skills acquired through climbing training are “reflected in increased synchronisation between the cortex and muscles, resulting in more efficient recruitment of motor units, which

can be transferred to everyday functional skills" (4). The presentation and analysis of the results recorded in this study highlights the issues revealed by highlighting the results assessed by motor tests compared to those presented in the assessment test provisions. "The means which adapt the daily physical activities improve physical fitness, form a positive engagement which prevents the child from giving up active play and sports" [16] thus ensuring a quick and positive integration in practical and social activities. The T-test results of 17.00 s related to the mean are in a good range, highlighting the possibility of "improved coordination in climbing practice, an improvement due to the novelty of the tasks, the difficulty of the route and the ability of the individual" [13]. These aspects are influenced by the coordination of actions between teacher and student and the level of proprioception of the student.

The value of the learning process and the improvement of motor skills, in extracurricular climbing activities, depends on "the temporal coordination of the teacher's actions with the student's movement and its orientation towards the tactile and proprioceptive sources available to perception", [14]. Climbing exercises provide children with "space to sit and think, also allowing them to solve problems for themselves, creating a sense of accomplishment and resourcefulness in particular environments" [11], thus providing opportunities to improve children's behaviour and increase their skill in performing a variety of practical activities. The values presented and analysed highlight a high level of bio-psychomotor behaviour in childrenaged 12-13 years who practise climbing in their free time, an idea also supported by Sylos-Labini et al. in 2017 [18] who following a study consider that, in the climbing movement,the "motor control must cope with a certain level of flexibility and nonlinearity".

5. Research Findings on the Motor and Mental Performance of Child Climbers

After analysing the data recorded after the evaluation of a group of 22 pupils (12 boys and 8 girls) aged 12-13 years, who practised climbing on an indoor wall, we found that

- in somatic development, of the 24 children who practise climbing, 18 fall into the group with a normal level of development, 2 boys and 4 girls fall into the level of moderate underweight with values between 17<18.5 and no child falls into the group of overweight, so a good classification according to the BMI values presented by the US National Institutes of Health, cited by Cordun, 2011, p. 146 [6]);
- for attention focus, of the 24 research participants, 3 fell into class II (with scores between 145-204), 14 into class III (with scores between 205-267) and 5 into class IV (with scores between 268-331); and for attention distribution, of the 24 research participants, 3 were in class II (with scores between 20-27 points), 5 in class III (with scores between 28-34 points), 6 in class IV (with scores between 35-44 points) and 8 in class V (with scores over 45 points), according to the CA II test score scales [14], [17].

The values presented confirm the hypothesis that the 12-13-year-old research subjects, who practise rock climbing, have a level of physical, motor and mental development within the limits predicted by the literature.

Designing and implementing diverse and different content in the field of physical education "means giving all the factors involved the satisfaction of a successful professional effort" [9].

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