



Research Article

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Original Aspects Regarding the Motor Age Chronological Age Relationship at Primary Vocational Cycle Pupils, in the Framework of Bilateral Coordination and Balance Sub-Tests



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Abstract

Purpose: The study of the main specific factors of the psycho-motor phenomenon (in this case, the aspects related to the bilateral coordination and the balance) and also to the relations established between these, in conjunction with the subjects' chronological age, at the vocational primary school level.

Objectives: In the framework of our experiments, we proposed an analysis of the existing relation between the motor age and the chronological age of the primary vocational study cycle, at the level of the bilateral coordination and balance components, by means of the information obtained following the application of the Bruininks-Oseretsky test battery, Second Edition (BOT-2).

Methods: In order to deploy the research experiment, we selected a number of 20 first grade pupils of the "Bălașa Doamna" Târgoviște Arts College. The subjects' evaluation took place on the sports ground and in the gym of the "Bălașa Doamna" Arts College and was realized in the period 28th April - 9th May 2014. It consisted in the application of 16 items, specific to the bilateral coordination and balance sub-tests, in the framework of the Bruininks-Oseretsky Second Edition tests. The informatics products and the specific instruments, used at the statistical analysis level of the obtained results, were represented by the BOT-2 ASSISTTM Scoring and Reporting System (the specific software of the Bruininks-Oseretsky test battery, Second Edition), the MINITAB version 15.1 of the MINITAB Inc. company and the MICROSOFT EXCEL version 2003 application .

Result: We established the fact that, at the bilateral coordination component level, the average chronological age equals 7.53 (7:6) - and the average motor age equals 9.80 (9:10) years. We observed that the average motor age is greater by 2.30 (2:4) years. The data dispersion is homogeneous at the chronological age and relatively homogeneous at the motor age. The effect size (1.61) indicates great to very great statistical differences between the two ages. The t dependent bilateral test for the averages equality shows that there are significant differences between the two average ages, $p < 0.0001 < 0.05$. Referring to the balance sub-test, the average motor age has the value of 9.55 (9:6) years, whereas the average chronological age equals 7.53 (7:6) years. It results that the average motor age is greater by 2.01 (2:0) years. The data dispersion is homogeneous at the chronological age and relatively homogeneous at the motor age. The t dependent bilateral test for the averages' equality shows that there are significant statistical differences between the two average ages, $p = 0.0034 < 0.05$.

Conclusion: From the particular analysis of the results obtained by the subjects following the evaluation, the research hypothesis is confirmed at the bilateral coordination and balance sub-tests level. It can also be concluded that the use of the Bruininks-Oseretsky test battery, Second Edition, in the framework of an experimental research at this study level, offers extremely valuable data regarding the vocational primary cycle students' psycho-motor features, forming a solid landmark in the orientation direction of the specific instruction - education process.

Keywords: Motor Age; Chronological Age; Vocational Primary Cycle; Bilateral Coordination; Balance

Introduction

Physical education and sport in primary schools are considered indispensable for the child's personality development. The development of the physical, intellectual and moral aptitudes through physical education and sport, offers the child opportunities for the extension of the abilities, the knowledge and the trust, needed in order to lead a physically active life style, as related

to the present requirements. Any educational approach must start, on one side, from the knowledge of the level represented by the motor and psycho-motor development normality in the ontogenesis - and on the other side, from the level at which a certain person presents itself. The knowledge of the general aspects, common to the subjects of a certain age, becomes an indispensable condition for the efficiency of the activity.

Studying the school documents for the primary education, both general and vocational-artistic, there are no differences regarding the contents, the objectives or the evaluation system, although the vocational profile should require this. Even therefore one observes the necessity of a specific approach of the school physical education in the vocational schools. As specific objective of the physical education, the development of the psycho-motivity, respectely the knowledge of the organization and function of its content elemenets, represents presently a major preoccupation of the specialists in the physical education and sport domain.

A correct and specific approach of all psycho-motor components, which have to take into account both the age and the established instruction objectives, will be reflected at the level of the child's behaviour by obtaining some essential aquisitions, which will form the premises of passing to the superior development and the aquisition of some new behaviours [1]. But for the fullfillment of this desideratum, the persons implied on different levels in the child's education, must very well know his/her psycho-motor development level. In this meaning, an evaluation centered on these aspects, by using of - as valid and objective as possible - specific instruments, represents an imperiously necessary condition.

The large scale use of the Bruininks-Oseretsky Test for the testing of different psychomotor components or the entire psychomotor capacity led to its recognition as one of the most important and valid evaluation instruments. Several studies conducted mainly in the medical field have used this test as a validation criterion for other instruments used for measuring motor abilities [2,3], with the purpose of exploring and identifying the nature and the degree of motor skills deficit in persons suffering from different types of coordination related motor disorders [4,5], as well as in the field of occupational therapy [6,7].

Purpose

The research performed by us, by its content and its approach mode, proposes to outline a series of informaion, meant to facilitate the optimal understanding of the manifestation of the main motor and psycho-motor factors at the primary vocational education level, related to the pupils' chronologic age. We also have in view that the obtained results form the base of a program's design, which shall reflect the dynamics of factors at the primary artistic vocational education level and their specific manifestation at the level of the used conditions.

Hypothesis

Following the subjects' evaluation by means of the Bruininks-Oseretsky test battery, Second Edition, we shall outline the existence of significant statistical differences between the arithmetical average of the chronological age-and that of the motor age, at the level of the *bilateral coordination* and balance components.

Materials and Methods

In vue of the deployment of the psycho-pedagogical experiment of the constatative type, we selected a number of 20 first grade pupils of the "Bălașa Doamna", Târgoviște, Arts College. The subjects' evaluation took place on the sports ground and in the gym of the "Bălașa Doamna" Arts College and was realized in the period 28th April-9th May 2014. It consisted in the application of 16 items, specific to the *bilateral coordination* and balance sub-tests, in the framework of the Bruininks-Oseretsky test battery, Second Edition. The informatics products and the specific instruments used at the level of the statistical analysis of the obtained results, were represented by the BOT-2 ASSIST™ Scoring and Reporting System (a specific software of the Bruininks-Oseretsky test battery, Second Edition), MINITAB version 15.1 of the MINITAB Inc. company and the MICROSOFT EXCEL, version 2003, application. In the framework of the research experiment, we used the improved variant of the Bruininks-Oseretsky tests battery (BOT-2). *Bruininks-Oseretsky Test of Motor Proficiency, (BOT-2), Second Edition* is a test battery that is administered individually, being based on a series of very well specified and directed objectives, în vue of evaluating a broad range of motor habits at subjects aged between 4 and 21 years. This battery was conceived to address, among others, kineto - therapists, psychologists, physical education teachers, coaches, offering them an efficient and credible instrument for measuring the fine and rough motor habits. BOT-2 evaluates the abilities of four different motor zones:

- a) **Fine Manual Coordination/ Fine Manual Control:** sub-test 1 - fine motor precision; sub-test 2 - fine motor integration;
- b) **Manual Coordination:** sub-test 3 - manual ability; sub-test 7 - superior limbs coordination;
- c) **Body (General) Coordination:** sub-test 4- bilateral coordination; Sub-test 5 - balance;
- d) **Force and Agility:** sub-test 6 - running speed and agility; sub-test 8 - force [8].

For the present research, from the framework of the eight sub-tests specific to the above described motor zones, we opted for the *bilateral coordination* and balance sub-tests, which comprise the following items.

Sub-Test 4: Bilateral Coordonination

The items of this sub-test evaluate the motor habits implied în practicing sports and other recreational activities. The tasks stipulated here impile body check, în the same time with sequential coordination of the superior and inferior limbs. For each item, the subject performs motion sequences, some of which being familiar (finger pivoting, hopping with clapping the hands), others being completely new ones for them (simultaneously tapping finger - opposite leg).

Content:

- a) **Item 1:** Touching the nose with the index finger, with closed eyes;
- b) **Item 2:** Hopping with legs spreading, simultaneously with raising the arms above the head;
- c) **Item 3:** Hopping on the spot - the leg and the arm on the same side, synchronised;
- d) **Item 4:** Hopping on the spot - the leg and the arm on the opposite side, synchronised;
- e) **Item 5:** Pivoting the thumb and the index finger;
- f) **Item 6:** Tapping with the finger and the leg on the same side, synchronised;
- g) **Item 7:** Tapping with the finger and the leg on the opposite side, synchronised [9].

Sub-Test 5: Balance

This sub-test evaluates motor habits implied in maintaining the repose posture, in motion or during the performing of other common activities. The tasks of this sub-test addresses the three zones affecting the balance: trunk stability, static and dynamic balance and use of visual clues.

Result

Table 1.

<i>Statistical Indices</i>	<i>Bilateral Coordination</i>		<i>Balance</i>	
	<i>Chronological Age</i>	<i>Motor Age</i>	<i>Chronological Age</i>	<i>Motor Age</i>
Arithmetical Average	7:6	9:10	7:6	9:6
Median	7:6	9:4	7:6	8:4
Standard Deviation	0:3	1:6	0:3	2:9
Mode	7:3	8:7	7:3	7:4
Maximum Value	8:3	12:3	8:3	14:3
Minimum Value	7:2	7:10	7:2	6:1
Amplitude	1:1	4:5	1:1	8:2
Variation Coefficient (%)	3.9%	15.4%	3.9%	29.0%
<i>Bilateral t Test</i>				
Difference Motive-Chronological Age				
Average	2:4	2:0		
Median	1:9	0:8		
Standard Deviation	1:5	2:8		
Critical t	2.093	2.093		
Computed t	7.218	3.345		
P << 0.0001		P = 0.0034		
Effect Size	1.61	0.75		

Table 1 presents the results obtained by the pupils in the framework of the *bilateral coordination* and balance sub-

Content:

- a) **Item 1:** Standing with spread legs alongside a line, traced on the ground, open eyes;
- b) **Item 2:** Walking alongside a line, traced on the ground, closed eyes;
- c) **Item 3:** Standing on the preferred leg on the ground, open eyes;
- d) **Item 4:** Standing with spread legs alongside a line traced on the ground, closed eyes;
- e) **Item 5:** Going heel to toe, alongside a line, traced on the ground,;
- f) **Item 6:** Standing on the preferred leg on the ground, open eyes;
- g) **Item 7:** Standing on the preferred leg, on the balance beam, open eyes ;
- h) **Item 8:** Standing heel to toe, on the on the balance beam;
- i) **Item 9:** Standing on the preferred leg, on the balance beam, closed eyes.

tests - and also the statistical interpretation of the values, characteristical for each sub-test [10].

Discussion and Conclusion

Following the statistical processing of the data resulting from the testing, we can outline the following aspects specific for the two approached components (*bilateral coordination* and *balance*).

At the *bilateral coordination* sub-test, the average motor age equals 9.83 (9:10) years, as compared to 7.53 (7:6) medium age. We observe that the average motor age is greater by 2.30 (2:4) years. The data dispersion is homogeneous at the chronological age and relatively homogeneous at the motor age. The most frequent result at the motor age is 8.58 (8:7) years, with a share of 40% of the results number. The effect size (1.61) indicates great to very great differences between the two ages. The t dependent bilateral test for the equality of the averages shows that there are significant statistical differences between the two average ages, $p<0.0001 < 0.05$. We accept the research hypothesis, according to which the difference between the motor age and the chronological one is statistically significant. The graphic representation of the ages recorded at the *bilateral coordination* is presented in Figure 1.

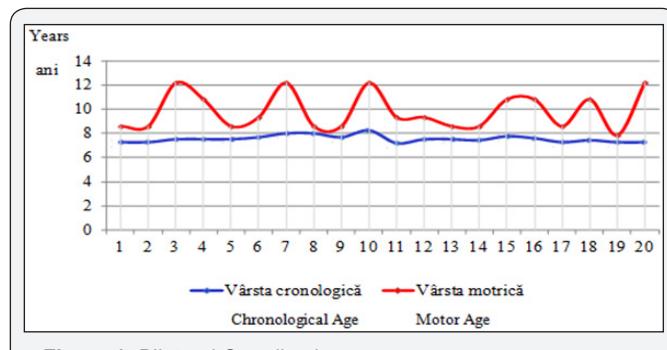


Figure 1: Bilateral Coordination.

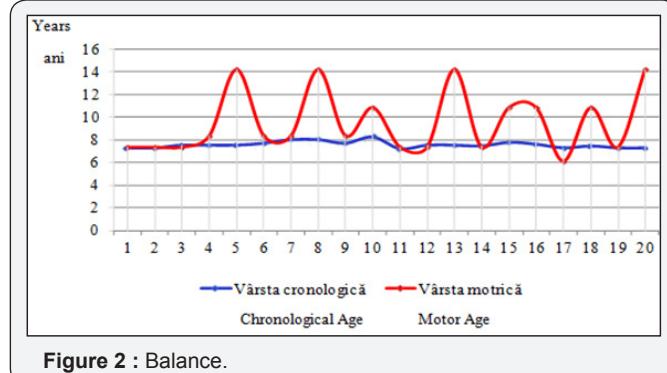


Figure 2 : Balance.

In the framework of the *balance* sub-test, the average motor age has the value 9.55 (9:7) years. We observe that the average motor age is greater by 2.01 (2:0) years than the chronological one. The data dispersion is relatively homogeneous at the motor age - and homogeneous at the chronological age. The most frequent motor age is 7.33 (7:4) years, with a share of 25% of the results number. The effect size (0.75) indicates medium to great differences between the two ages. The t dependent bilateral test for the averages equality shows that there are significant statistical differences between the two average ages, $p=0.0034$.

< 0.05 . We accept the research hypothesis, according to which the difference between the motor age and the chronological one is statistically significant. The graphic representation of the ages recorded at the *balance* test is presented in Figure 2.

Following the tests performed at the evaluated subjects' level, with the purpose of verifying the existence of some statistical differences between the arithmetical average of the chronological age and that of the motor age, at the level of the bilateral coordination and balance parameters, we find the following aspects:

- At the level of the bilateral coordination feature, the verification of the statistical hypothesis, performed with the bilateral t dependent test for the averages equality, shows that there is a significant statistical difference between the two average ages, $p<0.0001 < 0.05$. We accept the research hypothesis, according to which the difference between the motor age and the chronological one is statistically significant.
- At the level of the balance feature, the verification of the statistical hypothesis, performed with the bilateral t dependent test for the averages equality, shows that there are significant statistical differences between the two average ages, $p=0.0034 < 0.05$. We accept the research hypothesis, according to which the difference between the motor age and the chronological one is statistically significant.
- The psycho-behavioural component, essential for the school physical education domain -and not only for that, with a direct implication into the child's ontogenetic route, psycho-motivity offers the propitious framework for forming a system of habits, by means of which he/she can act efficiently under any conditions, adapting to the requirements imposed by the stimulus - situations.
- The application of the Bruininks-Oseretsky test battery, Second Edition, in the framework of this study, represents a first for the vocational artistic education, offering a series of extremely valuable information, regarding the psycho-motor behaviour of the pupils involved in this educational cycle. In the same time, our scientific approach imposes itself as an important landmark for further research, aiming at the particular aspects of the psycho-motor phenomenon, manifested at different age levels and under specific educational conditions, imposed by the nature of the school profile.

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