

## **THE PHENOMENON OF “CONCORDANCE” IN CHILDREN’S PSYCHOLOGICAL AND PHYSICAL DEVELOPMENT**

*(Preliminary communications)*

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### **Abstract**

*The paper focuses on a diagnostic method in the field of a recently developed concept of the concordance phenomenon presented as concordance in the development of different types of physical, psychological and other abilities of people at different age, gender, sport specifics and other factors which affect different aspects, processes and phenomena in the physical education theory and practice and sports training and performance. To reveal the potential of the diagnostic method the authors use data from different physical and psychological tests of kindergarten children in Blagoevgrad, Bulgaria. They present a sample methodology and offer some conclusions and recommendations for the practice improvement based on the data analysis. The aim of our study is to apply the fore-mentioned diagnostic method with children and to determine the extent of the synergy of their psychological and physical development. For the loco motor abilities research the authors have used 6 different tests (running 40 m., standing long jump, throwing a small solid ball at a distance, throwing a heavy (medicine) ball ,1 kg, over the head, sit ups (until the child gives up) and squatting for 20 seconds (maximum number of movements). The results confirm the intermittent nature of mental and physical development of children in terms of psychophysical parallelism, manifested as alternating dominance of physical and mental development of children throughout their pre-school age.*

**Keywords:** *diagnostics, physical abilities, psychological abilities, physical education, sports preparation, pedagogical practice, kindergarten, assessment scaling.*

### **INTRODUCTION**

The human nature and the environment are in relative balance and harmony. Their frustration is a result of the impact of various factors causing positive and negative changes. This disruption and reordering, i.e the changes in the proportions in the consistency of processes and phenomena, drew our attention to the study of nonlinear dynamics in physical and mental development of children, and in particular - in the consistency (or so called concordance). It is the process concordance indeed, which makes possible the transition from chaotic versatility of the dimensions - towards a convergent action. Through a profound study of the available literature resources we found that the consistency of loco motor skills in athletes is implemented by Brogli (Брогли), 1974.

The aim of our study is to apply the fore-mentioned diagnostic method with children and to determine the

extent of the synergy of their psychological and physical development.

### **METHODS**

The research has been transversally conducted with 3-6 year-old children in different kindergartens in Blagoevgrad, Bulgaria.

For the loco motor abilities research the authors have used 6 different tests (running 40 m., standing long jump, throwing a small solid ball at a distance, throwing a heavy (medicine) ball ,1 kg, over the head, sit ups (until the child gives up) and squatting for 20 seconds (maximum number of movements).

The mental processes and psychic reactions have been diagnosed by free associative experiment based on the speed of verbal reactions, which according to Glushkova (Глушкова), Glushkov (Глушков), Handziiska (Ханджийска), & Radeva (Радева), (2007)

correlate with children loco motor reactions.

The speed of operational thinking has also been a part of the study according to a methodology offered by Glushkov (Глушков) (2010) based on the time for orientation in an image maze. The processes connected with children’s attention have been studied and measured by Bourdon-Anfimov test of attention (focusing on the sustained attention lasting for 3 minutes), probated by the aforementioned authors.

The procedure and application of the offered method of studying the concordance is preceded by pre-standardizing some of the results. The standardizing technology is well-known. It is a procedure showing the linear transformation of the results of testing, expressed by transforming natural units and measures (number, kg., m, etc..) into standardized units (points).

The evaluation of different physical and mental development tests results, and the implementation of the assessment results to control the effects of physical

impacts, based on the standardization of the results, has high potential especially for the study of harmony, and concordance of loco motor skills and some psychic abilities.

## RESULTS AND DISCUSSION

In our research we applied the method for standardization of stigmatic deviations or more precisely its modification called semi T-scale. The distribution of the indices included in the test battery performance is normal or close to normal, which justifies the use of mathematical methods.

The mechanism of transformation of natural units has been accomplished by using linear functions and so called centering on arithmetic means  $j$  ( $j = 1,2,3 \dots$ ) and normalization of the relevant standard deviations  $S_j$ , which serve as a single scale standard in the assessment scaling.

Table 1. Results of application the system for express transformation from natural measure units to points for 3 year-old boys:

Tests	Point
1- speed (running 40 meters)	18
2 - explosive power of the lower limbs (standing long jump)	10
3 - speed-strength (throwing small heavy ball at a distance)	21
4 - explosive arm strength (throwing ball one kilogram above the head)	41
5 - strength endurance (sit ups)	9
6 - dynamic power (squatting for 20 seconds.)	18
7 - speed of verbal responses	12
8 - speed of operational thinking	27
9 - intensity of attention in 3-minute work	30
10- sustainability of attention in 3-minute work	10

Table 2. Values of C-concordance of the loco motor abilities of 3 year-old children based on the research indicators

Gender, loco motor abilities	3 year-old boys					3 year-old girls				
	X	T-grades	Rang №	$\mu$	$\mu$ -Tj	X	T-grades	Rang №	$\mu$	$\mu$ -Tj
Speed/Velocity 40 m/ sec/.	14,20	18	3-4		0	15,26	10	4		10
Lower limbs strength test Standing long jump sm.	41,93	10	5		8	40,93	19	3	20	1
Speed and strength test Throwing a small solid ball at a distance (m.)	3,69	21	2		3	3,40	5	5		15
Dynamic strength test20 sec. Squatting (number)	11,34	18	3-4	18	0	11,36	22	2		2
Body strength test Sit ups (number)	3,86	9	6		9	1,93	4	6		4
Upper limbs strength test Throwing a heavy (medicine) ball ,1 kg, over the head (sm.)	206,2	41	1		23	163,4	27	1		7

The function is the following:  $Z_{ij} = \frac{X_{ij} - X_j}{S_j}$  where,  $Z_{ij}$  is the individual evaluation (standardized value) of a child  $i$  for his score on indicator  $j$  is the result of the same child in  $X_{ij}$  on indicator  $j$ , expressed in natural units;  $X_j$  and  $S_j$  represent the arithmetic mean value and standard deviation of the same indicator (of the target group of children). In cases where some indicators of greater value (in natural units) corresponds to a lower quality (e.g running) symbols in the numerator are swapped.

Because of the need for systematic evaluation of the results of children testing for the theory and practice on one hand, and the enormous calculating and statistic data analysis based on the presented above statistic functions on the other hand, we have tabulated the data presenting it in tables and graphs, to facilitate the measurement. In this case it is enough only to look in the right table and column without any further calculations.

The special feature of this tabulation is that the locations of the dependent and independent variable exchange where  $Z_{ij}$  becomes an argument from a function and the argument  $X_{ij}$  becomes a function. Then the functions can be presented by the following formula:  $X_{ij} = X + S_j Z_{ij}$  and  $X_{ij} = X - S_j Z_{ij}$

The values of  $Z_{ij}$  usually -2.5 to 2.5 with 0.1. step variation. Thus less than 95% of the cases fall within the assessment of the 50 states, which is sufficiently selective in terms of precision.

The disadvantage of this system lies in the fact that the assessments  $Z_{ij}$  are expressed in decimals and half

of the values are negative numbers, which complicates their practical use. In this regard, we prefer modification of Z-scores into so called T-grades which are always positive integers. T-grades are a result of a simple linear transformation of the Z-assessment (and  $X_{ij}$ ). For the convenience we increase the accuracy to 51 states and the evaluation system takes the form of a classical semi T-scale.

In the process of T-grades tabulation separately for boys and girls and for each age group, the T arguments are assigned to the values 1,2,3 ... 51, while for each value of T we define accordingly the equivalent result of indicator  $j$  in natural units. Due to the established by Glushkov (Глушков), (2010) statistically significant gender differences in the children results there is a need to prepare separate evaluation tables not only for each age group, but also by gender specifics.

The next operation is related to the ranking of T grades of the average values of the indicators. The T-grades ranking within different age and gender groups is necessary because of the need to identify me. me presents such grade in points which divides the preliminary values of a given variable or group of variables into two equal parts so that both parts under and over me consist of 50% of the measured values of the variable. It is well-known that  $me = P_{50}$  (50 percentage) and can be determined and expressed by it.

After determining the median we estimate the deviations in absolute values of each indicator  $j$ . me defines the sum of the deviations  $m (m = e - T_j)$ , in this case 43 and

Table 3. Values of C-concordance of the loco motor abilities of 4 year-old children based on the research indicators

Gender, loco motor abilities	Boys (4 year-old)					Girls (4 year-old)				
	X	T-grades	Rang №	$\mu e$	$\mu e - T_j$	X	T-grades	Rang №	$\mu e$	$\mu e - T_j$
Speed/Velocity 40 m. \sec\.	12,86	21	5		8,5	13,85	15	3		0,5
Lower limbs strength test Standing long jump sm.	73,44	47	1		17,5	64,64	39	1		17,5
Speed and strength test Throwing a small solid ball at a distance (m.)	5,72	38	2		8,5	3,96	6	5		15,5
Dynamic strength test 20 sec. Squatting (number)	13,70	23	4	29,5	6,5	13,06	21	4	21,5	0,5
Body strength test Sit ups (number)	6,29	8	6		21,5	4,32	2	6		18,5
Upper limbs strength test Throwing a heavy (medicine) ball ,1 kg, over the head (sm.)	217,5	36	3		6,5	206,3	35	2		13,5

Табл. 4. Values of C-concordance of the loco motor abilities of 3 and 4 year-old children based on the research indicators

Indicators	3-year-olds					4-year-olds				
	X	T-grades	rang №	μe	μe-Tj	X	T-grades	rang №	μe	μe-Tj
<b>Boys</b>										
Speed of verbal responses (sec.)	66,4	112	44		116,5	55,7	116	44		220,5
Speed of operational thinking (sec.)	35,1	27	3	28,5	1,5	24,4	38	2	36,5	1,5
Intensity of attention in 3-minute work (number of checked symbols)	192,2	30	2		1,5	241,0	35	3		1,5
Sustainability of attention in 3-minute work (number mistakes)	6,4	42	1		13,5	5,6	41	1		4,5
<b>Girls</b>										
Speed of verbal responses (sec.)	5,9	17	4		12,5	4,8	21	4		6,5
Speed of operational thinking(sec.)	39,1	24	3	29,5	5	32,9	23	3	27,5	4,5
Intensity of attention in 3-minute work (number of checked symbols)	220,9	35	2		5,5	244,5	32	2		4,5
Sustainability of attention in 3-minute work (number mistakes)	3,3	49	1		19,5	3,0	49	1		21,5

divide that sum by (n - 1), where n is the number of variables involved. So concordance coefficient is defined as following:

$$K = \frac{\sum(\mu e - \overline{Tj})}{n-1} = \frac{43}{5} = 8,60$$

This result indicates that the degree of synergy of loco motor skills in 3-year-old boys is low due to the high values of C. For C = 0 the concordance is absolute, and any deviation from 0 reduces it. Similar procedures have been completed with 3-year old girls and the results are presented in the table above.

The results of a 4-year-olds have been approached the same way and the other concordance coefficients have been identified for the other age groups. For better precision separate procedures for mental development have been held as we said the test battery includes indicators with high impact and high level of contribution

to the explained variances.

Thus the procedure has been repeated and with the data of the other age groups and as a result we could identify the rest of the concordance coefficients.

The results show that the overall coefficient values of the preschool children abilities concordance varies from 4.00 to 11.83 for loco motor skills and 5.75 to 11.62 for their psychical and mental abilities. Furthermore, at the beginning and end of the pre-school period the loco motor abilities are more consistent but in the middle of the period they are the most inconsistent ones when the sensitivity is the most intensive.

The trend in mental processes is reversed - low coherence in 3-year-olds both girls and boys and gradual improvement in the fourth and fifth year, after that an incipient deterioration in 6-year-olds can be spotted.

The obtained results confirm the intermittent nature of mental and physical development of children in terms of psychophysical parallelism, however, manifested as alternating dominance sometimes physical, sometimes

Table. 5. Values of concordance coefficients (C-concordance)

Aspects of children's development	C-concordance loco motor abilities		C-concordance psychical processes	
	Boys	Girls	Boys	Girls
age /gender				
3	8,60	6,50	8,25	11,62
4	11,50	11,00	7,00	9,50
5	10,00	11,83	6,75	5,25
6	4,00	7,67	8,75	5,75

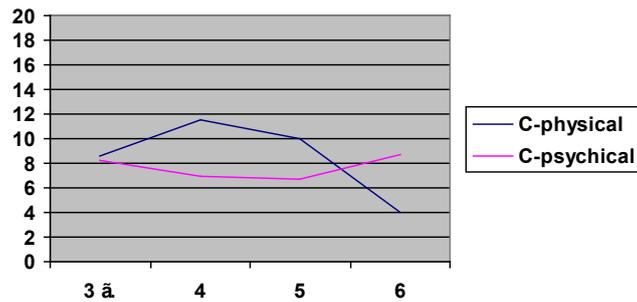


Fig. 1. Dynamics of C-concordance of physical and psychical indices for pre-school age boy

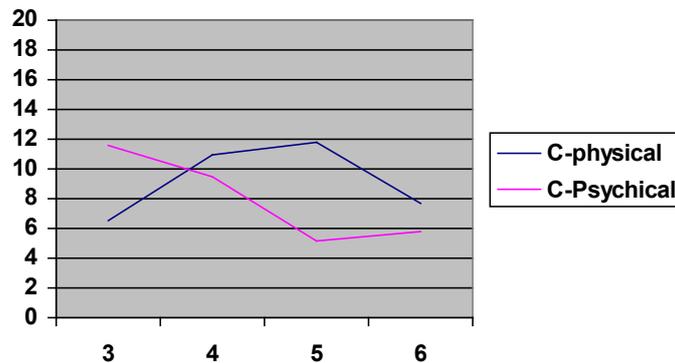


Fig. 2. Dynamics of C-concordance of physical and psychical indices for pre-school age girls

mental development throughout the preschool period discussed by Glushkova(Глушкова) et. al. (2007).

**CONCLUSIONS**

The research results bring forward the following main conclusions:

1. The offered research technology of the “concordance” phenomenon is suitable for the assessment of synergy between the psychophysical abilities and other aspects in the development of children, athletes and other people with different levels of physical and mental development.

2. The research shows that the harmony between the indicators of children’s psychological and physical development is low.

3. In general the concordance coefficients of

preschool children are close in value to the physical and mental aspects of their development.

4. At the beginning and the end of the pre-school period loco motor abilities are more consistent, and in the middle of the period - inconsistent when their sensitivity is the most intensive.

5. In mental processes the trend is reversed - low coherence in 3-year-olds and gradual improvement in the fourth and fifth year, and again deterioration in 6-year-olds.

6. A lack of synergy between the children’s physical and mental groups of indicators.

7. Alternating dominance in the synergy of sometimes one, sometimes other aspects of child’s development.

8. The results confirm the intermittent nature of

mental and physical development of children in terms of psychophysical parallelism, manifested as alternating dominance of physical and mental development of children throughout their pre-school age.

## REFERENCES

- Афифи, А., & Ейзек, С. (1982) *Статистически анализ - подход к использованию ЕВМ*. [Statistical analysis - an approach to the use of EBM. In Russian.] Москва: Мир.
- Брогли, Я. (1974). Метод за индивидуална оценка на конкорданцията (съгласуваността) между отделните признаци на едно цялостно явление. [Method for individual assessment of concordance (consistency) between signs of a global phenomenon. In Bulgarian.] *Трудове на Висшия институт за физкултура, ВИФ*, т. XVII, кн. 3 (стр. 93-100) София: ВИФ.
- Cronbach, L. J. (1990) *Essentials of Psychological Testing № 4*. New York: Harper Collins Publishers
- Глушкова, М. (2005) *Хуманизиране на детското развитие в условията на предучилищното физическо възпитание*. [Humanization of child development in a preschool physical education. In Bulgarian.] (Unpublished doctor dissertation, National Sports Academy, Sofia) София. Национална спортна академия.
- Глушкова, М., Глушков, Ив. Ханджийска, Т. & Радева, Цв. (2007) . Психо- физически паралелизъм в развитието на децата от предучилищна възраст. [Psychophysical parallelism in the development of preschool children. In Bulgarian.] *Научни трудове, „Физическо възпитание и спорт. Здравна промоция и превенция” на Русенския университет “Ангел Кънчев”* том 46, серия 8, (стр. 11-16) Русе: РУ „Ангел Кънчев“.
- Глушков, Ив. (2010). *Особености и развиване на пространствените, времевите и силовите ориентировки на 6-7 годишните деца във физическото възпитание*. [Features and development of space, time and power orientation of 6-7 year olds in physical education. In Bulgarian.] (Unpublished doctor dissertation, South-West University “Neofit Rilski”, Blagoevgrad) Благоевград: Факултет по педагогика.
- Димитрова, Зл. (2012) *Технологичен модел за реализиране на игровата дейност във физическото възпитание на 6-7 г. Деца*. [Technological model for the implementation of gaming activities in the physical education of children 6-7 years. In Bulgarian.] (Unpublished doctoral dissertation, South-West University “Neofit Rilski”, Blagoevgrad) Благоевград: Факултет по педагогика.
- Иванов, Ст. (2006). *Системи за оценяване на учениците по физическо възпитание и спорт в средната образователна степен* [Systems for assessment of students in physical education and sport in the mean level of education. In Bulgarian.] Автореферат на дисертация, защитена пред Специализиран научен съвет към Висшата атестационна комисия, в НСА «Васил Левски», София: НСА «Васил Левски».
- Масальгин, Н.А. (1974) *Математико – статистическите методи в спорта*. [Mathematical-statistical methods in sport. In Russian] Москва: Физкультура и спорт.
- Момчилова, А. (1984). *Психологически основи на двигателната координация и влиянието ѝ върху комплексното развитие на 5-6 годишните деца*. [Psychological foundations of motor coordination and its impact on the complex development of 5-6 year olds. In Bulgarian.] (Unpublished doctor dissertation, VIF) София. ВИФ.

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