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Method and Software Application in the process of Methodology for Assessing the Harmony of the Ratio of Physical and Mental Development of Preschool Children

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ABSTRACT

The article presents the priority components of the development of the personality of preschool children. The problem of assessing the level of harmonization of physical and mental development for children in the conditions of preschool education has been identified. A technique for assessing the harmony of the ratio of physical and mental development of preschool children 5-6 years is described.

One of the priority tasks put forward for the pre-school education system is the comprehensive and harmonious development of the child's personality. Existing program and regulatory documents in pre-school educational institutions suggest developing personal qualities at the expense of separately expressed educational areas in General, training sessions are held in a static position, their mental load significantly exceeds the physical one.

At the same time, it is proved that motor activity contributes to more productive mental development if you include mental exercises in the educational process of physical education.In the course of studying the problem of harmonization of physical and mental development of preschool children, it was revealed that some researchers correlate physical and mental development, the second physical and mental, the third motor and intellectual. At the same time, we have not found specific indicators of quantitative harmony, which makes it difficult to quantify it.

It was also not possible to achieve related indicators of harmonization through correlation coefficients, which are located in the range from 0.03 to 0.394. Partial similar results were found in other studies. All data we was analyzed by neural network.

Key words : methodology, physical, mental, development, neural network.

1.INTRODUCTION

There is a problem of assessing the level of harmonization for children in pre-school educational institutions. Based on the existing problem between the need for harmonious development and the assessment of this harmony, we have attempted to develop a methodology for assessing the harmony of the ratio of physical and mental development of preschool children aged 5-6 years.

The process of developing a methodology for assessing the harmony of the ratio of physical and mental development for preschool children has covered several successive stages. At the first stage, all indicators of physical and mental development of preschool children were transferred to 5-point level systems. The method of conducting all-Russian monitoring of physical development and physical fitness of students in educational institutions was used as the basis for converting physical development indicators into points [5]. This method assumed the translation of absolute values for each test into a 5-level rating scale for reference points: the high level corresponds to a scale value equal to 5 points, above average-4, average-3, below average-2 and low-1, respectively.

Taking into account the heterogeneity of physical fitness indicators and the need to use an integral (General) indicator of physical fitness of a preschool child, we determined the physical fitness index (IFI), which was determined by calculating the arithmetic mean of the points scored by the preschool child. The IFP was fixed to an integer value by mathematical rounding using the decimal system. If the number after the decimal point ends with 5, then rounding is performed in the higher direction. For example: 2.4 is rounded to two, and 2.5 is rounded to three.

2. MATERIALS AND METHODS

To assess mental development, we used the existing scale assessments proposed by the authors of methods for determining visual-figurative and verbal-logical thinking [12, 22]. These rating scales also had a 5-level structure. In this case, names (designations) similar to those used in the all-Russian monitoring of physical development were used for differentiating levels of the author's methods [5].

Table 1: Table of assessments of physical fitness of children aged 5-6 years (boys)

Tests	Age	The level of physical development				
		Tall	Above the average	Average	Below the average	Low
		5 points	4 points	3 points	2 points	1 point
30 m run (sec)	5	6.9 and below	7.0-7.5	7.6-8.1	8.2-8.9	9.0 and higher
	6	6.4 and below	6.5-6.9	7.0-7.5	7.6-8.3	8.4 and higher
Long jump from a	5	105 and higher	94-104	83-93	69-82	68 and below

place (m)	6	122 and higher	109-121	96-108	80-95	79 and below
Throwing the ball at a distance (m)	5	7.50 and >	7.40-5.80	5.70-5.00	4.90-4.00	3.90 and <
	6	9.80 and >	9.70-7.90	7.80-7.00	6.90-4.50	4.40 and <
Torso lift in 30 seconds (Qty)	5	13 and higher	12	10-11	7-9	6 and below
	6	15 and higher	13-14	10-11	7-9	7 and below
Leaning forward while sitting (cm)	5	>9	7-9	2-6	0-1	<1
	6	>10	9-10	3-7	1-2	<1
Running at 300 m (sec)	5	1.26 and below	1.27-1.42	1.43-1.59	2.00-2.20	2.21 and >
	6	1.16 and below	1.17-1.32	1.33-1.48	1.49-2.09	2.10 and >

Table 2: Table of assessments of physical fitness of children aged 5-6 years (girls)

Tests	Age	The level of physical development				
		Tall	Above the average	Average	Below the average	Low
		5 points	4 points	3 points	2 points	1 point
30 m run (sec)	5	7.2 and below	7.3-7.8	7.9-8.4	8.5-9.2	9.3 and >
	6	6.8 and below	6.9-7.3	7.4-7.9	8.0-8.7	8.8 and >
Long jump from a place (m)	5	95 and >	84-94	73-83	56-72	55 and <
	6	110 and >	99-109	88-98	74-87	73 and <
Throwing the ball at a distance (m)	5	5.90 and >	5.80-5.00	4.90-4.00	3.90-3.60	3.50 and <
	6	8.30 and >	8.20-5.50	5.40-4.80	4.70-3.40	3.30 and <
Torso lift in 30 seconds (Qty)	5	12 and higher	11	9-10	6-8	5 and below
	6	13 and higher	12	10-11	7-9	6 and below
Leaning forward while sitting (cm)	5	>11	9-11	4-8	1-3	<1
	6	>13	10-13	5-9	2-4	<2
Running at 300 m (sec)	5	1.26 and <	1.27-1.42	1.43-1.59	2.00-2.20	2.21 and >
	6	1.18 and <	1.19-1.34	1.35-1.50	1.51-2.12	2.13 and >

The final assessment of the mental fitness test (FMT) was carried out by analogy with the final assessment of physical fitness (IFP) as follows:

1. the absolute (numerical result) result in each test was translated into a score level using the table of scores of mental development.
2. the preschool child's mental fitness index (FMT) was Calculated, which is the arithmetic mean of the sum of the points received on the tests of mental development. PPI = (total points): number of tests = level of mental development (if the number ends with 5, we round it up).

For example, child P 5 years participated in 4 tests, its results were distributed by levels as follows: in the 1st test, the result fell into the range of "below average" (2 points), in the 2nd-"above average" (4 points), "average" (3 points) and in the 4th-"high" (5 points). Calculating the IUP = (2+4+3+5) : 4 = 3,5 points, rounding and getting the final value of 4.

At the second stage of developing a methodology for assessing the harmony of the ratio of physical and mental development for preschool children, it was supposed to formulate quantitative and qualitative indicators of the harmony of preschool development. The study of various variants of the ratios obtained at the first stage, ball scores of physical (IFP) and mental (IMP) readiness of children, allowed us to determine quantitative and qualitative approaches to assessing the harmony of the ratio of physical and mental development of preschoolers.

For this purpose, it is proposed to use the harmony index (HI) of the ratio of physical and mental development of preschool children aged 5-6 years. The essence of forming the harmony index is the summation of the obtained indices (IFP + IUP) and their qualitative differentiation.

2.1. Models and technologies of application metadata in the search in the Internet

The data structure can be implemented in many different ways. This can be implemented using structures that are inside the file itself, or it could be some kind of separately established a special system designed to collect and store data for analyzing [3-6]. One of the first attempts to create such a system was Roy Goldman and Jennifer Udom. Their proposal eventually was reduced to the necessity of creating a special database to create a TS "data grid" that would contain the formatted notes and information about reference materials and resources, and which would later became the basis for the formulation of more precise queries and to gather an increasing number of statistics which would allow to optimize the search process. These authors first proposed to use well-known tree model granularity, data, and by them was formed the basic concepts, which created the modern system. Let there exist a DB (for example types of establishments) with this structure (Figure 1).

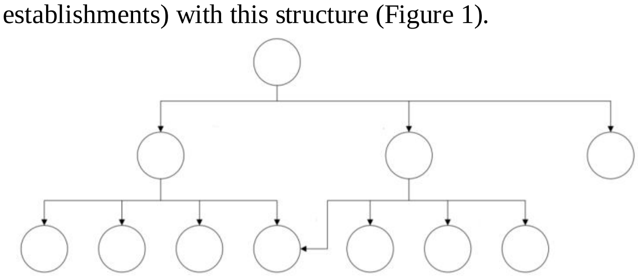

Figure 1: Tree-model database with fuzzy data structure (Kohonen network)

As can be seen from Figure 1, in this DB the same objects, it is not strange, may have a different list of properties.

Moreover, some of them can even be repeated and some may be missing altogether. With the aim to streamline all of this and allow the user system to operate the same type with all elements of the system, despite their differences, this DB engine uses metadata that is organized in accordance with the kinds and types of elements. This can be a separate structure that contains a list of possible properties which can be a separate element (Figure 2).

Initially, the model that data can be applied in analyze was created to accelerate human research. Organize content by tags and keywords allow to form a category hierarchy and, therefore, to take the share function and influence the processes of applying metadata in the search.

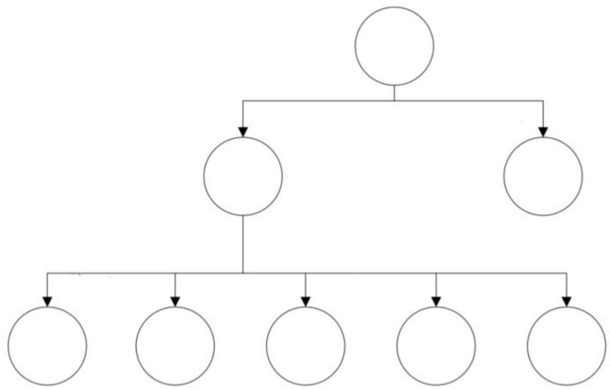

Figure 2: A Tree model database with a clear structure metadata for research

The General scheme for using correction coefficients is as follows:

1. if the sum of points (5+3) = 8, the correction coefficient is applied– 1,4; (8:1,4) = 5,7 (6 points) and in this case, the average level of harmonization is recorded.
2. (5+2) = 7, correction factor– 1,7; (7:1,7) = 4,1 (4 in this case, the level of harmonization is fixed below the average.
3. (5+1) = 6, correction factor– 2; (6:2) = 3 (3 in this case, the disharmony level is fixed.

For example, the 5th level in physical and 1st level in mental development, can not be a reflection of the child's harmony, but according to the norms of the assessment of harmony, 6 points are obtained - the average level. It is for such cases that the correction coefficient is proposed to be used.

Repeated results of the pedagogical experiment presented in the previous work were evaluated using the harmony index developed by us. The technology of harmonization of physical and mental development in physical education of preschool children aged 5-6 years based on the use of technical and tactical elements of football has led to a significant increase in the level of harmonization. The proof of this was the change in the harmony index in the experimental group C (5.6 to 7.5 points), which is an increase of 29%.

2.2. Using neural network for analyze data by type

There are a large number of types of data analysis based exclusively on neural networks, but two of them are the most popular. They are based on self-organizing neural networks and fuzzy networks.

1. Data analysis based on self-organization neural network. Self-organizing process – the process of learning without a teacher. For this type of training [7], the training set consists of the values of input variables during training, there is no comparison of the outputs of neurons with the desired values. We can say that such a network learns to understand the structure of data.

The idea of the Kohonen network belongs to the Finnish scientist ToivoKohonen [20-26]. The principle of operation of these networks is to introduce information about the placement of a neuron into the training rule, that is, maps of the placement of neurons are made.

Self-organizing Kohonen maps are used for modeling, forecasting, searching for patterns in large data sets, identifying sets of independent features, and compressing information.

2. Data analysis (data mining) based on fuzzy neural network. Fuzzy neural networks are based on the idea of using an existing data sample to determine the parameters of membership functions, conclusions are formulated based on the fuzzy logic apparatus, and neural network training algorithms are used to find the parameters of membership functions. Such systems can use previously known information, learn, acquire new knowledge, predict time series, and perform image classification. But one of the main advantages is the visibility of such a network for the user.

Each of the considered types of neural networks has its advantages and disadvantages in relation to data mining, so it is advisable to compare the Kohonen neural network in a group of data mining types based on neural networks.

The table shows that the Kohonen network and fuzzy neural network have advantages and disadvantages.

The main difference between Kohonen networks and other types of neural networks is in their visibility and ease of use. These networks make it possible to simplify the multidimensional structure. they can be considered one of the methods of projecting a multidimensional space into a space with a lower dimension. Another fundamental difference between Kohonen networks and other models of neural networks is unmanaged or uncontrolled learning, which makes it possible to set the values of input variables.

2.3. Insights

The result of the article is the increase in search results of documents matching the query, in the framework of some static collection of documents

3. CONCLUSION

Summing up the material and reasoning, we can conclude that the Kohonen self-organizing neural network can be one of the foundations of an adequate algorithm in comparison with other types of neural networks designed for cluster data analysis.

Kohonen networks are fundamentally different from all other types of networks. While all other networks are designed for managed learning tasks, Kohonen networks are primarily designed for unmanaged learning, which means that the network learns to understand the data structure itself.

So, the self-organizing neural network today is a strong tool in the field of algorithms for cluster data analysis and competes with modern algorithms, but none of the available pure models meets modern requirements.

In the future, the author does not reject the desire to pay attention to such algorithms as:

1) graph-oriented chameleon algorithm, which eliminates the problem of the Neva-importance of the number of clusters;

2) the K-means algorithm is a hard clustering method. This means that a data point can only belong to one cluster, and a single probability value is calculated for each data point in this cluster.

3) expectation maximization (EM) is a soft clustering method. This means that a data point always belongs to multiple clusters, and probabilities are calculated for all possible combinations of data points with clusters.

It is worth noting, in particular, that the Microsoft clustering model uses a scalable expectation maximization algorithm. This algorithm is used by default because it has several advantages in comparison with the method of K-means clustering:

– does not require more than one viewing of the database;

- works even with a limited amount of RAM,

– can use a single-pass cursor;

– outperforms methods that require sampling in terms of performance.

One of the most significant disadvantages of the Kohonen neural network is that the corresponding algorithm does not provide for determining the number of clusters. But it is able to function under interference conditions due to the fact that the number of clusters is fixed in advance.

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