

Factor structure of physical development, physical workability and specific preparedness of 8-year-old school children

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Abstract:

The standard teaching of basketball fundamentals in schools reveals that the methodology laid down in the physical education and sports program is not up to date. The requirements of the modern basketball game are related to the provision of game-based training in which movements, variations and games play a key role. The activities involving 7-11-year-old children have to be conducted in a positive emotional environment that is natural to the game activity. The aim of this research is to reveal the factor structure and to identify the main factors of the physical development, physical workability and specific preparedness of 8-year-old school children after the application of the game approach to teaching basketball. The tasks set out in the course of the research in order to achieve this aim are as follows: 1. Examination of the condition of the main signs providing information about the physical development, physical workability and specific preparedness of the school children included in this research. 2. Disclosure of the factor structure and identification of the main factors of the physical development, physical workability and specific preparedness of 8-year-old school children after the application of the game approach to teaching basketball. The subject of this research is the signs of the physical development, physical capacity and specific preparedness of school children from the initial stage of primary education. The sample size of the research was 15 eight-year-old school children. The experimental group participated in game-based basketball training. The anthropometric and velocity-force factor along with the weight factor have become the first and second most important factor respectively, which confirms that the capabilities relating to height and the force-velocity qualities are at the core of basketball training and their development is a priority in the game approach which has been applied.

Key words: physical development, physical workability and specific preparedness, basketball, game approach

Introduction

The standard teaching of basketball fundamentals in schools reveals that the methodology laid down in the physical education and sports program is not up to date. The requirements of the modern basketball game are related to the provision of game-based training in which movements, variations and games play a key role. The activities involving 7-11-year-old children have to be conducted in a positive emotional environment that is natural to the game activity (Alexieva, Petkova, 2016).

Purpose of the study

The *aim* of this research is to reveal the factor structure and to identify the main factors of the physical development, physical workability and specific preparedness of 8-year-old school children after the application of the game approach to teaching basketball.

The tasks set out in the course of the research in order to achieve this aim are as follows:

1. Examination of the condition of the main signs providing information about the physical development, physical workability and specific preparedness of the school children included in this research.
2. Disclosure of the factor structure and identification of the main factors of the physical development, physical workability and specific preparedness of 8-year-old school children after the application of the game approach to teaching basketball.

Scientific research and a work hypothesis

The basketball education in the initial stage of educational degree is not always successful, as most of the time the sport pedagogues are sticking to the already implemented working stereotypes and do not take into account the favorable conditions, which the game approach offers. It's necessary for ways to be found to apply in teaching practices on the fundamental technical and tactical actions from the basketball game through the meanings of direct and indirect method and combining them both.

This is an objective argument to compile the below work *hypothesis*:

The research and implementation of the game approach in the basketball education will positively affect the physical development, the physical capability and the specific preparedness of students in their initial stage of educational degree.

Methodology of the study

The *subject* of this research is the signs of the physical development, physical capacity and specific preparedness of school children from the initial stage of primary education.

The *sample size* of the research was 15 eight-year-old school children. The experimental group participated in game-based basketball training. The games were carefully selected according to the anatomo-physiological and psycho-pedagogical features of the children and the objectives of the training (Petkova, Alexieva, 2013). The sports educational experiment was conducted in the school year 2014-2015 with students from Primary School "Pencho Slaveikov" in the town of Veliko Tarnovo.

There are 14 indicators reflecting the situation of the studied groups in relation to the physical development, physical workability and specific preparedness which are subject to factorization, and they are as follows: 1. Height; 2. Body weight; 3. BMI; 4. Horizontal stretch; 5. Vertical stretch; 6. Standing long jump off two feet; 7. Vertical jump off two feet; 8. Running 10m from high start; 9. Solid ball shooting – 1 kg; 10. Tilt depth; 11. Two-handed chest pass against the wall; 12. Running between stands; 13. Dribble between stands; 14. Index 13-12.

Mathematical and statistical processing of the data

The mathematical and the statistical processing of the data from the testing are done on a personal computer with the help of the standard programs SPSS 19 and Microsoft Excel.

Results

Taking into account the extent of changes in the factor structure, we can judge the efficiency of the conducted impact (Tsarova, Alexieva, 2009). Prior to the experiment, the 14 variables monitored among the 8-year-olds were separated into 4 factors (**Fig. 1 and Fig. 2**). The influence of all examined factors on the indicator *body weight* is most pronounced ($h^2=99$), whereas the least affected indicator is *two-handed chest pass against the wall* ($h^2=48$).

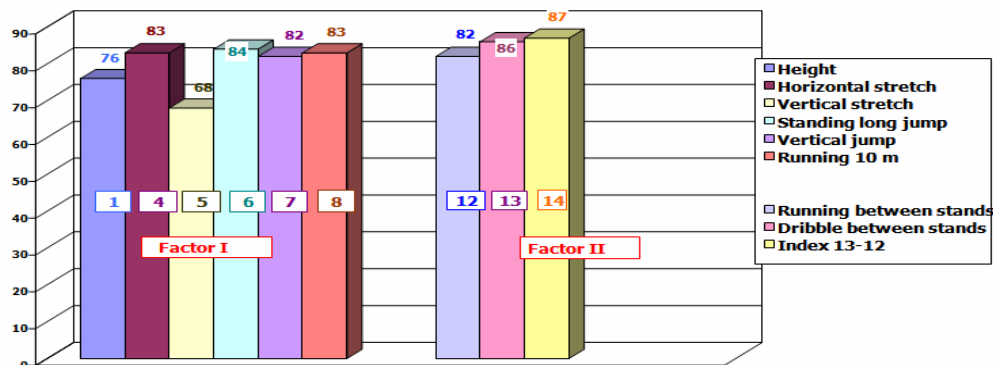


Fig. 1. Factor structure of the physical development, physical workability and specific preparedness of the 8-year-olds at the beginning of the experiment - Factor I and Factor II

The second factor consists of three tests which we can define as equivalent tests, proving information about the students' technical and tactical skills, and it accounts for 22.40% of the total dispersion (**Fig. 1**). It is logically defined as *techno-tactical* factor and *Index 13-12* is the most valid test in this case with a factor weight 0.870. **The third factor** which can be referred to as *strength, flexibility and agility* includes the following three tests: solid ball shooting (1 kg), tilt depth and two-handed chest pass against the wall (**fig. 2**). The *tilt depth* test has the highest factor weight (0,930) which determines it as the most valid test. This factor accounts for 10.42% of the total dispersion.

The fourth factor accounts for 8.35% of the initial dispersion. It covers indicators 2 and 3 – body weight and BMI (**fig. 2**). The highest values of the factor weights of the two aforementioned tests ($r=0,910$ and $r=0,980$ respectively) allow for the analysed factor to be identified as *weight* factor.

Figure 3 and Figure 4 display the rotated factor structure of the 8-year-olds after the completion of the experiment. There are again four separate factors just like at the beginning of the experiment. However, we have registered a change in the ordering of the factors and in the tests comprising them.

The first factor is almost identical to the first factor prior to the experiment but it accounts for a lower percentage (36.18%) of the initial dispersion of the studied phenomenon. This factor includes six tests and we can determine three of them as equivalent tests characterizing the components of anthropometry, and there are

also three tests relating to the force-velocity capabilities of the school children (**Fig. 3**). This factor can be identified as **anthropometric and force-velocity** factor and *running between stands* is the most valid test in this case with a factor weight 0,850.

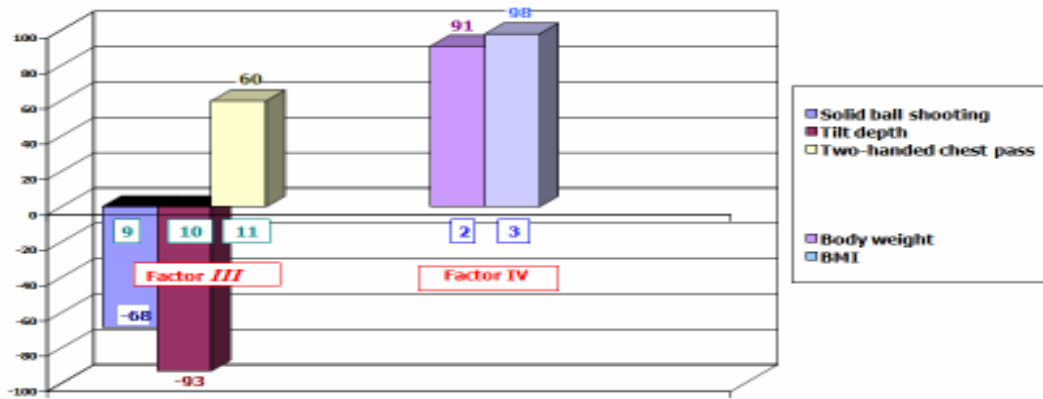


Fig. 2. Factor structure of the physical development, physical workability and specific preparedness of the 8-year-olds at the beginning of the experiment - Factor III and Factor IV

The second factor has a 22.13% share of the total dispersion. It combines two tests in which high factor weights (0,920) have been registered in the factor matrix - body weight and BMI (**Fig. 3**). Therefore **weight** can be identified as the aggregate capability relating to both variables.

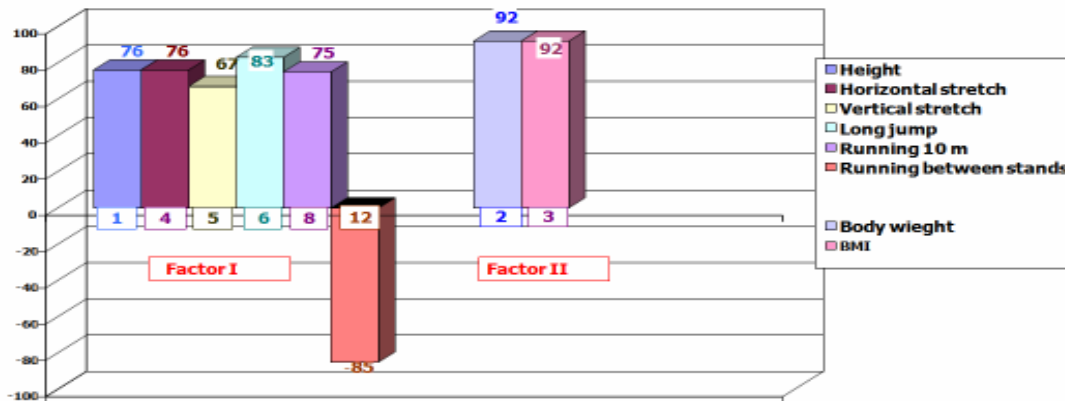


Fig. 3 . Factor structure of the physical development, physical workability and specific preparedness of the 8-year-olds at the end of the experiment - Factor I and Factor II

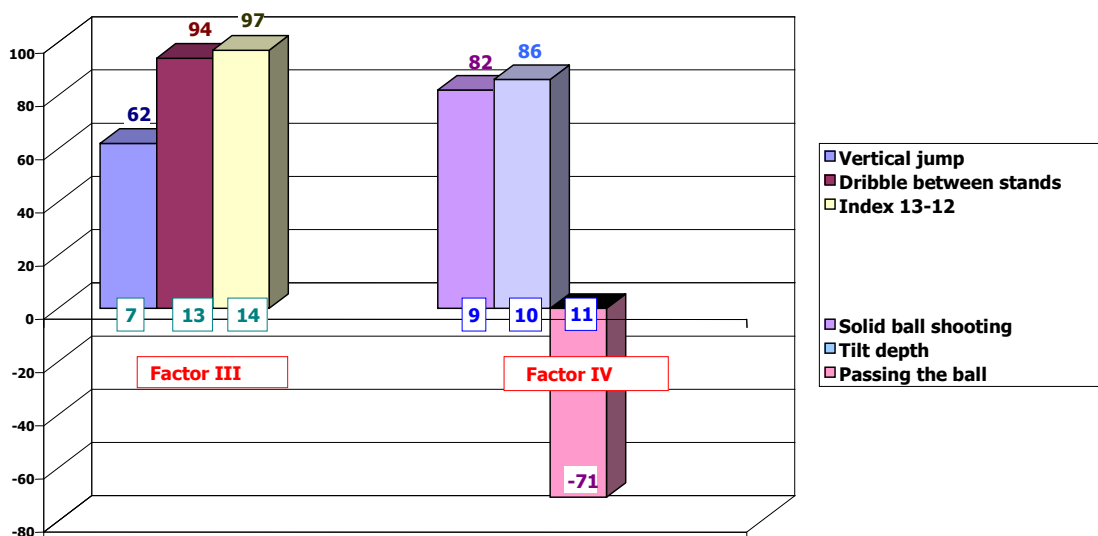


Fig. 4. Factor structure of the physical development, physical workability and specific preparedness of the 8-year-olds at the end of the experiment - Factor III and Factor IV

The third factor accounts for 15.70% of the initial dispersion and defines three indicators, one of which we cannot define as equivalent, namely the *two-legged rebound vertical jump* (fig. 4). The *index 13-12* test has the highest factor weight which determines it as the most valid test in this case. This factor can be identified as **rebound and technico-tactical** factor.

The fourth is completely identical to the third factor prior to the experiment but it accounts for a lower percentage (9.44%) of the initial dispersion of the studied phenomenon. It is identified as **strength, flexibility and agility** (Fig. 4).

Upon examination of the factor structure of the 8-year-olds after the end of the experimental impact, we found a slight increase in the total percentage of the explained dispersion. The first two factors account for the greatest share (58.31%) of the total dispersion. They refer to the anthropometric data of the school children included in this research and their force-velocity capabilities. According to S. Stefanov (2013) and M. Petkova (2013), it is in this age period that these qualities undergo a serious development, which gives us ground to assume that the resulting changes are not due solely to the impact on this group. The first factor has the highest number of tests (six), whereas the second factor has the lowest number of tests (only two). The indicator *Index 13-12* pertaining to the third factor has the highest factor weight (0.970). The factor structure of the physical development, physical workability and specific preparedness of the 8-year-olds does not undergo any changes in terms of the number of the separate factors but there are some obvious changes in the content of the factors.

Conclusions and recommendations

1. At the beginning of the experiment, the factor structure of the 8-year-olds is determined by four major factors. This factorization of the studied phenomenon remains the same after the end of the impact.

2. As regards the studied indicators, the factor structure of the 8-year-olds does not undergo a change in relation to the number of the separate factors but there are some obvious changes in the content of the factors which is a proof of the focused and controlled basketball training as a process.

3. The *anthropometric and velocity-force* factor along with the *weight* factor have become the first and second most important factor respectively, which confirms that the capabilities relating to height and the force-velocity qualities are at the core of basketball training and their development is a priority in the game approach which has been applied.

The significance of the anthropometric indicators for practising basketball is confirmed by the place of these factors in the factor structure of the observed aggregations. The normal weight, the height, as well as the long limbs of the school children in this experiment ensure successful acquisition of basketball skills even at the initial stage of training.

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