

THE EFFECT OF INTERVENTION ON THE CHANGES OF COORDINATION FACTORS IN THE YOUTH SPORTS PREPARATION

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Abstract

The author used intraindividual method for the assessment of changes in the level of coordination abilities in young martial arts sportsmen performing a special intervention programme. The results showed that both in the observed boys and the girl the focused sports preparation developed changes in physical abilities only in the intervention phases, while during the phases without special training no changes have been found. The longer the phases were, the worse it was for the quality of motor coordination. Special sports programme effected positively on the phase of commencing puberty during which no rapid decrease in the level of coordination abilities in young sportsmen was recorded.

Key words: youth sports preparation, coordination abilities, special programme, intervention phase, basic phase, intraindividual study

Introduction

One of the most important tasks in the theory of training is the problem of measuring and classifying the training means. The importance of the development of coordination abilities has grown during the last decades. Several researches have been carried out (Hirtz, 1981; Ljach, 1988; Raczek, 1990; Szczepanik, 1993; Šimonek, 1994; and others) which proved that it is very important to make use of the sensitive periods of the development of coordination abilities. The specialized coordination programme may positively affect the negative influence of puberty on motor performance in children (Hirtz & Starosta, 2002). When defining the coordination factors we come out of the work by Měkota (2000) (Fig.1).

In the school physical education and sport we focus on the development of five basic coordination abilities during the sensitive periods: Kinesthetic-differentiation ability: 6 - 9 years, rhythmic ability: 8 - 11 years, balance: 8 - 12 years, reaction speed: 8 - 11 years, space-orientation ability: 9 - 14 years. The development of individual abilities starts and finishes 1-2 years earlier in girls than in boys. The younger school age (8-11) is extremely favourable for the natural development and growth of coordination performance. The attention should therefore be paid first of all to the development of the brain which reaches already at the age of 6 years about 90-95% of the adults' values (Weineck, 1994) (Fig.2).

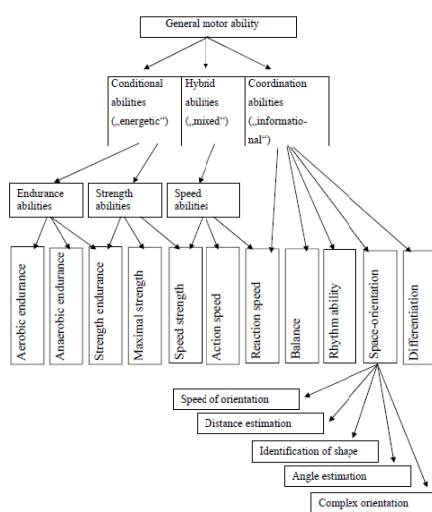


Figure 1. Model of the structure of motor abilities (Měkota, 2000)

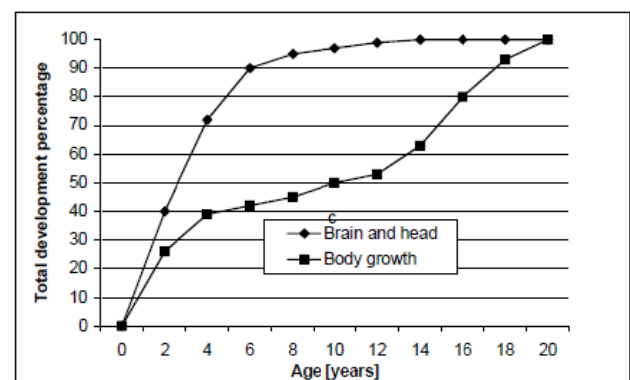


Figure 2. Development of brain, head and overall growth of a man (Weineck, 1994)

The basic principle of the training of coordination abilities is the variability of all training means. The principle of progression from the least complex (general coordination training) to the most difficult (special coordination training) should also be observed. The choice of means will depend on the creativity level of the trainer, on his planned and

meaningful work as well as methodical qualities. Adaptation changes, as the reaction to specific loads, have different time course and thus it is necessary to plan specific frequency of stimuli in microcycles. A special care should be taken of an optimum size of applied stimuli (volume and intensity) (Simonek & Zrubak, 1995). In order to reach necessary changes in the level of development of coordination abilities, some period of time is needed. During this period the organism of a sportsman adapts to the load by increasing its performance level. The time normally amounts to at least 8 – 10 weeks, with the frequency of stimuli in a microcycle: 4 – 6 times a week. Totally 30-50 training units are required for the solution of all the tasks of the given sport game (Tab.1).

Table 1. Course of adaptation changes conditioning development of movement abilities (Šimonek & Zrubák, 1996)

Model of changes	Changes in the level of coordination abilities				Maintaining the same level		
	More pronounced adaptation changes, weeks	Frequency of loads in a microcycle, number	Volume	Intensity	Frequency of loads in a microcycle, number	Volume	Intensity
Required Loads	8 – 10 30 – 50 training units	4 – 6	15 – 30 min.	Submax. to maximal	2 – 3	15 – 30 min.	Submax. to maximal

In the physical education and sports practice we can find individuals who differ thanks to their peculiar somatic, motor, psychic, social and other characteristics. This means that a teacher or a coach should „tailor“ the training process exactly to the specific features of an individual. Sports performance is a complex manifestation of the personality of a sportsman. Top performance can thus be considered as the display of a unique and non-recurring personality. From this aspect, in the sport research experiments with a single experimental person should be preferred to perform group experiments, where the uniqueness of personality is not taken into account. The aim of this study was to follow the changes in coordination abilities during the periods of training and resting on a sample of 3 boys and one girl attending aikido training units.

Method

We watched the level of coordination abilities in 4 children (3 boys and 1 girl) aged 9- 11 years (Tab. 2) using the intraindividual method. We used a specialized block of aikido exercises for the development of coordination abilities within the given period of 18 months, at 3 sixty-minute-long training units per week.

Individualization of load in the sports training is the key question, especially in group sports games where the training process is carried out in groups, not individually, which causes an unequal and unadequate adaptation of the organism to the given load. Results of the recent longitudinal researches with a single subject (Kazdin, 1982) have brought new knowledge, which is more valid

than the one of interindividual – group experiments with subjects of a heterogenous nature.

Table 2. Basic characteristics of the experimental persons

Tested person	Sex	Date of birth dd/mm/yyyy	Decimal age /yrs/	Body height /cm/	Body weight /kg/	BMI	Length of sports practice /yrs/
M.H.	Boy	28/02/1991	9.534	148	35	16.0	2 – aikido
T.P.	Girl	26/04/1991	9.378	143	36	17.6	2 – aikido
J.T.	Boy	09/11/1990	9.838	147	33	15.3	3 – aikido
V.B.	Boy	15/02/1991	9.570	154	56	23.6	2 – aikido

The intervening effect is repeated in certain time intervals. The effect of intervention is clear if the systematic changes find their place during each of the stages of intervention. The analysis of time sequences requires information on changes and trend during individual stages. In the ABAB-patterned project the intervening effect is repeated in certain time periods in one subject. The method of assessment of results we used is called „visual control“ (Kazdin, 1982). When analysing the results we followed two aspects:

1. Changes in averages in individual stages of experiment and their mutual comparison,
2. Changes in trend (systematic increase or decrease of the level of the followed phenomenon) in individual stages of experiment.

The change in trend does not depend on the change in the average. Fig. 3 depicts the hypothetical model of the course of experiment in which the trends change during individual stages of the ABAB project.

In our research *intervention phase I* represented the months of September through May, *basic stage I* – June through August, *intervention stage II* – September through mid December and *basic stage II* – mid December through February. Trends according to the pattern of changing of phases ABAB were recorded.

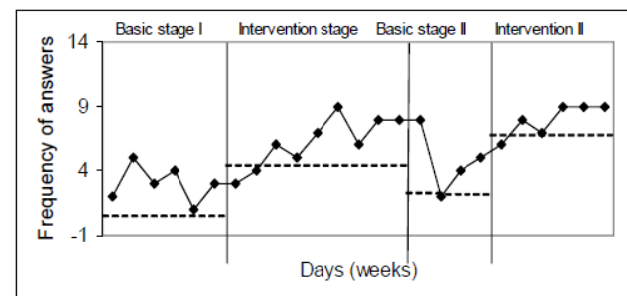


Figure 3. Example of graphic depiction of the project with a single subject (Kazdin, 1982)

During the basic phase we did not introduce the experimental factor (special coordination exercises), while during the intervention phase a special coordination programme was introduced into the training unit. The special coordination programme consisted of coordination exercises implemented in the training process of young aikido

sportsmen 3-times a week and 30 minutes at each practice. We used a set of exercises performed in a higher frequency and smaller volume. Examples of aikido exercises: Improvement of the technique of katatetori aihanmi kotegaeši, katatetori aihanmi ikkjó, suwariwaza kokjúho (Shioda, 1990). Examples of preparatory exercises: falling down, gymnastic exercises with a focus on orientation in space, preparatory games – Samuray and Ninja game, etc.

Instruments

To evaluate the effect of a training load on the sportsmen we carried out 19 research testings in the span of 1 month. We used the following four tests of coordination abilities standardized by Sehlbach (1988) and Hirtz (1981):

TEST 1: Balance test (dynamic balance).
 Description: Tested person stands at one end of a bench. The bench is laid on the floor upside down. The task of the tested person is to walk on the narrower side of the bench as fast as possible, while making 3 turns (360 degrees). The test finishes by touching the ground behind the bench with one leg. 2 attempts are measured with the 0.01 accuracy.

TEST 2: Stopping the falling ball (reaction speed).
 Description: A gymnastic bench is put along the starting line in a distance of 3 m. 2 balls are put on the ends of the bench. The tested person lies with his/her face down, arms are along the body, legs are behind the starting line. The examiner stands behind the bench and on a signal he puts one arm to the side, pointing at one of the balls. The task of the tested person is to start on a signal and touch the ball, the examiner is not pointing at, as quickly as possible. Three consecutive attempts are measured with the 0.01 s accuracy.

TEST 3: Shuttle run (space-orientation ability).
 Description: 6 balls are situated on the ground in the way that 0 ball is in the centre, other randomly numbered 5 balls are situated on a semi-circle in a distance of 3 m each from the 0 ball. The distance between balls 1-5 is 2.4 m. On the examiner's signal the tested person standing with his/her back to the balls, above ball 0, runs quickly to the ball with the number shouted by the examiner. After touching this ball he/she runs back to touch ball 0. On the way back, the examiner shouts another number of the ball and the activity of the tested person repeats again. The examiner shouts altogether 3 numbers. The test finishes after the tested person touched the ball 0. Two consecutive attempts are measured with the accuracy of 0.01 s.

TEST 4: Three consecutive front rolls (complex coordination ability).
 Description: A medicine-ball is situated 7 m from the starting line. On a signal the tested person runs towards the 7-m ball making on the way a front roll, 180° turn, back roll, 180° turn, front roll and touches the ball.

Time is measured with an accuracy of 0.01 s from the starting signal until the 7-m ball is touched.

Results

We found out that the application of exercises with a special focus on coordination development had an important effect on the level of coordination exercises in the watched children. As an effect of special block of exercises applied during the two stages of intervention, all experimental subjects improved in the performance in the tests of space-orientation, dynamic balance and reaction speed (Fig. 4 -7). On the other hand, during basic stages I and II there did not come to an improvement of the given abilities.

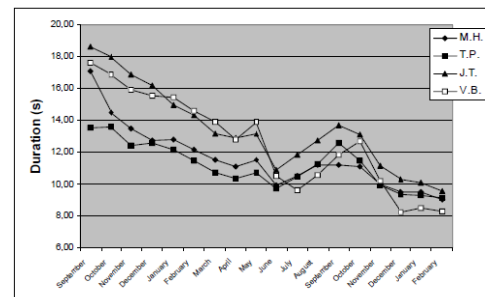


Figure 4. Results of tests of dynamic balance – Bench walking test

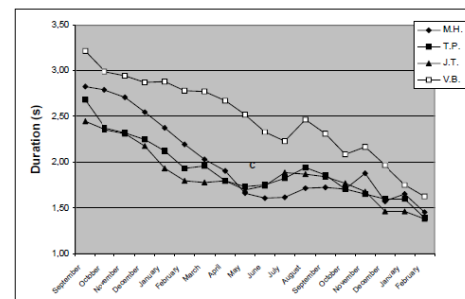


Figure 5. Results of tests of reaction speed – Stopping the falling ball

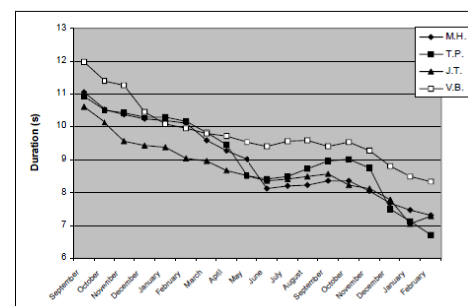


Figure 6. Results of tests of space-orientation ability – Shuttle run

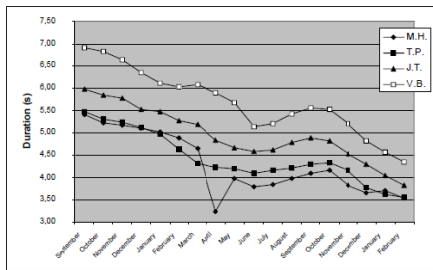


Figure 7. Results of tests of space-orientation ability – Front rolls

We did not find any intersexual differences in the coordination factors developmental curves. The girl obtained comparable results with the tested boys in all tests. A close relationship between somatic parameters and results in motor coordination tests was found. V.B. showed too high BMI value, which negatively influenced the results in all tests when compared with the other tested persons (including the female one).

Discussion

The purpose of this study was to find out some regularities in the development of coordination abilities influenced by a specialized coordination training in aikido. Having finished visual control of all four motor tests we can conclude in concord with the findings by Schmidt & Lee (1999) that the resulting values have no differences in the trend so there is no intersexual difference between boys and girls in the given age. However, there are certain differences in the absolute values of boys and girls. Considering the obtained results together with the results of the previous studies (Hirtz, 1981; Ljach, 1988; Raczek, 1990; Szczepanik, 1993; Šimonek,

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1994; and others) it is necessary to stress the following conclusions:

1. The age of 9-11 years is favourable for the development of coordination abilities in boys and girls. With the growing age a substantial improvement in the level of dynamic balance, space orientation and reaction speed was recorded in consent with Halmová (2000, 2001). The assumption that „coordination maturity“ lies ahead of the sexual one has thus been proven.

2. The period of puberty is the one of motor coordination disruption and performance stagnation. In spite of this, thanks to the regular performance of exercises, there comes to the adaptation of organism to the changing internal conditions for movement. In compliance with Roth & Winter (1994) we recommend to devote at least 30 minutes to the special coordination exercises three times a week in order to improve coordination abilities.

3. We recommend using a large number of exercises in a higher frequency and smaller volume so that there is no fatigue of the central nervous system.

4. The trend in the development of coordination abilities has a similar course in both sexes. In the phases of intervention, when the children carried out a block of special exercises along with aikido training, we can observe an improving trend in the development of coordination abilities. However, in the two stages of rest (between the two testing units in June and August, as well as mid December and February), when children did not carry any exercises, the results in coordination tests were decreasing.

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UČINAK POSREDOVANJA U VEZI PROMJENA FAKTORA KOORDINACIJE U SPORTSKOJ PRIPREMI MLADIH

Sažetak

Autor je koristio intraindividualne metode za procjenu promjena u razini sposobnosti koordinacije kod mladih sportaša koji se bave borilačkim vještinama te izvode poseban program posredovanja. Rezultati su pokazali da je i kod promatranih dječaka i djevojčica usmjerena sportska priprema razvila promjene u tjelesnim sposobnostima samo u fazama posredovanja, dok tijekom faza bez posebnog treninga nisu pronađene promjene. Što su faze bile dulje, bilo je gore po kvalitetu motoričke koordinacije. Posebni sportski program imao je pozitivan učinak na fazu s početkom puberteta, tijekom koje nije zabilježen nagli pad u razini koordinacijskih sposobnosti kod mladih sportaša.

Ključne riječi: sportska priprema mladih, koordinacijske sposobnosti, poseban program, faza posredovanja, osnovna faza, intraindividualno istraživanje

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