

THE DYNAMICS OF THE FOCAL QUALITIES IN GIRLS AGED 10-15 YEARS

Samonenko S.B.

Chernigov National Pedagogical University

Annotation. *Purpose:* determine the dynamics of focal qualities in girls of secondary school age. *Material:* is used stabiloanalyzer with biofeedback STABILAN-01. The study involved 254 girls (age - 10-15 years). To assess the temporal and spatial parameters of motor actions reproduce the trajectory of the girls (which is shaped like a triangle) and the rate of passage. *Results:* the obtained data on averages percent error when playing a temporal and spatial parameters of motor actions girls. Revealed that girls have a better ability to manage spatial than temporal parameters of motor coordination. A high coefficients of variation in all parameters. *Conclusions:* the results indicate large individual differences in the level of development of coordination abilities of girls at this age. This is reflected in the effectiveness of teaching motor actions. Also confirms the assumption about the possibility of taking into account these indicators as criteria for selecting a method of differentiated teaching motor actions of girls of secondary school age.

Keywords: spatial, temporal, parameters, criteria, differential, learning, motor, girls, age.

Introduction

Effective solution of pedagogic tasks, oriented on formation of schoolchildren's motion functions at physical culture classes has been acquiring great significance in connection with society's demand in increasing of quality of rising generation's physical fitness [8, pg. 9]. In this aspect theory of control (by V.V. Petrovskiy) can be of great use. This theory bases on principle that coordination is characterized as person's ability to control movements [5, pg. 129]. A little bit different statement is delivered in work by M.O. Bernstein, in which coordination is determined as "overcoming of excessive steps of freedom of our motion organs and transformation of them in controlled systems" [2, pg. 54].

It is known that process of movements' training is closely connected with development of coordination. Also it is regarded as specific form of delivering of knowledge about movements and mastering of special skills, which reflect motion experience of previous generations [11, pg. 30]. It should be supplemented by the fact that level of coordination's development is a basis of successes in different spheres of human motion functioning [10, pg. 1]. In its turn appropriate sides of person's motion qualities are conditioned by previous motion experience and are realized in conditions of fulfillment of actions with complex coordination. Their result depends on accuracy of differentiation of space, time and power motion's parameters [8, pg. 52]. They are ensured by complex interaction of central and periphery links of motor system on the base of back apperentice (transmitting of impulses from working centers to nervous ones) and have expressed age and gender specificities (V.S. Farfel, 1975; Ye.P. Ilyin, 1976; V.V. Filatov, 2009) [15, pg. 48].

On the other hand complex character of physiological mechanism of human motion functioning's organization and complexity of its quantitative evaluation resulted in the fact that in conditions of physical education and sports, system of evaluation of coordination requires further scientific foundation [18, pg. 52]. Alongside with it researches of scientists (V.S. Farfel, 1959-1975; M. Prasilova, 1981; I. Yurina, 1982; L.Ye. Liubomyrskiy, 1983; V.I. Liakh, 2006; A.M. Kolumbet, 2012) showed that development of coordination goes in hetero-chronic way; on the age from 7 to 9 years old indicators of coordination increase the most intensively as well as in the age from 9 to 11-12 years old. [16, pg. 63]. In this aspect the most important are biomechanical regularities of motion actions, the base of which are works by V.K. Baksevych, N.A. Bernstein, D.D. Donskoy, V.M. Zatsiorskiy, V.B. Korenberg, V.I. Liakh, L.P. Matveyev, N. A. Fomina.

It is known that level of coordination's development of a person depends on level of central and periphery nervous systems' development (to be more exact – on sensor-motor analyzers): visual, hearing, vestibular and kinetic-static. Interaction of these complex physiological mechanisms is reflected in ability to accurately differentiated power, time and space parameters of person's movements. They are integral indicators of coordination of human organism's Відомо, що рівень розвитку координаційних якостей людини залежить від рівня розвитку центральної та motion functions [14, pg. 110]. That is why, when characterizing memories efficiency, mistakes in motion actions can depend on effector reasons that inevitably spoil indicators of memorizing [4, pg. 4]. As per theory of functional systems by P.K. Anokhin, useful result (motion skill) will be a system forming factor for transformation and fixing of central mechanisms of coordination [1].

As it was noted by some researches (M.M. Bogen, V.I. Goncharov, D.D. Donskoy, N.V. Zymkin, T.Yu. Krutsevych, G.F. Korotko, V.M. Pokrovskiy, V.V. Frolov) motion coordination means accordance of body links in space, time and by power parameters, which corresponds to fulfilled motion task in certain condition. It actualized problem about purposefulness of consideration of motion coordination as criterion of differentiation of middle school age girls' training to motion skills.

The research has been fulfilled in compliance with combined plan of scientific research works of Chernigov national pedagogic university, named after T.G. Shevschenko "Didactic principles of motion function's formation of

persons, practicing physical culture and sports” (state registration number 0108U000854 date February 19th, 2008) and in compliance with state financed topic “Pedagogic ways of health life style formation of different age schoolchildren (state registration number 0112U001072 date, January 18th, 2012).

Purpose, tasks of the work, material and methods

The purpose: determination of dynamic of coordination’s development of 10-15 years old girls.

The material and methods: analysis of scientific methodic literature; application of stability analyzer with biological feedback “Sabilan-01”. The research was carried out on the base of Chernigov national pedagogic university, named after T.G. Shevchenko. In the research 254 girls of middle school age participated: 44 girls of 10 years old; 36 girls – 11 years old; 50 girls – 12 years old; 34 girls – 13 years old; 44 girls – 14 years old; 46 girls – 15 years old.

We used automatic measuring complex “Stabilograph”, which permitted to quickly evaluate coordination in the process of movement.

We chose this complex, basing on the fact that indicators of coordination permit to prognosticate level and quickness of motion skills’ formation [11, pg. 130].

For evaluation of time and space parameters of girls’ movements we used methodic “Triangle” with the help of stability analyzer with biological feedback “Stabilan-01”. It included two stages: training and analysis. At the stage of training the teasted reproduced trajectory of movement (triangle by shape) and temp of passing, while at the stage of analysis – passing of trajectory without markers, in the set temp. By this methodic we studied time parameters of movement by the following parameters: dispersion of passing periods (stage of training (LenQTest,sec.) and stage of analysis (LenQAnal, sec.)), dispersion of quickness of passing (training stage (SpdQTest, mm.p.sec.) and stage of analysis τ (SpdQAnal, mm/p/sec.)) and space parameters by indicators: dispersion of triangles’ area (training stage (SqrQTest, mm²) and stage of analysis (SqrQAnal, mm²)), random error of triangle’s center by axis X (training stage (MdRndXTest, mm) and stage of analysis (MdRndXAnal, mm), random error of triangle’s center by Y axis (training stage (MdRndYTest, mm) and stage of analysis τ (MdRndYAnal, mm)).

Results of the researches

As a result of experiments we received mean indicators of errors’ percentage found with reproduction of time parameters of middle school age girls’ movements (see table 1).

Table 1

Time parameters of 10-15 years’ old girls’ movements

Stages	Age	10 years	11 years	12 years	13 years	14 years	15 years
	Indicators						
Training stage	LenQTest, sec.	9,11± 0,50	8,87± 0,88	9,02± 0,70	9,13± 0,42	8,81± 0,68	8,71± 0,39
	SpdQTest, mm.p. sec.	4,62± 1,77	3,73± 0,48	4,01± 1,13	4,96± 1,97	4,91± 1,53	3,95± 1,40
Analysis stage	LenQAnal, sec.	11,36± 0,80	11,34± 0,94	11,43± 0,68	12,07± 0,95	11,31± 0,70	11,29± 0,83
	SpdQAnal, mm.p. sec.	4,74± 1,77	3,70± 1,44	3,97± 1,21	4,76± 1,66	3,34± 1,33	3,28± 0,87

In group of 10 years’ old girls percentage of errors in dispersion of passing periods in training stage (LenQTest, sec.) was 9.11±0.50%, at analysis stage it increased up to 11.36±0.80%. In group of 11 years’ old girls, at training stage it was 8.87±0.88% and at analysis stage – 11.34±0.94%. For 12 years’ old girls percentage of the same errors was 9.02±0.70%, at analysis stage – 11.43±0.68%; for 13 years old girls - 9.13±0.42% and 12.07±0.95%. In period 12-13 years’ old age these indicators worsen that is connected with intensive growth of body’s bio-links and period of puberty (appearance of menarche). In 14-15 age period these indicators were at training stage 8.81±0.68%, 8.71±0.39%. At analysis stage (11.31±0.70%, 11.29±0.83%) they improve in connection with relative stabilizing of growth of girls’ organism.

Variation coefficients of the researched indicators are rather different with analysis of indicators of time parameters' reproduction.

For 10 years' old girls variation coefficient of errors' percentage in periods of passing was at training stage 5.49% and at analysis stage – 7.04%. At age of 11, 12 and 14 years old variation coefficient increased and at training stage it was accordingly: 9.92%, 7.76% and 7.71% at analysis stage – 8.21%, 5.95% and 5.80%. In age of 13 and 15 years old variation coefficient reduced: at training stage to 4.60% and 4.48%; at analysis stage – to 7.87% and 6.92%. Variation coefficient for quickness of passing at training stage was the highest in age group of 10, 13, 14 and 15 years' old – 38.31%, 39.72%, 31.16% and 35.44%, they are quite less in age group of 11 and 12 years old – 12.87% and 28.18%. At analysis stage variation coefficients of certain indicator nearly in all age groups are high: 10-14 years – 37.34%, 38.52%, 30.48%, 34.87%, 39.82%, a little less they are in 15 years age group – 23.64%.

Variation coefficients for time parameters are highly variable, in particular in age of 12-13 years. It witnesses about morphological changes in organisms in this period and about purposefulness of consideration of time parameter in training of girls to motion skills.

Besides, as a result of experimental research we received mean indicators for space parameters of movements (see table 2).

High level of errors of triangles' area dispersion at training stage ($SqrQTest, mm^2$) was in age of 10, 11 and 13 years – $508.96 \pm 211.96\%$, $500.94 \pm 82.92\%$ and $467.22 \pm 141.29\%$. Lower percentage of the same errors at training stage was in age of 12, 14 and 15 years – $380.76 \pm 137.23\%$, $402.43 \pm 136.65\%$ and $401.65 \pm 65.38\%$. At analysis stage ($SqrQAnal, mm^2$) in all age groups they vary within limits from $230.74 \pm 70.81\%$ to $298.88 \pm 117.33\%$.

Table 2

Space parameters of 10-15 years' old girls' movements

Stages	Age	10 years	11 years	12 years	13 years	14 years	15 years
	Indicators						
Training stage	SqrQTest, mm^2	$508,96 \pm 211,96$	$500,94 \pm 82,92$	$380,76 \pm 137,23$	$467,22 \pm 141,29$	$402,43 \pm 136,65$	$401,65 \pm 65,38$
	MdRndX Test, mm	3.62 ± 1.59	3.43 ± 1.13	2.80 ± 0.74	2.63 ± 0.93	2.52 ± 0.62	2.56 ± 0.87
	MdRndY Test, mm	2.63 ± 0.72	2.60 ± 0.44	2.23 ± 0.41	2.15 ± 0.48	2.11 ± 0.43	2.07 ± 0.86
Analysis stage	SqrQAnal, mm^2	298.88 ± 117.33	251.43 ± 46.18	235.60 ± 66.72	287.63 ± 132.20	235.63 ± 84.27	230.74 ± 70.81
	MdRndX Anal, mm	2.04 ± 0.75	1.65 ± 0.35	1.49 ± 0.32	1.51 ± 0.31	1.47 ± 0.27	1.52 ± 0.27
	MdRndY Anal, mm	1.84 ± 0.67	1.52 ± 0.21	1.36 ± 0.38	1.36 ± 0.33	1.28 ± 0.27	1.21 ± 0.54

At training stage variation coefficients of 10 years' old girls – 41.65%, 12- years' old girls – 39.04%, 13 years' old – 30.24%, and 14 years old – 33.96% are rather high; they are lower in groups of 11 years old girls – 15.44% and 15 years old girls – 15.62%. At analysis stage we can notice high variability: 10 years' old age – 39.26%, 11 – 18.37%, 12 – 28.32%, 13 – 45.96%, 14 – 35.76% and 15 – 29.41% .

Also we determined percentage for random errors of triangle center by X axis. We noticed dynamic of improving of this indicator at training stage (MdRndXTest, mm); according to every following age period: 10 years old age – $3.62 \pm 1.59\%$, 11 – $3.43 \pm 1.13\%$, 12 – $2.80 \pm 0.74\%$, 13 – $2.63 \pm 0.93\%$, 14 – $2.52 \pm 0.62\%$ and 15 years old – $2.56 \pm 0.87\%$. At analysis stage MdRndXAnal, mm) we noticed wave-like character of indicators. The least percentage

of errors was in groups of 12-15 years old age – from $1.47 \pm 0.27\%$ to $1.52 \pm 0.27\%$, the highest – in group of 10 years old girls – $2.04 \pm 0.75\%$.

Variation coefficients in percentage of random errors of triangle center by axis X in training period was in 10 years group – 43.92%, in 11 years' group – 32.94%, 12 years – 26.43%, 13 – 35.36%, 14 – 24.60% and 15 – 33.98%. At analysis stage it was for 10 years old girls – 30.76%, 11 years' – 19.39%, 12 – 21.48%, 13 – 20.53%, 14 – 18.37% and 15 – 17.76%. It witnesses about the highest variability among all other indicators and about rather high individual specificities of middle age school age girls' development.

We also determined percentage of random errors for triangle's center by Y axis. At training stage (MdRNdYTest, mm) we see a trend to reducing of errors' percentage with every age period: 10 years – $2.63 \pm 0.72\%$, 11 – $2.60 \pm 0.44\%$, 12 – $2.23 \pm 0.41\%$, 13 – $2.15 \pm 0.48\%$, 14 – $2.11 \pm 0.43\%$ and 15 – $2.07 \pm 0.86\%$, that is quite logic. At analysis stage (MdRNdYAnal, mm) we can see nearly the same picture, except equal indicators in period of 12-13 years' age ($1.36 \pm 0.38\%$).

The determined variation coefficients of percentage of random errors of triangle's center by Y axis at training stage in 10 years' group – 16.48% and 13.82% accordingly, in 12 years group – 18.39% and 27.94%, in 13 years group – 22.33% and 24.26%, in 14 – 18.61% and 18.24% and in 15 years group – 31.85% and 33.54%.

Discussion

The carried out research proved results of a number of authors about coordination in process of motion [7, 8, 10, 13, 18]. We considered that indicators of movement's coordination permit to prognosticate level and quickness of motion skills' formation [11]. In compliance with it we determined dynamic of coordination's development among girls of 10-15 years' old age with the help of stability analyzer "Stabilan-1".

Alongside with it the fulfilled researches specified data about mean indicators of errors' percentage with reproduction of time and space parameters by middle school age girls. For example it was found that girls of the tested age control better space parameters of motion than time ones. Basing on our researches we determined high variation coefficients by all indicators. Statistic processing of the received results resulted in high varying of indicators in reproducing of time and space parameters. It witnesses about significant individual distinctions of the tested in their coordination abilities that rather influence on mastering of motion skills and requires differentiated approach.

The obtained data permit to think that exactly great individual distinctions in coordination of this age girls' influence on effectiveness of training to motion skills. Besides, they prove that it is possible to consider space and time parameters as criteria in methodic of differentiated training of middle school age girls to motion skills.

In the whole materials of the research can be practically used in practical functioning of physical culture instructors with studying of curriculum's sections, devoted to mastering of motion skills.

Conclusions

So we determined that girls of middle school age have better bents for controlling of space parameters of movement's coordination than time ones. We found high variation coefficients by all indicators. It witnesses about great individual distinctions by level of coordination of this age girls that can not but influence on effectiveness of motion skills' mastering. It proves assumption that it is possible to consider these indicators as criteria for choosing of methodic of differentiated motion skills' training for middle school age girls.

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Information about the author:

Samonenko S.B.: <http://orcid.org/0000-0001-6729-5171>; samonenko.sveta@mail.ru; Chernigov National Pedagogical University; Getman Polubotka str. 53, Chernigov, 14013, Ukraine.

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