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EFFICIENCY OF ACTIVE AND PASSIVE VERBALISATION METHODS OF MOTOR LEARNING FOR THE STABILITY OF DYNAMIC STEREOTYPES OF PRE-SCHOOL CHILDREN

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UČINKOVITOST AKTIVNIH IN PASIVNIH METOD MOTORIČNEGA UČENJA ZA STABILNOST DINAMIČNIH STEREOTIPOV PRI PRED-ŠOLSKIH OTROCIH

Abstract

Active and passive verbalisation, as well as standard (control) methods of motor learning of gymnastic floor exercises and compositions, were applied on a sample of three groups of pre-school children. Motor learning was practised one hour weekly during two months and after that the children had a two-month rest period. The measurements were performed twice, the first time after the experiment and the second time after the break. The results of the research showed that the motor abilities of the children had no significant influence on the quality of exercise and composition learning, but that the general motor ability had a significant influence on the stability of dynamic stereotypes. On the basis of the results of the canonical discriminant and regression analysis, it was confirmed that the active verbalisation group had the best success in learning and memorising, i.e. the most stable dynamic stereotypes. The passive verbalisation group came second and the control group had the poorest results.

Key words: active and passive verbalisation, motor learning, dynamic stereotype, pre-school age

Izvleček

Aktivna in pasivna verbalizacija ter običajne (kontrolne) metode motoričnega učenja talnih gimnastičnih vaj in sestav so bile preizkušene na treh skupinah predšolskih otrok. Motorično učenje je bilo izvajano dva meseca, po eno uro na teden, potem je sledilo dva meseca odmora. Meritve so bile izvedene dvakrat, prvič po koncu eksperimenta in drugič po odmoru. Rezultati kažejo, da motorične sposobnosti niso imele značilnega vpliva na učenje vaj in sestav, splošna motorična sposobnost pa je imela značilen vpliv na stabilnost dinamičnih stereotipov. Rezultati kanonične diskriminantne in multiple regresijske analize so potrdili, da je imela skupina aktivne verbalizacije največ uspeha pri motoričnem učenju in pomnjenju, torej najbolj stabilne dinamične stereotipe. Skupina pasivne verbalizacije je bila druga, kontrolna skupina pa je imela najslabše rezultate.

Ključne besede: aktivna in pasivna verbalizacija, motorično učenje, dinamični stereotip, predšolski otroci

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INTRODUCTION

The most important period of human life for motor learning and stability of the acquired dynamic stereotypes is between the age of three and ten. In later period of life motor learning is considerably harder and with a much lower degree of efficiency (Singer, 1972). The kindergarten is the first institutional form of education in a child's life, where the learning of motor skills should be carried out under the control of experts (Arnheim, & Pestolesi, 1973). But sometimes the experts need help in selecting ways of learning motor (movement) skills.

One way to improve the teaching of motor skills and motor behaviour is by using verbal pre-training and verbalisation during the training. The teachers supply simple and picturesque word labels to help remind the children of what to do while executing the tasks. These word labels can be realised in different songs, which identify steps in the sequence simply and directly, and they make preparation for practice and learning the movement skills much easier. The use of verbal labels and such verbalisation should be simple, direct and describing the movement or position the teacher wants the children to learn. The verbalisation could be active (children speak or sing loudly the appropriate word labels and songs during exercising) or passive (listening to a tape with appropriate word labels, songs and descriptions of exercises in a relaxed position)(Hamza, 1999).

The verbalisation method is linked with a form of visual imagery (mental practice). The experience of using imagery is similar to sensory experiences like seeing, feeling, and hearing. Imagery usually involves more than just the visual sense under the influence of verbal labels and entire verbalisation during motor learning. With practice, the children can develop the ability, not only to see the imagined movement skills, but also to »hear« and »feel» them. Feeling may include the sensation of touching, muscular tensions and forces, and the body's orientation in space, and in that way improve much more the entire motor behaviour of children, including motor learning (Christina, & Corcos, 1988).

In this research it was assumed that physical exercising linked with active and passive verbalisation shortens the learning time and improves the quality of exercising, which is opposite to learning based only on physical exercising (Hannaford, 1995). That is because of better understanding of the logical relations and emphasis on the main details in exercises and compositions during motor learning. Beside that, it was also assumed that such learning would create more stable dynamic stereotypes during exercising. When more senses are involved in the learning process, we can expect more efficient and durable results.

The problem of this research was to analyse the efficiency of the active and passive method of verbalisation during the learning process, as well as the formed dynamic stereotype stability of performing gymnastic floor compositions with different complexities.

The basic purpose of this research was to enable conscious and active participation of pre-school children in the education process, using relatively new pedagogical methods and forms of teaching. All this should result in more stable stereotypes of exercising and motor actions, which would make physical education in the kindergarten more efficient.

METHODS

The sample of subjects

The sample of subjects, 5–7 years of age, was selected from the kindergartens in Budapest (Hungary). The sample was divided into three groups: 1) experimental group which learned gymnastic exercises and compositions by the active verbalisation method, and consisted of 20 children; 2) experimental group which learned gymnastic exercises and compositions by the passive verbalisation method and consisted of 20 children; 3) control group which learned the same exercises and compositions by the regular method (only by physical exercising) and consisted of 40 children. In all the groups the proportion between girls and boys was 0.5-0.5.

The sample of gymnastic floor compositions and motor tests

Three short and one longer (24 units) gymnastic floor compositions were created. The first three compositions focused on the quality of performing and the forth one on the speed of learning. The exercise and composition evaluations were performed according to a special code of points by three referees.

The first composition consisted of the following exercises: from a rear stand: jump to a straddle position with arms sideways; forward lean (2s); forward roll to a sitting position with stretched legs and arms behind the body; »candle« (2s); rolling forward to a squatting position; straight stand and scale position (2s) and rear stand.

The second composition consisted of the following exercises: from a rear stand: squatting position; backward roll to the shins; jump to a squatting position; stand up to a rear stand, arabesque (2s); a rear stand.

The third composition: from a rear stand: jump to a straddle position with the arms sideways; forward lean (2s); straddle forward rolling (hands between the legs); jump up into a rear stand, arms circle backwards.

The fourth composition: from the first till the eighth unit: motions with arms and legs during complete-

body movements; from the ninth till sixteenth unit: balance positions; from seventeenth till twenty-fourth unit: rhythm changes during exercising.

It was assumed that motor abilities would influence the quality of performance and the duration of memorised exercises and compositions in different ways. For that reason, motor abilities were tested before the experiment, according to a model which was established for children, as well as on the results obtained by Slemin (Kobjakov, 1976). According to that model, manifestations of the following potential motor abilities were tested:

1) balance – by a vestibular stability test (Slemin-test),
2) explosive strength (power) – by Sargent's test with a vertical jump,
3) flexibility – by pelvic girdle flexibility,
4) arm co-ordination – by Slemin umbrella test 1,
5) leg co-ordination – by Slemin umbrella test 2 and
6) general strength – by handgrip.

Short descriptions of the motor tests:

1) Vestibular stability test (Slemin-test). The child sat, with covered eyes, in an arm-chair, which turned round six times, and then stood up and leant against a wall for 2s and walked 4m along a straight line. The result was the maximal difference between the walked line and the guide-line.
2) Sargent's test with a vertical jump. The child jumped down from a box and linked a vertical jump to reach a table with the hand. The table had a scale in cm and the result was the difference between the jump-reach and the standing-reach of the child.
3) Pelvic girdle flexibility. The child stood with the back against the wall with two tables with scales of 180 degrees and lifted the left or right leg sideways. The result was average of four performances expressed in degrees.
4) Slemin umbrella test 1. The child stood face against a wall with two tables with the scales of 30, 45, 90 and 135 degrees, and lifted the arms sideways in every position. After that, the child stood with the back against the wall and lifted the arms sideways in the same memorized positions. The result was the sum of the differences in degrees.
5) Slemin umbrella test 2. The child stood against the wall with two tables with the scales of 30 degrees, and lifted the left and right leg sideways. The result was the difference between the lifted and 30 degree positions.
6) Hand grip. The child gripped a child dynamometer with left and right hand in a standing position. The result was the average between the grips of both hands.

The children who used the passive verbalisation method, which consisted of learning a song with the text in order to memorise exercises and compositions, listened to a tape with songs and descriptions of exercises and compositions in a relaxed position for 5 minutes before the end of physical education class. The exercises for muscle contraction and relaxation were incorporated into a game in the main part of the class.

The active verbalisation method consisted of the following: a song would be learned by heart and then the exercises and compositions were demonstrated. During the demonstration and performance of all gymnastic material, the children spoke out the text linked to every detail of the exercise. The text is in Hungarian, with suitable and melodic words, so the author considered that it was senseless to translate the appropriate text into another language, because the translation could caricature the meanings of the text, which is in the function of the learning process.

Children in the control group learned the gymnastic exercises and compositions in the regular way, with a teacher's explanation and demonstration. After that the children started exercising.

The experiment was performed for two months, during regular physical education classes for all three groups. At the end of the second month, three referees evaluated the performance of the exercises and compositions. After the evaluation, the children had a two-month break. During the break the children didn't perform gymnastic compositions, and at the end of the break the same referees evaluated the compositions again. At the same time the second motor testing was performed, using the same tests as at the beginning of the experiment.

Data analysis

In order to determine the differences between the three groups of children in motor variable space, canonical discriminant analysis was applied. In order to examine the significance of the influence of the analysed motor abilities on the performance success of gymnastic compositions after the two-month motor learning, as well as the quantitative and qualitative memorising of gymnastic materials after the two-month pause, regression analysis was used.

RESULTS

In motor learning of gymnastic exercises and compositions by way of active and passive verbalisation methods, a significant and positive influence of the children's motor abilities could be expected on the quality of performance and on the speed of learning these compositions. If that were correct, then such a finding would rather decrease the value of the verba-

lisation method effects. Because of this, analyses that took care of the interaction between motor abilities and achieved results in learning and performing the gymnastic compositions, as well as their memorisation, were used. It should be mentioned, that at the initial testing of motor abilities the differences between the three groups of children were not statistically significant (Table 1).

From Table 2 we can see that only the first discriminant function was statistically significant (Q=.00) in the initial analysis. It explained about 80.5% of the differences between the three groups of children in the analysed variable space. The structure of the discriminant factor (function) was composed of all four variables that evaluated the quality and speed of learning the floor exercises, and the variable to estimate vestibular stability. Based on such a structure, the factor could be defined as «The learning speed and performance exactness of gymnastic compositions on the floor».

According to the position of the group centroids on the first discriminant factor, it could be concluded that the group which used the active verbalisation method was significantly the most successful in learning speed and performing exactness of gymnastic compositions on the floor. Less successful children were in the group which learned by way of passive verbalisation method, and least successful children were in the control group. It is very important to point out that there were no significant contributions by motor abilities to the structure of the first discriminant factor and that the motor abilities were rather homogenous in all three groups of children.

Table 3 shows the situation after the two-month pause, when the memorised compositions were re-examined. The results of discriminant analysis showed that both discriminant functions were statistically significant in describing the differences between the three groups of children. Interaction of the used variables created a structure in which the gymnastic compositions and vestibular stability significantly dominated. It explained the differences between three groups of children with 82.3%. As the quality of the performance of gymnastic compositions was evalua-

Table 1. Canonical discriminant analysis of motor tests before the experiment

Function	λ	%	CR	Wilks' λ	χ^2	Q	
1	.26	86.79	.45	.76	19.95	.07	
2	.04	13.21	.19	.96	2.87	.72	
						Centroid	
V a r i a b l e			F1	F2	Group	F1	F2
Vestibular stability (balance)			-.44	-.07	Active verb.	-.27	.32
Sargent's test (power)			.37	-.06	Passive verb.	-.68	-.21
Pelvic girdle flexibility (flexibility)			.24	.13	Control	.48	-.06
Slemin umbrella test 1 (arm co-ordination)			.42	.70			
Slemin umbrella test 2 (leg co-ordination)			.48	-.55			
Hand grip (general strength)			.35	-.40			

Table 2. Canonical discriminant analysis at initial testing

Function	λ	%	CR	Wilks' λ	χ^2	Q
1	.724	80.5	.65	.493	51.22	.00
2	.175	19.5	.39	.851	11.72	.23
V a r i a b l e		Structure		Group		Centroid
First gym. composition		-.66		Active verb.		-1.166
Second gym. composition		-.57		Passive verb.		-.418
Third gym. composition		-.42		Control		.792
Forth gym. composition		.39				
Vestibular stability (balance)		.31				
Pelvic girdle flexibility (flexibility)		.22				
Hand grip (general strength)		.11				
Slemin umbrella test 1 (arm co-ordination)		-.20				
Sargent's test (power)		.19				
Slemin umbrella test 2 (leg co-ordination)		.10				

Table 3. Canonical discriminant analysis at final testing

Function	λ	%	CR	Wilks' λ	χ^2	Q		
1	1.579	82.3	.78	.289	89.88	.00		
2	.340	17.7	.50	.746	21.20	.01		
V a r i a b l e			Structure				Centroid	
			F1	F2	Group		F1	F2
Forth gym. Composition			.66	.13	Active verb.		-1.50	-.71
Third gym. Composition			-.51	.05	Passive verb.		-.94	.89
Vestibular stability (balance)			.47	-.16	Control		1.22	-.01
Second gym. Composition			-.46	-.22				
First gym. composition			.42	.06				
Sargent's test (power)			.03	.48				
Hand grip (general strength)			.12	.46				
Pelvic girdle flexibility (flexibility)			.06	-.24				
Slemin umbrella test 1 (arm co-ordination)			.01	-.16				
Slemin umbrella test 2 (leg co-ordination)			.06	.06				

ted, as well as the presence of mistakes after the two-month pause, the first discriminant factor could be named »Stability of dynamic stereotypes on the floor«. On the basis of magnitudes and directions of the group centroids on this factor, it could be concluded that the group of children who learned the exercises and compositions by way of active verbalisation method had statistically significantly the most stable dynamic stereotypes; in other words, those children recalled the exercises and compositions best. This proved that the active verbalisation method was the most successful one. The control group of children showed the poorest results.

The second discriminant factor could be named »Intensity of motor unit excitation«, as it was significantly defined only by the variables for estimating explosive strength (power) and strength of hand grip. On this factor, the best results were shown by the children from the group on which the passive verbalisation method was applied, and the poorest results by children from the group who learned by way of the active verbalisation method.

At the initial testing and evaluation there was no evidence of a statistically significant influence of motor abilities on the quality and speed of gymnastic exercises and composition learning. After the analysis of the motor and gymnastic variables at final testing and evaluation, the presence of the influence of motor variables on the quality of performance and stability of performance and stability of created dynamic stereotypes after two-month pause was noticed. For that reason the regression analyses were reapplied to every gymnastic composition on the floor. The main results of those analyses are in table 4.

The results suggest that there was a statistically significant influence of motor abilities on all four criterion variables (gymnastic compositions) (Q=.01). The motor variable for estimating vestibular stability was the most important and positive in all realisation of the gymnastic compositions on the floor. In the performance of the second and third gymnastic composition, flexibility of the pelvic girdle had a significant and positive role. The other motor variables didn't influence statistically significantly the realisation of the

Table 4. Influence of motor abilities on the stability of dynamic stereotypes

V A R I A B L E	1st composition		2nd composition		3rd composition		4th composition	
	β	q	β	q	β	q	β	q
Vestibular stability test	-.41	.00	-.41	.00	-.40	.00	.35	.00
Explosive strength	.11	.29	.16	.11	.11	.25	.02	.84
Pelvic girdle flexibility	.18	.08	.29	.00	.32	.00	-.04	.73
Arm co-ordination	-.05	.65	-.09	.40	.07	.50	.12	.30
Leg co-ordination	-.06	.57	-.03	.80	-.08	.44	.12	.30
General strength	-.07	.52	.00	.96	.05	.60	.03	.81
	Q = .00		Q = .00		Q = .00		Q = .01	

exercises and compositions on the floor after the two-month pause.

DISCUSSION

The group which used the active verbalisation method was significantly the most successful in learning speed and performance exactness of gymnastic compositions on the floor, less successful children were in the group which learned by way of the passive verbalisation method, and least successful children were in the control group. The active verbalisation method created the situation where the children developed the ability to involve more senses (auditory, imagery, tactile, muscular tensions and forces). In this way they developed better body's orientation in space and balance, which were very important abilities in performing the floor compositions. It is very important to point out, that at the end of motor learning there were no significant contributions by motor abilities to the effects of the learning process. The children develop their motor skills and the necessary motor abilities mutually, but it is very difficult to define the participation of every single factor in the result of motor test (Pišot, 1997).

The results of the research showed that the group of children who learned the exercises and compositions by way of the active verbalisation method had statistically significantly the most stable dynamic stereotypes and they recalled the exercises and compositions best. This proved that the active verbalisation method could be use to retain motor performance of preschool children. That means that by using the active verbalisation method the teachers could improve short-term and long-term memories. They also could create situations when learning and performing motor skills helped the children to: rehearse and repeat what they see, hear, and practice; group and recode information to enhance memory; broaden their motor experience. All that lead to the way of achieving the goal where short- and long-term memory interact in a co-operative way.

The fact that there was a statistically significant influence of motor abilities on all four criterion variables (gymnastic compositions) means that for small children the general motor ability is very important for memorising and realisation of learned compositions on the floor. In other words, there is a statistically significant influence of the general motor factor on the stability of dynamic structures. A better general motor factor will create better and more stable dynamic stereotypes, which will retain their quality even after longer pauses, with fewer mistakes in their realisation.

That the motor variable for estimating vestibular stability had the most important influence on all four criterion variables (gymnastic compositions on the floor) was an expected result, because the compositions were performed with restricted locomotion in a limited space on the floor. In such performance the position of arms, legs, as well as the position of trunk, in relation to the vertical body axis, had a very important role. Every deviation from the axis should be symmetric and balanced and the vestibular system, with reference to the vestibular stability of children during exercising on floor, is responsible for this. The importance of flexibility of the pelvic girdle showed that the children with good pelvic girdle flexibility, with longer amplitudes and extended legs, executed better and nicer exercises in the compositions.

CONCLUSIONS

According to obtained results in the research, it can be concluded that the applied active verbalisation method of gymnastic exercise and composition learning showed the best results. It was proven that the children who learned by way of active verbalisation were aware of the tasks, which had a controlled and active influence on motor learning. The structure of every composition was determined by words, by the order of exercises in the composition and the rhythm of the performance. All this resulted in a much better execution technique. By using the active verbalisation method, the correct motor performance of the exercises became better and more stable, and in an indirect way the mistakes were eliminated. Conscious and willing verbalisation accelerated motor learning and improved the memorising and the stability of the formed dynamic stereotypes during the motor learning process, respectively.

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