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Do Kinesiologic Activities Change Aberrant Behavior in Preschool Children?

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A B S T R A C T

An experimental treatment was carried out in a sample of 117 preschool children by applying kinesiologic activities. The treatment lasting for 60 minutes was applied for a period of 9 months, twice a week. Control group of 139 children were trained according to the program for preschool institutions. Treatment effects were assessed by 7 motor ability tests, one intellectual test (Raven's Colored Progressive Matrices) and 36-item questionnaire for assessing aberrant behavior, which was filled out by parents. Aberrant behavior reduced significantly when motor abilities improved through systematic exercise. These findings point to the importance of motor exercise and applying additional kinesiologic activities with various modalities to reduce aberrant behavior in preschool children.

Key words: *behavioral disorders, motor exercise, preschool age, motor development*

Introduction

Aberrant behavior implies current psychopathological symptoms of the child and his/her environment, regardless of whether they result from intrapsychical conflicts and how much their symptoms are more or less subconscious. Such a definition of disturbed behavior inevitably includes factors related to parenthood, educators, teachers, and all those that are involved in the child's development, whose behavior causes reactions of the environment. These problems become more pronounced in transition or unstable societies. Earlier studies indicated the frequency of psychosocial problems to be related to the presence of particular sociodemographic factors viewed as risk factors. Low socioeconomic status, single parents, mental illness in the family and family disorders, and sex of the child are the factors contributing to more frequent occurrence of these problems (Levy et al., 2005[1]; Gershon, 2002[2]; Murphy and Jellinek, 1988[3]; Jellinek et al., 1986[4]; Jellinek et al., 1988[5]).

Aberrant behavior depends mostly on personality traits, and it is often manifested at the motor level. Results of some earlier studies in subjects characterized by a relatively stationary stage of conative and motor development indicated that there were significant correlations between personality traits that affect modality of behavior assessed by various models of conative functioning and motor abilities (Ismail and Gruber, 1971[6]; Ismail, 1976[7]; Katić, 1977[8–9]; Katić et al., 2006[10]; Bala and Katić, 2009[11]; Bala and Katić, 2009[12]; Bala et al., 2010[13]). However, it seems there was no interest in carrying out similar research dealing with analysis of relations between aberrant behavior and motor functioning of subjects in development, in particular preschool children. This is probably due to the fact that it is very difficult to determine and define conative characteristics (personality traits) in small children, especially when group testing is performed in a great number of children.

Some rather rare studies tackling the relations of aberrant behavior and motor abilities of preschool children, conducted by Bala et al., (2002)[14], and Bala et al., 2003[15] indicated the presence of a significant relation between motor abilities and aberrant behavior. There was a significant relation between the factors of negativism, unaccomplished control, anxiousness on one hand, and motor control on the other hand, suggesting a possibility to prevent or reduce the occurrence of aberrant behavior by use of properly selected and goal-oriented exercises.

Effects of cognitive functioning of children on their aberrant behavior were also demonstrated by Bala et al. (2007)[16] in a sample of 712 preschool boys and girls aged 4–7 years (mean 5.96 decimal years and standard deviation of 0.96) from preschool institutions in Novi Sad,

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Sombor, Sremska Mitrovica, and Bačka Palanka (Serbia). The authors analyzed data on 36 indicators of aberrant behavior of the children, provided by their parents, whereas their cognitive ability was tested by Raven's Colored Progressive Matrices. Based on factor analysis (promax method), four factors, i.e. generators of aberrant behavior in children, were singled out: aggression, anxiousness, dissociation, and hysteria, whose relations with cognitive functioning and age were also analyzed by factor analysis. Aberrant behavior and general cognitive ability showed significant interrelatedness.

The purpose of this paper is to analyze the effects of organized application of kinesiologic activities on reduction of aberrant behavior in preschool children. The study was performed within the framework of the scientific research project »Integral development, physical activity, and aberrant behavior of preschool children« carried out by the Faculty of Sport and Physical Education in Novi Sad and co-financed by the Ministry of Science and Technological Development of the Republic of Serbia.

Method

Experimental design

For the purpose of this study, a quasi-experimental design was applied with non-equivalent groups of children, including pretest-posttest. Accordingly, children samples were not random-selected, control groups had the usual treatment of physical education and exercising applied in preschool institutions, while the experimental group had an additional experimental treatment with different kinesiologic activities. Treatment effects were evaluated by a particular measurement instrument before and after the experimental/control treatment lasting for one academic year.

Participants

This longitudinal study was performed in a suitable sample including 256 preschool children from Novi Sad (Serbia) divided into two groups: experimental (n=117) and control (n=139), mean age at the beginning of treatment 6.15(±1.14) and 5.51(±0.89) decimal years, respectively.

Subjects:

Group	Boys	Girls	Total
Experimental group	87	30	117
Control group	69	70	139
Total	156	100	256

Measures

The questionnaire used in the study was compiled by Hošek et al. (2003)[17], by means of extension of the standard list of symptoms of aberrant disorders in small children. The extension was made in such a way to enable registration of disorders of five dominant systems of regulation and control of neural functions.

Data were collected by use of a questionnaire filled out by one parent with assistance of a psychologist. Parents were asked to assess the behavior of their children before the experiment, and after nine months of treatment. Assessment was reached by application of the three-point Likert scale of agreement with the offered statements »No«, »Sometimes«, and »Often«.

Indicators for assessment of aberrant behavior of children:

Item No.	Symptom
01	Is often forced to eat
02	Sometimes has nightmares
03	Sometimes behaves aggressively
04	Acts too vividly
05	Is used to biting his nails
06	Sometimes has no control over urination during sleep
07	Is rather disobedient
08	Often quarrels with other children
09	Often fights with friends
10	Is too sniveled
11	Is rather timid
12	Is too reticent
13	Fears the dark
14	Fears dogs
15	Sometimes tortures animals
16	Is rather distrustful
17	Becomes easily confused when he/she needs to do something
18	Is rather clumsy
19	Is rather obstinate
20	Likes to lie
21	Sometimes snatches other children's toys
22	Is avoided by other children
23	Is too spoiled
24	Often changes his/her mood without evident reason
25	Is rather stubborn
26	Is rather untidy
27	Becomes very angry if he/she doesn't get what he/she wants
28	Occasionally he/she takes something without permission
29	Sometimes stutters
30	Is too shy
31	Throws things in anger
32	Extorts what he/she wants by weeping
33	Occasionally says that nobody loves him/her
34	Often spoils or breaks his/her toys
35	Is too sensitive
36	Sometimes uses an improper order of words

Metric characteristics were tested in more detail in a greater sample of preschool children by Fajgelj and Bala (2007)[18]. On the whole, discriminativeness of items was satisfactory, whereas reliability of the scale reached 0.84. According to factor analysis, the authors found that 36 indicators of aberrant behavior generated only two factors related to behavior: externalizing (disorder of insufficiently controlled behavior) and internalizing (disorders of overcontrolled behavior). As earlier attempts to analyze the whole space of the questionnaire including 36 indicators of aberrant behavior did not yield satisfactory results, only those indicators that assessed externalizing and internalizing behavior of children were singled out for the purposes of this study.

Indicators for assessment of externalizing and internalizing aberrant behavior of children:

Externalizing	Internalizing
Sometimes behaves aggressively	Is too sniveled
Is rather disobedient	Is rather timid
Often quarrels with other children	Is too reticent
Often fights with friends	Is rather distrustful
Sometimes snatches other children's toys	Becomes easily confused when he/she needs to do something
Becomes very angry if he/she doesn't get what he/she wants	Is too shy
Occasionally he/she takes something without permission	Is too sensitive
Throws things in anger	
Often spoils or breaks his/her toys	

Each subject's result of the internalizing/externalizing behavior assessment was a factor score in the first principal component within variables for assessment of externalizing/internalizing behavior, depending on whether the subject belonged to experimental or control group.

Assessment of cognitive functioning was made using the Raven's Colored Progressive Matrices (RCP Matrices) test. Fajgelj et al. (2007)[19], as well as Fajgelj et al. (2010)[20] determined principal measuring characteristics of RCP Matrices in a sample of 2334 children from Voivodina aged 3.5 and 11. By testing dimensionality, the test was found to have one main object of measuring. There was no statistically significant sex difference in solving the test requirements at any age, or any significant interaction of sex and age. Test reliability was over 0.85 in the 6–11 age group and 0.75 at age 5.

The following test battery was used in motor ability assessment:

a) for assessment of the movement structuring factors:
   - obstacle course backwards – restructuring of movement stereotype;

b) for assessment of functional synergy and tonus regulation factors:
   - arm plate tapping – frequency speed, and
   - seated straddle stretch – flexibility;

c) for assessment of motor unit excitation duration factors:
   - crossed-arm sit-ups – repetitive trunk strength, and
   - bent-arm hang – static strength of arms and shoulder girdle; and

d) for assessment of motor unit excitation intensity regulation:
   - standing broad jump, and
   - 20-m dash – running speed.

The motor tests employed in the study are briefly described below (Bala et al., 2009)[21]:

1) Obstacle course backwards. The child has to walk backwards on all fours and cover the distance of 10 m, climb the top of the Swedish bench and go through the frame of the bench. The task is measured in tenths of second.
2) Arm plate tapping. For fifteen seconds the child has to tap alternately two plates on the tapping board with his/her dominant hand, while holding the other hand in between the two plates. The result is the number of alternate double hits.
3) Seated straddle stretch. The child sits on the floor, leaning against the wall, in straddle position and bows forward as far as possible. A straight-angle ruler lies down in front of the child and he/she reaches the scale with cm as far as he/she can. The result is the depth of the reach measured in cm.
4) Standing broad jump. The child jumps with both feet from the reversed side of Reuter bounce board onto the carpet, which is marked in cm. The result is the length of the jump in cm.
5) 20-m dash. On command »GO« the child standing behind the start line has to run 20 m as fast as he/she can to the end of the track (20 m). The children run in pairs. The score is the time of running measured in tenths of second.
6) Crossed-arm sit-ups. The child lies on his/her back with his/her knees bent and arms crossed on the opposite shoulder. He/she rises into seated position and returns into starting position. The instructor's assistant holds the child's feet. The result is the number of correctly executed raises to seated position (no longer than 60 seconds).
7) Bent arm hang. The child under-grips the bar and holds the pull-up as long as he/she can (with the chin above the bar). The result is the time of the hold measured in tenths of second.

The reliability of these motor tests as composite tests with 3 items (replications) was previously analyzed in a sample of 64 male and female children aged 6–7 years by calculating the reliability α-coefficient (Spearman-Brown-Kuder-Richardson-Guttman-Cronbach) under the classic summation model. Good reliability coefficients were obtained for all these motor tests, as follows: Obstacle course backwards 0.96; Arm plate tapping 0.90; Seated straddle stretch 0.97; Standing broad jump 0.88; Crossed-arm sit-ups 0.92; Bent-arm hang 0.91; and 20-m dash 0.86.

Description of experimental treatment

Experimental treatment, i.e. plan and program of application of kinesiologic activities in the experimental group of children (sports school) was implemented twice a week for 60 minutes during one academic year. Kinesiologic activities applied in the training process included the following: calisthenics with and without the use of various apparatuses, preventive and corrective exercises for posture control, flat feet, unique exercises on apparatuses and aerobics, specific exercises for the development of motor abilities (especially coordination, balance, precision, all kinds of speed, agility, flexibility, as well as all kinds of strength and stamina), athletic events, elements of sports games (football, handball, basketball, volleyball, tennis), elements of martial arts (karate, wrestling), elementary games (catching, group games, etc.), children dances, outdoor activities, swimming, aquatic activities, basic yoga asanas, stretching, and aerobics.

Control treatment included means of exercising, learning methods, and exercising itself, the purpose of which was to fulfill the requirements of the formal plan and program of preschool institutions in the Autonomous Province of Voivodina, which is presented in the Model of the Fundamentals of the Work Program with Preschool Children (Kamenov, 1995)[22], part VII, under the title Physical Development, Physical Activities.

Data analyses

Scores of the questionnaire for aberrant behavior were grouped into simple frequency distributions and corresponding histograms, followed by calculation of means and standard deviations. Differences between groups were determined using t-test for independent samples, while for intra-group differences t-test for dependent samples was applied.

Statistical analysis was preceded by calculation of the first principal component of the vectors of indicators for assessment of externalizing behavior as well as the internalizing one, which was followed by transforming raw results of subjects to factor scores. Quantitative differences in initial and final measurements within the applied variables were determined by multivariate analysis (MANOVA) and univariate analysis (ANOVA), whereas significance of quantitative changes, i.e. effects of the applied treatments were defined by means of multivariate (MANCOVA) and univariate (ANCOVA) analysis of covariance. Structural changes between initial and final measurements were determined by use of factor analysis. Matrices of intercorrelations were calculated initially, followed by factorizing of each matrix applying the procedure of principal components using Kaiser-Guttman's criterion for the number of principal components to retain. Principal components were then rotated in the promax solution, while interpretation and comparison of structures of analyzed spaces were based on the corresponding pattern matrices as well as the correlation coefficient between the factors singled out.

Results

Distributions of evaluation scores of aberrant behavior of children based on the complete system of applied indicators (reached by summation of indicator evaluations) at the beginning of experimental and control treatments lasting for one academic year and at its end are shown in Figure 1.

Separate analysis was done for a group of children whose total score at the beginning of experiment was lower than the sum of mean (M) (about 52 points) and one standard deviation (SD) (about 7 points), i.e. which was approximately below 59 points, as well as a group whose result was above 59 points. According to this criterion, both experimental and control group accounted for about 16% of children with marked aberrant behavior (Figure 2).

The t-test for independent samples showed the control group children to have statistically more significant manifestations of aberrant behavior at the beginning of treatment than the children in experimental group (Table 1).

After one academic year, parents reported a slight decrease of aberrant behavior in both groups of children. However, this decrease did not reach statistical significance (Table 2).

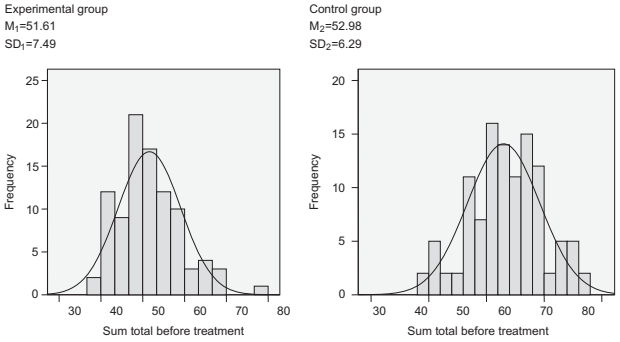

Fig. 1. Distribution of evaluation scores of aberrant behavior of children at the beginning of experimental (left panel) and control (right panel) treatment.

TABLE 1
ABERRANT BEHAVIOR MANIFESTATIONS AT THE BEGINNING OF TREATMENT IN EXPERIMENTAL AND CONTROL GROUP OF CHILDREN (T-TEST FOR INDEPENDENT SAMPLES)

Aberrant behavior	Experimental group				Control group				t	P
	$\overline{X}$	SD	MAX	MIN	$\overline{X}$	SD	MAX	MIN		
	49.43	5.26	59	38	51.52	5.25	59	38	–2.63	0.01

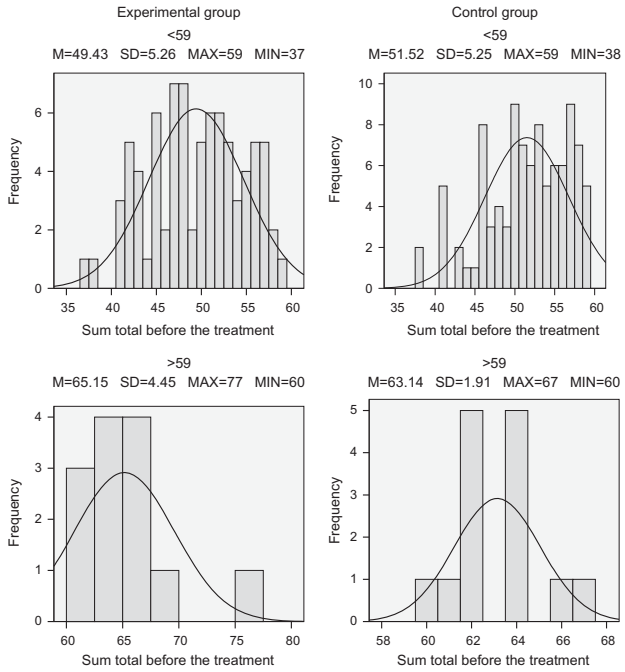

Fig. 2. Distribution of evaluation scores below 59 points, and above 59 points of aberrant behavior of children at the beginning of experimental (left panel) and control (right panel) treatment.

As significant changes may not be expected in children with minor aberrant behavior, i.e. the one that does not deviate from generally accepted behavior standards for the age, the focus of interest in this study were children with marked aberrant behavior, i.e. those with more than 59 points reached by their parents' evaluation using all 36 indicators applied. There were 13 such children in experimental group and 14 in control group. At the beginning of treatment, there was no statistically significant between-group difference in terms of marked aberrant behavior (Table 3).

After the applied treatments, differences in the total number of points for all indicators of aberrant behavior of children were lower in both experimental and control groups, which is indicative of improved behavior of children with marked aberrant behavior. However, between--group differences were not statistically significant (Table 4).

Therefore, changes of total aberrant behavior were analyzed within each group by use of t-test for dependent samples. Results indicated that there were no statistically significant changes in aberrant behavior in the experimental group of children, with a total of 59 points during one-year application of treatment (Table 5).

However, significant changes occurred in the control group, which might indicate that these children improved their behavior without additional kinesiologic activities, during their growth and development, as well as through activities in their kindergartens and families. This could probably be explained by the fact that this group included a higher number of cases of aberrant behavior at the beginning of treatment, unlike children in the experimental group. This difference, yet significantly reduced, persisted to the end of treatment (Table 6).

Significant difference in behavior changes was observed in children that had marked aberrant behavior at the beginning of treatment, i.e. whose total score exceeded 59. Such children in experimental group showed

TABLE 2
ABERRANT BEHAVIOR MANIFESTATIONS AFTER ONE ACADEMIC YEAR IN EXPERIMENTAL AND CONTROL GROUP OF CHILDREN (*t*-TEST FOR INDEPENDENT SAMPLES)

Aberrant behavior	Experimental group				Control group				t	P
	$\overline{X}$	SD	MAX	MIN	$\overline{X}$	SD	MAX	MIN		
	49.05	5.45	65	38	50.29	6.85	66	38	–1.32	0.19

TABLE 3
ABERRANT BEHAVIOR MANIFESTATIONS OF CHILDREN WITH ABOVE 59 POINTS AT THE BEGINNING OF EXPERIMENTAL AND CONTROL TREATMENT (*t*-TEST FOR INDEPENDENT SAMPLES)

Aberrant Behavior	Experimental group				Control group				t	p
	$\overline{X}$	SD	MAX	MIN	$\overline{X}$	SD	MAX	MIN		
	65.15	4.45	77	60	63.14	1.92	67	60	1.55	0.14

TABLE 4
ABERRANT BEHAVIOR MANIFESTATIONS OF CHILDREN WITH ABOVE 59 POINTS AFTER EXPERIMENTAL AND CONTROL TREATMENT (*t*-TEST FOR INDEPENDENT SAMPLES)

Aberrant behavior	Experimental group				Control group				t	P
	$\overline{X}$	SD	MAX	MIN	$\overline{X}$	SD	MAX	MIN		
	60.15	9.52	78	47	59.64	8.33	75	46	0.15	0.88

statistically significant reduction of aberrant behavior, since total score was decreased by 5. However, the fact is that the reduction of aberrant behavior was not even in this group, as the changes were smaller in some children but greater in others, as indicated by the value of standard deviation (Table 7).

Improvement was also recorded in children with marked aberrant behavior from the control group; however, it was not statistically significant (Table 8). This finding indicates that experimental treatment produced significant reduction of aberrant behavior in children subjected to such treatment, which was not the case with control treatment.

As certain changes in the components of aberrant behavior were noticed in practical work with experimental group children, factor structures of the applied motor, cognitive, externalizing and internalizing aberrant behavior variables were analyzed in order to define qualitative changes in children influenced by kinesiologic treatment. Factor analysis of results of the initial measurement (before treatment) identified three factors in each group of subjects, which explained common variance with 48.95%, 11.11%, and 10.07% in experimental group, and 36.98%, 12.45% and 11.39% in control group. Final analysis was based on promax pattern matrices (Table 9). The factors singled out in experimental group were defined as follows: 1) Motor and cognitive behavior, 2) Externalizing behavior, and 3) Internalizing behavior; while those in control group included 1) Motor behavior, 2) Externalizing and cognitive behavior, and 3) Internalizing behavior. Statistically significant correlations of factors were only noticed between combinations of motor, cognitive and externalizing behavior of children (Table 10).

At the end (after treatments), results of factor analysis indicated that only two factors were singled out in experimental group, whereas the number of factors singled out in control group remained the same as at the beginning of the experiment. According to the pattern matrix of experimental group, the following factors could be recognized: 1) Motor and cognitive behavior and 2) Internalizing and externalizing behavior of children (Table 11). Compared to the pre-experiment conditions, there was a considerably increased share of cognitive functioning within the structure of motor behavior, as well as linking of the components of aberrant behavior (externalizing and internalizing behavior) to a unique factor, which was attributed to the effects of experimental treatment. Correlation between the two factors was negative in terms of statistical significance (–0.26).

TABLE 5
ABERRANT BEHAVIOR MANIFESTATIONS OF CHILDREN WITH BELOW 59 POINTS BEFORE AND AFTER EXPERIMENTAL TREATMENT (*t*-TEST FOR DEPENDENT SAMPLES)

Aberrant behavior (experimental ≤59)	Pretest		Posttest		t	p
	$\overline{X}$	SD	$\overline{X}$	SD		
	49.43	5.26	49.05	5.45	0.66	0.51

TABLE 6
ABERRANT BEHAVIOR MANIFESTATIONS OF CHILDREN WITH BELOW 59 POINTS BEFORE AND AFTER CONTROL TREATMENT (*t*-TEST FOR DEPENDENT SAMPLES)

Aberrant behavior (control ≤59)	Pretest		Posttest		t	P
	$\overline{X}$	SD	$\overline{X}$	SD		
	51.52	5.25	50.29	6.85	2.38	0.02

TABLE 7
ABERRANT BEHAVIOR MANIFESTATIONS OF CHILDREN WITH ABOVE 59 POINTS BEFORE AND AFTER EXPERIMENTAL TREATMENT (*t*-TEST FOR DEPENDENT SAMPLES)

Aberrant behavior (experimental >59)	Pretest		Posttest		t	P
	$\overline{X}$	SD	$\overline{X}$	SD		
	65.15	4.45	60.15	9.52	2.29	0.04

TABLE 8
ABERRANT BEHAVIOR MANIFESTATIONS OF CHILDREN WITH ABOVE 59 POINTS BEFORE AND AFTER CONTROL TREATMENT (*t*-TEST FOR DEPENDENT SAMPLES)

Aberrant behavior (control >59)	Pretest		Posttest		t	P
	$\overline{X}$	SD	$\overline{X}$	SD		
	63.14	1.92	59.64	8.33	1.65	0.12

Factors singled out in control group remained practically the same, implying an increased share of cognitive functioning and reduced externalizing behavior compared to the other factor before the experiment, as well as an increased share of internalizing behavior within the structure of the third factor (Table 11). Certain changes were noticed in mutual correlations of the three factors; however, it should be noted that the value of correlation coefficient between Motor functioning and Externalizing and cognitive functioning was considerably reduced, even though it was still positive and statistically significant (Table 12).

Discussion

The child is not a static being, and his/her development is characterized by a »mosaic« of behavior dynamics, which represents a development stage at a particular age but pathologic manifestation of behavior in another one. Understanding differences among factors that affect behavior, as well as specificities of behavior manifested by each child in different situations pose additional difficulties. Thus, it is not possible to reach an exact determination of the extent to which experimental treatment contributed to qualitative changes in aber-

TABLE 9
PATTERN MATRICES BEFORE TREATMENTS

Variable	Experimental group			Control group		
	A1	A2	A3	A1	A2	A3
20-m dash (0.1 s)	–0.95	0.11	0.12	–0.67	–0.25	–0.09
Obstacle course backwards (0.1 s)	–0.92	0.10	–0.05	–0.72	–0.10	0.20
Arm plate tapping (freq.)	0.83	0.07	0.03	0.48	0.28	0.26
Seated straddle stretch (cm)	0.06	0.64	0.20	0.05	0.47	0.43
Standing broad jump (cm)	0.95	–0.09	–0.09	0.70	0.23	–0.25
Bent-arm hang (0.1 s)	0.17	0.25	0.71	0.82	–0.29	0.00
Crossed-arm sit-ups (freq.)	0.85	0.02	0.09	0.92	–0.31	0.12
RCPMatrices (points)	0.57	0.26	0.04	0.21	0.61	–0.05
Externalizing behavior (points)	0.16	–0.90	0.17	0.32	–0.82	0.06
Internalizing behavior (points)	–0.21	–0.30	0.71	–0.06	–0.07	0.87

TABLE 10
CORRELATION MATRICES OF THE FACTORS BEFORE TREATMENTS

Experimental group			Control group		
Factor	1	2	Factor	1	2
1 Motor and cognitive behavior			1 Motor behavior		
2 Externalizing behavior	0.50		2 Externalizing and cognitive behavior	0.42	
3 Internalizing behavior	0.07	0.04	3 Internalizing behavior	0.01	–0.00

TABLE 11
PATTERN MATRICES AFTER TREATMENTS

Variable	Experimental group		Control group		
	A1	A2	A1	A2	A3
20-m dash (0.1 s)	–0.78	0.23	–0.88	–0.07	0.01
Obstacle course backwards (0.1 s)	–0.82	–0.05	–0.78	–0.09	0.19
Arm plate tapping (freq.)	0.87	0.01	0.52	0.52	–0.01
Seated straddle stretch (cm)	0.49	0.06	0.07	0.14	0.75
Standing broad jump (cm)	0.76	–0.23	0.85	–0.03	0.04
Bent-arm hang (0.1 s)	0.53	0.06	0.52	–0.50	0.24
Crossed-arm sit-ups (freq.)	0.87	0.07	0.73	–0.12	0.09
RCPMatrices (points)	0.73	0.23	0.25	0.72	0.00
Externalizing behavior (points)	–0.05	0.71	0.20	–0.60	–0.33
Internalizing behavior (points)	0.18	0.85	–0.08	0.07	0.74

TABLE 12
CORRELATION MATRIX OF THE FACTORS IN CONTROL GROUP AFTER TREATMENT

Factor	1	2
1 Motor behavior		
2 Externalizing and cognitive behavior	0.22	
3 Internalizing behavior	0.10	–0.09

rant behavior of children, or the extent of its being due to regular growth, development, and socioeconomic, educational and cultural environment.

According to the structure of the second factor upon treatment, it can be noticed that experimental treatment transformed externalizing and internalizing behavior to a unique factor, which can be defined as a behavior of children. This is explained by the fact that kinesiologic activities and physical exercising during nine months reduced aggressiveness, anger, and destructivity in children with increased externalizing behavior, as well as anxiousness, phobicity, and timidity in children with pronounced internalizing behavior. This was not true for control group children.

The high share of RCPMatrices variable in structuring of the general motor factor indicates an integral development of intellectual and motor behavior of preschool children in experimental group. The significant negative correlation of this factor with a unique factor of behavior indicates that, owing to the development of motor and cognitive abilities, experimental treatment resulted in children's recognition and understanding of their own reactions in different situations, as well as the development of new ways of reaction, all of which yielding better psychosocial certainty and adapted behavior complying with age and one's own abilities.

Considering the fact that conative factors are not independent of the process of conditioning during one's lifetime, sports turns to be a very important activity because it provides an opportunity to almost naturally reduce the adaptively unwanted behavioral modalities while developing the individually and socially desirable ones. Being aware that other functions, along with motor and intellectual abilities, can also be upgraded through proper treatment or control of particular conative features, is highly relevant for both sports and social efficiency[9–13,23–24].

These results indicate that systematic exercising through certain sports activities contributes to improvement of efficiency of almost all conative regulators, especially those that significantly affect formation of socialized models of behavior. During such process, improvement may also be expected in terms of activity control, anxiousness reduction, reduction or channeling of aggressiveness, increased efficiency of control systems of organic functions, especially increase of coordination, control, and integration of all neural functions, all of which may significantly improve aberrant behavior of children too. However, a serious problem was observed in parents' evaluation of the level and changes of aberrant behavior of their children, since a relatively fast familiarization with changes, i.e. reductions of manifested aberrant behavior was observed. This means that construction of a valid, reliable, and sensitive measurement instrument for evaluation of aberrant behavior of preschool children is a serious problem.

Even it was not fully possible to explain whether aberrant behavior defines motor functioning, or whether motor functioning, among other things, governs normal and aberrant behavior, according to the results obtained in this study the following conclusions can be drawn:

- It is difficult to determine quantitative effects of the application of kinesiologic activities and physical exercising in preschool children during one academic year only;
- There are significant changes in qualitative effects, i.e. changes in the structure of components of aberrant behavior;
- Experimental treatment resulted in normalized behavior of preschool children even though the period was short (nine months).

More frequent and more intensive perennial application of kinesiologic activities and physical exercising would be a highly suitable, inexpensive and entertaining means of prevention and reduction of extreme aberrant behavior in children, which could subsequently lead to reduced delinquent behavior of the young. These results indicate that organized physical exercising produced significant changes in reduction of aberrant behavior even when applied for only one academic year. Longer application of physical exercising and kinesiologic activities would surely result in even greater reduction of this type. The authors believe that such exercising process would significantly decrease not only aberrant behavior but also delinquent behavior of children and youth.

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DA LI KINEZIOLOŠKE AKTIVNOSTI MOGU PROMIJENITI ABERANTNO PONAŠANJE PREDŠKOLSKE DJECE?

S A Ž E T A K

Na uzorku od 117 predškolske djece proveden je eksperimentalni tretman primjenom kineziloških aktivnosti u trajanju od 9 mjeseci, dva puta tjedno po 60 minuta. Kontrolna grupa od 139 djece vježbala je po programu za predškolske ustanove. Kontrola efekata tretmana bila je pomoću 7 motoričkih testova, test za procjenu opće inteligencije (Ravenove progresivne matrice u boji) i upitnik od 36 indikatora za procjenu aberantnog ponašanja kojeg su popunjavali roditelji. Uočeno je da se aberantno ponašanje reducira kada se motoričke sposobnosti poboljšavaju pod utjecajem redovnog vježbanja. Taj nalaz ukazuje na značajnu vrijednost motoričkog vježbanja i primijene kineziloških aktivnosti raznih modaliteta i intenziteta u redukciji aberantnog ponašanja predškolske djece.