

## Exercise effects on mental health of preschool children

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**Título:** El efecto del ejercicio físico en la salud mental de los niños de edad preescolar.

**Resumen:** El objetivo de esta investigación era identificar los efectos de un programa de ejercicio físico de una duración de 2 años y medio en la salud mental de los niños de edad preescolar, es decir, en la reducción de los síntomas de su comportamiento externalizado e internalizado. La muestra incluía 184 participantes de entre 5 y 7 años de edad, de ambos sexos y de los cuales 17 participaron en el programa de intervención del ejercicio físico, mientras que los otros 167, elegidos de manera aleatoria, fueron sometidos a pruebas en sus guarderías. Para examinar los síntomas del comportamiento externalizado e internalizado se utilizó El Cuestionario de Investigación del Comportamiento Aberrante (Hošek, Momirović y Bala, 2003). Los resultados obtenidos demuestran que todos los indicadores del comportamiento externalizado se reducen en el grupo de intervención infantil y, asimismo, la regularidad detectada se observa desde la medición inicial hasta la final, pasando por la de control. Por otro lado, el programa de intervención tuvo un efecto mucho más reducido en los indicadores del comportamiento internalizado. Aunque solo fueron identificadas las tendencias de reducción del comportamiento problemático en los niños, el potencial preventivo de una actividad física continuada, planificada y sistemática en el ámbito de la salud mental no se debe soslayar.

**Palabras claves:** Salud mental; comportamiento externalizado e internalizado; programa de ejercicio físico; niños de edad preescolar.

**Abstract:** The study's purpose was to identify effects of 2.5-year movement program on mental health of preschool children, as measured by reduction in symptoms of externalizing and internalizing behavior. The sample consisted of 184 participants of both sexes, aged between 5 and 7 of which 17 were in the intervention movement program and the remaining 167 participants were chosen randomly and tested on one-time basis in their kindergartens as the comparison group. The Aberrant Behavior Questionnaire (Hošek, Momirović, & Bala, 2003) was the measure utilized to examine the symptoms of externalizing and internalizing behavior. The results indicated that all indicators of externalizing behavior were reduced in intervention group of children with remarkable pattern of changes from the initial, through transitive to the final measurement. At the same time, the intervention program had significantly weaker effects on indicators of internalizing behavior. The obtained tendencies of reduction of children's problem behavior suggest that a preventive potential of continuous, planned and regular physical activity on mental health must not be overlooked.

**Key words:** Mental health; externalizing and internalizing behavior; movement program; preschool children.

### Introduction

Positive effects of physical exercise on mental health are supported by the results of previous researches based predominantly on the population of adults (clinic and non-clinic), while children of different ages were neglected. The latest meta-analysis research conducted on the population of children and adolescents indicates a wide range of obtained results: from those indicating medium to strong correlation between physical activity engagement and mental health of young people, especially when anxiety and depression are concerned, to those which indicate that the correlation is weak, if there is any at all (Whitelaw, Swift, Goodwin, & Clark, 2008). In this manner, for example, it was found that physical activity of this population represents a medium of improving self-worth and reduction of depression, tension and anxiety (Biddle, Whitehead, O'Donovan, & Nevill, 2005). It was also found that the most consistent effect of physical exercise on children and adolescents is the increase of self-esteem and self-image, as well as the fact that long-term participation in physical activity has a beneficial effect on the reduction of neuroticism (Calfas & Taylor, 1994). Fox (2000, 108) compared the results of the examination of effects of physical activity on self-esteem of children and adults and he noticed that "doing physical exercise is an efficient means of boosting positive feelings children have

about themselves, especially in children with low self-esteem, or those with a high potential for its development, in the sense of encouraging the feeling of predominance during the period of skill development, or self-development", in relation to the population of adults where this connection is still uncertain; 44% of the studies used in meta-analysis pointed out the positive changes in self-esteem after implementing the intervention movement program.

However, there is no doubt that physical activity can significantly improve the way children behave in their social environment, in such a manner that physical activity is considered to be a mechanism of social development. In this sense, it is especially noticeable that a feeling of success in physical exercise causes respect and appreciation by teachers and peers, in addition to popularity among peers; it develops fair-play and the skills necessary for taking over leadership, which is generally important in different life situations, as well as willingness to take over responsibility (Bailey, 2006). Participating in physical activity also influences the development of cooperation among children (Biddle & Mutrie, 2007). The above results of effects of physical exercise, in the sense of social functioning, explain, among other things, an agreement among authors on the issue of possible improvement of certain problems in social behavior. Namely, physical exercise was found to take effect on improvement of interaction among children and reduction of behavioral problems in terms of relationship with others, as well as improvement of cooperation, and decrease of aggressiveness in the interaction (Allin, Wathen, & Macmillan, 2005). Thus, physical activity contributes to the development of prosocial behavior and the reduction of antisocial one (Bailey, 2006).

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Limited research exists dealing with the effects of exercise on mental health of preschool children, even though important habits, values and attitudes are formed in this period of life. Therefore, the development of habit of regular participation in physical activity, and positive attitudes towards physical activity in general, which are developed in childhood, represent a basic assumption for the continuous participation in physical activity later in life (Hallal, Victora, Azevedo, & Wells, 2006; Malina, 2001). In the same time, every eighth child in the population has certain psychological problems (Costello, Egger, & Angold, 2005; Roberts, Atkinson, & Rosenblatt, 1998). By analogy with the results of the research made on the population of adults and older children, we could expect that some behavioral problems of preschool children could be prevented or reduced by regular physical exercise.

The reasons for lack of research on exercise effects on the behavior of preschool children could be reduced to two basic ones. Until recently, the first is believed to be due to a highly present attitude among experts and concerned non-experts that the children of this age are, actually, physically active, taking into account that they play most of the day, and that there are many possibilities of development through play, which get realized by physically active play (McCune, 1998; Pellegrini & Smith, 1998). Playing doubtlessly improves cognitive, physical, social, and emotional wellbeing of a child (Burdette & Whitaker, 2005; Ginsburg, 2007). Even Piaget dealt with the role of motor activities in the exploration and obtaining a concrete experience in reality, as well their psychological and social significance (Pellegrini & Smith 1998). However, the question is how actually active preschool children are, i.e. whether developmental potential of physical exercise is realized at this age.

Results of the latest research led to conclusions which are quite opposite from the firmly established beliefs. Neither the level of habitual physical activity of children nor participation in organized physical activity is satisfactory enough (Đordić, 2007; Tubić, 2007). The increased number of obese children at this age, as well as children with cardiovascular problems, support this claim (He & Sutton, 2004; Canning, Courage, & Frizzell, 2004). A direct systematic observation of the sample of children aged between 2 and 5, lasting for 60 minutes in total, indicated that they sit still, dangle their feet or simply stand for about 60% of time; moderate walking or fast running was present in 11% of the observation period or 7 minutes (Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004). In order to verify these results, other researchers reached very similar conclusions (Benham-Deal, 2005): preschool children spend about 2 minutes per hour in vigorous physical activities, and more than 50% of the time they spend sitting or engaged in light physical activity. Other reasons for an evident underrepresentation of exercise effects on mental health of preschool children in the relevant studies can be found in the methodological problems, which, in fact, are the result of specificity of the sample itself.

This paper deals with problem behavior in terms of externalizing and internalizing behavior, which is well-known and accepted classification in children's psychology and psychiatry (Achenbach, 1978). The externalizing behavior includes a group of problem behaviors, such as aggressiveness, delinquency and hyperactivity (Liu, 2004); so, this behavior is manifested by negative and/or inappropriate relationships with others, due to which children are often non-cooperative, defiant and aversive (Campbell, Shaw, & Gilliom, 2000; Eisenberg et al., 2001). About 10 to 15% preschool children showed weak or moderate symptoms of externalizing behavior (Campbell, 1995). These children are mostly referred to as antisocial, problem, and *difficult* children (Hinshaw, 1987).

On the other hand, children who are characterized by the internalizing behavior are inconspicuous, so that symptoms manifested by anxiety, reticence or depression and somatic problems, often remain unnoticed parents themselves. The most represented component is anxiety, followed by depression and somatic problems (López Soler, Alcántara, Fernández, Castro, & López Pina, 2010). Taking into account that the problem children are directed towards themselves, not towards the outside world, these children are often seen as neurotic or too controlled (Campbell et al., 2000; Eisenberg et al., 2001; Hinshaw, 1987). Research results show that manifestation of symptoms of externalizing behavior is reduced as children grow up, from the preschool to the adolescent period, irrespective of gender (Bongers, Koot, Van der Ende, & Verhulst, 2004; Campbell et al., 2000). Other researches conducted on the sample of children aged 2 to 6 agree to the fact that externalizing behavior gradually reduces, but this also implies that the internalizing behavior increases as children grow up, in males and females alike (Gilliom & Show, 2004). Some studies point out that there are some gender differences among children in manifestation of internalizing behavior symptoms, some of them claim that internalizing behavior increases with the older age only in females (Leve, Kim, & Pears, 2005), while others indicate that the increase of the externalizing behavior is more present in boys (Furniss, Beyer, & Guggenmos, 2006). Besides, the children with externalizing behavior often turn to delinquent behavior later (Farrington, 1989), while children with internalizing forms of behavior have greater chances of suffering from depression and anxiety as adults (Publication manual of the American Psychological Association, 1994). The research of Tubić and Golubović (2010) confirms positive influence of physical exercise on externalizing and internalizing forms of behavior in preschool children.

The study's purpose was to identify effects of 2.5-year movement program on mental health of preschool children, as measured by reduction in symptoms of externalizing and internalizing behavior by comparing the intervention and control groups. It is hypothesized that children from intervention group will express less externalizing and internalizing behavior in comparison to children from control group after 2.5-year period.

## Method

### Participants

The total sample consisted of 184 children (boys and girls) aged between 5 and 7 which refer to preschool age in educational system in Serbia. The intervention group consisted of 53 children who participated in movement program in their free time. These children were followed longitudinally during the period of 2.5 years, with the initial measurement made in October 2007 when they were aged between 4.00 and 4.99, whereas the transitive measurement was made a year later and the final one in April 2010. The number of participants from the intervention group reduced significantly, so only 17 children fulfilled the condition of being continuously exposed to the intervention movement program. Other participants from the sample, 167 children who were randomly chosen and tested in their kindergartens, participated in physical exercise only through their regular activities within preschool curriculum. These children represented the control group, which allows a comparison to the intervention group and tracking and interpretation of effects of the experimental program of physical exercise. All children from the sample were enrolled in kindergartens in Novi Sad, the administrative centre of the Autonomous Province of Vojvodina (Serbia).

### Procedure

The intervention movement program was aimed at encouraging motor, biological and psycho-social development of preschool children. Each training session lasted for 60 minutes and the sessions were held three times a week in groups of 24 to 30 children. Three coaches, supervised by one coordinator, worked with every group of children. Basic activities of the intervention program included fundamental motor skills, different body shaping exercises, exercises for the correct posture, gymnastic exercises, games, martial arts, dance, outdoor activities, swimming, stretching and relaxation (for detailed description of movement program refer to Bala, 2002). Special attention was paid to the discipline, obeying rules, independence, overcoming anxiety, mutual respect and helping each other, as well as cooperation among all participants. Process evaluation was integral part of intervention program and included data on number of participants, duration and number of exercise session, observational notes on children behavior etc.

### Measures

The Aberrant Behavior Questionnaire (Hošek, Momić, & Bala, 2003), containing 16 items, was used for collecting the data on externalizing and internalizing types of children's behavior. Metric characteristics of this instrument were verified on the Serbian sample of 1165 children aged between 4 and 7 (Fajgelj & Bala, 2007). The questionnaire

has satisfying internal consistency with 0.84 (Spearman-Brown), and .86 (Cronbach- $\alpha$ ). The factor analysis was used for identifying three factors, among which the greatest and statistically significant correlation was found between the first and the third factor ( $r = .57$ ). Fajgelj and Bala (2007) concluded that if only two factors were retained, the first one would include the items from the first and the third factor, while the second one would be the same as in three-factor solution. This two-factor analysis served as a model in our research, based on which certain items from the questionnaire were classified either into a group of indicators used for describing the externalizing behavior (first factor), or a group of items used for describing the internalizing behavior (second factor), which is shown in Tables 1 and 2.

**Table 1.** Indicators of Externalizing Behavior .

Indicators
1. The child sometimes behaves too aggressively.
2. The child is disobedient.
3. The child argues with other children.
4. The child sometimes fights with other children.
5. The child sometimes snatches other children's toys.
6. The child gets really angry if he/she does not get what he/she wants.
7. It has happened that the child has taken something without permission.
8. When the child is angry he/she yells and throws things around.
9. The child sometimes breaks or smashes his/her toys.

**Table 2.** Indicators of Internalizing Behavior .

Indicators
1. The child is too timid.
2. The child is very weepy.
3. The child is overly withdrawn.
4. The child is rather distrustful.
5. The child gets easily confused when he/she should do something.
6. The child is too shy.
7. The child is too sensitive.

The above Likert-type scales were filled in by parents who estimated their own children's behavior in certain situations by circling one of three offered answers (never, sometimes, often). Before filling in the questionnaire the parents were told to estimate the behavior manifested in the previous six months, not at the particular moment.

### Data analysis plan

The data were analyzed using descriptive statistics method. Arithmetic mean and standard deviation were applied in order to determine the level of presence of the examined parameters of children's problem behavior, while as non-parametric tests were used to determine the differences between the observed groups (Mann-Whitney test), or between periods of measuring within a certain group of participants (Wilcoxon test).

## Results

Tables 3 and 4 contain the results of descriptive statistics of indicators used for examining externalizing and internalizing

behavior in the control group of children first and then in the intervention group.

**Table 3.** Descriptive Statistics of Indicators of Externalizing and Internalizing Behavior in Control Group.

Indicators of externalizing and internalizing behavior	Five-year-old children		Six-year-old children		Seven-year-old children	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Externalizing behavior						
The child sometimes behaves too aggressively.	1.36	0.48	1.41	0.56	1.33	0.62
The child is disobedient.	1.60	0.62	1.66	0.60	1.53	0.64
The child argues with other children.	1.56	0.55	1.55	0.52	1.33	0.48
The child sometimes fights with other children.	1.29	0.46	1.34	0.52	1.33	0.48
The child sometimes snatches children's toys .	1.42	0.58	1.36	0.53	1.20	0.56
The child gets really angry if he/she does not get what he/she wants.	1.98	0.69	1.85	0.67	1.87	0.52
It has happened that the child has taken something without permission.	1.43	0.62	1.37	0.51	1.20	0.41
When the child is angry he/she yells and throws things around.	1.40	0.58	1.42	0.58	1.33	0.62
The child sometimes breaks or smashes his/her toys.	1.51	0.59	1.58	0.67	1.27	0.59
Internalizing behavior						
The child is too timid.	1.42	0.50	1.61	0.63	1.60	0.63
The child is very weepy.	1.49	0.59	1.43	0.60	1.47	0.52
The child is overly withdrawn.	1.11	0.38	1.24	0.48	1.40	0.51
The child is rather distrustful.	1.27	0.45	1.29	0.53	1.33	0.49
The child gets easily confused when he/she should do something.	1.24	0.43	1.34	0.54	1.73	0.59
The child is too shy.	1.40	0.58	1.67	0.64	1.87	0.83
The child is too sensitive.	2.04	0.60	2.16	0.68	2.40	0.51

**Table 4.** Descriptive Statistics of Indicators of Externalizing and Internalizing Behavior in Intervention group.

Indicators of externalizing and internalizing behavior	Initial measurement		Transitive measurement		Final measurement	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Externalizing behavior						
The child sometimes behaves too aggressively.	1.59	0.62	1.47	0.51	1.13	0.35
The child is disobedient.	1.71	0.69	1.41	0.62	1.18	0.39
The child argues with other children.	1.59	0.62	1.41	0.51	1.24	0.44
The child sometimes fights with other children.	1.41	0.51	1.24	0.44	1.12	0.33
The child snatches children's toys .	1.47	0.62	1.24	0.44	1.06	0.24
The child gets really angry if he/she does not get what he/she wants.	2.06	0.56	1.76	0.56	1.53	0.62
It has happened that the child has taken something without permission.	1.47	0.62	1.29	0.47	1.24	0.44
When the child gets angry he/she yells and throws things around.	1.71	0.69	1.41	0.51	1.18	0.39
The child sometimes breaks or smashes his/her toys.	1.47	0.72	1.35	0.49	1.12	0.33
Internalizing behavior						
The child is too timid.	1.76	0.56	1.41	0.51	1.59	0.51
The child is very weepy.	1.71	0.59	1.65	0.79	1.47	0.71
The child is overly withdrawn.	1.29	0.47	1.12	0.33	1.24	0.44
The child is rather distrustful.	1.29	0.47	1.41	0.51	1.18	0.39
The child gets easily confused when he/she should do something.	1.35	0.49	1.53	0.51	1.24	0.44
The child is too shy.	1.76	0.75	1.53	0.51	1.41	0.51
The child is too sensitive.	2.59	0.51	2.29	0.69	1.82	0.73

According to the values of parameters of descriptive statistics shown in the Table 3, no regularities were noticed in terms of manifesting symptoms of children's externalizing behavior. The only thing that could be noticed is the fact that there are variables which show the tendency of slight decrease with the age (*The child argues with other children, The*

*child snatches children's toys , It has happened that the child has taken something without permission*), while other variables were within almost the same limits for all three age groups, provided that the values were a bit higher or lower in the six-year-olds.

When it comes to the indicators of internalizing behavior in the control group of children (Table 4), the opposite ten-

dency can be seen; it is noticeable that there are two groups of variables: one group where the mean values remain almost the same for all three age groups (*The child is very weepy, The child is rather distrustful*), while the values of the second group which is composed of all other variables, increase with the age.

All indicators of externalizing behavior, without any exception, decrease in the intervention group of children who took part in the intervention movement program. The regularity of changes is seen from the initial, through transitive to final measurement. Besides that, not only the tendency of decreasing of this form of behavior measured by the appropriate indicators can be noticed, but also decreasing within much wider limits, in comparison to the control group of children.

Concerning indicators of internalizing behavior, it can also be noticed that all variables in the final measurement

had lower scores than those in the initial, but in this case only three of them decrease monotonously (*The child is very weepy, The child is shy, The child is too sensitive*).

In order to take a deeper insight into the changes of certain types of problem behavior under the influence of the intervention movement program, the statistical significance of the differences within intervention group (Wilcoxon test) and the control group (Wilcoxon test) were analyzed (tables 5 and 6).

From the results presented in the Table 5 it can be noticed that there are only two statistically significant differences in the indicators of the externalizing behavior between six-year-olds and seven-year-olds (*The child sometimes fights with other children, The child gets really angry if he/she does not get what he/she wants*).

**Table 5.** Age Differences in Indicators of Externalizing and Internalizing Behavior in Control Group (Wilcoxon test).

Indicators of externalizing and internalizing behavior	Five-year-old/ Six-year-old		Six-year-old/ Seven-year-old		Five-year-old/ Seven-year-old	
	Z	p	Z	p	Z	p
Externalizing behavior						
The child sometimes behaves too aggressively.	-0.76	.08	-0.62	.11	-0.84	.40
The child is disobedient.	-0.16	.88	-0.43	.67	-0.11	.91
The child argues with other children.	-0.79	.43	-2.03	.04	-0.51	.61
The child sometimes fights with other children.	-0.41	.68	-0.05	.99	-0.37	.71
The child snatches children's toys .	-1.10	.27	-1.72	.09	-0.19	.85
The child gets really angry when he/she does not get what he/she wants.	-0.01	.98	-0.96	.05	-1.24	.21
It has happened that the child has taken something without permission.	-0.87	.38	-0.01	.98	-0.89	.37
When the child is angry he/she yells and throws things around.	-0.36	.72	-1.49	.13	-0.50	.61
The child sometimes breaks or smashes his/her toys.	-0.97	.33	-0.56	.58	-1.28	.20
Internalizing behavior						
The child is too timid.	-2.01	.04	-0.37	.71	-2.24	.02
The child is very weepy.	-0.57	.57	-0.86	.39	-0.01	.99
The child is overly withdrawn.	-1.58	.06	-0.09	.93	-0.65	.51
The child is very distrustful.	-0.20	.84	-0.21	.84	-0.33	.74
The child gets easily confused when he/she should do something.	-0.28	.78	-1.31	.19	-1.95	.05
The child is too shy.	-0.94	.34	-0.62	.53	-1.50	.13
The child is too sensitive.	-0.63	.53	-0.01	.99	-0.71	.48

When the internalizing forms of behavior are taken into account, there are two statistically significant differences between the five-year-olds and the seven-year-olds, which is a consequence of increased scores for the seven-year-olds in comparison to the five-year-olds (*The child is too timid, The*

*child gets easily confused when he/she should do something*). The differences between the five-year-olds and the six-year olds occur only in one variable (*The child is too timid*), while between the six-year-olds and the seven-year-olds, there are no statistically significant differences in any of the variables.

**Table 6.** Age Differences in Indicators of Externalizing and Internalizing Behavior in Intervention Group (Wilcoxon test).

Indicators of externalizing and internalizing behavior	Initial/ Transitive		Transitive/Final		Initial/Final	
	Z	p	Z	p	Z	p
Externalizing behavior						
The child sometimes behaves aggressively.	-1.41	.16	-2.00	.04	-2.45	.01
The child is disobedient.	-1.67	.09	-1.41	.16	-3.00	.00
The child argues with other children.	-1.13	.26	-1.73	.08	-2.45	.01
The child sometimes fights with other children.	-1.34	.18	-1.41	.16	-1.89	.06
The child snatches children's toys.	-2.00	.04	-1.73	.08	-2.65	.00
The child gets really angry if he/she does not get what he/she wants.	-2.24	.02	-2.00	.04	-2.71	.00
It has happened that the child has taken something without permission.	-1.00	.32	-0.38	.71	-1.26	.21
When the child gets angry he/she yells and throws things around.	-1.51	.13	-1.63	.10	-3.00	.00
The child sometimes breaks or smashes his/her toys.	-0.63	.53	-2.00	.04	-1.73	.08
Internalizing behavior						
The child is too timid.	-1.90	.06	-1.13	.26	-1.34	.18
The child is very weepy.	-0.30	.76	-1.34	.18	-1.15	.25
The child is overly withdrawn.	-1.34	.18	-0.82	.41	-1.00	.32
The child is rather distrustful	-0.82	.41	-2.00	.04	-1.00	.32
The child gets easily confused when he/she should do something.	-1.00	.32	-2.24	.02	-0.82	.41
The child is to shy.	-1.41	.16	-1.00	.32	-1.90	.05
The child is to sensitive.	-1.51	.13	-2.53	.01	-3.36	.00

**Table 7.** Age differences in Indicators of Externalizing and Internalizing Behavior between Control and Intervention Groups (Mann-Witney test)

Indicators of externalizing and internalizing behavior	Initial		Transitive		Final	
	measurement		measurement		measurement	
	Z	p	Z	p	Z	p
Externalizing behavior						
The child sometimes behaves too aggressively.	-1.92	.11	-0.06	.94	-1.17	.14
The child is disobedient.	-0.37	.76	-1.47	.14	-2.76	.01
The child argues with other children.	-0.34	.78	-1.40	.16	-1.48	.14
The child sometimes fights with other children.	-0.47	.71	-0.40	.69	-1.42	.16
The child snatches children's toys .	-0.97	.44	-1.32	.19	-1.38	.17
The child gets really angry if he/she does not get what he/she wants.	-0.27	.83	-1.30	.19	-1.05	.29
It has happened that the child has taken something without permission.	-0.30	.81	-0.56	.57	-0.23	.82
When he/she gets angry the child yells and throws things around.	-1.29	.26	-0.14	.89	-1.02	.31
The child sometimes breaks or smashes his/her toys.	-1.16	.30	-1.02	.31	-2.27	.02
Internalizing behavior						
The child is too timid.	-2.56	.02	-1.04	.30	-0.06	.95
The child is very weepy.	-1.62	.16	-0.58	.56	-0.07	.95
The child is overly withdrawn.	-1.33	.37	-0.51	.61	-0.57	.57
The child is rather distrustful.	-0.01	.98	-1.14	.25	-0.67	.51
The child gets easily confused when he/she should do something.	-1.68	.23	-2.18	.03	-0.93	.35
The child is too shy.	-1.51	.18	-0.03	.88	-1.30	.19
The child is too sensitive.	-2.79	.01	-1.04	.29	-1.65	.10

With reference to the children who took part in the intervention movement program the statistically significant differences exist in six indicators of externalizing behavior variables, starting from the initial to the final measurement. If the variable *It has happened that the child has taken something without permission* is not taken into account, the remaining two variables are also very close to the statistical significance (*The child sometimes fights with other children*, *The child sometimes breaks or smashes his/her toys*). Considering the differences between the initial and transitive measurement, or between the transitive and final measurement in the intervention group of children, there are two i.e. three statistically significant differences, respectively. It should be noticed here that the only variable which showed statistically significant differences in

all three cases is *The child gets really angry if he/she does not get what he/she wants*.

The intervention treatment had a significantly weaker effect on indicators of internalizing behavior in comparison to the externalizing one. There are three statistically significant differences between the transitive and final measurement and two between the initial and final measurement. The only item which has statistically significant differences in both above mentioned cases is the item *The child is too sensitive*.

The final testing was conducted in order to determine whether there are statistically significant differences on certain levels of measurement between the experimental and reference group of children (see Table 7).

The results presented in the Table 7 indicate that there is a greater variability within the intervention and control groups, than between them. So, there are only two statistically significant differences among the indicators of externalizing behavior, which were registered in the final measurement. With reference to internalizing forms of behavior, there are two statistically significant differences in the initial measurement and two in the transitive one.

## Discussion

The previous research suggests that externalizing behavior symptoms are reduced as children grow up (Bongers, Koot, Van der Ende, & Verhulst, 2004; Campbell et al., 2000), while internalizing behavior has a tendency to increase with age, regardless of gender (Furniss, Beyer, & Guggenmos, 2006; Leve, Kim, & Pears, 2005). Although, the lack of research on preschool children is evident, findings on older children and adult samples suggest that physical activity is related to mental health, particularly to anxiety and depression symptoms reduction (Biddle et al., 2005; Whitelaw et al., 2008). Physical activity can enhance self-concept as well as social functioning (Allin et al, 2005; Bailey, 2006; Biddle & Mutrie, 2007; Fox, 2000). Bearing in mind these findings, the study was conducted aiming to identify effects of 2.5-year movement program on mental health of preschool children. It was hypothesized that children from intervention group would express less externalizing and internalizing behavior in comparison to children from control group after 2.5-year period

It turned out that the intervention movement program for preschool children led to the decrease of both types of the examined problem behavior, but the effects were visible in the indicators of externalizing behavior where the values of almost all variables decreased monotonously, which was not generally true of the internalizing one. Namely, in manifesting externalizing forms of behavior, statistically significant differences existed in six out of nine observed indicators, while for the internalizing forms of behavior, significant changes occurred in two out of seven indicators. Taking into account that the greatest shifts were registered between the initial and final measurement, it can be concluded that the continuity plays a very important role in engagement in physical activity. The effects on children's mental health can be expected in a year or two, which means that physical activity engagement cannot be short-termed and on a one-time basis.

At the same time, in the control group of children there was no regularity in manifesting symptoms of externalizing behavior, while manifestation of indicators of internalizing behavior displaying remained at the same level (two indicators), or it increased with the age (five indicators). These results indicate that physical exercise had an influence on the reduction of problem behavior and that it was not the consequence of development. However, considering the fact that there were no statistically significant differences be-

tween the intervention and control groups at the observed ages of children, except for sporadic ones, we can only talk about the tendencies of reducing problem behavior by physical exercise, even though they were very noticeable. Therefore the research hypothesis has only been partly confirmed.

Possible explanation of the obtained results can be found in the characteristics of the intervention movement program, structured in such a way to encourage not only motor learning and development, but also to promote a positive interaction among participants, acquisition of social skills and children's independence. Before, during and after the training sessions with children, it was insisted on previously established behavioral rules, mutual respect and help. A potential influence of parents, who cooperated with the coordinator of the project intensively during the intervention through the series of parental meetings and individual conversations, should not be neglected. That has led to the assumption that there should be transfer of the achieved changes of behavior outside the physical activity context as well.

As far as the limitations of the study are considered, it should be mentioned that the number of children who participated in the intervention movement program was significantly reduced from the initial to the final measurement, which doubtlessly limits the possibility of generalizing the results. All children involved in the study were White, they lived on the territory of Novi Sad, but the intervention and control groups were not matched according to socio-economic status. Taking into account that the parents of children included in the intervention movement program financed attending it themselves, it can be assumed that those children belong to the families of higher socio-economic status.

Due to the fact that the applied measuring instrument (Hošek, Momirović, & Bala, 2003), even though possessing satisfactory metric characteristics, is based on parent's estimates of the level of occurrence of certain indicators of problem behavior, it was impossible to eliminate a certain level of subjectivity. Besides, it is also true that the attitudes of parents on desirability of each of the examined characteristics, independent of their children, come to the fore here (for most parents, whether a child is sensitive is a less acute problem than whether he/she fights with other children, smashes, takes, etc.)

It would be interesting to examine similar problems in future studies, paying attention to the variables which indicate the problem behavior after a longer lasting intervention movement program, as well as to the existence of long-term or postponed effects of such activity on mental health of children and adults. It would also be interesting to examine the gender aspect of exercise effects on mental health within a certain cultural context, which could add to the understanding of the role of exercise in personality forming and psychological wellbeing.

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