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THE EFFICIENCY OF ADOPTION OF BASKETBALL ELEMENTS IN STUDENTS WITH SPECIAL NEEDS

Abstract

The subject of this research is studying of morphological characteristics, motor skills and situational basketball motor skills in children with special needs, and with the purpose of establishing possible correlation with the result efficiency of situational motor basketball abilities of the said group. The sample of subjects consisted of 120 students with special needs, between 11 and 16 years of age, who regularly attended Primary and Secondary Special Education Boarding School "Milan Petrović", Novi Sad. The study applied statistical methods of data processing. Obtained results indicate that in children of this age, specific basketball movement structures can positively stimulate cognitive processes, which is of particular significance when it comes to people with intellectual disabilities. The applied physical training, which is improving basketball technical elements, like specific coordination, can have positive effects on sensory integration and better functioning of cognitive processes, thus mitigating or reducing intellectual disability in development of these students. The results can also be used in solving theoretical and practical problems in physical education of students with special needs.

Key words: *basketball, result efficiency, students with special needs*

INTRODUCTION

Physical education of students with special needs is organized and conducted within three equal and functionally encircled fields: basic physical education, vocational physical education and applied (functional) physical education. Basic physical education comprises of basic physical education functions which should contribute to development of necessary abilities and characteristics of students with special needs. Vocational physical education should fulfil individual needs and interests for specific sport activities and physical exercising. Realization of vocational physical education should take place as in the school, so in the nearby schools and sport facilities. One of the possible forms of vocational physical education is training basketball, especially because it is known that the said population is good at enduring physical strains, particularly if they are not related with mental strains which are quite exhausting for them. Applied (functional) physical education is characterized by mastering special motor abilities and skills. The elements of activities are defined by the

needs and the interests of students and the social environment in which the school is functioning (Kristen et al., 2002).

The subject of the research refers to studying of morphological characteristics, motor abilities and situational basketball motor abilities in children with special needs. Also, the said research refers to comparing of the obtained results in two different age groups of students, in the context of assessment of abilities for adoption of basketball elements.

The objective of the research was to establish correlation between morphological characteristics and motor abilities (as set of predictor variables), with the result efficiency in situational basketball motor abilities (as set of criterion variables) in students with special needs, and the possibility of mitigating or reducing their intellectual disability.

Morphological characteristics are used in assessment of physical condition and development in children, youth and adults, and in determining their constitution. During the period of development, it is necessary to observe and differ chronological and biological ages, that is, growth and development of children and youth. Implementation of anthropometry measures on larger samples of subjects can establish appropriate standards for comparison of growth and development in children (Kurelić et al, 1975), and which should, primarily, interest educational medicine experts. Besides, the information about morphological characteristics may, to a great extent, contribute to better observing of efficiency in realization of various motor tasks, that is, contribute to more successful interpretation of motor abilities of man. Motor ability manifestation also depends on effectors (musculature, bone lever, joints), so the research in the field of motor characteristics is very significant for analysis of motor abilities in students with special needs (Bala, 1981; Kabok, 2013).

Motor abilities are the part of psychosomatic status which manifests the efficiency of motor reactions, that is, human motor ability. It is considered that motor abilities represent the field of education of students with special needs and which can be most influenced, thus preparing them for personal, working and defensive fitting into "social life", making their socialization (Fejgin et al., 2005), and self-actualization as efficient as possible.

American experts Francis and Rarick (Francis and Rarick, 1960) were studying motor abilities of persons with mental disabilities and came to conclusion that falling behind in motor behaviour in children with intellectual disabilities is 2 – 4 years, as compared with children of normal intellectual abilities of the same chronological age. According to the obtained results (Bala, 1981) it can be concluded that the motor abilities in children with special needs are poorly developed. It is observed that motor abilities in children with special needs are so much weaker, if their intellectual level is lower, which can indicate to the fact that the correlation between motor and intellectual abilities is much higher than in standard population.

Specific motor abilities are very significant in basketball, regardless the fact whether such specific motor abilities are achieved through exercising or are genetically determined. Such specific abilities relevant for successful basketball playing are also called situation and motor abilities from the reason that they mainly include certain combinations of basic motor abilities, functional abilities, cognitive abilities and characteristics (Krsmanovic, 2011). Generally accepted fact among researchers and practitioners (Blašković 1982; Jakovljević 2002; Ángyán et al., 2003; Krsmanović, 2008; Krsmanovic, 2010; Radovanović et al., 2013) is that the motor abilities tasks, such as repetitive strength, explosive strength, velocity and agility are most often classified into simpler situational-motor structures, and the tasks including accuracy, balance, flexibility and coordination are classified as complex basketball situational motor structures. In basketball, situational motor accuracy is the most important one. Motor abilities, to a certain extent, represent good predictor system for situational motor abilities in basketball.

In this study, after introduction and presentation of some of the relevant studies realized in this field, the second section explains methodology, while the third section will present the obtained results. Discussion and conclusions give particular indication that this study provides useful information in practice, particularly in the field of work of physical education teachers in primary and secondary schools for children with development disabilities.

1. METHODS

2.1. The sample of subjects

The subjects belong to population of students with special needs, regularly attending the school for special education and upbringing. The age of subjects was between 11 and 16. For the purpose of analysis of segments, the sample was divided into two groups, according to the age. The first group comprised of boys of 11 - 13 years of age, and the second were boys 14 - 16 years of age. All students from the sample are attending classes in the Primary and Secondary Special Education Boarding School "Milan Petrović", Novi Sad, as follows:

- Group of 60 students (boys) of 11 - 13 years of age,
- Group of 60 students (boys) of 14 - 16 years of age.

Selection of children was made according to criteria implying:

- Regular attending of physical education classes,
- Records of complete results in assessment list.

1.2. *The sample of variables*

Table 1. Tabulated review of sample of variables

Variables for assessment of anthropometric dimensions	***Variables for assessment of motor abilities***
For assessment of skeleton dimensionality:	*For assessment of movement frequency:*
Body height – AVIS,	Arm plate tapping (MTAP),
Leg length – ADNO,	Foot tapping (TAPN).
Hand length – ADRU.	
For assessment of body mass and weight:	*For assessment of agility:*
Body mass – AMAS,	Sit and reach on bench (MDP).
Maximal forearm girth – AOPL,	*For assessment of explosive strength*:
Upper leg girth – AONK,	Standing broad jump (MDM),
Chest girth – AOGK	Dash 60 m (MTR2),
Situational basketball tests	Medicine ball throws (MBAM).
For establishment of correlation between predictor and criterion variables:	*For assessment of static strength of arms and shoulder girdle:*
Slalom and double step with shot (SSLK),	Bent arm hang (MVIS).
Throw and catch the ball against the wall cross hand (SDHZ),	*For assessment of repetitive strength:*
Leading jump shot (SVSŠ), and	30 sec sit ups (MDTZ),
Free throws (SSLB).	30 sec push ups (SKLE).

Selection of tests was influenced by curriculum for students with special needs. Namely, by the end of the 8th grade, the students should master simple elements of basketball.

1.3. *Assessment technique*

The following equipment was used for establishment of selected anthropological measures in experimental procedure:

- Medical decimal (transportable) scales with 100 grams measurement accuracy. The scales was calibrated each day before use and after each tenth weighing;
- The Martin Anthropometer with 1 mm measurement accuracy;
- Measuring plastic band, 1 meter long, which enables 5 mm measurement accuracy (the result is rounded to nearer value);
- Electronic scales Tanita for measuring of total tissue fats, with result measuring accuracy expresses in percentages (%);
- Anthropometric dimensions were measured by means of methods of the International Biological Programs.

1.4. Measuring instruments

The selection of tests was made so to represent several primary motor factors. One part of the aforesaid measuring instruments was applied in a way identical to methodology described in the study. Kurelić, N. et al.: "Structure and development of morphological and motor dimensions in youth". The second part, which is identical to methodology described in work of Karalejić, M. and Jakovljević, S.: "Testing and control of training process".

1.5. Data processing methods

The possibility of resolving the problem defined by research model in optimal way depends on methods of collection of primary information and selection of mathematical and statistical procedures for data condensation and transformation. With the purpose of formulating correct conclusions, we used statistical program Basic Statistics Version 6.0, for testing of hypothesis with the following programs:

- Data Management, for creation of the database;
- Basic Statistic, for determining of basic variable distribution parameters;
- Factor Analysis, for determining of the space structure;
- Multiple Regression, for determining of the influence of predictor system of variables on criteria;
- Anova/Manova, for establishment of differences in arithmetic means.

The first step implied calculation of central tendency measures for all applied variables, as well as measures of variability:

- AM- arithmetic mean;
- SD- standard deviation;
- CV – variation coefficient;
- MED – median;
- MIN- min. result;
- MAX - max. result;
- R – span.

Regularity of distribution of variables was tested on the basis of two values: skew-skewness (represents the symmetry of the curve, so the curve is normally distributed, that is, distribution of normal skewness is "0". Negative sign refers to higher number of weak results (hypocurtic up to -3), and positive sign refers to higher number of good results (epicurtic up to +3). All results exceeding the value of 1.00 refer to tasks which are either too difficult or to easy. Kurt – kurtosis (establishment of significance of differences in results, as compared to normal distribution, is performed by means of Kurtosis, when deviations from regular values are not statistically significant (mezzokurtic 2.75). If the result is much higher than 2.75 that means that the results are very close (leptokurtic > 2.75 distribution) thus resulting in flatness and enlogation of the curve. If the results are much lower than 2.75, that will mean that the results are rather diffused

(platikurtic 2.75 < distribution). The differences between the students of various ages will be established by means of analysis of variance (ANOVA).

2. THE RESULTS AND THE DISCUSSION

The results of the study are presented as comparison and differences in mean values of parameters of morphological characteristics, motor and situational basketball abilities in students with special needs of 11 - 13 years of age and 14 to 16 years of age in the following table 2:

Table 2: Mean values of all parameters of morphological characteristics, motor and situational basketball abilities in the group of students with special needs of 11 - 13 years of age and the group of 14 - 16 years of age

DESCRIPTIVE

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviat.	Std. Error	Lower Bound	Upper Bound	Min.	Max.
Body height	11-13	60	151.7033	12.74401	1.64524	148.4112	154.9955	123.50	176.60
	14-16	60	167.9643	10.27901	1.32701	165.3090	170.6197	145.50	185.00
	Total	120	159.8338	14.12686	1.28960	157.2803	162.3874	123.50	185.00
Leg length	11-13	60	85.3172	10.03970	1.29612	82.7236	87.9107	64.00	103.10
	14-16	60	91.8583	9.17307	1.18424	89.4887	94.2280	75.10	105.20
	Total	120	88.5878	10.12324	0.92412	86.7579	90.4176	64.00	105.20
Arm length	11-13	60	70.8733	7.32263	0.94535	68.9817	72.7650	57.20	85.30
	14-16	60	74.8900	7.84843	1.01323	72.8625	76.9175	61.10	87.50
	Total	120	72.8817	7.82257	0.71410	71.4677	74.2957	57.20	87.50
Body mass	11-13	60	45.9083	9.50380	1.22693	43.4532	48.3634	26.50	62.00
	14-16	60	55.1150	8.80385	1.13657	52.8407	57.3893	38.00	68.90
	Total	120	50.5117	10.22636	0.93354	48.6632	52.3602	26.50	68.90
Maximal forearm girth	11-13	60	18.9650	1.75700	0.22683	18.5111	19.4189	16.50	22.60

	14-16	60	19.1767	1.76974	0.22847	18.7195	19.6338	16.50	23.10
	Total	120	19.0708	1.75917	0.16059	18.7528	19.3888	16.50	23.10
Upper leg girth	11-13	60	21.2450	2.51048	0.32410	20.5965	21.8935	18.00	30.50
	14-16	60	22.1450	2.84435	0.36720	21.4102	22.8798	19.00	31.50
	Total	120	21.6950	2.70927	0.24732	21.2053	22.1847	18.00	31.50
Chest girth	11-13	60	87.3018	9.09034	1.17356	84.9535	89.6501	61.20	100.00
	14-16	60	87.9005	8.82233	1.13896	85.6215	90.1795	64.00	100.00
	Total	120	87.6012	8.92469	0.81471	85.9880	89.2144	61.20	100.00
Arm plate tapping	11-13	60	16.6333	4.47580	0.57782	15.4771	17.7896	7.00	25.00
	14-16	60	22.7000	5.00948	0.64672	21.4059	23.9941	10.00	32.00
	Total	120	19.6667	5.62607	0.51359	18.6497	20.6836	7.00	32.00
Foot tapping	11-13	60	8.5667	2.43816	0.31477	7.9368	9.1965	4.00	15.00
	14-16	60	11.8000	2.57629	0.33260	11.1345	12.4655	8.00	16.00
	Total	120	10.1833	2.97887	0.27193	9.6449	10.7218	4.00	16.00
Sit and reach on bench	11-13	60	35.5500	9.64176	1.24475	33.0593	38.0407	17.00	51.00
	14-16	60	34.7000	10.06302	1.29913	32.1004	37.2996	17.00	51.00
	Total	120	35.1250	9.82243	0.89666	33.3495	36.9005	17.00	51.00
Standing broad jump	11-13	60	148.9667	40.89008	5.27889	138.4036	159.5297	35.00	201.00
	14-16	60	149.6667	39.97697	5.16100	139.3395	159.9938	35.00	201.00
	Total	120	149.3167	40.26738	3.67589	142.0380	156.5953	35.00	201.00
60 meter dash	11-13	60	12.4250	3.60393	0.46527	11.4940	13.3560	6.90	19.60
	14-16	60	13.9783	3.64385	0.47042	13.0370	14.9196	8.20	19.30

	Total	120	13.2017	3.69201	0.33703	12.5343	13.8690	6.90	19.60
Medicine ball throw	11-13	60	3.6083	1.38421	0.17870	3.2508	3.9659	1.00	6.00
	14-16	60	4.5417	0.98416	0.12705	4.2874	4.7959	2.50	6.50
	Total	120	4.0750	1.28444	0.11725	3.8428	4.3072	1.00	6.50
Bent arm hang	11-13	60	30.6863	14.83177	1.91477	26.8549	34.5178	3.00	65.30
	14-16	60	31.8033	17.93737	2.31570	27.1696	36.4370	5.60	69.00
	Total	120	31.2448	16.39828	1.49695	28.2807	34.2089	3.00	69.00
30 sec sit ups	11-13	60	14.0667	4.41441	0.56990	12.9263	15.2070	5.00	25.00
	14-16	60	13.6667	4.58689	0.59216	12.4817	14.8516	5.00	25.00
	Total	120	13.8667	4.48702	0.40961	13.0556	14.6777	5.00	25.00
30 sec push ups	11-13	60	10.8833	5.53905	0.71509	9.4524	12.3142	1.00	26.00
	14-16	60	10.9333	6.10325	0.78793	9.3567	12.5100	1.00	26.00
	Total	120	10.9083	5.80350	0.52978	9.8593	11.9574	1.00	26.00
Slalom and double step with shot	11-13	60	1.9833	1.64153	.21192	1.5593	2.4074	0.00	5.00
	14-16	60	1.9833	1.64153	0.21192	1.5593	2.4074	0.00	5.00
	Total	120	1.9833	1.63462	0.14922	1.6879	2.2788	0.00	5.00
Throw and catch the ball against the wall cross hand	11-13	60	1.1000	1.17459	0.15164	0.7966	1.4034	0.00	3.00
	14-16	60	.9000	1.11538	0.14399	0.6119	1.1881	0.00	3.00
	Total	120	1.0000	1.14496	0.10452	0.7930	1.2070	0.00	3.00
Leading jump shot	11-13	60	2.0667	1.63507	0.21109	1.6443	2.4890	0.00	5.00
	14-16	60	2.1833	1.58907	0.20515	1.7728	2.5938	0.00	5.00
	Total	120	2.1250	1.60651	0.14665	1.8346	2.4154	0.00	5.00
Free throws	11-13	60	1.2500	1.15897	0.14962	0.9506	1.5494	0.00	3.00

	14-16	60	1.2833	1.16578	0.15050	0.9822	1.5845	0.00	3.00
	Total	120	1.2667	1.15761	0.10567	1.0574	1.4759	0.00	3.00

Table 2 gives parallel presentation of mean values by groups as well as maximal and minimal values and standard deviations. When comparing all the values, particularly mean ones, we can see that the most turbulent changes occur in morphological measurements, which certainly represents logical biological development in these periods of ontogenetic development. Morphological changes come as a result of normal biological development, so no deviations were observed in that part. As for motor abilities, the only significant differences in arithmetic means are observed in arm plate tapping, and which is used in assessment of the velocity of alternating movements. In other motor, but also situational and basketball motor abilities, the difference in mean values between the formed groups is much less significant. In some positions, the mean value was even lower, like, for example, in 60 m dash and sit-and-reach, and some values are almost the same, like, for example, in 30 sec push ups, as well as in all specific basketball motor abilities. Insignificant differences were established in other applied motor abilities. Generally speaking, the results in all motor abilities fall behind as compared to population of normal boys (standard population boys) of the same age, particularly in coordination and accuracy tests, and which were the most related to cognitive factor in which the boys with special needs demonstrated lower degree of functioning.

When observing distribution of results in group of boys of 11 - 13 and 14 - 16 years of age, significant overlapping in distribution of results in motor ability tests in those two groups of boys can be observed. That means that some boys from the first group achieved results similar to those from the second group and vice versa. Also, a number of boys from both groups achieved the same results like boys from standard population, which can be particularly seen from maximal achieved values of results. This particularly referred to the velocity of running, repetitive and static strength.

Also, it was observed that the differences in mean values and the distribution of results in general, are the consequence of differences in anthropometric characteristic more than being the consequence of intellectual abilities, which is also confirmed by pour results in situational basketball motor abilities which required much higher level of coordination, that is, cognitive functioning.

The following Table 3 presents univarite significance of differences in arithmetic means of each variable in morphological, motor and situational basketball motor space between the boys with special needs of 11 to 13 and 14 to 16 years of age:

Table 3: Univariate significance of differences in arithmetic means of parameters of morphological characteristics, motor and situational basketball motor abilities between the boys with special needs of 11 to 13 and 14 to 16 years of age

ANOVA

		N	Mean	Std. Deviat.	F	Sig.
Body height	Between Groups	60	151.7033	12.74401	59.184	**.000**
	Within Groups	60	167.9643	10.27901		
	Total	120	159.8338	14.12686		

Leg length	Between Groups	60	85.3172	10.03970	13.881	**.000**
	Within Groups	60	91.8583	9.17307		
	Total	120	88.5878	10.12324		
Arm length	Between Groups	60	70.8733	7.32263	8.402	**.004**
	Within Groups	60	74.8900	7.84843		
	Total	120	72.8817	7.82257		
Body mass	Between Groups	60	45.9083	9.50380	30.303	**.000**
	Within Groups	60	55.1150	8.80385		
	Total	120	50.5117	10.22636		
Maximal forearm girth	Between Groups	60	18.9650	1.75700	.432	.512
	Within Groups	60	19.1767	1.76974		
	Total	120	19.0708	1.75917		
Upper leg girth	Between Groups	60	21.2450	2.51048	3.377	.069
	Within Groups	60	22.1450	2.84435		
	Total	120	21.6950	2.70927		
Chest girth	Between Groups	60	87.3018	9.09034	.134	.715
	Within Groups	60	87.9005	8.82233		
	Total	120	87.6012	8.92469		
Arm plate tapping	Between Groups	60	16.6333	4.47580	48.934	**.000**
	Within Groups	60	22.7000	5.00948		
	Total	120	19.6667	5.62607		
Foot tapping	Between Groups	60	8.5667	2.43816	49.855	**.000**
	Within Groups	60	11.8000	2.57629		
	Total	120	10.1833	2.97887		
Sit and reach on bench	Between Groups	60	35.5500	9.64176	.223	.637
	Within Groups	60	34.7000	10.06302		
	Total	120	35.1250	9.82243		
Standing broad jump	Between Groups	60	148.9667	40.89008	.009	.925
	Within Groups	60	149.6667	39.97697		
	Total	120	149.3167	40.26738		
60 meters dash	Between Groups	60	12.4250	3.60393	5.512	**.021**
	Within Groups	60	13.9783	3.64385		
	Total	120	13.2017	3.69201		
Medicine ball throw	Between Groups	60	3.6083	1.38421	18.119	**.000**
	Within Groups	60	4.5417	.98416		
	Total	120	4.0750	1.28444		
Bent arm hang	Between Groups	60	30.6863	14.83177	.138	.711
	Within Groups	60	31.8033	17.93737		
	Total	120	31.2448	16.39828		
30 sec sit ups	Between Groups	60	14.0667	4.41441	.237	.627

	Within Groups	60	13.6667	4.58689		
	Total	120	13.8667	4.48702		
30 sec push ups	Between Groups	60	10.8833	5.53905	.002	.963
	Within Groups	60	10.9333	6.10325		
	Total	120	10.9083	5.80350		
Slalom and double step with shot	Between Groups	60	1.9833	1.64153	.000	1.000
	Within Groups	60	1.9833	1.64153		
	Total	120	1.9833	1.63462		
Throw and catch the ball against the wall cross hand	Between Groups	60	1.1000	1.17459	.915	.341
	Within Groups	60	.9000	1.11538		
	Total	120	1.0000	1.14496		
Leading jump shot	Between Groups	60	2.0667	1.63507	.157	.693
	Within Groups	60	2.1833	1.58907		
	Total	120	2.1250	1.60651		
Free throw	Between Groups	60	1.2500	1.15897	.025	.875
	Within Groups	60	1.2833	1.16578		
	Total	120	1.2667	1.15761		

When observing the significance of F-test in each variable, we can see that out of total 20 applied variables only 8 have statistically significant difference between two groups formed in this way. Out of the said number of variables with statistically significant difference, five variables are from morphological space, and only three from motor space. The differences in morphological space are expressed in the longitudinal dimensionality and the body mass, and in motor space, they are expressed in the velocity of alternating movements, running velocity and explosive strength of arms and shoulder girdle. Thus, this confirms previous conclusion and which says that the groups of boys with special needs, in many – and in particular motor abilities, had very similar results, that is, that the visible development was expressed by the age of 14, from which moment it was replaced with stagnation or very poor development. The said reasons indicate that the adaptation abilities, particularly consolidation of the neuromuscular process, are significantly reduced in puberty and later stages of puberty. Insignificant differences in specific coordination and accuracy assessment tests confirm poor adaptability of neuromuscular processes which are closely related to cognitive factors. Comparing all values, particularly the mean ones, in groups of boys of 11 - 13 years of age and groups of 14 - 16 years of age, we established that the most turbulent changes were manifested in morphological measures, which certainly represents normal biological development in these periods of ontogenetic development. Morphological changes came as a result of normal biological development and no deviations were observed in that segment. As for the motor abilities, the only significant difference in arithmetic means can be seen in arm plate tapping which assesses the velocity of alternating movements. In other motor and basketball situational motor abilities, the difference was by far less minor in mean values between the formed groups. In some activities, mean values were even lower, such as in 60 m dash and sit-and-reach, in some activities the results were almost the same, like in 30 sec push ups, as in all specific basketball motor abilities. Minor differences were established in other applied motor abilities. Generally speaking, the results in all motor abilities fall behind as compared to population of normal boys (boys of standard population) of the same age,

particularly in coordination and accuracy tests, which are most related to cognitive factor in which the boys with light mental disability had lower degree of functioning.

3. CONCLUSIONS

The results of the study indicate that in boys of this age, particularly after the age of 13, mechanisms connected with cognitive processing are increasingly being involved. This, at the same time, could mean that specific moving basketball structures could positively stimulate cognitive processes, which is certainly of a great importance for this kind of stimulation of persons with mental disabilities. It seems that this period is very significant for this kind of stimulation of boys with special needs. Basketball situational moving structures, that is, technical elements, like specific coordination, may have positive effects on sensory integrations and better functioning of cognitive processes, and in that way mitigate or reduce the difference between the boys with special needs and the students of standard population without mental, that is, intellectual disability.

Taking the subject and objectives of the study as the starting point, and which refer to population of boys with special needs aged between 11 and 16 years of age, the obtained results may be used in solving of theoretical and practical problems which will make the work of physical education teachers in special schools much easier, particularly from the aspect of realization of curriculum of vocational physical education. One of the possible forms of vocational physical education is engagement in basketball, especially when it is known that the students with special needs attending special schools are very good at enduring physical strain, particularly if it is not related to mental strain which is exhausting for them.

The study is also significant for wider scientific and professional public, and particular significance of this research reflects in the fact that the obtained results provide exact information on relations and differences in morphological, motor and basketball situational motor space in students with special needs of various age, and that the said information can be used for practical pedagogical work with students.

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