

PROBLEMATICS OF DEVELOPMENT OF COGNITIVE ABILITIES OF YOUNGER SCHOOL AGE CHILDREN IN RELATION TO MOTOR SKILLS

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Abstract

The study presents the issue of cognitive processes in the sense of verbal competence in relation to the adaptive behavior of the pupil at the first stage of primary school. This is an important period in the life of a child in terms of future school and personal success. Individual adaptation to the school environment is determined, among other things, by the development of cognitive processes and the appropriate development of fine and gross motor skills. The aim of the research is to analyse some factors that contribute to the development of the above-mentioned characteristics of the child. Data were measured by the Cognitive Ability Test (in Czech TKS) (R. L. Thorndike, E. Hagen, N. France, 2013). The research group consisted of 200 pupils of primary school at the age of 9.87 ± 0.65 years. The Ethics Committee of the Institute (Palacký University in Olomouc) approved the research. The results of the research suggest the necessity of possible interventions within the pedagogical process in the area of development of children's verbal expression and maladaptation prevention. The results of the research suggest the need for possible interventions within the pedagogical process in the field of cognitive and motor skills development. Study limits and application options are discussed below. The study was supported by the project GF_PdF_2019_0003.

Keywords: Younger school age, cognitive processes (verbal competence), motor skills

1 INTRODUCTION

Psychoanalysis marked the period of the younger school age as latency, when one stage of psychosexual development is completed and the basic instinctive energy is relatively calm until the beginning of adolescence. Langmeier (1983), Langmeier, Krejčířová (1998, 2006) characterize this stage as the age of sober realism, where the child is focused on the world as it is and child wants to understand this world. The tendency to realism can be seen in verbal and written expression, activities of interest, reading and also in child's play like activities. At the beginning of this period, the child is usually heavily dependent on an authority (naive realism), at the end its approach with the beginning of pubescence starts to be more critical (critical realism). Psychosomatic developmental changes are neither stormy nor revolutionary, the development is rather fluent, with progress in all areas. The child's activity and willingness to cooperate is striking.

E. Erikson (1963, 2015) described this stage as a period of effort and initiative. The child proves its own value primarily through performance, has a sense of commitment and diligence, experiences feelings of cooperation within given tasks and solidarity. The aim is to achieve a sense of competence and self-esteem, as opposed to feelings of failure and inferiority. Undoubtedly, the subjective experience with the school environment has a dominant influence. In general, it can be stated that in terms of personality

characteristics, it is probably the most stable period in child development if the child grows up in adequate, healthy conditions. The area of knowledge development, cognitive processes develops appropriately to the child's activity. According to Voinov (2008), the central nervous system and the mind of the developing child shows high compensation plasticity. A younger school age child is supposed to receive information actively, wants to participate in everything, understand the context, determine the attributes of objects and situations, is attentive, persistent and consistent. All these activities are increased with the activity and stimulus of parents (Casey, Tottenham, Liston, Durston, 2005). Cognitive processes are closely linked to emotionality (Casey, Giedd, Thomas, 2000). Perception becomes a purposeful act, randomness starts to be less often, further is perception aimed at learning the principles and attributes of objects and life situation. The growing ability to analyze and differentiate enables even-better recognition. During this development stage, the child gradually moves from the perception of concrete situations to perceptions more abstractly. Around 10.-11. year, the quality of perceptions is roughly as accurate as in an adult, but the child has less experience in sorting out information and contextualization (visual acuity, colour distinction, shape and size, auditory and tactile sensitivity undergoing a great development; relationships and perception of time; Farková, 2017).

The development of thinking is significantly influenced by school activity and teacher's personality. The child gradually acquires the ability of logical operations and breaks away from imminent ideas. Child's logical reasoning is based on specific things and phenomena that can be imaginatively presented, the child prefers to know and verify the reality around him. According to Piaget, Bärbel (1970), this is a phase of specific logical operations. Therefore, at the beginning of school age, visual tools are beneficial for teachers (Hornýšová, 2013). The child can connect different thought processes at the moment, thought processes at the level of concrete logical operations form a unified system (can understand the inclusion of elements in the class, classifies objects according to the criteria, understands the conservation of quantity, causal relations, etc.). Children's performance depends on motivation, task adequacy, and other factors. In general, younger pupils are able to work mostly in the subject matter (based on actual objects or their representation), generalization is based on the noticeable features of objects. Because of controlled teaching, thinking activity separates itself from perception and becomes a relatively separate process. Aimed procedures can support the construction of logical thinking. Thanks to the ability of the younger schoolchild to understand the relationships of a particular logic, and because of his attachment to reality, knowledge in this age becomes more objective and accurate than it was in the pre-school period. A younger school age child is able to free himself from the subjective egocentric view of the world and his approach is realistic. Specific logical operations allow the child to understand the variability of reality (Mikulajová, 2018). According to Vágnerová (1997), Hornýšová (2013), the development of metacognition cannot be neglected in the cognitive development of a child at a younger school age. It is the ability to think about cognition, the ability to use feedback. Metacognition is related to the development of cognitive processes and includes the self-evaluation of one's own knowledge and competences, the appreciation of the suitability or recognition of the inefficiency of a particular strategy in solving the problem. The child learns not to adhere to one solution. Along with the development of thinking, verbal expression is increased. The child enters the school with a practical knowledge of the mother tongue. However, there are great individual differences in vocabulary, speech composition and pronunciation among children. At school, the child learns to understand written language, read and write, which is very challenging and tiring for him at first. Writing and reading requires a complex coordination of analysing functions, auditory, visual and kinesthetic, connected with the quality of sensory analysis and synthesis related to complex neuropsychic processes (Mikulajová, 2018). With the influence of school and reading skills, the child's speech develops significantly - vocabulary, length and complexity of sentence, growing sentence structure, including the use of grammatical rules, is evident, with some children showing progress in articulation. Gender differences in speech in the direction of female dominance new studies do not confirm (as opposed to older research). Differences caused by individual dispositions and stimulus of the environment are more significant than differences between the genders (Langmeier, Krejčířová, 1998).

The younger school age is marked by the first and second structural transformations of the organism. After a temporary disharmony at the beginning of the period, the schoolchild appears to be mostly harmonious, but there are large individual differences, including gender differences. The biological age does not always correspond to the calendar age, the individual growth and weight graphs often significantly differ. Mostly, we see acceleration in girls' development. The growth of the body is usually accelerated after entering school and is slowing down as well as weight increase around the eighth year. At the same time, the resistance of the organism gets better, vegetative regulation improves, the volume of the heart increases, the weight of the brain is increased, nerve conduction accelerates, muscle activity and joint mobility also improves. Motor development is gradually calming down. Movements are more effective, faster, more accurate, more economical, more coordinated than in pre-school periods; gross and fine motor skills are improving, visual-

motor coordination is more precise. There is general activity of the child with a great deal of pleasure from movement. Especially at psychic tension, movement is a suitable relaxation that returns the child to a mental balance, so it should be an integral part of the schoolchild's daily regime. The child starts to be interested in different and various kinds of sports. In this area, it should get as many opportunities as possible. Ogden, Carroll, Kit and Flegal, (2012) dealt with adaptation to physical changes related to sports activities. They deal with the terms "atypical bodies", which are common in sports performances (it refers to the average player height in the National Basketball Association, which is 2 meters, the average lineman weight in a national football league of 142 kg, etc.). However, researchers know surprisingly little about getting motor skills in people with such atypical body morphology. Atypical bodies are part of not only sporting activities, but also everyday life, e.g. in the form of obesity (Graf et al., 2004; Slining, Adair, Goldman, Borja, & Bentley, 2010), which is a health and social problem at a younger school age. Voinov (2008) points out in this context the possible causes of children's behavioral disorders, which are mainly sorted in two, usually competing approaches: exploring the morphological and functional characteristics of central nervous system formation and estimating how harmoniously is child evolving. Motor skills does not only depend on internal dispositions, but also on external conditions that can encourage and develop or slow it down. In the real world, motor development is part of adaptive behavior and flexibility is a sign of adaptive behavior (Pellis & Pellis, 2012). Langmeier and Krejčířová (1998, 2006) report that repeated sociometric studies have shown that body strength and motor proficiency play an important role in the position of a child in a group of peers. Scientists state that motor activities are in fact psychological. Motor performance means more than muscle building activity, joint angles and strength. Adaptive behavior to body and environmental limitations requires perception, planning, decision-making and learning (Rosembaum, 2005), but also active verbal expression. An important part of the typical activity of a child at a younger school age is therefore a motor game. Burghardt (2005) states that the game is a spontaneous activity common to all young species, not just humans.

2 AIM

The aim of the research was to find out, map and analyze factors of some cognitive abilities (in terms of verbal competences) in children of primary school age in the Czech Republic, in Olomouc region. The presented paper is part of a complex research (see abstract). In this case, it is currently focused on verbal competence assessment (verbal battery).

2.1 RESEARCH QUESTIONS

2.1.1 What are the differences in cognitive abilities (in terms of verbal competence) in terms of gender?

2.1.2 Is the vast majority (i.e. 70%) of surveyed respondents in the average (adequate) level of cognitive abilities (in terms of verbal competence)?

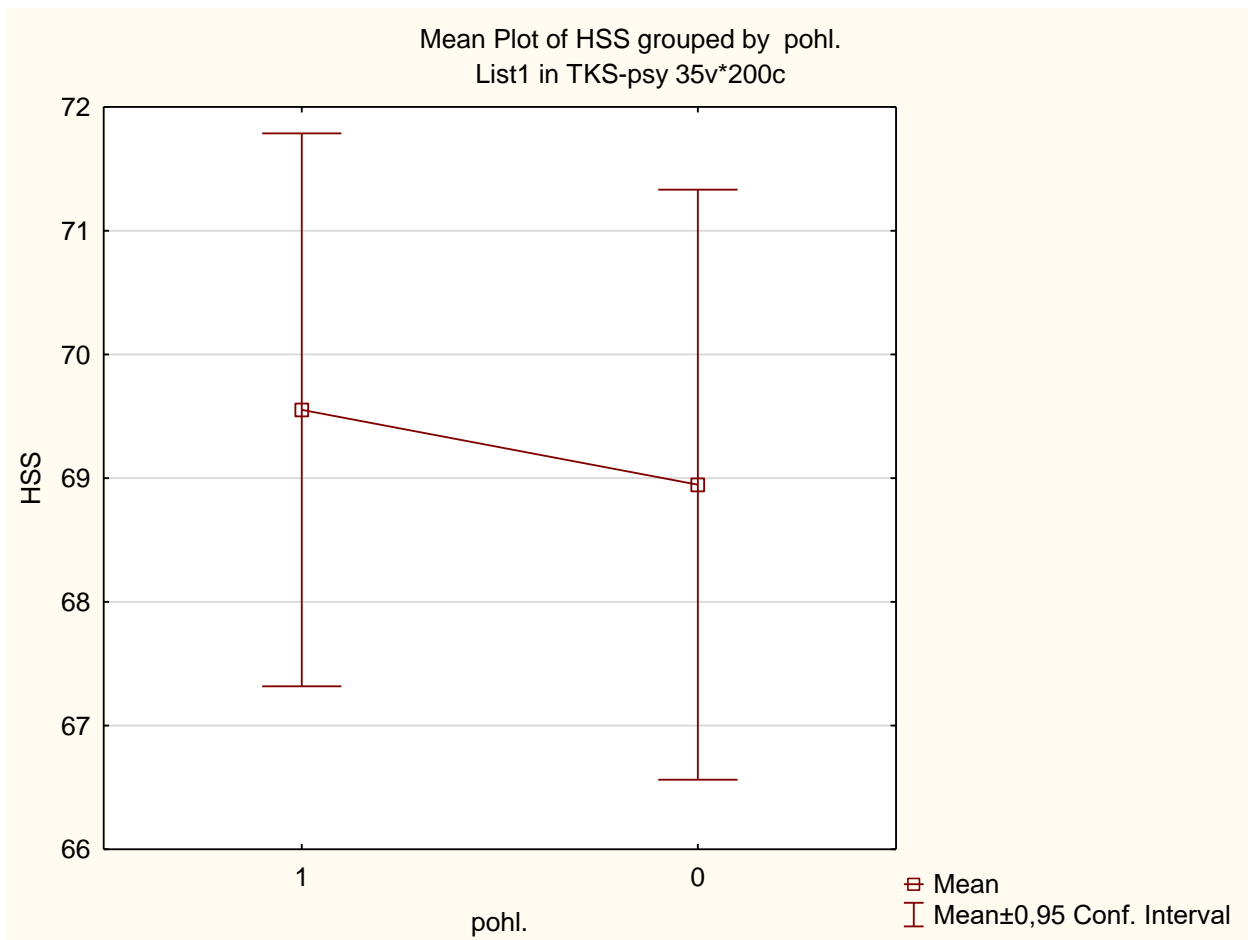
3 METHODOLOGY

The research group consisted of 200 respondents (pupils of primary school in the Czech Republic in the Olomouc region) at the age of 9.87 ± 0.65 years. Data was obtained by Cognitive Abilities Test (TKS in Czech) (Thorndike, Hagen, 1998), which focuses on assessment individual's cognitive abilities to use abstract and symbolic relationships. The test consists of three types of symbols related to the verbal, numerical and image batteries. The verbal battery consists of subtests: dictionary, sentence completion, classification of terms and word analogy; the numerical battery consists of subtests: numerical relations, numerical series, and equations; the picture battery consists of subtests: image classification, image analogy, and image synthesis. The test is designed for children aged 7 to 16 years old. The Ethics Committee of the Institute (Palacky University) approved the research. Statistical procedures were used for data processing: t-test, frequency occurrence.

4 FINDINGS

Research question 2.1.1 was processed by T-test. There was no statistically significant difference between the groups of boys and girls ($p = 0.713598$), so there is no difference in cognitive abilities (in terms of verbal competences) in terms gender (i.e., differences in verbal production of boys and girls) (Fig. 1).

Figure 1. The difference in verbal competences between boys and girls



Legend: Mean 1 = boys; Mean 0 = girls

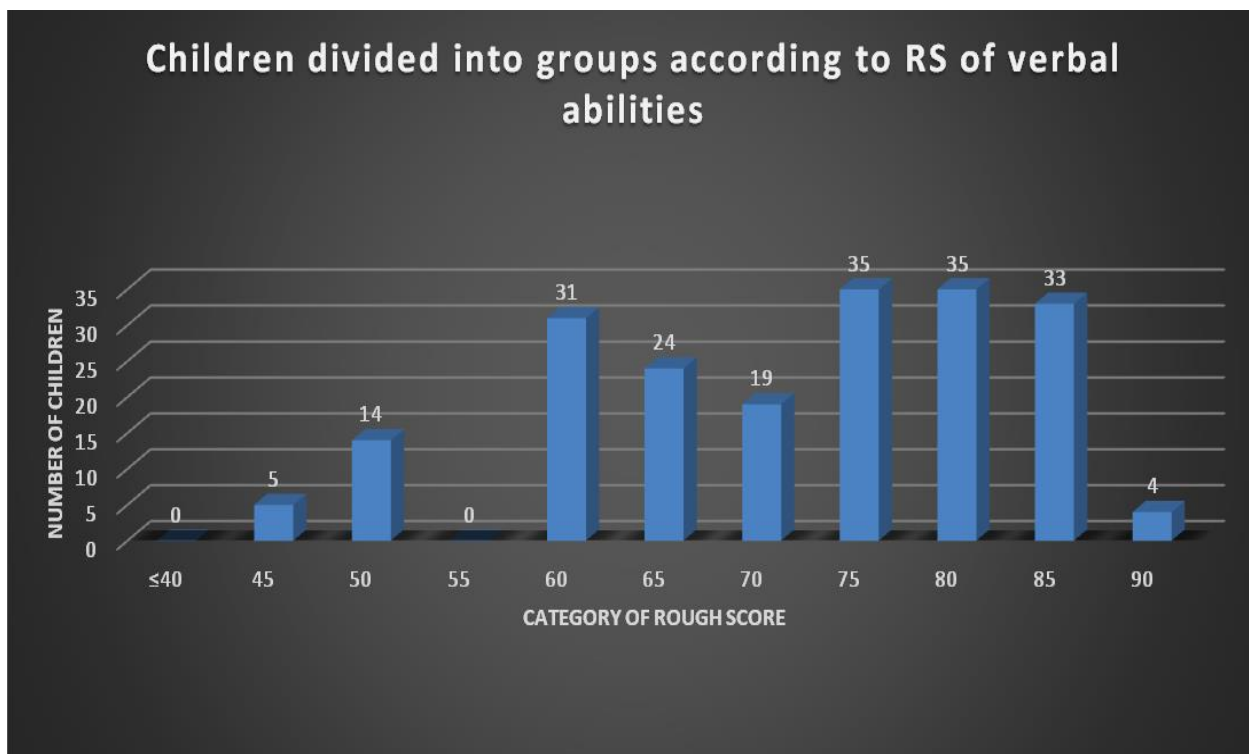
The research question 2.1.2 was assessed by the frequency occurrence (Fig. 2).

Figure 2. Frequency occurrence of performance of children of both genders in verbal production

Variable: HSS, Distribution: Normal (List1 in TKS-psy) Chi-Square = 60,14524, df = 7 (adjusted) , p = 0,00000									
Upper Boundary	Observed Frequency	Cumulative Observed	Percent Observed	Cumul. % Observed	Expected Frequency	Cumulative Expected	Percent Expected	Cumul. % Expected	Observed-Expected
<= 40,00000	0	0	0,00000	0,0000	1,16371	1,1637	0,58186	0,5819	-1,1637
45,00000	5	5	2,50000	2,5000	2,48097	3,6447	1,24048	1,8223	2,5190
50,00000	14	19	7,00000	9,5000	6,02962	9,6743	3,01481	4,8371	7,9704
55,00000	0	19	0,00000	9,5000	12,20296	21,8773	6,10148	10,9386	-12,2030
60,00000	31	50	15,50000	25,0000	20,56663	42,4439	10,28332	21,2219	10,4334
65,00000	24	74	12,00000	37,0000	28,86659	71,3105	14,43329	35,6552	-4,8666
70,00000	19	93	9,50000	46,5000	33,74194	105,0524	16,87097	52,5262	-14,7419
75,00000	35	128	17,50000	64,0000	32,84659	137,8990	16,42330	68,9495	2,1534
80,00000	35	163	17,50000	81,5000	26,62905	164,5281	13,31453	82,2640	8,3709
85,00000	33	196	16,50000	98,0000	17,97883	182,5069	8,98942	91,2534	15,0212
90,00000	4	200	2,00000	100,0000	10,10878	192,6157	5,05439	96,3078	-6,1088
< Infinity	0	200	0,00000	100,0000	7,38433	200,0000	3,69217	100,0000	-7,3843

Regarding the overall performance of respondents' verbal production, it was found that out, that from the total number of respondents (i.e. 200), 139 respondents (i.e. = 69, 5%, almost 70%) achieved average and higher rough scores (RS) = 69, 3 ± 11.6, which is an equivalent to achieving at least average or higher level of verbal performance (according to test standardization, Thorndike, Hagen, 1998). Based on the mentioned results, it can be stated that the vast majority (i.e. 70%) of researched respondents achieved an average (adequate) level of cognitive abilities (in terms of verbal competence) (Fig. 3).

Figure 3. Frequency occurrence of children's verbal production according to their rough scores



5 RESULTS, CONCLUSIONS AND RECOMMENDATIONS

In the introduction of the presented paper, the general psychological characteristics of the younger school age, the development of some cognitive processes, the psychological importance of motor development were discussed. All these fundamental determinants of development have been mentioned in relation to the complex research plan and investigation (see abstract), in this case we focused on verbal competence assessment (verbal battery, vocabulary, sentence completion, classification of terms and word analogy). As part of the development of cognitive processes, the verbal competence of the child at a younger school age is essential, as they are almost irreplaceable in the process of adaptation to the school environment (making friends, communication, empathy, etc.). In this paper, we asked two research questions (2.1.1 and 2.1.2). In the first research question, we were interested in whether differences in cognitive abilities (in terms of verbal competence) in relation to gender will be demonstrated. There was no statistically significant difference between the groups of boys and girls, so there is no difference in cognitive abilities (in terms of verbal competences) in relation to gender (i.e. in the difference in verbal production of boys and girls). It is surprising, on the one hand, because some authors (Janošová, 2008) state that the current school environment mostly supports the development of such cognitive abilities and skills that are more close to girls (especially communication, task motivation, etc.), as well as practical experience primary school teachers are more likely to show gender differences in terms of little lower level of verbal-cognitive performance of boys (probably due to internal motivation, not due to the quality of cognition). However, older studies do not confirm gender differences in speech in the direction of superiority of girls (Langmeier, Krejčířová, 1998).

In the second research question, we were asking whether the vast majority (i.e. 70%) of the surveyed respondents would show an average, i.e. adequate level of cognitive abilities (in terms of verbal competence). Regarding the overall performance of the respondents' verbal production, it was found out that from the total number of respondents (200), 139 respondents (i.e. almost 70%) achieved average and higher rough scores, which is an equivalent to achieving at least average or higher level of verbal performance. Based on these findings, the majority of the respondents have a reasonable level of cognitive ability. This finding also seems surprising to us, given the current reality of the contemporaneity, which symbolizes the overuse of media, even among younger school children. Spitzer (2004), with his numerous researches, points to the decline in cognitive processes (including non-verbal production) in the population. Also, the practical experience of primary school teachers signals rather lower levels of verbal production among younger school pupils. On the other hand, Mikulajová (2018) explains the good level of verbal production,

because the child learns to write and read, which is very difficult for a child at first, but with the influence of school and reading skills, speech is developing and getting better (wider range of vocabulary, the length and complexity of sentences, the sentence structure, including the use of grammatical rules, articulation, etc.). All of this is enhanced by synergies with other activities and skills, one of dominant factors are the motor skills in the younger school age.

Adequate (or optimal) level of factors monitored is an important prerequisite for successful adaptation of the child to the school environment (even outside the school), including adjustment to a group of peers (in terms of certain psychological flexibility), respect for teacher's authority, performance success (in teaching and teacher assessment). It is not possible to express all the essential determinants involved in the child's success in the capacity of this paper. However, it brings surprising, encouraging, challenging and interesting findings that will be further monitored in connection with other variables.

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