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Edinburgh Picture Test: From the Experience of Use in Belarus, Russia and Poland

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Abstract

The relevance of the problem under study is explained, on the one hand, by the theoretical and practical need for reliable knowledge about human intelligence, cognitive operations and general thinking skills. In our opinion, individual differences in cognitive abilities of children with normal development and special needs require close attention. On the other hand, the issue on early diagnosis of children's intellectual capacity is quite important due to the demand made by modern schools, where a great emphasis is being placed on the differentiation of education. In this regard, the early detection and reliable diagnosis of the individual level of intellectual development and thinking skills are vital.

The paper is aimed at describing Edinburgh Picture Test (EPT), which is designed to test children at the age ranging from 6 years and 6 months to 8 years and 3 months. This test allows assessing the general reasoning ability in the form of RQ (Reasoning Quotient). Moreover, the article describes the experience of applying EPT in Belarus, Russia and Poland.

The research involved three stages: 1) theoretical analysis of existing methods for diagnosing and evaluating the level of general thinking skills in the RQ form; 2) adaptation of EPT for the diagnosis of 5-8 year olds; 3) approbation of EPT in the practice of Russian, Polish and Belorussian psychologists.

Keywords: ntelligence, cognitive operations, diagnosis.

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Introduction

Today the relevance of the problem under study is explained, on the one hand, by the theoretical and practical need for reliable knowledge about human intelligence, cognitive operations and general thinking skills. In our opinion, individual differences in the intellectual capacity and intellectual giftedness of children with special needs and normal development require close attention. In this regard, the early detection and reliable diagnosis of the individual level of intellectual development are of great importance. An individual approach is especially required for children with special needs when their intellectual potential can remain unlocked in connection with their mental or physical impairments. On the other hand, the issue on early diagnosis of children's thinking skills is quite important due to the demand made by modern schools, where a great emphasis is being placed on the differentiation of education.

In special needs psychology, the issue of intelligence and cognitive operations is related to the problem of their diagnosis and enhancement in children with special needs. The ontogeny of intelligence and cognitive skills is clearly observed and effectively enhanced in the preschool period (Aleksandrovich, 2003; Bespanskaya, 2009; Buslaeva, 2006; Veraksa, 1981; Zak, 1996).

The differentiated analysis of individual differences in thinking skills of senior pre-schoolers with normal development and special needs allows determining the cognitive activity of each child. This fact makes it possible to work out strategies for individual enhancement and creation of favourable conditions for learning and development (Aleksandrovich, 2010).

According to Borisova (1997), modern psychodiagnosis concentrates on two types of problems:

1) diagnosis of the child's readiness for school, finding causes for underachievement at school, identification of gifted children, differentiation of education, implementation of an individual approach in teaching, career guidance, determination of difficulties and developmental deviations, etc.

2) evaluation of the effectiveness of curricula and teaching methods, monitoring over the obtained knowledge and skills (primarily with the help of didactic tests), mental and personal development.

The purpose of the study is to describe the practice of using *Edinburgh Picture Test* (*EPT*) in Belarus, Russia and Poland. The test is designed to test children at the age ranging from 6 years and 6 months to 8 years and 3 months and to assess their general reasoning skills in the form of RQ (*Reasoning Quotient*).

Literature review

In the studies on the development of human intelligence and cognitive operations one can single out several perspectives from which this question is considered. *The test approach* which includes two tendencies: on the one hand, a rigorous reduction of the intelligence to test performance skills (Francis Galton; James Cattell); on the other hand, a considerable expansion of the notion's scope due to different types of intellectual behaviour (Binet & Simon,1998).

The genetic approach (Piaget, 1959; Vygotsky, 1982) deals with the nature and the ontogenetic development of human intelligence and intellectual ability, cognitive stages of development, "evolution" of intelligence as a reaction to the selection, the development of mental operations, and also, the social and cultural influence on intellectual abilities. Cognitive psychology theories are determined to study the basic elements of intelligence, intellectual ability, types of intelligence and cognitive processes as well as the theory of multiple intelligence, psychological analysis of internal cognitive processes, and individual differences in cognition (Eysenck, 1982; Stenberg, 1986; Kholodnaya, 1992, 2002; Nęcka, 1997). Factor analysis is another method with a well-developed empirical foundation. The method is used to explain the nature of intelligence taking into account non-intelligence factors (Spearman, 1927; Guillford, 1979; Vernon, 1979; Druzhinin, 1998).

On the one hand, research on intelligence may disregard the factors such as age, gender and other individual characteristics. On the other hand, some authors claim that an individualistic approach is

required while studying the intelligence of children of different age groups with normal development (Piaget, 1959; Dyachenko, 1997) and children with disabilities (Zeigranik & Bratus,1980; Paszkowska-Rogacz, 1996; Yewchuk & Lupart, 2000; Pilecka & Pilecki, 2001).

Numerous studies that were conducted with children with infantile cerebral palsy (ICP) (Knupher & Ratke, 1994; Levchenko & Prikhodko, 2001) showed that these children have promising preconditions which can lead to the development of intelligence.

Obukhova (1987) and Grigoryeva (1999) analysed the mental abilities of hearing-impaired children. They found changes in cooperative interactions among sensory receptors; children might experience speech problems and problems with conceptual thinking and visualization.

The aforementioned studies confirm the significance of the early diagnosis of children' intellectual potential.

The Edinburgh Picture Test vs. Tools for the Assessment of Reasoning Skills Available in Belarus, Russia and Poland

There are several tools available in Belarus, Russia and Poland which can measure intellectual abilities of children beginning primary school education. A review of these tools is presented in table 1.

Table 1. A comparison of the Belarusian version of the EPT and the tools available in Belarus, Russia and Poland which can be used in diagnosing reasoning skills of children beginning primary school education

Name	**Application**	**Norms PL**	**Norms BY/RU**	**Duration**
SB5 Intelligence Scale Stanford-Binet 5	Used to measure general intelligence in verbal and non-verbal scales, in typical and clinical groups	2,0-18,11 (from 2016/17)	-	Individual - 15-90 min
EPT Edinburgh Picture Test	Used to assess reasoning skills and operational thinking	5,0-8,3 (from 2005)	5,0-8,3 (from 2003)	Individual or group assessment, 25-60 min.
CFT 1-R Cattell Culture Fair Intelligence Test – version 1, revised edition	Non-verbal test which measures perception skills, attention, visual-motor coordination, and reasoning skills: detecting rules which determine the relations between elements, and completing structures	4,0-9,11 (from 2010/2011)	-	Individual – approx. 35 min; group – approx. 45-50 min.
GFT 2 Cattell Culture Fair Intelligence Test – revised edition	-	-	8,0-60 (from 1996)	Individual – approx. 35 min; group – approx. 45-50 min.
CMMS	Non-verbal test which	3,5(16)-	-	Individual only – no

Columbia Mental Maturity Scale†	measures reasoning skills (simple classification and manipulating symbolic concepts)	9,11(15) (from 1990)		time limit given
DMI-2 Diagnoza Możliwości Intelektualnych – 2 / Diagnosis of Intellectual Abilities – 2	Assessing the general mental level in children and diagnosing the level of development of concrete operations	6-13 years (from 1996)	-	Individual or group assessment – no time limit is given
IDS - 2 Intelligence and Development Scales for children aged 5-20	Assessing cognitive abilities (intelligence, executive functions) and competences (psychomotor skills, social-emotional competences, school competences and attitudes to work). In addition it is possible to assess the behavior during the test situation.	5,0-20 (from 2018/2019)	-	Individual only (average time – 90 min.)
IDS Intelligence and Development Scales for children aged 5-10	Assessing cognitive abilities (visual perception, selective attention, phonological memory, visual-spatial memory, spatial reasoning, concept reasoning, auditory memory) and five competences (psychomotor skills, social-emotional competences, mathematics, language, achievement motivation)	5,0-10,11(30) (from 2010/2011)	-	Individual only (average time – 90 min.)
Leiter International Performance Scale	Non-verbal test of fluid intelligence	3-15 years (from 1993/1994)	-	Individual only (duration depends on age and correctness of responses; average time: 20 to 60 min.)

† No longer distributed in Poland

Raven's Coloured Progressive Matrices	Non-verbal test used to measure general intelligence, understood as fluid intelligence	3,11-9,11 years (from 1991/1992)	-	Individual or in small groups – average time: 15 min.)
Raven's Coloured Progressive Matrices – modified version	Non-verbal test used to measure general intelligence, understood as fluid intelligence	-	4,5-8 from 2004	Individual or in small groups – average time: 15 min.)
Wechsler Intelligence Scale for Children – modified version	Used to measure general intelligence in verbal and non-verbal scales	6,0-16,11 (form 1988)	6,0-16,11 (form 1973)	Individual – average time: 60 min.
Guilford & Sullivan test of social intelligence	Used to measure social intelligence - ability to understand and predict people's behavior	-	9,0 and older (from 1996)	Individual – average time: 35-40 min.
Torrens Test	Used to measure creative thinking	-	5,0 and older (from 2006)	Individual – average time: 60-90 min.
IST Intelligence Structure Test by Amthauer	Used to measure the intelligence's structure of a person	-	12-40 (from 2003)	Individual – average time: 90 min.
Silver Drawing Test	Used to measure the cognitive skills, cognitive strengths and weakness that may not be detected verbally, responses and emotions towards self and others, fundamental reading and math abilities, aggression and depression	-	6,0 and older (from 2004)	Individual or group – average time: 15-20 min.
The method of the measure of level of intellectual development of 7-9 years old children by Zambitsyavichene	The test developed on the basis of IST for to measure the level of conceptual thinking, the formation of the most important logical operations.	-	7-9 (from 1984)	Individual – average time: 40 min.

Developed based on the catalogue of the Psychological Test Laboratory of the Polish Psychological Association (http://practest.com.pl/), Psychological and Pedagogical Test Laboratory SEBG (www.pracowniatestow.pl), Educational Collector "The World of Psychologist" by IMATON (https://shop.imaton.com) and Krasowicz-Kupis et al. (2015).[‡]

[‡] Krasowicz-Kupis G., Wiejak K., Gruszczyńska K., Katalog metod diagnozy rozwoju poznawczego dziecka na etapie edukacji przedszkolnej i wczesnoszkolnej, Warszawa 2015.

Analysis of the data presented in the Table indicates which tools can be most useful in diagnosing reasoning skills. These tools can later help parents to decide when to send their children to primary school and help educators and psychologists to choose the right way of early support of the development.

Two of the tests listed above (WISC-R and DMI-2) cannot be used to diagnose children under the age of 6. Hence, they will not be useful to parents of five-year-olds in making that key decision. LEITER and Raven's test raise objections not only because of their outdated norms but also because they measure general intelligence, and do not diagnose particular skills. The CFT1-R also measures general intelligence, particularly fluid intelligence.

It appears that the CMMS and DMI-2 are the most similar to the EPT with regard to the scope of the assessed functions. However, the latter apart from images also includes verbal and numerical material, which limits its usefulness in diagnosing children who have difficulties with learning to read.

Although the authors of the CMMS and the EPT do not supply the theoretical basis for their tools, the authors of the adaptations pointed out that the tools can be used to diagnose the ability to create concepts (Ciechanowicz, 1992; Aleksandrovich, 2003). However, the Polish version of the CMMS does not enable the analysis of the functioning of particular intellectual operations. The norms of that tool are also outdated.

Among the tools suitable for pre-schoolers' diagnosis which are based on principles referring to operational thinking is the IDS, IDS-2 and SB5. One of 17 tasks in IDS requires conceptual reasoning (completing object classes).

Methodology

Present research was conducted in the frames of Rubinstein's theory of thinking (Rubinstein, 2008). This theory is based on the assumption that human thinking and its productivity are mainly regulated by the mechanism of analysis through synthesis and "*each process of thinking, because of its inner structure, leads to the solving of a particular task.*" (Rubinstein, 2008, p. 112). This process is a result of cooperation of mental operations, which consist in transforming information contained in the thought material. At each stage of reasoning development we distinguish such mental operations as analysis and synthesis, comparison, abstraction and generalisation, which are used to transform information gathered in the process of perception. *Analysis and synthesis* are two aspects of the same thinking process: with each analysis we need to start from the whole and the occurring dependencies, and then, bearing in mind the discovered dependencies, conduct the process of synthesis. This way we do not break up the whole but transform it, creating a new entirety by conducting a synthesis.

Comparison means searching for similarities and differences between elements, which is connected with the ability to classify. Often comparison is the primary form of knowledge: the first things are learned by comparison. At the same time it is an elementary form of knowledge, while deeper knowledge requires disclosure of internal connections, patterns and material properties, made by analysis and synthesis.

Abstraction is the ability to select the properties and qualities of the objects from the group of the others in any significant correlation to them.

Generalisation means including the features of all objects belonging to this term under one term. Generalisation arises in the action, as an individual responds to various stimuli in the same generalised way, building the response on the basis of some similarities in stimuli (Rubinstein, 2008).

The significant role of operational thinking should motivate specialists to look for tools which could diagnose this skill. The Edinburgh Picture Test (EPT) is one suggestion for such a tool.

Edinburgh Picture Test's presentation

The original version of the EPT is developed for use with children aged 6;6 to 8;3 and enables the assessment of general reasoning ability (in the form of RQ – Reasoning Quotient) in children. It should be

stressed, after the authors of the tool, that the RQs obtained in the test "*do not measure innate or immutable intelligence, nor do they measure potential: they estimate (with a certain amount of error) a child's current level of cognitive performance, and this estimate may be used to predict (again, with error) future levels. It is recommended that RQs from this test should not be considered valid indicators of anything 18 months or more after the test is taken.*" (Edinburgh Picture Test. Manual, 1985). Thus, the EPT serves mainly as a screening tool. Its reliability, assessed in a sample of 286 children, was considered high ($\rho KR20 = 0.892$). In the original version of the test no information is given as to its validity (Edinburgh Picture Test. Manual, 1985).

The Belarusian version of the test expands the age norms to 5;0-8;3 (Aleksandrovich, 2003). The adaptation process also revealed that the test can also be used to assess particular intellectual operations of older preschoolers, although the English version does not offer this option. The reliability of this adaptation was evaluated using the alternative version method ($\tau xy = 0.86$, $p = 0.001$). The tool's validity was also considered high.

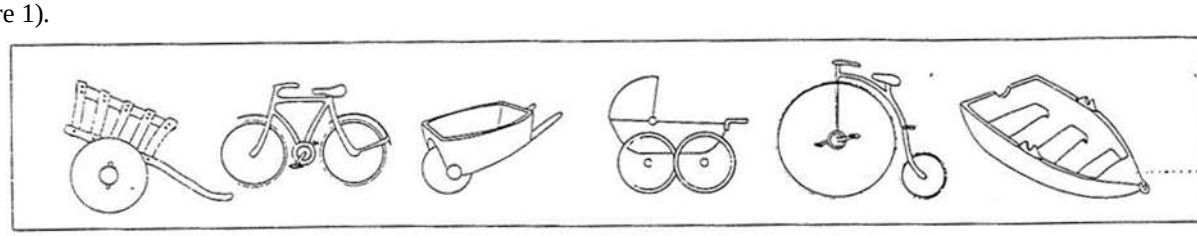
In the EPT each subtest includes ten tasks. In total the test consists of 50 tasks plus eight training tasks. It takes approximately 25 minutes to do the EPT tasks, and the entire test can take up to 1 hour. There are also approximate time frames for each subtest (from 2,5 to 6 minutes, see table 2).

According to the EPT procedure the test should be conducted individually or in a group, using standard stimulating material in the form of A4 format worksheets (individually for each child). Next, the data and test indicators for each child are written on the result sheet. During the test the diagnostician should create a favourable emotional atmosphere while remaining in control, so that his/her favourable and well-meaning behaviour does not affect the test results.

One advantage of the EPT is that there are no written instructions which makes it accessible for children who have not yet learned to read. The method consists of five subtests with varying degrees of difficulty. Each subtest should be filled out separately, according to the assigned order, without moving to the next subtest or going back to the previous one.

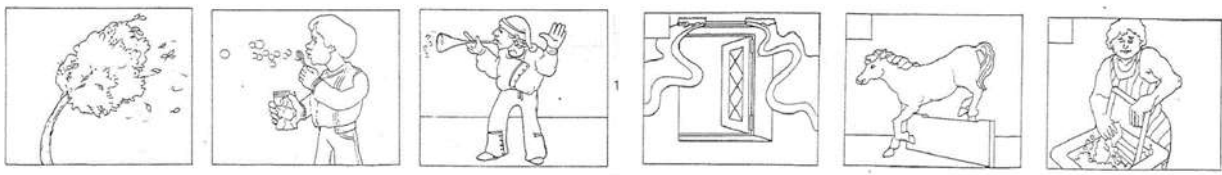
Each subtest of the EPT includes several examples, to which the respondent is given explanations and instructions. The answers given in these pre-tasks are not taken into account in the final results. The following instructions are provided in the subtests:

•*Subtest 1. Doesn't belong*. The child is shown illustrations of six objects. Five of them are connected by common visible features but the sixth object has nothing in common with them and is redundant. Task: look carefully at the pictures, find and indicate the sixth picture which does not match (picture 1).



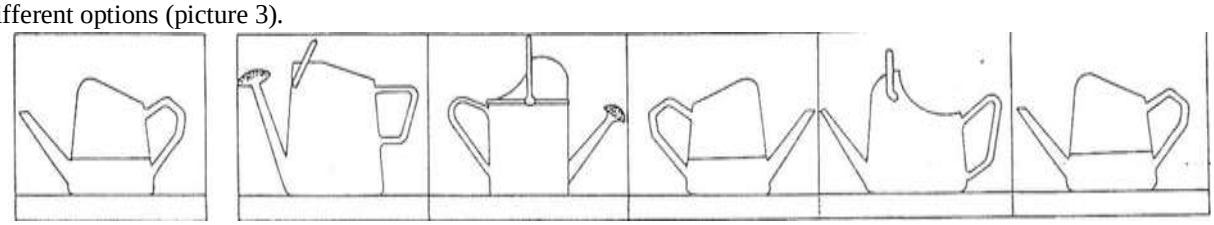
Picture 1. Example of the task from the subtest 1

•*Subtest 2. Classification.* The child looks at five rows, with three pictures in each row. The pictures in each row are connected and show one type of activity. Task: match the mixed pictures to the correct rows (picture 2).



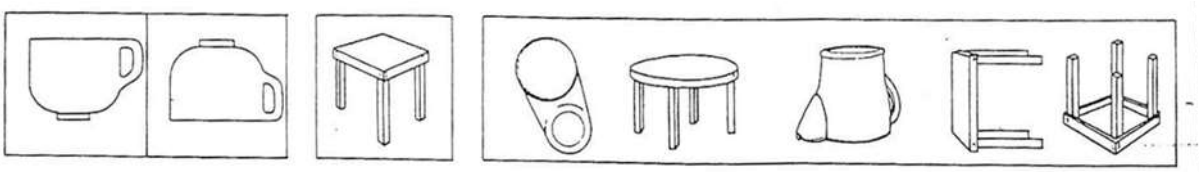
Picture 2. Example of the task from the subtest 2

•Subtest 3. Reversed similarity. The child looks at an illustration and chooses its mirror image out of five different options (picture 3).



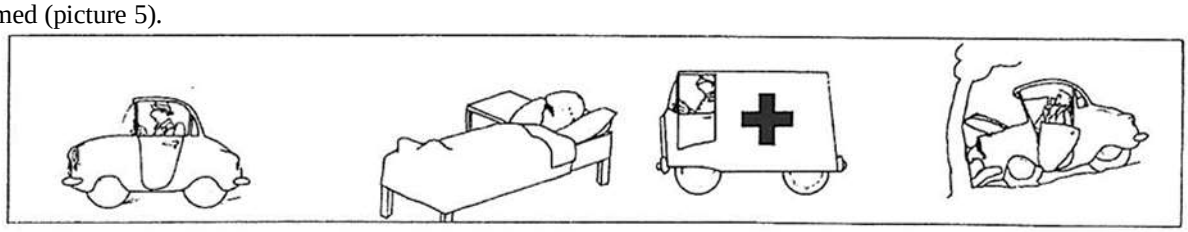
Picture 3. Example of the task from the subtest 3

•*Subtest 4. Analogy*. The child looks at a pair of pictures (A and B), which are connected, and one additional picture (C). The task is to choose one out of four answers – the one which is connected to picture (C) in the same way as picture (A) is connected with picture (B) (picture 4).



Picture 4. Example of the task from the subtest 4

•*Subtest 5. Sequences*. The child looks at four or five mixed pictures which have to be arranged in the correct order, according to the intensity of a given feature or to the order in which an action is performed (picture 5).



Picture 5. Example of the task from the subtest 5

Table 2. Duration of the test and the intellectual operations assessed in the EPT subtests

Subtest	Name	Duration/min	Leading tested intellectual operation
1	Doesn't belong	2.5-4	Generalisation
2	Classification	3.5-5	Generalisation, comparison connected with classification
3	Reversed similarity	2.5-3	Comparison
4	Analogy	4-6	Abstraction, comparison connected with classification
5	Sequences	4-6	Analysis - synthesis and abstraction

The experiment was conducted in nurseries and schools of Belarus, Russia and Poland.

Findings

This research involving Russian, Polish and Belorussian psychologists confirmed that the EPT can assess both general thinking skills and the level of development of various cognitive operations of children with normal development (Aleksandrovich, 2003), with intellectual disabilities (Zvereva et al., 2015), and with physical disabilities such as infantile cerebral palsy (Aleksandrovich, 2003), hearing impairment (Aleksandrovich, 2003; Lubimova and Basilova, 2015) and autism spectrum disorder (Kozorez & Zvereva, n.d.).

In the research of Zvereva et al (2015) on the problem of psychological (psychometric) diagnosis of intelligence in children with developmental disorders it was shown, that 6-8 y.o. children with autism spectrum disorder are able to fulfill EPT and on the basis of these results it is possible to describe the level and the qualitative features of the intellectual activity of children with autism spectrum disorders.

Lubimova and Basilova (2015) conducted a research devoted to the experience of using the EPT in the diagnostic survey of deaf and hard of hearing children 5-8 years. The study showed that this non-verbal symbolic test can be applied in the diagnosis of the intellectual development of deaf and hard of hearing children with appropriate adaptation of instruction based on their speech development and the possibilities of incorporating written and sign language instruction in job training. The use of EPT in the diagnostic survey of deaf and hard of hearing children also gives new possibilities in the study of development and originality of the intellectual operations of generalization, analysis, synthesis, classification and comparison.

Conclusion

Nowadays there are a number of methods dedicated to the assessment of the level of general thinking skills of children (IST Intelligence Structure Test by Amthauer; Raven's Coloured Progressive Matrices; Wechsler Intelligence Scale for Children, Stanford-Binet 5). However, the above-mentioned methods cannot examine a present level of intelligence and then, foresee the future level of it. The absence of written instructions can be considered as another benefit of EPT because it is especially helpful while conducting research with young children and children with disabilities.

To summarise, the following conclusions can be made:

1. EPT may allow determining the level of children' intellectual abilities, the level of intelligence' development, intellectual impairments;
2. EPT can differentiate children depending on the level of thinking skills and particular intellectual abilities;
3. The collected data allows to investigate the dynamics of the development (individual and group) of general intelligence and particular intellectual abilities; General and specific recommendations can be created for the process of enhancement and development of thinking skills in order to improve the development of children with disabilities.

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