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Tests for assessing the child's school
readiness and general development.
Trial of the tests on the samples
of pre-school children and
first-grade students in Estonia



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LIST OF THE ORIGINAL PUBLICATIONS

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The author of the dissertation contributed to these publications as follows:

- In Study I: analyzing the data gathered in a kindergarten (CDO, individual tests, teacher reports) and comparing these results to the results of the subject tests (mathematics and Estonian language); writing the manuscript in cooperation with Eve Kikas, Helen Henno and Terje Peets.
- In Study II: modifying the CDO test (CDO-R) for the first grade students, conducting individual interviews with the children and instructing the CDO-R test in a group; involvement in the analysis of data concerning the CDO-R test and the results of the word guessing and subject tests. The manuscript was written in cooperation with Katrin Mägi and Eve Kikas.
- In Studies III, IV: participating in the adaptation of the PEP-R test, conducting individual testing of children, carrying out data analysis. The manuscript was written in cooperation with Eve Kikas.

PREFACE

The assessment of the development of small children was started in the first half of the 20th century as a need to find out children who need assistance before they start school in order to reduce the dropout rates (Kelley & Surbeck, 2000). Aside school aged children, the assessment of the development of smaller children has gained greater attention since the 1980s (Nagle, 2000). The purpose of psychoeducational assessment is to find out children who need help, to diagnose areas where problems exist, to plan developmental activities and intervention, to assess the progress of each child (Barona & Santos de Barona, 2000; Gerken, 2000; Sattler, 2001; Wortham, 2005). Therefore, assessment is related to the prevention and detection of developmental and learning problems in children on the one hand and, on the other, to the planning of appropriate teaching and intervention.

The assessed areas depend mainly on the age and characteristics of the child. With children up to five years old, cognitive and motor development, social and emotional competence and communication are evaluated (Anastasi & Urbina, 1997; Cicchetti & Wagner, 1990; Kelley & Surbeck, 2000). With children of 6–7 year old, attention is also paid to academic knowledge and skills, learning related social skills and motivation (Kline, 2000; McClelland, Connor, Jewkes et al., 2007; Scott-Little, Kagan, & Frelow, 2006). Sattler (2001) outlines the primary assessment (screening) and the general assessment (diagnostic) of the child's developmental level as the different types of evaluation. The primary psychoeducational assessment of small children is conducted by kindergarten and school teachers, the assistance of a psychologist and/or special education teachers is necessary in general assessment and when children with special needs are involved.

Although means of assessment have been provided for more than a hundred years, their psychometric indicators are nowadays criticised, as well as verified and corrected (Bagnato & Neisworth, 1991; Gredler, 2000; Kelley & Surbeck, 2000). Also, many other alternative assessment methods have been developed in addition to tests, such as observations, interviews, curriculum-based assessment, which are more dynamic and flexible and more useful in the planning of teaching (Bagnato & Neisworth, 1991). There are two main options for creating means of assessment: to create material that takes into account the local situation and needs, or to adapt tests acknowledged in the rest of the world. Whereby tests evaluating general development (exc. for area of speech and language) are relatively little culture specific, then it is economical to apply them. In order to adapt tests to be used in a local situation, the tests have to be translated first, then standardized in the respective language and based on a representative sample, checked for the reliability and validity (Männamaa, 2000; Sandoval & Irvin, 2003; Sattler, 2001; Strauss, Scherman, & Spreen, 2006). There are very few adapted tests that suit for use in Estonia and could be used to assess the level of development of a preschool child (see Kikas, 2006).

The aim of the present doctoral thesis is to adapt and try tests for assessing the development of children up to 8 years old, to analyze their suitability to be used in kindergartens and schools of Estonia. The objects of research are Controlled Drawing Observation (CDO; Krogh, 1977) and Psychoeducational Profile Revised (PEP-R; Schopler, Reichler, Bashford et al., 1990). CDO is a group test, which enables to screen school readiness of 6–7 year old children. The present research involved trying the CDO test in the autumn of the last kindergarten year. In addition to that, a new version of the test – the CDO-R (Controlled Drawing Observation Revised) – was developed, in order to assess the development, knowledge and skills of children at the beginning of the first school year. PEP-R test gives a thorough overview of the general development of the child. PEP-R test was used with smaller children, as it is an individual test with flexible administration; the suitability of the developmental scale of the test was checked for the assessment of normally developed children, aged 7 months to 7 years old.

The doctoral thesis consists of a theoretical part, in which the bases for the assessment of development and knowledge of pre-school age children and those about to start school, previous studies and conditions in Estonia and elsewhere are described; and a part that analyzes and summarises the results of the research. The paper concludes with suggestions to practitioners, based on the research results, and possibilities for further research.

I. THEORETICAL BASIS

I.1. The goals and areas of psychoeducational assessment

The practice of different countries in assessing children's level of development, as well as early intervention, have in the present day been influenced most by the example of the USA (see Kelley & Surbeck, 2000; Odom, Hanson, Blackman, & Kaul, 2003; Pierangelo & Giuliani, 2006; Sattler, 2001; Shonkoff & Meisels, 1990; Wortham, 2005). Whereas, at first, the main aim of evaluating preschool children was to prevent and decrease the later dropout rate (see Kelley & Surbeck, 2000), right now, assessment is considered to be a widespread process, the aim of which is to understand the child, his or her behaviour, the environment and the connections between them (Reynolds, Gutkin, Elliot, & Witt, 1984). The results of the assessment form a basis for recommendations and decisions regarding the curriculum and environment that are suitable for the child (Sattler, 2001).

According to the cultural-historical theory (Rogoff, 1990; Vygotsky, 1994), learning is always social and situational. The grouping of children based on their age, expectations on their development in various age groups, understanding on how to take care of a baby and a small child, which environment is the most suitable in kindergarten and in school, etc., are somewhat different between different cultures and countries (Rosseti-Ferreira, Amorim, & Silva, 2007). External changes during transition from kindergarten to school have an influence on the child's mental development (Broström, 2007). School is a new social context for the child, which transforms pre-school learning: there is a transfer from general activities (playing, drawing) to isolated activities, like learning various subjects (Elkonin, 1971; Zuckerman, 2003).

The transfer from home, a childcare institution or a kindergarten to school deserves great attention because in most countries, the compulsory part of education starts from school and it is thought that the child's experience of the transfer influences the child's later success at school and the way the child manages in life (Kienig, 2002; Margetts, 2002; Rimm-Kaufman & Pianta, 2000). Children with potential learning and behavioural problems (up to 25% of children experiences difficulties at primary school level; see Gredler, 1992; Janus & Offord, 2007; Mantzicopoulos & Neuharth-Pritchett, 1998) need to be found out as early as possible before the start of school, in order to provide them with suitable support services (counselling of parents, special pedagogical aid, an individual curriculum, etc.).

Delayed entry and repeating the grade are nowadays considered to be inefficient solutions (see Carlton & Winsler, 1999; Ferguson, Jimerson, & Dalton, 2001; Hojnovski & Missall, 2006). That is why several researchers emphasise the importance of school psychologists in the evaluation of the child's level of development in relation to the child transferring from a kindergarten into a

school. A child's school readiness as a complicated construct needs to be assessed in all children.

1.1.1. The concept of school readiness

In order for the transfer from kindergarten to school to be smooth and successful, the following elements are considered to be necessary: the child's readiness for school; the support of parents, family and community; a high-level system of kindergartens; the readiness of schools; and activities supporting the transition, like consistency of curricula, cooperation between home and school, the openness of the school to families and children (Broström, 2002; Rimm-Kaufman & Pianta, 2000).

Attempts have been made to define the child's readiness for school based on different studies; for instance, kindergarten curricula have been analyzed (Scott-Little et al., 2006), the opinions of parents, teachers (Piotrkowski, Botso, & Matthews, 2000) and children have been questioned (Broström, 2003; Griebel & Niesel, 2002). The concept of school readiness involves, on the one hand, the child's readiness to learn the specific material used at school and, on the other, the child's readiness to start learning in a classroom setting (Kagan, 1990). Researchers maintain a common position that, when evaluating school readiness, the child's developmental level as a whole should be established and developmental dynamics taken into account (Forget-Dubois, Lemelin, Boivin et al., 2007). In the present doctoral thesis the child's readiness for school is seen and tested as a measurable set of cognitive and verbal abilities, pre-academic and social skills that have been proven to predict later academic success (Scott-Little et al., 2006; VanDerHeyden, Witt, Naquin, & Noell, 2001).

The area of cognition and general knowledge which is evaluated when the child enters school involves logic-mathematical knowledge and knowledge about physical and social world; the area of language and communication development is divided into the categories of verbal communication and the pre-skills of reading and writing (Scott-Little et al., 2006). Parallel to the surrounding world (objects, their qualities and connections between them), a small child starts to systematize the received experiences (images) and creates order in these. The acquisition of language helps to think and speak about these objects when it is impossible to experience them first-hand (Elkonin, 1971). The development of the meaning of words and concepts is closely related. The child acquires so-called everyday concepts through its everyday activity, via interaction with adults and peers (e.g. game). Before school, a child groups objects mainly by their perceptible qualities, for instance, "these look like triangles". In conjunction with starting school, another important change in the development of thinking and verbal abilities is the development of so-called scientific concepts. Scientific concepts develop as a result of systematic teaching; they are introduced to the child by a grown-up as part of a wider system of concepts. Scientific concepts help the child to become aware of his or her mental opera-

tions; the child can define the concepts (Toomela, 2003; Van der Veer & Valsiner, 1993; Vygotsky, 1975). Studies have shown that the knowledge of concepts helps to distinguish between children with age-appropriate development and those with learning difficulties (Kavale, 1982); to predict the child's success in mathematics (Stock, Desoete, & Roeyers, 2007), and is related to general academic success and social skills (Glutting, Kelly, Boehm, & Burnett, 1989).

In connection with starting school, the amount of verbal information which needs processing increases considerably. The speed and efficiency of processing information depend mainly on the child's age and experience (knowledge), the level of structuredness of information (Schneider, 2002). The working memory retains and processes a limited amount of information, in order to understand it or use it. It has been discovered that the administration of the various components of the working memory allows to predict academic success in mathematics (Bull, Espy, & Wiebe, 2008; Gathercole & Pickering, 2000; Rasmussen & Bisanz, 2005; Shi-Jie, Juan, Ya-Lan, & Tai-Sheng, 2006) and language (Gathercole & Pickering, 2000; He, Gou, & Yao, 2004; Montgomery, Polunenko, & Marinellie, 2009; Smith, 2006). In children with special needs, deficiencies in the functioning of all the parts of working memory (especially in the central executive component) have been discovered (Gathercole & Pickering, 2001); therefore, the use of tasks that require simultaneous remembering and processing of information allows to find children needing more precise evaluation from the general sample.

Researchers (Blair, 2002; Harris, 2007; La Paro & Pianta, 2000; Rimm-Kaufman & Pianta, 2000) emphasise nowadays that, in addition to cognitive abilities and academic pre-skills, it is also necessary to take into account the child's social skills and motivation, when readiness for school is being evaluated. In pre-school age, the child learns to control his or her behaviour, overcomes dependency on the environment and via self-regulation acquires intentional behaviour. McClelland and others (2007) used the Head-to-Toes tasks for assessing the behavioural regulation of 4–5-year-old children. The child was asked to respond naturally to simple commands and was then instructed to switch the rules. The strongest correlation ($r = .47$) was displayed between behavioural regulation and mathematics measured in the same period. McClelland, Acock, and Morrisson (2006) focussed on the influence of learning-related social skills to academic success and found that the skills of concentrating on a task, working independently, taking orders and following these, co-operation and self-regulation in the kindergarten allow to predict the results achieved in language and mathematics at the end of the second school year. Diamond, Barnett, Thomas, and Munro (2007) have argued that executive functions (inhibitory control, working memory, cognitive flexibility) are more strongly associated with school readiness than the intellectual aspect and academic pre-skills.

On primary school level the expression of emotions starts to depend increasingly on context and people and to approach the normative standards (Denham, Salisch, Olthof et al., 2004). That is why the child's emotional and behavioural problems need to be evaluated in his or her natural environment. Qi and Kaiser (2003) have drawn up a summary of longitudinal research and found that the behavioural problems of pre-school children who come from a lower socio-economic class tend to be stable when the children start school and also to influence their learning negatively. Other researchers (Duncan, Claessens, Huston et al., 2007; Gredler, 2000) have argued that behavioural problems in preschool age do not predict difficulties in school.

The child's behaviour, learning and adapting to the school environment are influenced by his or her perception of self, beliefs and task valuing. Measelle and others (1998) studied the social and academic self-perception of 4–7-year-olds and noticed its stability, especially during the transition from kindergarten to school. It has also been found (Wigfield, Eccles, Kwang et al., 1997) that the beliefs of children in their capabilities and valuing tasks are high when they enter school, but during the first school years they decrease. Children with a mastery goal orientation feel an internal interest in what is being studied, keep their focus for a longer time and study more in depth; whereas children with task-avoidant behaviour are passive and make lesser efforts. Onatsu-Arviolommi and Nurmi (2000) found that children who were focussing on avoiding failure achieve lower scores in reading tests, and poor reading skills, in turn, intensify behaviour that aims to avoid failure. A high level of mathematical skills increases the motivation targeted at the task and this, in turn, helps the child to achieve good results in mathematics (Aunola, Leskinen, & Nurmi, 2006).

1.1.2. Tests for assessing the child's school readiness

Both individually conducted and group tests are used for assessing school readiness, but individual tests take prevalence (Janus & Offord, 2007). La Paro and Pianta (2000) have drawn up a conclusion of 70 longitudinal studies that reported correlations between preschool measures and assessments in first or second grade. They found that academic knowledge and pre-skills are related to school success at medium level ($r = .49$) and social skills at low one ($r = .27$). The following tests are used for preschoolers: the Denver Developmental Screening Test and the Minnesota Child Development Inventory (see Meisels & Wasik, 1990); the Gesell Screening Test; the Early Screening Profiles, the Pre-Kindergarten Screen, the DABERON-2 Screen for School Readiness (see Pierangelo & Giuliani, 2006); the Lollipop Test; the Phelps Kindergarten Readiness Scale; the Developmental Indicators for the Assessment of Learning DIAL-R (see Janus & Offord, 2007), etc.

Screening is a primary, relatively short and fast process that helps to analyze a group in order to determine children who (1) are ready to learn according to a certain programme, (2) need assistance or tutoring, or (3) need a more thorough

evaluation of their level of development (Sattler, 2001). Screening can be based on informal assessment methods, such as interviews (getting information from teachers and parents), observation (interaction between mother and child, games, learning) and tests (Barnard & Kelly, 1990; Pierangelo & Giuliani, 2006; Sattler, 2001; Wortham, 2005). Meisels and Wasik (1990) stress that a test to be used for screening has to be inexpensive, with standardised administration, objective scoring, to involve different areas of development, be reliable and valid. In general, screening helps the teacher to determine “the children at risk” whose level of development needs more specific assessment for various reasons (special needs, domestic problems, adaptation issues, different cultural background, etc.).

The concept of school readiness involves, among other things, the aspect of the child’s social skills. In the first grade the child needs to pay attention to the teacher’s instructions, consider other students and follow behaviour order. To assess all this within an individual test is complicated. Little research concerning school readiness tests conducted in a group can be found as of late. For instance, when verifying the psychometrical indicators of the Curriculum-based Measurement Readiness Probes (CBM) for kindergarten students, it became evident that the said group test allowed predicting retained students with a probability of 71.4% (5 children of 7) (VanDerHeyden et al., 2001). The authors emphasise that a test used for the screening of school readiness should be related to the curriculum and include the monitoring of behaviour.

The Nordic countries use the Controlled Drawing Observation (CDO; Krogh, 1977) conducted in a group. The test was created in order to find out 6–7-year-old children with potential learning and behavioural problems in the general group prior to entering school. The CDO test allows assessing several aspects of the child’s school readiness that had proven to predict later school success:

- (1) knowledge of basic concepts (spatial, temporal and numerical concepts);
- (2) listening comprehension (comprehension of words and sentences);
- (3) behavioural regulation (attention, working memory and inhibitory control).

Children’s school readiness is assessed via drawing in the CDO test. On middle and upper preschool level, thinking is based on general images, supported mainly by memory processes. Imaginative activities (drawing, games) lead this process, during which the child moves from a thought to a situation and realizes his or her intentions (Vygotsky, 1969). Drawing is a complex process, which is influenced by fine motor skills, memory, vocabulary, imagination and perception. Language mediates the connections between a visual stimulus and drawing activity (Toomela, 2002). While drawing, the child pays attention to others’ activities and speech, uses egocentric speech and talks to his or her companions. Taking into account the context it helps to understand better the process of drawing, as well as the outcome, and through this, the child’s level of develop-

ment (Cox, 2005; Swann, 2009). The CDO test was used in earlier research dealing with school readiness by Liikanen (1987), Oja and Jürimäe (2002), Jensen and Krogh (2009), for example.

1.1.3. Tests for assessing general development

The general assessment (diagnostic) of the level of development involves all the areas that are important in a certain age period in the child's development; the process takes a lot of time and is thorough. The evaluation is conducted by specialists (psychologists, speech therapists, special education teachers) of different areas and teamwork is considered to be the best way to do it (McCormick, 2006; Porter, 2002). The results of general assessment help to determine a medical diagnosis and/or find a suitable kindergarten group/school curriculum, form the basis of an individual developmental plan (curriculum), counselling of parents and coming to agreement on different support services.

A majority of diagnostic tests designed for babies measure motor and sensory development. The following areas are distinguished in infant and preschooler tests: motor, cognitive and speech development, emotional qualities and social skills (Anastasi & Urbina, 1997). In addition to performance, observing the child's activity gives useful information concerning the development level. The best known tests for up to 7-year-olds are the Wechsler Preschool and Primary Scale of Intelligence, the Wechsler Intelligence Scale for Children, the Boehm Test of Basic Concepts, the Kaufman Assessment Battery for Children (see Wortham, 2005), the Bayley Scales of Infant Development (see Meisels & Wasik, 1990), etc.

Most traditional tests enable to assess the present level of the child's development; there are fewer of those that take into consideration the developing skills of the child. Vygotsky (1975) emphasised that in assessing the child's cognitive abilities, the level achieved with assistance needs to be considered in addition to independent performance (to determine the so-called zone of proximal development), because imitation and susceptibility to teaching are important indicators of development. In this case, the role of the evaluator is somewhat different: the evaluator assists and teaches, gives feedback and, in addition to the result, takes into account the performance process (Lidz & Gindis, 2003). Assessment and teaching have been connected in several programmes created for children with special needs, such as the Carolina Curriculum for Infants and Toddlers with Special Needs; the Assessment, Evaluation, and Programming System; the ABILITIES Index; the System to Plan Early Childhood Services (see Bagnato & Neisworth, 1991).

The Psychoeducational Profile (PEP; Schopler & Reichler, 1979; revised version PEP-R; Schopler et al., 1990) is the first part of the programme of assessment and teaching, called the Treatment and Education of Autistic and Related Communication Handicapped Children. The PEP test was created in the USA to help autistic children and other children with communication

disabilities aged 7 months to 7 years old. The PEP-R test consists of two parts: developmental and behavioural scales. The Developmental Scale of the PEP-R test involves the areas of:

- (1) cognitive activities (perception, cognitive performance);
- (2) language and speech (cognitive-verbal area);
- (3) starting point for learning and socialization (imitation);
- (4) motorics (gross and fine motor, eye-hand integration).

Tasks of the Behavioural Scale are divided into four areas: relating and affect, play and interest in materials, sensory responses, and language. The test has very child-centred and flexible administration, as well as enables to evaluate the existent skills and those that need assistance (Bagnato & Neisworth, 1991). The PEP-R test results form a basis for the so-called profile of a developmental scale, which shows the stronger and weaker areas of the child's development, the extent of the zone of proximal development within the areas and in total. In addition, the developmental age of the child is calculated based on the result, which can be compared to his or her chronological age (Schopler et al., 1990).

Earlier studies have shown a high reliability of the PEP-R test (the correlation between the assessment of various test administrators $r = .92$; Cronbach $\alpha > .85$). The reliability of PEP-R is comparable with such tests, as the Non-verbal Intelligence Test ($r = .92$), the Merrill-Palmer Scale ($r = .85$), the Vineland Social Maturity Scale ($r = .84$) and the Bayley Scales of Infant Development (Schopler et al, 1990; Steerneman, Muris, Merckelbach, & Willems, 1997). For now the third version of the test has been created as yet (PEP-3; Schopler, Lansing, Reichler, & Marcus, 2005), which includes a Caregiver Report and some new items for children with autism and communicative disabilities.

1.1.4. Adaptation of tests

The tests of screening, as well as general assessment, have been developed on the basis of a certain cultural context and for the evaluation of children in that environment. While choosing a test, Kaplan and Saccuzzo (1989) recommend finding out (1) the number and the cultural background of children who form the basis for the results of the test; (2) the level of the indicators of reliability and how they have been checked; (3) how well the test performs (validity); (4) how the results are calculated and recorded; (5) how to conduct the test (duration, the necessary level of speech in order to complete the test, the necessity of training for the tester).

The test is best suitable for assessing a child whose background factors (geographical location, race, domestic environment, health, the level of education of their parents and the socio-economic status of the family) are comparable with the factors of the group of children who formed the basis of the test. The comparisons of the results of the children in the USA and England, and the USA and Canada, have proved that a common language is not enough (see

Strauss et al., 2006). The comparison of intercultural test results can be achieved only when the groups share similar access to education, the children are similarly familiar with the test and excited to a comparable degree, and value the studied skills similarly (Kline, 2000).

Ideally, a new standardisation in a new language based on a representative sample needs to be achieved for all the translated tests. A practical solution in the transfer of standards is to take into account the factors that might influence the test results the most in a particular case. For instance, the biggest influence in the measurement of psychomotor speed is the age and not education, whereas in the evaluation of verbal abilities, education influences probably the most (Strauss et al., 2006).

Comparative research concerning school readiness is scarce (see Tymms, Merrell, & Jones, 2004; Van de Rijt, Godfrey, Aubrey, et al., 2003) and it is also complex to carry out due to the fact that compulsory school attendance by the child begins at somewhat varying ages (5–7 years) by countries; and the network and quality of preschool child care institutions, requirements set to the children at home and in schools also vary. Rimm-Kaufman and Pianta (2000) have suggested that a transition period should be considered one year before entering school and the first school year as well. Thus it is extremely complicated to pick up tests recognised elsewhere in the world that would suit exactly Estonian children and the local educational system. By the organisation of education, Estonia is mostly similar to the Nordic country tradition (see Kikas & Lerkkanen, 2010; Wagner, 2003).

I.2. Psychoeducational assessment in Estonia

I.2.1. The need and means for assessing school readiness

The need to assess children's school readiness came to prominence in connection with attempts to establish compulsory school attendance for all Estonian children in the period of 1920–1940. The first scientific research of school readiness was made by Olup (1936), the purpose of which was to evaluate the relationship between the age of school entrance and school success. According to the research, Olup found that the Estonian child was psychologically school mature at the age of 7 (compulsory school attendance began at the age of 8 at the time) and a majority of school entrants had received home preparation.

Also in the period of 1941–1990 school readiness tests were drawn up in order to specify the age suitable for Estonian children for attending school (Tulva & Kitvel, 1985); and to analyze relations between school readiness and study results (Indre, 1993; Kees, 1983). The general purpose was to prevent dropping out of school via assessment of school readiness, and all the aforementioned researchers differentiated between the intellectual, social and physical aspects of school readiness. Table 1 gives a comparative approach to the intellectual aspect of school readiness by the researchers.

Kees (1983) created and standardised a group test for measuring the intellectual aspect of school readiness for 6–7-year-old children ($n = 1000$). The test was designed to be carried out on two consecutive days by groups of 10–15 children. The test displayed very good validity and reliability indicators. The author found that, while school readiness needed to be assessed in all children, a regular teacher did not qualify as a person conducting the tests (Kees, 1979). Tulva (1987) dealt with the assessment of school readiness of 5–6-year-old children, which was related to compulsory school attendance starting at the age of 6 in the 1980s. Seven hundred thirty-nine children and their teachers took part in the research. The testing was prevalingly individual and half the tasks assumed verbal response by the child. The highest correlation became evident between assessments by the teachers and telling a story based on a sequence of pictures, followed by repeating sequences of words and drawing. The test results, estimates by the kindergarten teachers concerning school success, as well as assessments by the first grade teachers of actual success in school, coincided predominantly. Both Kees and Tulva emphasised the role of motivation, in addition to the three basic aspects of school readiness.

Table 1. Types of task in school readiness tests drawn up for Estonian children

Tulva and Kitvel (1985): 5–6-y-old children	Kees (1983): 5–7-y-old children	Indre (1993): First grade students
Self-portraying	Speed and accuracy of perception	Knowledge and reading of letters
Continuing a pattern (Raven matrices)	Speed of acquisition	Writing upper and lower case letters
Telling a story based on a picture or series of pictures	Reversing squares	Counting and calculating within 10
Finding similar figures	Ordering pictures	Telling a story based on a picture
Finishing a picture	Assembling squares	Continuing a pattern (Raven matrices)
Repeating a sentence		Copying drawings
Repeating sequences of words		
Fourth odd out in pictures		
Attributing a common denominator to objects		

Indre in her Master’s thesis (1993) summed up research carried out during 20 years. A majority of school readiness tests were performed on a sample of students at the beginning of the first grade. She considered copying drawings to be a good assessment method, whereas, when drawing, comprehending orders, the ability to plan one’s actions, steadfastness and concentration, perception and attention qualities, and the level of eye-hand cooperation become evident. When assessing children with behavioural problems, Indre found that social skills have an even greater role in school success than intellectual preconditions. She

preferred to testing preschool children the option that the kindergarten teacher drew up a characterisation of the child and forwarded it to the first grade teacher. A longer contact with the child, enabling to know them better, serves as a good basis for drawing up a characterisation.

The newest test was introduced by Männamaa and Kikas (2010) – the Test Battery for Assessing 6- and 7-Year-Old Children’s Cognitive Skills. Psychometric properties were examined on the sample of 269 children. Modern school readiness research and the valid kindergarten curriculum served as a basis for drawing up the test. The test assessed phoneme analysis, visual-perceptual skills, visual reasoning, attention and planning, basic concepts, comprehension of text and pre-academic skills. The children’s results were compared to the teachers’ reports.

1.2.2. The need and means for assessing general development

Psychoeducational assessment is related to the achievements of psychology in the field of measuring the psychological qualities of a person. Articles on children’s psychological research started to be published in the pedagogical press in the period of 1920–1940 (see overview by Kõrgesaar & Veski, 1987). The research target group was mostly school-children, yet the results are transmissible to the assessment of smaller children’s general development to an extent.

In 1925 Valma drew up “The Person’s Book” (“*Isikuraamat*”) in order to support the teacher in primary schools when deciding over children making poor progress at school. Among other things, Valma recommended recording the results of intelligence tests in “The Person’s Book”; for that purpose he adapted the Binet-Simon-Bobertag test to Estonian. The test caught attention and a few years later also the suitability of the German standards for Estonian children was checked (Meiusi, 1932 and Walma, 1927; referred by Kõrgesaar & Veski, 1987). In 1939 thorough research by Tork concerning the intelligence of Estonian children was published. Tork adapted the National Intelligence Tests used in the USA for evaluating the mental abilities of students. He chose adaptation instead of developing new tests, because it was a less expensive and faster way.

In the period of 1941–1990 testing and examining intelligence were officially banned in Estonia, similarly to the rest of the Soviet Union. Still, educational research dealt also with general ability issues, and solutions were sought for the issues of the organisation of education, such as underachievement, individualisation of learning (Must & Allik, 2011). In 1958 Unt defended a dissertation about the pedagogical characterisation. When analyzing the characterisations of the students drawn up by the class teachers, the author found that they tended to be one-sided and prepared basing on random material.

According to Unt, forwarding correct and reliable information concerning the student to the next class teacher or educational level was necessary for not commencing the entire getting to know work from scratch. Kivistik (1994) states that in 1970 the reliability and validity of the non-verbal intelligence test of the Raven Colour Progressive Matrices were checked on the sample of 5–11-year-old Estonian children. In 1984 Kees adapted the Terman-Merill general intelligence tests for 2–14-year-old Estonian children.

After the restoration of the independence of Estonia in 1991, to a greater or lesser degree, the following foreign general development tests have been studied and put into practice: the Kaufmann-ABC (adapted by Männamaa, 2000); the Bayley test (used by Veisson & Veispak, 2005); the WPPSI-R (used by Nugin, 2007); the Reynell test for assessing speech and language development (adapted by Tammemäe, 2009). Diagnostic general development tests are capacious and carrying them through presupposes the qualification of a psychologist or speech therapist, as well as purchasing a user licence. Diagnostic assessment of a child with a development level different from peers is necessary as well in kindergarten, for planning education at a suitable level of complexity. For these purposes the PEP-R test (adapted by Häidkind, 2001) and the Strebeleva's test for mental development (used by Viks, 1999) were drawn up. Tests created and being created in Estonia are mainly to do with the field of language: the Word Guessing test (Männamaa, 2010); the Picture–Elicited Narratives (Soodla, 2011); the Speech and Language Assessment Test for Estonian 5–6-year-old children (see Padrik, Hallap, Mäll, & Aid, 2008).

I.2.3. Areas of development and learning according to the curriculum

The restoration of the Republic of Estonia in 1991 brought the individual's rights, including the right to receive education according to the abilities and the parents' right to decide on their child's education, under greater attention, as well as the equal opportunities of children with special needs to be educated. Efforts to join the European Union strengthened the idea that everyone has the right to receive education according to his or her abilities. Such a right also means that it is necessary to find out the level of each child's skills and knowledge, based on which teaching can be planned. This also made it necessary to further educate school psychologists and teachers, to complement curricula and acquire acceptable means of assessment.

In kindergarten and school, the aims of evaluation and their organisation within different curricula are defined in a concrete way. The obligation of evaluating the level of development of all children was set for kindergarten teachers by the National Curriculum for Preschool Education (*Alushariduse raamõppekava*), which was passed in 1999. It prescribed the evaluation of every child's physical, mental and social development once or twice each academic

year and the standards for the evaluation were the presumed development results for three-, five- and seven-year-old children. The National Curriculum of Preschool Institutions (*Koolieelse lasteasutuse riiklik õppekava*, 2008) and the National Curriculum of Secondary Schools (*Põhikooli riiklik õppekava*, 2011) use a similar division: general skills (general competences) and areas of learning. The emphasis of general skills in the curriculum is based on Vygotsky's theory on the development of an individual and should help the teacher (a) to evaluate and facilitate learning activity and to compile study materials of an appropriate level; (b) to assess the child's potential for development, to recognise and understand developmental needs (Ots, 2005).

The child's development in all ages (incl. school readiness of a 6–7-year-old child) is described in kindergarten in the same areas. The areas of general skills are cognitive and learning, playing, self-regulating and social skills. The topics and learning activities are divided into areas: Child and his/her environment, Speech and language, Estonian language as a second language, Mathematics, Art, Music and Physical education. It is agreed that the assessment and analysis of the child's development is vital to the understanding of the child's individual nature, to finding out his or her special needs, to supporting the development of positive self-esteem and his or her developing, and to planning study and educational activities. The basis for the assessment of the child's development is the presumed general skills and the results of learning activity; the methodology for assessment is chosen by the pedagogical council of the kindergarten (*Koolieelse lasteasutuse riiklik õppekava*, 2008; *Õppe- ja kasvatustegevuse valdkonnad*, 2009). The National Curricula of Secondary Schools (*Põhikooli riiklik õppekava*, 2011) describes general, field and subject competences, which form the basis for teaching and grading 1st to 3rd year students. Assessment in kindergarten and in school is ideally based on various methods, means and ways; informal observation and interviews are predominant.

In order to achieve a more purposeful use of informal means of assessment and a smooth transition from kindergarten to school, the Ministry of Education and Research recommends recording the process of assessing the child's development and teaching by using a card for each child/student reflecting his or her individual progress (Häidkind, 2007; Kivirand, 2007). Starting from the academic year 2010/2011, kindergarten has to provide the child (the parent) who has passed the kindergarten curriculum with one part of the aforementioned card – the school readiness card (*Koolieelse lasteasutuse seadus*, 1999/2011), which describes the level of abilities and skills achieved by the end of kindergarten and special help offered. The school readiness card supports the first grade teacher in getting an overview of the level of development of the children who enter school, helps secure a smooth transition from kindergarten to school and, if needed, continues to provide support services at school. Thus the recommendations of Unt (1958) and Indre (1993) that the previous teacher draws up an overview of the child's development and forwards it to the following are realised.

2. THE AIM AND TASKS OF THE RESEARCH

In Estonia, it is compulsory for the child to attend school when he or she has become 7 years old by October 1st of the current year. If the parent so wishes, children who are six months younger, are admitted to school, and if the advisory board (*nõustamiskomisjon*) so proposes, it is possible to postpone the start of school for one year. In making recommendations regarding the child, the advisory board bases its decisions on the results of pedagogical and psychological assessments and, if necessary, also on the results of medical studies (*Põhikooli ja gümnaasiumiseadus*, 2010).

In practice, the main assessment methods for teachers remain to be the observation of the child's learning and behaviour, the analysis of his or her school work and interviews with the child's parents. The expected (consensual) developmental and learning results presented in the curricula and subject plans act as guides in giving evaluations on the level of development of the child. In both kindergarten, as well as school, regular performance reviews (*arenguvestlused*) with the parents take place, during which more precise evaluation activities may be recommended for the child in counselling centres (*õppe-nõustamiskeskused*) or clinics, as well as being counselled by the advisory board.

A psychological test is considered to be the best, most reliable and economical means of evaluation (Murphy & Davidshofer, 1994). The availability of suitable tests would help to study, as well as improve the efficiency of teaching and intervention.

Tests can be useful tools in the understanding of children's level of development only when they are used in a smart and responsible way. Although there are very many tests in the world, these cannot be accepted directly and used in the context of Estonian culture and language. The general goal of the present doctoral thesis is to try the CDO, CDO-R and PEP-R tests, to analyze their suitability for the psychoeducational assessment of Estonian pre-school and first year school-children. Both the original tests were created in the 1970s in foreign countries and were put into practice in Estonian kindergartens, schools (CDO) and/or clinics (PEP-R) at the beginning of the 1990s. The psychometric indicators of the tests have not been verified in the general group.

The field of application and advantages of the psychoeducational tests being the object of this research can be summarised as follows:

1. Estonian kindergarten and primary school teachers need screening tests the most in order to get an overview about the general level of the group and find out children who need further assessment and help. CDO (Krogh, 1977; translated by Kikas, 1998) is the screening test of school readiness. The tasks of CDO are in compliance with the requirements of the curriculum of Estonian kindergartens (areas of cognitive and learning, self-regulating and social skills, Child and his/her environment, Mathematics, Speech and language). The school readiness tests created in Estonia serve mainly for

assessing the intellectual aspect of school readiness (Kees, 1983; Tulva & Kitvel, 1985; Männamaa & Kikas, 2010). An advantage of the CDO is that the intellectual and social aspects of school readiness are evaluated at the same time. In addition, performing a group test takes little time, is simple and inexpensive.

2. Since in Estonia (especially in towns) children come to school from different kindergartens and information on the child's level of development reaches school often only via the parents, the first grade teacher needs means for finding out children whose skills and knowledge differ from the general group. Therefore, we saw a necessity for a new methodology and modified the CDO test as well as analyzed the suitability of one of its versions (CDO-R) for Estonian children. Modification was necessary in order to take into account the development, skills and knowledge of the children who started the first grade, and to create equal conditions for taking the test for all the children. The original CDO test has been available for teachers since it was translated into Estonian in 1998 and that is why many children have taken the test already in kindergarten (had "acquired" the test).
3. For assessing the level of development of those children who differ from the general sample, Estonian psychologists and special education teachers require more thorough diagnostic tests. PEP-R (Schopler et al., 1990) was one of the first diagnostic means in the field of special education during the beginning of the restoration of Estonian independence, which was used in the children's ward of the Psychiatric Clinic of the University of Tartu. The advantages of the PEP-R test over any other general development tests are as follows: the area of imitation is highlighted separately (related to teaching and communication), the tester is allowed to assist the child, the assessment procedure is flexible, the child tested is not required to speak, the observation of the performance is used and the test has sequel publications to plan education.

The tasks of the present research were:

- 1) to try the CDO test in practice, to check its psychometric indicators; to use the CDO test for predicting school success at the end of the first grade compared to individual tests and teacher reports (Study I);
- 2) to modify the CDO test and check the psychometric indicators of the CDO-R test; to use the CDO-R test for predicting school success at the end of the first grade (Study II);
- 3) to adapt the PEP-R test and to try it in a group of normally developed children; to check the psychometric indicators of the PEP-R test (Studies III and IV).

3. METHOD

3.1. Participants and procedure

The translated and adapted tests were tried on normally developed children aged 7 months to 8 years, in order to evaluate their development, knowledge and skills. The language spoken in the homes of all children was Estonian; the children were from big cities, small towns and rural areas. We informed the children's parents of the aims and the content of the study, and asked for their informed content for the children who participated in the study. Table 2 provides an overview of the distribution of children and the content of different studies.

Table 2. The children who participated in the study, the types of the study and the means of assessment used

Study	Studied tests	Other materials	Number of children	Age of children	Location	Period and type of the study
I	CDO	Individual tests Teacher reports Subject tests (1 year and 6 months later)	112	6–8 years	Kindergarten and school	2004–2006 Longitudinal study
II	CDO-R	Motivational questionnaire Word guessing test Teacher reports Subject tests (6 months later)	174	7–8 years	School	2005–2006 Longitudinal study
III, IV	PEP-R Develop mental scale	–	260	0.5–7 years	Home or kindergarten	2000–2001 Cross-sectional study

Note. CDO-R – adapted version of CDO; PEP-R – translated and adapted version of original PEP-R.

In study I, the knowledge and skills of 6–8 year old children ($n=112$, 48 boys and 64 girls) was evaluated in two time points: in the last autumn in the kindergarten and in the spring of the first year at school. Four kindergartens were situated in a big city, one in a small town and one in a rural area; the selection of the school was based on where the child had gone on to learn. In kindergarten, the CDO test was conducted in groups of 6–10 children and, in addition, the children took an individual test in a separate room. The kindergarten teachers filled in a written questionnaire on the child. At the end of the first

grade, the children took written subject tests on Estonian language and mathematics during one lesson at school.

Study II involved testing 174 (80 boys and 94 girls) first grade students aged 7–8 years old in October and April. The children studied at 13 schools situated in a big city, two small town schools and one school in a rural area. In autumn, individual oral interview of the students took place in a separate room and the teachers were asked to fill in a written questionnaire on the child; in addition, the children took the CDO-R group test with the whole class. At the end of the first grade, written subject tests in Estonian language and mathematics were taken during one lesson at school. The samples of studies I and II overlap partially ($n=87$).

Studies III and IV involved testing 260 small children (0.5–7 years old, 130 boys and 130 girls) from towns ($n=194$) and rural areas, who had been selected randomly and whose development had been assessed to be age appropriate by a general practitioner or a kindergarten teacher. The children were divided into thirteen age groups with a six-month interval (0.5–1 year, 1–1.5 years, 1.5–2 years, 2–2.5 years, etc.); the size of one group was 17–24 children. We tested babies and small children mainly at home, older children in the kindergarten in a separate room. Individual testing using the PEP-R test took 45–90 minutes depending on the age of the child and the number of the tasks. The tasks were offered based on the original test manual, whereby following the interruption rules.

3.2. Materials and coding

In the present research, we tried out the CDO test, compiled the CDO-R test and tested this version, as well as an adapted one, and tested the PEP-R test. In order to evaluate the validity of the CDO and CDO-R tests, we used other means of evaluation: individual tests, questionnaires for the child, teacher reports, subject tests.

3.2.1. Studied tests

The CDO test (Kikas, 1998; Krogh, 1977) was used in Study I for measuring the child's knowledge of basic concepts, listening comprehension and behavioural regulation. Testing took place in small groups of children (6–10 children); each child was seated at a separate desk so that he or she could not copy the work from any of his or her mates. The children were handed a sheet in size A4 and a pencil. First, the administrator of the test explained the rules to the children, which were as follows: "Now we are going to draw. This time, we will do so that I will tell you what to draw and you will draw it. Please, pay attention and listen carefully, because I will say each sentence only once. Before you draw anything, listen to what I say. Let's agree that you do not erase

anything. It does not matter if something goes a bit wrong.” At the same time, the observer of the test drew a plan of the children’s seating arrangement and recorded any behavioural problems that appeared during the test (request to repeat the instructions, asking for help, looking around, distracting companions, moving around, talking to another student, looking down, repeating instructions, starting to cry). The test administrator and the observer moved around in the room; they were allowed to provide supportive comments, but they did not intervene in their activity. The tasks of the test were divided as follows:

I part. Dividing the paper (3 tasks, for instance “Draw a straight line from the circle to one side of the paper.”).

II part. Geometrical figures (4 tasks, for instance “Draw four circles. Two circles must be of the same size.”).

III part. Pictures of everyday life (4 tasks, for instance “Draw an apple tree. There are three apples in the tree and five apples under the tree.”).

The correct performance of each task gave the child one point; if a mistake was made, no points were given. The drawing of a person and a cat was evaluated based on the skills of the child in a particular age (0 – important parts missing, 1 – details missing, 2 – all parts present). The general quality of the drawings (CDO Outlook) was evaluated on a three-point scale (0 – weak, 1 – good, 2 – very good), behavioural problems that appeared were coded based on the frequency of appearance (0 – no problems, 1 – one or two problems, 2 – several problems).

The CDO-R test was used in Study II. During modification we took into a consideration the fact that when the child enters school, the efficiency of the working memory in processing verbal information increases (Gathercole, Pickering, Ambridge, & Wearing, 2004; Gathercole & Pickering, 2001). The child needs to know the concepts (geometrical figures, relations) separately and to take this into consideration simultaneously (Männamaa & Kikas, 2010; Zhou & Boehm, 2004); not let himself or herself be distracted by his or her companions and focus on the drawing (McClelland et al., 2006; Qi & Kaiser, 2003). The previous knowledge and skills of the mother tongue and mathematics are traditionally part of school readiness tests (Carlton & Winsler, 1999; Indre, 1993; Scott-Little et al., 2006).

The changes that were made in the CDO-R test were the following: we left out some easier CDO’s tasks (drawing lines, a cat); instead of dividing the sheet, we used tasks involving orientating on the sheet of paper and writing numbers, added tasks that evaluate the knowledge of geometrical figures and concepts of relation; as well as tasks involving writing and understanding sentences. Testing took place in classes and one class included up to 24 students. The children were seated at desks either alone or by two, each child was handed a paper in size A4 divided into eight sectors and a pencil. The test administrator introduced the activity and the observer started to protocol the children’s behaviour as was done in CDO.

The parts of the CDO-R test were as follows:

- I part. Writing and understanding the sentence (2 new tasks, first of which (writing his or her name) was done on the other side of the sheet).
- II part. Geometrical figures (3 tasks from the CDO test and 2 new tasks, for instance, “Draw four circles inside one another.”).
- III part. Pictures of everyday life (2 tasks from the CDO test).
- IV part. Orientating on the sheet of paper and writing numbers (4 new tasks, for instance, “Find a box that is in the upper right hand corner. Write the number 1 in the box.”).

The coding of the tasks of the CDO-R test was done based on the same principle as for the CDO test: each correct performance gave one point and when the child made a mistake, no point was given. The correctness of the drawings and behavioural problems were assessed on a three-point scale (0-1-2). The results of writing sentences and tasks on understanding (part I) were ambiguous and could be interpreted in various ways, which is the reason why we did not use these in further analyses. This was also partly the reason why Study II did not include the correctness of the CDO-R test drawings and problems that occurred during the test. According to the aim of the particular study, we focused on tasks evaluating the knowledge of basic concepts, verbal skills and behavioural regulations (parts II–IV of the CDO-R test).

The PEP-R test (Schopler et al., 1990) was used in Studies III and IV. Developmental scale tasks (131) were used and normally developed children who exhibited no autistic behaviour assessed. We followed the general procedures and criteria for evaluating the tasks, described in the test manual, but also made some adaptations, taking into consideration the Estonian language and culture. The tasks of the developmental scale and changes were divided based on the fields as follows:

1. Imitation (16 tasks). The tasks help to evaluate the motor and verbal skills of imitation of the child; all activities will be demonstrated by the administrator of the test before the child. In adapting the test, we changed the verbal material and contributed to it, for instance, added sound combinations (*lala-lalla* (extra-long *l*) and *lala-lalla* (long *l*)) (task 123), because the Estonian language is based on the degree of quantity (Karlep, 1998). We also changed the repeated words (task 124) and numbers (task 100), trying to maintain the length (Männamaa, 2000) and familiarity of words.
2. Perception (13 tasks). The tasks help to evaluate the peculiarities of the child’s sight and hearing.
3. Gross motor skills (18 tasks). The tasks help to evaluate the child’s independence in movement and in being active.
4. Fine motor skills (16 tasks). The tasks are to do with the child’s manual skills, for instance, opening a jar, handling clay, placing pearls on a stick and on a string.

The tasks involving perception, gross and fine motor skills remained the same as in the original test.

5. Eye-hand integration (15 tasks). The tasks help to evaluate eye-hand coordination and fine motor skills, which form a basis for drawing and writing. The tasks are to do with movement in space (for instance, building a tower of blocks, drinking from a cup), as well as movement on a surface (drawing geometrical figures based on samples, colouring a picture without crossing the lines). We changed the stimulus material of the tasks involving matching letters and imitating (tasks 80, 83), where we replaced uncommon letters (Z, Y, H, J, G) with those more familiar to Estonian children (L, N, A, M, O).
6. Cognitive performance (26 tasks). The tasks help to evaluate the child's memory and thinking and presuppose understanding of verbal directions. The tasks of cognitive activity included also filling out verbal orders consisting of one or several parts, reading and acting based on orders. The changes made to the test were again to do with the selection of letters (task 82); in addition, with the language book of the test (task 121) and the reading text (task 140). In the language book, we replaced some pictures (for instance, a turkey was replaced with a rooster, a puppet – with a glove doll) and some names in the reading texts (Tommy-*Anu*) with ones more familiar in the Estonian culture, as well as changed some bits of sentence construction.
7. Cognitive verbal area (27 tasks). The tasks help to evaluate cognitive activity, as well as verbal capability, the stimulus material overlaps greatly with the material used in cognitive activity. An important difference between both fields is that now the child needs to express himself or herself verbally as well to perform certain tasks. We translated the sentences to be repeated and read into Estonian and made some changes to these as well. For instance, a complex simple sentence can sometimes be more difficult to understand than a compound sentence (Karlep, 1998), which is the reason why the sentence “I saw an airplane fly up high” was translated as “*Ma näen, et lennuk lendab kõrgel*” (I see that an airplane is flying up high). The words and sentences in the reading tasks were changed to block letters as is customary in pre-school education in Estonia. We also replaced the currency (penny-*kroon*).

The evaluation of the developmental scale tasks in PEP-R is based on the idea of the zone of proximal development by Vygotsky (1975; Lidz & Gindis, 2003), which means that skills that have been acquired, as well as those that are being developed, are evaluated. The test manual describes in the case of each task performance necessary to qualify as passed, emerged or failed. General guidelines for evaluation and assistance are as follows:

- Passing: the child performs the task successfully, without any prior demonstration.

- Emerging: the child seems to know how to perform the task, but is not able to do it successfully; the test administrator needs to show the task many times or teach the child how to perform the activity. The possibilities of assistance are further verbal instructions, gestures while making orders, demonstration of the task, supporting the movement of the child's hands during the task.
- Failing: the child cannot or does not make an effort to perform the task after being shown how to do it.

The results of all fields are summed up and marked on a graph, which compares the level of the child's skills to his or her chronological age. Although it is recommended to use a three-point scale in practical work (for planning teaching activity), the results in Studies III and IV have been coded on the scale of 0–1 (0 – failing or emerging; 1 – passing).

3.2.2. Other materials

Individual tests in kindergarten (Study I) were compiled as a part of Mürsepp's (2005) Master's thesis and were used to evaluate verbal (6 tasks) and mathematical abilities (3 tasks) and eye-hand integration (2 tasks). We evaluated the knowledge of the concepts of space, number and time: for instance, the test administrator asked the child to point at the first and the last car of the train in a picture. In mathematical tasks the child was asked to compare the size of various groups, count the elements of the groups and solve a problem situation, which involved addition ($3+2=5$). Eye-hand integration was evaluated in a copying task; the child had to draw a square with a circle and three crossing lines based on a sample (see VMI; Beery, 1989). For each correct answer in the individual tests, the child scored one point, up to 11 points in total.

Teacher reports (Study I). Both kindergarten teachers were asked to evaluate the child's reading, writing and math skills on a five-point Likert scale (very low to very high). In addition, they were asked to evaluate the child's behaviour (following rules, conflicts with other children) and independence and activeness on performing the study tasks (on a five-point Likert scale: never to very often). In Study I, the arithmetic mean of both teachers' reports was used.

The word guessing test in kindergarten (Study I) and at the beginning of the first grade (Study II) was compiled by Männamaa (2010). The test administrator said to each child both on kindergarten level, as well as at the beginning of the first grade, three characteristic qualities and the child had to guess the concept. Only accurate answers were considered correct and each correct answer gave one point. In kindergarten, the concepts were "snake", "flag", "night" (up to 3 points); at school (in autumn) "chess", "ticket", "mask", "volcano", "desert", "advertisement", "calendar" and "museum" (up to 8 points).

Motivational questionnaires for the child and the teacher at the beginning of the first grade (Study II) were compiled based on earlier means of evaluation by Mägi. The first part of the child's questionnaire contained statements about performance-approach goal orientation (3 statements, for instance, "I want to show the teacher that I am smarter than others", see Midgley, Maehr, Hruda et al., 2000). The second part was to do with task-avoidant behaviour (3 statements, for instance "When a task is hard, I will not finish it", see Fyrsten, Nurmi, & Lyytinen, 2006). When the child agreed with the statement (this applies in my case), the child scored one point, and when the child disagreed, he or she received zero points. The teacher's questionnaire was compiled on the basis of BSRS (Aunola, Nurmi, Niemi et al., 2002; Onatsu & Nurmi, 1995; Onatsu-Arvilommi & Nurmi, 2000). The teacher was asked to evaluate the child's task-avoidant behaviour in a study situation (5 statements, for instance, "The child works hard in order to manage difficult activities and tasks"); evaluation was given on a five-point Likert scale (1 – never, 5 – very often).

Subject tests (Estonian language and mathematics) at the end of the first grade (Studies I, II) were compiled by Peets (2006) and Henno (2006), based on the requirements of the national curriculum. There were five types of tasks in the Estonian language test: reading a text and answering questions; forming a sentence of given words; guessing the word; choosing the words, written correctly, to go with the pictures; a task on orthography and finding mistakes. Each correctly done task gave one point, 24 in total. The subject test for mathematics included five types of tasks as well: addition and subtraction within 20; finding the right shape from other shapes; solving a problem situation, involving one calculation; counting cubes in a shape and changing the time. Each correct answer gave one point, 33 points in total.

4. THE MAIN RESULTS AND DISCUSSION

4.1. Psychometric indicators of the CDO test

The psychometric indicators of the CDO test based on the samples of kindergarten and first grade students in Estonia were addressed in Study I. Differently from earlier studies (Liikanen, 1987; Oja & Jürimäe, 2002) where only total scores were used, we carried out exploratory factor analysis ($n=453$, 219 boys and 234 girls, with an average age of 6.21 years, 11 tasks) with the Principal Component Method with Varimax rotation and Parallel analysis for determining the number of factors. We found the following three-factor solution, specifically:

- CDO₁ – dividing the paper (tasks 1–3, see Studied tests),
- CDO₂ – drawing geometrical figures and specific number of objects (tasks 4–9),
- CDO₃ – drawing daily objects (tasks 10–11).

The first factor CDO₁ has mainly to do with the skills of orientating in space. If in preschool age the child plays in three-dimensional space, then at school one must predominantly sit at a desk and operate within paper. This test has CDO₁ tasks of preparing paper for following drawings. The child had to comprehend the concepts “corner” and “edge” in order to execute orders.

Six tasks of the CDO test related to geometrical figures and numbers (including drawing an apple tree and a house) belong under the second factor CDO₂. In the performance of all the CDO₂ tasks, it is necessary to know basic concepts (geometrical figures, numbers, size and location); to listen carefully, remember and analyze relatively long and complicated verbal instructions. Considering the content, these are mostly tasks measuring knowledge and pre-skills in mathematics, but understanding these and putting these into practice also presupposes developed verbal abilities and an efficiently functioning working memory. All of these aspects have been emphasised in the research of school readiness and predicting success at school by earlier researchers as well (e. g. Bull et al., 2008; Glutting et al., 1989; Montgomery et al., 2009; Stock et al. 2007; Zhou & Boehm, 2004; Vygotsky, 1975).

The third factor CDO₃ includes tasks of drawing a cat and a human being, with no specific instructions available. The preschooler realises their intentions when drawing and draws mostly what they know about the object (Cox, 2005; Vögotski, 1969). Thus these tasks display the child’s general drawing skills and knowledge of the cat and the human being (essential body parts and details, location).

According to the results of factor analysis, new scales (subtests) were made and sum scores were calculated and used in further analyses. The indicators of internal reliability of subtests were sufficiently high – Cronbach $\alpha=$.71 (CDO₁); .72 (CDO₂) and .81 (CDO₃).

As it is a group test, the individual results were probably also influenced by the presence and activities of others. Learning is always related to a concrete situation and other people (Rogoff, 1990; Vygotsky, 1994); the same has been found concerning drawing (Cox, 2005; Swann, 2009). Therefore, it is reasonable that, in addition to the performance of the tasks, the concentration and behavioural problems (CDO Problems) of the child and the general correctness of the drawings (CDO Outlook) were considered as well. Whereas fine motor skills, memory, vocabulary, imagination, and perception (see Toomela, 2002) contribute to the drawing process, then it is expected that CDO Outlook correlated with all the three subtests positively ($r = .41$ to $.53$; $p < .001$). McClelland and others (2007) have written on negative relations between behavioural problems and study results. Also in this case negative correlations between CDO Problems and other parts of the CDO test ($r = -.20$ to $-.38$; $p < .05$) became evident.

In order to assess the validity of the CDO test, the kindergarten results correlated (Pearson r) with individually carried out tests, teacher reports, and the results of the subject tests at the end of the first grade (see Study I and Table 3).

Table 3. Correlations (Pearson r) of CDO subtests with other tests and teacher reports

	CDO ₁	CDO ₂	CDO ₃	CDO Outlook	CDO Problems
Individual tests					
Word guessing	.26***	.26***	.29***	.30***	-.30**
Space and time	.20**	.19**	.06	.07	-.04
Mathematics	.14	.17*	.15*	.18*	.02
VMI	.09	.06	.18*	.12	-.06
Teacher reports					
Mathematics	< .01	.21**	.25***	.25***	-.07
Estonian	.03	.21**	.38***	.24***	-.09
Behaviour	-.07	.08	.36***	.20**	-.21**
Independence	.10	.20**	.43***	.29***	-.21**
Subject tests					
Estonian	.13	.32***	.29***	.38***	< .01
Mathematics	.09	.45***	.12	.26***	-.12

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

In order to evaluate the concurrent validity of the CDO test, firstly, the results of the group test (CDO₁, CDO₂, CDO₃ and CDO Outlook) with the results of the individual tests were obtained. CDO subtests and individual tests were used for assessing almost the same knowledge and skills as CDO (verbal skills, mathematical concepts and eye-hand integration), so positive correlations ($r = .15$ to $.29$) between two measurements were expected. The highest correlation was between the CDO subtests and the word guessing test. Word guessing

presupposes developed verbal abilities (vocabulary, understanding of sentences), knowledge regarding the characteristics of objects and phenomena, as well as relationships, ability to analyze information outside context and personal experience. The child was told three characteristics for each concept (general category, description, and function) and asked to guess what it was (Männamaa, 2010). In the CDO test, the child was given a similar instruction with verbal information, which he or she completed by drawing. The more carefully the child listened, could remember and understand the instruction, the more likely he or she was to guess the word or complete the drawing task successfully. When these results are interpreted, it needs to be taken into account that the means of evaluation used for comparison were small-scale, their tasks did not measure exactly the same skills and the indicators of reliability were borderline (word guessing Cronbach $\alpha = .52$; concepts of space and time Cronbach $\alpha = .69$).

Secondly, we correlated the CDO test (CDO₁, CDO₂, CDO₃ and CDO Outlook) results and teacher reports (Estonian language and mathematics). The connections between the teacher reports and the CDO (exp. CDO₁) were positive too and within the same magnitude ($r = .21$ to $.38$) than between the CDO test and the individual tests. Thirdly, we analyzed relations between CDO Problems and teacher reports concerning the child's social skills (Behaviour and Independence). Correlations were within the same magnitude as the aforementioned, yet negative. Thus, if the teacher assessed the child's concentration and behavioural skills low, then the child would be mistaken in relation to behavioural rules in the drawing test more frequently. Using teacher reports in order to evaluate the validity of a test is common in school readiness tests (see Duncan et al., 2007; Janus & Offord, 2007; Männamaa & Kikas, 2010; Tulva, 1987). In this case we used the arithmetic means of the assessments of two teachers and the correlation of the two teacher reports was rather low ($r = .43$ to $.73$).

In order to examine the predictive validity of the CDO test, the results of CDO (CDO₁, CDO₂, CDO₃ and CDO Outlook) were compared with the results of the subject tests in the Estonian language and mathematics. As expected (Duncan et al., 2007), the strongest correlation existed between CDO₂ and the subject test in mathematics ($r = .45$; $p < .001$). CDO₂ contained tasks which required mathematical pre-skills, i.e. the child had to be able to handle groups (1–4), know geometrical figures (circle, triangle, square) and understand words that express relationships (of the same size, the smallest, below, beside, etc.). The results of the Estonian language subject test correlated within the same magnitude with CDO Outlook, CDO₂ and CDO₃. Toomela (2002) has written on relations between drawing and verbal skills. The better the child knew the basic concepts and was able to draw according to verbal orders in kindergarten, the better were the results of subject tests at the end of the first grade. So it seems to be reasonable enough to use drawing in different school readiness tests, as has been done before in Estonia (see Indre, 1993; Tulva & Kitvel,

1985). The correlations are altogether moderate similarly to any other school readiness tests, since the relations of school readiness tests with the child's future success at school vary between .11 to .64 (Carlton & Winsler, 1999; La Paro & Pianta, 2000).

La Paro and Pianta (2000) maintain that it is customary that a school readiness test describes about 25% of the variability of results in the 1st-2nd grade. In Study I the Forward-Stepwise Multiple Regression Analyses (scale scores were used) were carried out, in order to find out whether the CDO test enables to describe the study results to a greater extent than the kindergarten teachers reports or individual tests. The results showed that the CDO test describes 21 % of the variability in the children's mathematics results and 22 % of the variability in the Estonian language results. It is somewhat more than by the kindergarten teacher reports (18 and 17%) and the results of the individual tests (4 and 11%) could achieve. In Finland, Liikanen (1987) found that the CDO test allows to describe 26% of the variability in the writing skills of Finnish first grade students, 22% in mathematics skills and 16 % in reading skills. Therefore, the results of the regression analysis support the use of group tests and teacher reports for the primary assessment of children's school readiness more than before. These are sufficiently reliable and seem to be quicker and less expensive ways of receiving information than individual testing. The added value in the case of the group tests is the similar conditions to the school environment (VanDerHeyden et al., 2001) and the long-term experience of the kindergarten teachers in teaching the child (Duncan et al., 2007; Indre, 1993).

To examine whether children with low scores in the CDO subtests in kindergarten also tend to show low scores in achievement at the end of the first grade (and those with medium to high scores in kindergarten show medium to high scores in school), we additionally conducted Configural Frequency Analysis (CFA; von Eye, 1990), which compares the observed and expected frequencies in cross-tabulation for every cell in the table. The results of the analysis show Types (observed frequency is significantly higher than expected frequency) and Antitypes (observed frequency is significantly lower than expected frequency). The analysis was performed by the program SLEIPNER 2.1 (Bergman & El-Khoury, 2002). We differentiated between two groups of children based on the CDO test (CDO₁, CDO₂, CDO₃) and subject tests (Estonian language and mathematics): (1) poor performance (belong to the lower quartile based on the result) and (2) adequate performance (remaining children). We performed six different analyses (separately for each subtest and the Estonian language and mathematics), yet no Types or Antitypes differentiated. Borderline was differentiating such a Type where the child failed both the CDO₂ and mathematics subject tests (19 observed cases and 11.65 expected cases; $p = .09$). The reason behind not finding any Types or Antitypes may have been also the fact that we only used a small part of the total sample. Both in kindergarten and

at school the children in this sample ($n=112$) may not have been among the unsuccessful.

One must concur with Kline (2000) who writes that if the results of the psychological test are compared with the child's future success at school, a wide variety of influential factors need to be taken into account. The study results are influenced (in addition to the tested knowledge and skills) also by the different families of the children, schools, classes and teaching (Rimm-Kaufman & Pianta, 2000). So one needs to be extremely careful in highlighting children who need help based on the CDO test alone. It is necessary to conduct a specific and comprehensive evaluation of the child's development before recommendations regarding the curriculum or support services can be made.

4.2. Psychometric indicators of the CDO-R test

We tried the CDO-R test in Study II. The CDO-R test consisted of five tasks, which were the same as in the kindergarten CDO₂, two new tasks of the same type and four orientating tasks on paper. The internal reliability of the 11 test tasks was very good – Cronbach $\alpha = .82$. The correlations (Pearson r) between the CDO (taken at the beginning of the final year in kindergarten) and CDO-R (taken at the beginning of the first grade) tests were as follows. The strongest correlation was displayed between CDO₂ (drawing geometrical figures) in kindergarten and CDO-R taken at school ($r = .48$; $p < .001$). In both cases, the child had to know the basic concepts, regulate his or her behaviour and respond according to verbal instructions. Correlation between CDO₃ and CDO-R was weaker ($r = .22$; $p < .05$) and CDO-R connections with CDO₁ were statistically insignificant.

Five tasks were the same in the CDO test taken at kindergarten and the CDO-R test taken at school. The correlation between the five overlapping tasks of CDO ja CDO-R was moderate $r = .28$ ($p < .05$). For a comparison of results in two time points we used the Cochran Q test ($n=87$). It became evident that the results had considerably improved in the case of four tasks (exp. drawing a tree). During the interim year, the children had developed considerably and acquired necessary knowledge needed for school. The changes made to the test may have something to do with the considerable improvement of the children's results – in kindergarten the child had to divide the sheet of paper to parts shaped like triangles, whereas at school the dividing had already been done for the child. In the future, the layout of CDO-R could be made more difficult.

In order to examine concurrent validity, we compared the results of the CDO-R test and individually carried out word guessing test at the beginning of the first grade. As in the case of kindergarten, the word guessing and the tasks of the CDO-R test correlated positively also at the beginning of the first grade ($r = .27$; $p < .001$). To examine predictive validity, we calculated correlations between the CDO-R test and subject tests. The correlations of the CDO-R test

with the subject tests results at the end of the first grade were for the Estonian language $r = .31$ and mathematics $r = .33$ ($p < .001$). One might think that the knowledge and skills at the beginning of the first grade have a tighter connection with the results at the end of the first grade than the assessment performed in kindergarten (the interval is shorter), yet the correlations were in the same magnitude. Consequently school readiness can be assessed at the end of kindergarten (as is done by a majority of researchers), as well as at the beginning of the first grade (see Indre, 1993; Rimm-Kaufman & Pianta, 2000). However, the sooner children in need of support are found out, the faster suitable intervention (for example, choice of school) can be planned.

To examine whether children with low scores in CDO-R also tend to show low scores in achievement at the end of the first grade (and these with medium to high scores show medium to high scores in school), we additionally conducted CFA. We divided the children in two groups based on the results of the CDO-R test and subject tests (Estonian language and mathematics): (1) poor performance (belong to the lower quartile based on the result) and (2) adequate performance (remaining children). We performed two different analyses (separately in relation to CDO-R and the Estonian language and mathematics). The results are given in Table 4. More frequent than expected were children who had poor results in both the CDO-R test and mathematics subject test. The second Type comprised of children who failed in both the CDO-R and Estonian language subject tests. However, less frequent than expected were children whose CDO-R result was adequate, yet who failed in the Estonian language subject test.

Table 4. CFA results between CDO-R and subject tests in first grade ($n=390$)

CDO-R test	Subject test	Observed cases	Expected cases
<i>Mathematics</i>			
adequate performance	adequate performance	207	193.91
poor performance	adequate performance	69	82.09
adequate performance	poor performance	67	80.09
poor performance	poor performance	47	33.91*
<i>Estonian language</i>			
adequate performance	adequate performance	218	199.34
poor performance	adequate performance	66	83.66
adequate performance	poor performance	57	74.66*
poor performance	poor performance	49	31.34*

Note. * The results are significant at p -level $< .05$ with the Bonferroni correction.

For the time being, in the case of school readiness research (Blair, 2002; Harris 2007), increasingly more emphasis is placed on the need to evaluate and take into account motivational factors among others, i.e. to what extent the child can exert an effort and is not afraid to reach out for support in an actual class

situation. In Study II we examined the effect of CDO-R on language and mathematics (achievement) at the end of the first grade together with motivational constructs. The theoretical model included constructs of goal orientation and conceptual knowledge (CDO-R and word guessing tests) and is provided in Figure 1.

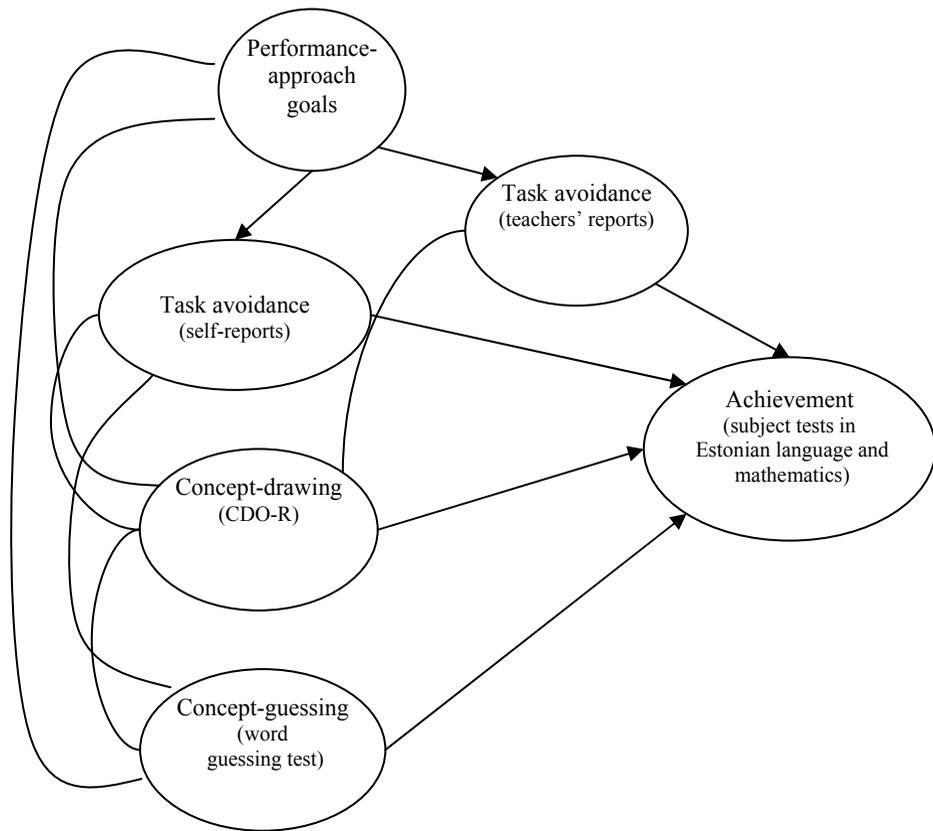


Figure 1. Theoretical model

However, in the final model the direct effect of CDO-R on achievement was insignificant ($B = .05$; $p = .37$). The study results in the Estonian language and mathematics were best predicted by the teachers' reports on the child's task avoidance behaviour ($B = -.48$; $p < .001$). It became evident that the CDO-R and word guessing scale score correlated with achievement within the same magnitude, while only the relation between the word guessing test with the achievement was faintly present in the model. At the same time, a relatively strong negative correlation ($B = -.46$) between CDO-R and task avoidance behaviour assessed by the teacher became evident in the model; in the case of word guessing the connection was weaker. The situation can be explained in such a

way that the CDO-R test was performed by the child in such a manner as they usually behave when studying in a lesson. The lower test result may have been related not to the fact that the child did not know the concepts or could not draw, rather than to the fact that he or she did not try enough. In the case of individual testing (word guessing test), the researcher had the time and the opportunity to observe the child and encourage him or her to exert an effort to an extent (cf. Sattler, 2001).

Thus, the lower the teacher evaluated the fear of failure in the child, the better the child performed in the tasks of the CDO-R test, and vice versa. Similar relations between the study results and motivational factors have previously been described by Onatsu-Arvilommi and Nurmi (2000), as well as Aunola and others (2006). If the child feels that he or she has hard times and needs help, yet makes no effort (does not feel like, is afraid, cannot) in order to get help and move on, but quits, then this will result in poorer performance than the others. The low fear of failure in the child and his or her ability to make an effort seem to predict success at school in the first grade better than the knowledge of the basic concepts. A child with less previous knowledge and skills (for instance, a child who has been at home) can reach a good level at various subjects quickly if the class climate is beneficial to studying and the teacher takes his or her specialty into consideration. Thus, even though it has been established that individually assessed cognitive abilities predict later achievement the best (La Paro & Pianta, 2000), motivational factors must certainly be considered too.

4.3. Psychometric indicators of the PEP-R test

Based on the screening tests (for instance, CDO), children can be differentiated whose development level requires more thorough individual assessment. The purpose of general assessment is to understand the child's developmental level and to create a basis for the planning of appropriate teaching and intervention. The PEP test was drawn up for the assessment of the development of children with autism or any other communication problems. In order to evaluate how well the application of the test in Estonia justified is, we tried to verify both the main psychometrical indicators, as well as the level of complexity of the tasks of the test, in the pilot research.

We analyzed the psychometric indicators of the PEP-R test in Estonian children in Studies III and IV. The internal reliability of the development scales of the test in children up to 5 years were good and very good, with Cronbach $\alpha = .72$ to $.99$. Children in the age of 5–7 years achieved near-maximum results in four areas (imitation, perception, fine and gross motor skills), which is why it was not possible to calculate the coefficients.

As the child becomes older, he or she acquires new knowledge and skills. To examine construct validity, the average score of the groups of children in each

area were compared to their chronological age. The older the child was, the more points he or she scored. The correlations between the arithmetic average and chronological age were high and statistically significant ($r = .86$; $p < .001$ in perception up to $r = .97$; $p < .001$ in the area of eye-hand integration) in all areas. Thus, the indicators of internal reliability, as well as the construct validity, were as good in the case of the Estonian PEP-R test, as was found in a similar study in the Netherlands (cf. Steerneman et al., 1997). More specific data regarding the performance of PEP-R in different age groups have been presented in Study III.

Of the 131 tasks, the level of difficulty was suitable (successful performance at least by 80 % of children, as determined by the manual) for 90 tasks. Tasks that were too easy (32 tasks in total) could be found in each area (except for the cognitive-verbal area). For instance, children in Estonia could sit on a chair, handle a ball, wave good-bye and match items of a similar colour earlier. 41 tasks were too difficult for the children, most of which belonged to the cognitive-verbal area (21 tasks of 27). Only 7–8 % of five-year-old children in Estonia could handle tasks related to mathematics (solving addition and subtraction problems by heart) and 36–65 % of six-year-old children could manage tasks related to reading (reading short words, sentences, text). Therefore, when the test tasks are adapted further, the age limits of some tasks evaluating sensory motor skills need to be lowered and the age limits of the tasks of the cognitive-verbal area increased (see Häidkind, 2001). The content of individual tasks and the criteria of assistance and assessment need to be based more on the specifics of the Estonian language and culture, as well as the requirements of the curricula of kindergartens.

5. SUMMARY AND CONCLUSIONS

Similarly to other countries, the educational politics of the Republic of Estonia are moving towards integrative education, which means teaching children with a different level of development, knowledge and skills in the same kindergarten group and class at school. An important prerequisite for planning and offering efficient teaching for everyone is psychoeducational tests, which teachers and psychologists can use.

The general goal of the present doctoral thesis was to try the CDO, CDO-R and PEP-R tests, analyze their suitability for the psychoeducational assessment of pre-school and first grade children in Estonia. The results of the research allow to draw the following conclusions:

1. The indicators of CDO internal reliability and concurrent validity in the evaluation of the development and knowledge of 6–7-year old children are good. The tasks of the CDO subtests are in compliance with the requirements set for the knowledge and skills of 6–7-year old children in the national curriculum in the areas of learning (Child and his/her environment, Mathematics, Speech and language). The test also helps to assess the child's level of general skills (cognitive and learning, self-regulating and social skills). That is why the CDO test is suitable for the screening of the school readiness of children whose mother tongue is Estonian at the end of kindergarten.
2. The results of the CDO test taken in kindergarten help to predict the child's study results in their mother tongue and mathematics at the end of the first grade. The performance of the CDO tasks takes place in a context similar to the work done in the class; it is possible to assess cognitive abilities, listening comprehension and social skills at once and with sufficient reliability. Therefore, the results of the CDO test along with the evaluations by kindergarten teachers are suitable for use for describing the child's school readiness (on the school readiness card, for example). In order to assess the child's level of development more accurately, more thorough individual tests should be used.
3. The indicators of CDO-R internal reliability and validity are good. The results of the CDO-R test at the beginning of the first grade made it possible to differentiate two different types of children from the general group. More often than children who did not succeed in the CDO-R test experienced difficulties in mathematics and the Estonian language at the end of the first grade. At the same time adequate performance in CDO-R did not entail good results in subject tests. Thus, it is reasonable to use other means of evaluation in order to find children who may experience difficulties at the end of the first grade, such as to rely on the school readiness card given to the child in kindergarten; to analyze the child's level of mathematics, reading and writing skills, based on the curriculum of a particular school.

4. The results of the CDO-R test at the beginning of the first grade had a negative correlation with the teachers' evaluation of task-avoidant behaviour in the child. A positive attitude to studying and skills, to putting in some effort, are important aspects in order to achieve good test or study results. Thus, we found proof that the motivation is a crucial component in school readiness. At the beginning of the first grade, it is important to keep up the high study motivation, which is characteristic of children in this age, to avoid competition and take notice of learning problems, so that appropriate help would be offered when difficulties appear.
5. Of the aspects of the child's school readiness, the importance of the motivation, knowledge of the basic concepts, verbal skills and behavioural regulation were highlighted based on the present study. The child's school readiness should be measured during the last year in kindergarten and again at the beginning of the first school year. In the meantime change, the physical and social contexts, children's personal experiences and adaptation process may be slightly different. The purpose of screening remains the same – to find out children who need further assessment and help.
6. PEP-R is suitable for use to give a general evaluation of the level of development of up to 5-year-old children, whose mother tongue is Estonian, because internal reliability and construct validity are good. The tasks of the test are to do with the more important steps in the development of the child at a particular age: it is possible to evaluate the sensory motor and imitation skills in infants and small children and in pre-school age, the areas of the mother tongue and mathematics. The procedure of conducting the test is flexible and the materials are interesting even for very small children. The toys and pictures of the original test are generally suitable for Estonian children.
7. The tasks of the PEP-R test involving the areas of perception and motorics were too easy for 5–7-year old children in Estonia; tasks on mathematics and reading, in contrast, were too difficult. The tasks of the cognitive-verbal area need further adaptation. In the adaptation process, the requirements of the national curricula set for 6–7-year old Estonian children need to be taken into consideration, especially in the areas of learning the mother tongue and mathematics.
8. The advantage of the examined tests over any other screening or general developmental tests is that the context where the child usually develops and learns is taken into account. It has been established that the children display their knowledge and skills most optimally in the same conditions they have acquired them. In the PEP-R test the child acts together with an adult, following a role model and/or independently; the tools are toys and pictures. In connection with entering school, it is inevitable to work under the guidance of a teacher together with a lot of other children; this way also carrying through the CDO and CDO-R tests in groups take place.

5.1. Limitations

The CDO and PEP tests, which were used in the present study, were originally drawn up in Denmark and the USA in the 1970s. In the meantime, the society, principles of domestic upbringing and content of education have changed. When the test was adapted, we tried to make the test material more contemporary, by adding new tasks to the CDO-R test and refreshing the pictures in the PEP-R test. It was possible to take into consideration the national curricula of kindergartens and secondary schools, adopted in 2008–2011 in Estonia, already when the results of the conducted study were being interpreted.

Like in the rest of the world, it is possible to come up with different definitions on which the risk group children are, what school readiness is and what is understood by success at school in Estonia as well. The definitions depend on specialists, the context and the bases of evaluation. In Studies I and II, risk group children or children with low school readiness were those who had scored considerably fewer points in the CDO and CDO-R tests than their peers; success at school was determined based only on the results in the Estonian language and mathematics. The positions of schools selecting their first grade students concerning the level of school readiness is probably different, and many of those children who scored average test results would probably have failed at the entrance examination (*koolikatsed*). In addition, we need to consider while interpreting the results that the samples of Studies I and II were small and not representative in terms of those children who were raised at home, as we only evaluated the school readiness of children attending kindergarten.

Domestic background, choice of schools, suitability of the difficulty of the curriculum with the child's skills, quality of teaching, etc., influence the development of the child. This doctoral thesis does not take into account these factors that also influence the transition; we have only focused on the evaluation of the child's level of development. When to interpret the test results of a particular child, it is necessary to pay attention to the contextual factors, because these help to understand the child's level of development. Alongside tests, informal methods of evaluation (observation, questionnaire, curriculum-based evaluation) need to be used and, if possible, different evaluators are to use and annual evaluation of the child's progress conducted.

5.2. Recommendations for practitioners

The results of the testing of the children whose mother tongue is Estonian show that the CDO is suitable for the screening of school readiness at the end of kindergarten, CDO-R at the beginning of the first grade and PEP-R is reliable to be used for the general assessment of the development of children up to 5 years old.

The CDO test suits for use in the case of kindergarten children one year before school. In Estonia, the administrator of the CDO test could be a kinder-

garten teacher, who gives orders, and a special education teacher/speech therapist/another teacher, who observes the behaviour of the children and takes notes. Later, the process and results of each child's work should be analyzed together and with a parent (a performance review). The CDO-R test may be used at the beginning of the first grade, when the teacher gets to know the children, and it can be taken by the entire class at once. The taking of the test, led by the class teacher, could be observed by a school psychologist, a special education teacher or a social pedagogue. Based on the results of the CDO and CDO-R tests, it is possible to find out children who need further evaluations, to plan activities that support the transition and to start adapting teaching to be suitable for individual children or groups of children.

There are many options to support the transition from kindergarten to school, and one important element is the guaranteeing of consistency in teaching and support services. The school readiness card, which the kindergarten teacher fills out for each child who enters school (since 2011), should help to keep the first grade teacher informed of the level of development and requirements of the new students. The school readiness card could also help when recommending a suitable curriculum for the child by an advisory board. The descriptions of the child's level of development and skills on the school readiness card should be based on various sources and methods, including, for instance, the CDO test.

The PEP-R test is suitable for use by special education teachers, speech therapists and psychologists of kindergartens, counselling centres and clinics, which need to get a thorough overview of the development of a child who is different from other children in several areas. The test results could form the basis of an individual developmental plan (the original test has two follow-up versions to plan teaching), to direct the adaptation of teaching both at home and kindergarten, to highlight the necessity of medical diagnostics, to help to explain the child's problems to his or her parents. The PEP-R test is a convenient means especially in integration and special groups (*sobitus- ja erihmades*) in kindergartens, where children with special needs are sent by an advisory board and where an individual developmental plan is most likely to be used. In practical work, a three-point scoring of the test should definitely be used, because the planning of teaching is based on the emerging skills.

5.3. Recommendations for further research

The psychoeducational means of assessment are necessary tools for the teacher and the psychologist in order to find out risk group children and analyze the knowledge and skills of children with different levels of development. The preparation of tests, adaptation and checking their reliability are not an easy task for a teacher or a psychologist, carrying out their everyday tasks. This field needs a systematic approach from the state, in order to make various reliable

means of assessment available for kindergartens and schools, when they draw up their curricula.

The advantages of the CDO-R test are the consideration of both cognitive abilities (attention, memory, thinking, verbal abilities), as well as social skills (learning skills, behaviour), which is not emphasised by the traditional subject-centred approach to school readiness and learning. In the further adaptation of the CDO-R test, the number of tasks could be increased, the form changed and different test versions for children who enter the first grade compiled. In the further adaptation of the PEP-R test, the requirements of the national curriculum set for Estonian children should form the basis, and the skills of reading, writing and mathematics of 6–7-year old children should be checked. It seems that during the last ten years, the emphasis on subject-related knowledge has increased in kindergartens due to entrance examinations at schools and the pressure of the parents. It is wise to continue the adaptation of the PEP-R test since the new version – PEP-3 – is even more focused on autistic children and its range of use is therefore considerably narrower. In the case of CDO, CDO-R, as well as the PEP-R tests, it is necessary to check, how well the test results predict the future performance of children, and to collect data for comparison regarding children with special needs.

SUMMARY IN ESTONIAN

Testid lapse koolivalmiduse ja üldarengu hindamiseks. Testide katsetamine Eesti eelkooliealiste laste ja esimese klassi valimitel

Sarnaselt teistele arenenud riikidele liigub Eesti Vabariigi hariduspoliitika kaasava hariduse suunas, mis tähendab erineva arengutaseme, teadmiste ja oskustega laste õpetamist samas lasteaiarühmas ja kooliklassis. Eesti lasteaiad ja koolid saavad vabalt valida, missuguseid hindamismeetodeid õpetajad kasutavad. Kõige enam on levinud vaatlus- ja küsitlusmeetodid, kaasaegseid ning kontrollitud usaldusväärsusega teste koolivalmiduse ja üldarengu hindamiseks on vähe (vt. Kikas, 2006). Ometi peetakse just psühholoogilist testi kõige paremaks, usaldusväärsemaks ja ökonoomsemaks hindamisvahendiks.

Kui 20. sajandi esimesel poolel oli koolieelikute hindamise peamiseks eesmärgiks ennetada ja vähendada hilisemat koolist väljalangemist (vt. Kelley & Surbeck, 2000), siis praegu käsitletakse hindamist laiaulatusliku protsessina, mille eesmärgiks on mõista last, tema käitumist, keskkonda ja seoseid nende vahel (Reynolds, Gutkin, Elliot, & Witt, 1984).

Sõeluuring on esialgne, suhteliselt lühike ja kiire protsess, et üldgrupist selgitada välja lapsed, kes a) on valmis mingi programmi järgi õppimiseks, b) vajavad õppimisel abi või järeleaitamist või c) vajavad põhjalikumat arengutaseme hindamist (Sattler, 2001). Kontrollitud joonistamise vaatlus (CDO; Krogh, 1977; tõlkinud Kikas, 1998) on Taanis välja töötatud grupitest, mis võimaldab esmaselt hinnata 6–7-aastaste eakohase arenguga laste kooliks vajalikke teadmisi ja oskusi. Uuringud on näidanud, et hilisema kooliedukusega seostuvad lapse kognitiivsed võimed ja oskused (sh. põhimõistete tundmine, matemaatika eeluskused), verbaalsed võimed ja oskused (sh. lugemise ja kirjutamise eeluskused), sotsiaalsed oskused (käitumise reguleerimine, õpioskused) ning motivatsioon.

Arengutaseme ülevaatlilik hindamine hõlmab kõiki lapse arengus antud vanuseperioodil olulisi valdkondi, protsess on aeganõudev ja põhjalik. Hindamist viivad läbi erinevate valdkondade spetsialistid (psühholoogid, logopeedid, eripedagoogid) ning parimaks viisiks peetakse tänapäeval meeskonnatöö erinevaid vorme (McCormick, 2006; Porter, 2002). Ülevaatliliku hindamise tulemused aitavad kaasa meditsiinilise diagnoosi määramisele ja/või sobiva lasteaiarühma/kooli õppekava soovitamisele, võivad olla aluseks individuaalse arendus- või õppekava koostamisele, lapsevanemate nõustamisele, tugiteenuste kokkuleppimisele. Psühholoogilis-hariduslik profiil (PEP-R; Schopler jt., 1990) on Ameerika Ühendriikidest pärit üldarengu hindamise test, mis on koostatud autismiga ja teistele suhtlemisprobleemidega lastele vanuses 7 kuud kuni 7 aastat. Lisaks arengu hetketasemele võimaldab PEP-R test välja tuua lapse arenemisjärgus oskused (abiga sooritatud ülesanded) ehk kirjeldada lähimat arengutsooni (Võgotski, 1975).

Käesoleva doktoritöö üldeesmärgiks oli katsetada CDO, CDO-R (modifitseeritud CDO) ning PEP-R teste, analüüsida nende sobivust Eesti eelkooliealiste ja I klassi laste psühholoogilis-hariduslikuks hindamiseks. Uurimistöö ülesanded olid:

- 1) katsetada CDO testi, kontrollida selle psühhomeetrilisi näitajaid; kasutada CDO testi õpitulemuste ennustamiseks I klassi lõpus võrreldes individuaaltestide ja õpetaja hinnangutega (uurimus I);
- 2) modifitseerida CDO testi ja kontrollida CDO-R testi psühhomeetrilisi näitajaid; kasutada CDO-R testi õpitulemuste ennustamiseks I klassi lõpus (uurimus II);
- 3) kohandada PEP-R testi ja katsetada seda eakohase arenguga laste grupis (uurimused III ja IV); kontrollida PEP-R testi psühhomeetrilisi näitajaid.

Uurimuse I eesmärgiks oli katsetada CDO testi Eesti laste koolivalmiduse esmaseks hindamiseks ja kooliedukuse ennustamiseks I klassi lõpus. Laste teadmisi põhimõistetest, kõne mõistmist ja käitumise regulatsiooni hindasime CDO testi abil lasteaia viimase aasta sügisel ning õpitulemusi emakeeles ja matemaatikas esimese kooliaasta kevadel. Uurimusest selgus, et CDO test sobib koolivalmiduse esmaseks hindamiseks ja võimaldab I klassi lõpu õpitulemusi ennustada samal määral kui teised koolivalmiduse testid (vt. La Paro & Pianta, 2000).

Uurimuses II modifitseerisime CDO testi I klassi alustanud laste jaoks (CDO-R) ja hindasime lisaks kognitiivsele ja sotsiaalsele õpivalmidusele ka motivatsioonilisi tegureid. Selgus, et CDO-R testi psühhomeetrilised näitajad on head, testitulemused seostusid positiivselt mõistete äraarvamise testiga (vt. Männamaa, 2010) ja negatiivselt õpetaja antud hinnangutega sellele, kui võrd esineb lapsel ebaedu kartust. Otsest mõju CDO-R ülesannete sooritusel I klassi lõpu eesti keele ja matemaatika õpitulemustele ei ilmnenud. Seega ka nõrgemate eelteadmiste ja oskustega laps (näiteks kodune laps) jõuab koolis kiiresti edasi, kui ta oskab pingutada ega muretse ebaõnnestumiste pärast.

Uurimustes III ja IV kohandasime PEP-R testi arenguskaala ülesanded Eesti laste jaoks ning hindasime vahendi psühhomeetrilisi näitajaid. Kuna tegemist oli esmakordse kohandamisega, püüdsime võimalikult säilitada originaaltesti sisu. Muudatused puudutasid peamiselt kõnega seotud ülesandeid, kus arvestasime eesti keele spetsiifikat (Karlep, 1998). Uurimuse tulemusel selgus, et üksnes PEP-R testi tõlkimisest ja minimaalsetest muudatustest ei piisa, sest kultuuri ja keelega seotud kognitiiv-verbaalse valdkonna ülesanded olid Eesti lastele liiga rasked.

Doktoritöö peamised tulemused ja järeldused on:

1. CDO testi sisereliaabluse ja kaasneva valiidsuse näitajad 6–7-aastaste laste arengu ja teadmiste hindamisel on head. CDO ülesanded on kooskõlas

- Koolieelse lasteasutuse riiklikus õppekavas (2008) esitatud nõuetega 6–7-aastaste laste teadmistele ja oskustele õppe- ja kasvatustegevuse valdkondades (mina ja keskkond, matemaatika, keel ja kõne). Testi kaudu saab hinnata ka lapse üldoskuste taset (tunnetus- ja õpioskused, enesekohased ja sotsiaalsed oskused). Seega sobib CDO ühe vahendina kõikide eesti keelt emakeelena valdavate laste koolivalmiduse esmaseks hindamiseks lasteaia lõpus.
2. Lasteaias sooritatud CDO testi tulemused võimaldavad ennustada lapse õpitulemusi emakeeles ja matemaatikas I klassi lõpus. CDO ülesannete sooritamine toimub klassitööle sarnases kontekstis, korraga ja piisavalt usaldusväärselt saab hinnata paljude laste kognitiivseid võimeid ja oskusi, kõne mõistmist ja sotsiaalseid oskusi. Seega sobib CDO testi tulemusi kasutada koos lasteaia õpetaja antud hinnangutega, kui on vaja kirjeldada lapse koolivalmidust (näiteks koolivalmiduskaarti täites). Lapse arengutaseme täpsemaks hindamiseks tuleb kindlasti kasutada põhjalikumaid individuaalseid teste.
 3. CDO-R testi psühhomeetrilised näitajad on head. I klassi alguses tehtud CDO-R testi tulemuste alusel eristusid üldvalimist kaks gruppi lapsi. Oodatust sagedamini said eesti keele ja matemaatika ainetestides madalaid tulemusi need lapsed, kellel eelnevad CDO-R testi tulemused olid nõrgad. Samas edukus CDO-R testis ei tähendanud ühtlasi häid tulemusi ainetestides. Seetõttu tuleb õppimise probleemidega laste eristamiseks I klassis kasutada kindlasti ka teisi vahendeid, näiteks toetuda lasteaias täidetud koolivalmiduskaardile, analüüsida lapse oskusi emakeeles ja matemaatikas lähtuvalt konkreetse kooli õppekavast.
 4. CDO-R testi tulemused I klassi alguses seostusid negatiivselt õpetaja antud hinnangutega, kuivõrd laps väldib koolis olukordi, kus ta võib kogeda ebaedu. Et saavutada häid testi- ja õpitulemusi, on vajalikud positiivne suhtumine õppimisse ning oskus pingutada. Seega on motivatsioon väga tähtis koolivalmiduse aspekt. I klassi alguses on oluline hoida lapsele selles vanuses iseloomulikku kõrget õpimotivatsooni, vältida võistlemist ja kiiresti märgata õppimisprobleeme, et raskuste korral pakkuda sobivat abi.
 5. Motivatsioon, kognitiivsed ning verbaalsed võimed ja oskused, käitumise regulatsioon on käesoleva uurimuse põhjal need aspektid, mida lapse koolivalmidust hinnates arvesse tuleb võtta. Koolivalmidust on vaja hinnata viimasel lasteaia aastal ja uuesti I klassi alguses. Vahepeal toimuvad suured muutused nii sotsiaalses kui füüsilises keskkonnas, lapse isiklikud kogemused ja kohanemisprotsess võivad seoses üleminekuga olla üsna erinevad. Koolivalmiduse sõeluuringu eesmärk jääb ikka samaks – leida üles need lapsed, kes vajavad edaspidi täpsemat hindamist ja abi.
 6. PEP-R testi sobib kasutada kuni 5-aastaste eesti keelt emakeelena valdavate laste arengutaseme ülevaatlikuks hindamiseks, sest testi sisereliaablus ning konstrukt-valiidsus on head. Testiülesanded puudutavad olulisemaid lapse arengu valdkondi vastaval vanuseastmel: imikutel ja väikelastel saab hinnata sensomotoorseid ja jäljendamise oskusi ning koolieelses eas lisanduvad

emakeele ja matemaatika valdkonna oskused. Testi läbiviimise protseduur on paindlik ja vahendid huvipakkuvad isegi väga väikestele lastele. Originaaltesti mänguasjad ja pildimaterjal on Eesti lastele valdavalt sobilikud.

7. 5–7-aastastele Eesti lastele olid PEP-R testi taju ja motoorika valdkonna ülesanded liiga kerged, matemaatika ja lugemise ülesanded aga pigem liiga rasked. Edasist kohandamist vajavad kognitiiv-verbaalse valdkonna ülesanded. Kohandamisel tuleb lähtuda riikliku õppekava nõuetest 6–7-aastastele Eesti lastele, eriti emakeele ning matemaatika õppe- ja kasvatustegevuse valdkondades.
8. Uuritud testide eelis teiste sõeluuringu ja üldarengu hindamise vahendite ees on, et võetakse arvesse kontekst, kus laps tavapäraselt areneb ja õpib. On leitud, et laps esitleb teadmisi ja oskusi kõige optimaalsemalt samades tingimustes, kus ta on need omandanud. PEP-R testis tegutseb laps koos täiskasvanuga, ettenäitamise järgi ja/või iseseisvalt; vahenditeks on mänguasjad ja pildimaterjal. Kooliminekuuga seoses on vajalik töötada õpetaja juhendamisel koos paljude teiste lastega, nii toimub ka CDO ja CDO-R testide läbiviimine gruppide kaupa.

CDO test sobib kasutamiseks lasteaia lastele üks aasta enne kooli. Testi läbiviijateks võiks Eestis olla lasteaia õpetaja, kes ütleb korraldusi, ja eripedagoog/logopeed/teine õpetaja, kes laste käitumist vaatleb ja protokollib. Hiljem analüüsitakse ühiselt ja koos lapsevanemaga (arenguvestlusel) iga lapse töö protsessi ja tulemusi. CDO-R testi võib kasutada lastega tutvumise perioodil I klassi alguses kogu klassile korraga. Klassiõpetaja poolt juhendatud testi sooritamist võiks jälgida koolipsühholoog, eripedagoog, sotsiaalpedagoog või õpiabi rühma õpetaja. PEP-R test on tänuväärne abivahend õppenõustamiskeskustes ja kliinikutes, aga ka lasteaedade sobitus- ja erirühmades, kuhu erivajadustega lapsed suunatakse nõustamiskomisjoni kaudu ning kus rakendatakse kõige tõenäolisemalt individuaalset arenduskava. Praktilises töös tuleks kindlasti kasutada testi kolme-punktilist hindamise skaalat, sest õpetuse planeerimine lähtub kujunemisjärgus oskustest.

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1. **Карлеп, Карл.** Обоснование содержания и методики обучения родному языку во вспомогательной школе. Tartu, 1993.
2. **Ots, Loone.** Mitmekultuurilise hariduse õppekomplekt eesti kirjanduse näitel. Tartu, 1999.
3. **Hiie Asser.** Varajane osaline ja täielik keeleimmersion Eesti muukeelse hariduse mudelitena. Tartu, 2003.
4. **Piret Luik.** Õpitarkvara efektiivsed karakteristikud elektrooniliste õpikute ja drillprogrammide korral. Tartu, 2004.
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10. **Anu Palu.** Alklassiõpilaste matemaatikaalased teadmised, nende areng ja sellega seonduvad tegurid. Tartu, 2010.
11. **Mairi Männamaa.** Word guessing test as a measure of verbal ability. Use of the test in different contexts and groups. Tartu, 2010.
12. **Piret Soodla.** Picture-Elicited Narratives of Estonian Children at the Kindergarten–School Transition as a Measure of Language Competence. Tartu, 2011.
13. **Heiki Krips.** Õpetajate suhtlemiskompetentsus ja suhtlemisoskused. Tartu, 2011.