

Research Article

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Cognitive Analysis of 9 to 11-Year-Old Children With Intellectual Development Disorders

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Abstract: Cognitive development significantly influences efficiency and results of child's understanding and comprehension of the world. Attention and cognition play a significant role to ensure academic achievement and success. Attention is essential for purposeful planning of action and systematic work. Attention is necessary to follow the study material and for physical survival in everyday life. Cognition is significant in decision making and evaluating possible outcomes, being especially important in children with cognitive development disorders. The aim of the present study was to find out the peculiarities of the cognitive processes in 9 to 11-year-old children with cognitive development disorders. Previous literature suggests that children with intellectual development disorders are at increased risk of general cognitive disorders. To test this assumption and establish cognitive abilities in children with intellectual development disorders, the following subtests of the Vienna Test System (VTS) were used: CPM/S2 (Raven's Coloured Progressive Matrices), B19 (Double Labyrinth Test) and WAFF (Perception and Attention Functions: Focused Attention). VTS is one of the leading computer-based psychophysiological testing systems in Europe. In addition to testing, behavioural observations were also carried out. Study results reveal that children with a shared diagnosis are not as similar when it comes to cognition and attention. Not all children within the sample group exhibited reduced attention and concentration, although the whole participant sample was diagnosed with intellectual development disorder. Meanwhile, risk factors hindering normal cognitive development were identified.

Keywords: children with intellectual development disorders, attention, cognition, memory

Introduction

Intellectual development or mental disorders are difficulties that can be treated but cannot be cured. People with intellectual development disorders have learning difficulties and their cognitive development is slower than that of their peers. This condition is usually diagnosed on birth or in early childhood. Sometimes it is due to brain damage sustained during chronic illnesses or physical trauma. Mental or intellectual development disorders may sometimes be called mental retardation, learning difficulties and so on (Amerikas intelektuālo un attīstības traucējumu asociācija, 2017). Intellectual development disorders are stable, pronounced and irreversible. They cause cognitive as well as emotional disorders (Hulme & Snowling, 2010).

Children with intellectual development disorders routinely show limited results in intellectual assessment tests. World Health Organization and American Psychiatrist Association recommend coding intellectual development disorders by IQ (intelligence quotient) levels:

1. IQ 70 – 50 ,mild intellectual development disorders or mild mental retardation,
2. IQ 50 – 35, medium intellectual development disorders,

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3. IQ lower than 35, severe intellectual development disorders or severe mental retardation (World Health Organization, 2017; ICD-10, 2016)

Intellectual development disorders create limitations of cognitive development, thus hindering not only academic performance but also social skills and abilities.

People with intellectual development disorders are faced with few job opportunities in Latvia. Most of the people with intellectual development disorders have trouble in finding employment, and their families often do not receive adequate help and assistance (Cilvēku ar intelektuālās attīstības traucējumiem tiesības, 2005). Successful inclusion in social life following graduation can be aided by timely support and learning measures, which are particularly significant to children with intellectual development disorders. Research, diagnosis, risk analysis and corrective actions are all important (Kauliņa & Tūbele, 2012). Satisfying special educational needs is also one of the priorities of the Latvian education system as laid out in Education Development Guidelines 2014–2020 (Izglītības attīstības pamatnostādnes, 2014.- 2020.).

As stated by Orska and Olutnika (2005), Latvian education institutions are placing more emphasis on what a particular child cannot do when compared to others instead of praising what they can do. This outlines a secondary goal of this paper: understanding and improving cognitive resources to secure a successful inclusion of children with intellectual development difficulties in the society and social life.

Latest research in special pedagogy, psychology and neuroscience has revealed the importance of brain stimulation in the early age. Previous research has shown that training and development of cognitive systems, particularly attention skills, increases child's ability to learn and, consequently, dictated improved academic performance later in life (Tereško & Kondrova u.c., 2013). International documents also stress the importance of early diagnostics and intervention of child development disorders, because timely intervention has a greater effect and serves the child's, their parent's and society's interests the most (Eiropas speciālās izglītības attīstības aģentūra, 2005; Kirk, Gallagher & Anastasiow, 2000; Ahrbwck & Willmann, 2010).

The aim of the study

Theoretical analysis and empirical study of specificities of cognitive processing in 9 to 11 years old children with intellectual development disorders.

Material and methods

- Theoretical methods: literature review,
- Empirical methods: subtests of the Vienna Test System (VTS): CPM/S2 (*Raven's Coloured Progressive Matrices*), B19 (*Double Labyrinth Test*), WAFF (*Perception and Attention Functions: Focused Attention*) and behavioural observations.
- Data analysis methods: mathematical and statistical analysis of the acquired data with *IBM SPSS 17.0* and *Microsoft Excel*.

Location: The study was carried out in a boarding primary school – rehabilitation centre for children with physical development disorders, motor disorders and learning disorders. Study sample consisted of 17 children aged 9-11 enrolled in Latvian general education programmes 21015611 and 21015811. The limited number of participants was a result of few available children and the complex research process requiring individual approach to each participant.

The study was carried out within the project '*Health and Social Indicators of Participation in Physical Activities for Children with Disabilities*', project number: NFI/R/2014/070, financed by the Norway Grants 2009-2014 programme 'Research and scholarships'.

Results and discussion

Learning is not possible without cognition. Learning and cognition are closely linked and secure our understanding of the external world, the ability to think, cognise, analyse and collect available information, resulting in conclusions based on our thinking process. Each cognitive process plays a specific role and function. We obtain sensory information, indirectly analyse it through our thoughts and language and use our memory to consolidate both levels of representation (see Table 1). Whilst attention allows us to select the relevant bits of information and focus on them (Vorobjovs, 1996; Bazzet, 2008).

Table 1. Cognitive system

Direct or sensual inquiry	Feelings, perception	Attention, memory
Indirect or generalised inquiry	Thoughts, speech, imagination	

Cognition is one of the most researched problems in psychology and pedagogy. Cognition binds together all mental processing, thus creating consciousness. The core question of this problem is how cognition is linked to conscious decision making and development (Vigotskis, 2002). Fully developed cognition allows one to analyse the available information and make decisions related to social relationships, and also formulate proper conclusions about the external world. Unfortunately, not everyone is successful at doing so, with this being especially applicable to people with intellectual development disorders.

For children with intellectual development disorders, changes in primary sensory processes are mostly linked with dysfunction in central nervous system. Development of sensory and perception processes is a unique process, with aspects of it closely linked to general mental development. People like these often require more time to develop adaptive response reactions and learn about the external world.

Children with intellectual development disorders have significantly reduced sensory cognition – they perform worse than other children in understanding their surrounding environment and their role within it (Cheung & Siu, 2009). It is characteristic to all children with intellectual development disorders, no matter how severe their condition is (Engel-Yeger, Hardal-Nasser & Gal, 2011).

Indirect attention is the most dominant aspect of attention in people with intellectual development disorders. The most complicated action is focussing attention on a certain object or task and then switching attention towards something else. Attention deficits usually manifest as a tendency to avoid difficulty.

The quality of attention is determined and influenced by characteristics of attention: capacity, division, concentration, perseveration, shifting and fluctuation. Results of the empirical study reveal that attention perseveration indicators range from 50 to 105 ($M = 82.15$) (see Fig. 1). Indicators of attention and focus, characteristic of the level of concentration and exclusion of other stimuli, are generally average.

Nevertheless, the results of the *Double Labyrinth Test* are significantly lower. They describe conscious attention shifting from one object to another as the ability to split one's attention and multitask. The average time it takes to shift one's attention from one object to another was significantly increased when compared to the results of *attention concentration test*. This reveals that simultaneous division of attention by hand–eye coordination is difficult for 9 to 11-year-old children with intellectual development disorders (see Fig. 1). The results of attention concentration in this test ranged from 50 to 112 ($M = 68.8$).

Upon comparative performance analysis, there is a medium-strength correlation between results achieved at *attention concentration* and *Double Labyrinth* tests ($kk = 055$).

Children with intellectual development disorders have a specific ability to memorise, store and reproduce information; they exhibit slower memorisation and tend to forget easily (Liepiņa, 2008). Children with intellectual development disorders have impaired mechanisms of memorisation; therefore, additional methods of indirect memorisation must be used when studying, such as use of additional material, imagination techniques and visualisation of study material (Schuchardt, Maehler & Hasselhorn, 2011).

Previous longitudinal studies have shown that children with severe intellectual development disorders (IQ below 55) have significant working memory dysfunction. Insufficient amount of readily available information gets stored in the working memory. Children with moderate intellectual development disorders

(IQ 55-85) exhibit comparable, but very different memorisation capabilities (Van der Molen, Van Luit, Jongmans & Van der Molen, 2009). Studies have shown that academic achievement is directly linked with proper function of working or operative memory and not indicators of general intelligence per se (Maehler & Schuchardt, 2016; Schuchardt, Maehler & Hasselhorn, 2011).

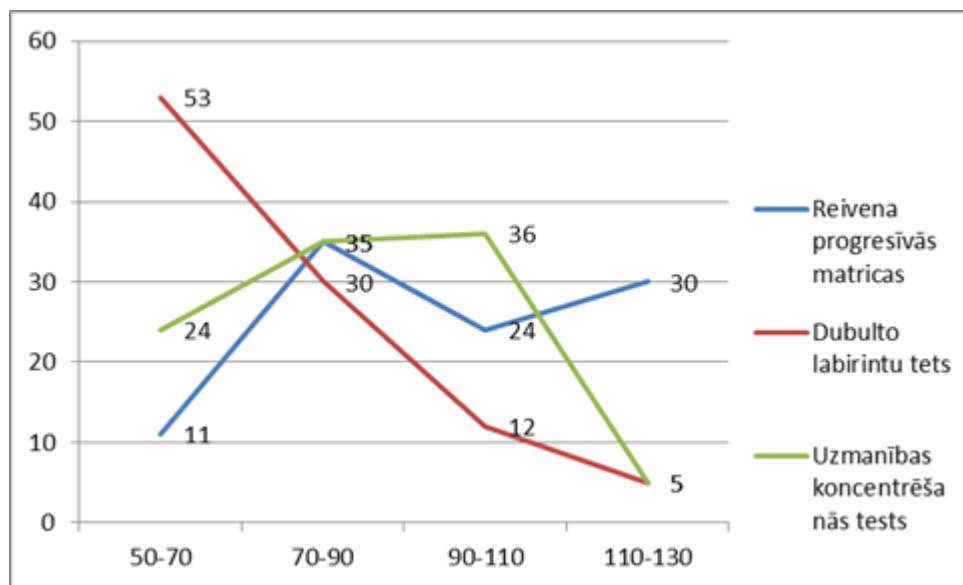


Figure 1. Developmental indicators of cognitive processes (%).

One of the most significant peculiarities of cognition in children with intellectual development disorders is the particularity of abstract thought. Their cognition is characteristic of belated comprehension of numbers and amount – it is difficult to link the abstract meaning of a number to a specific meaning of a certain quantity (Brankaer, Ghesquière & De Smedt, 2011). Children are having trouble discerning important from less important issues and make cognitively based decisions. Understanding consequences and causality is also difficult.

Children with intellectual development disorders are having trouble navigating various social and academic situations. Children cannot fully use the information stored in their memory, are occasionally passive and exhibit low levels of interest (Riņķis, 2007).

General cognitive disorders manifest in all physical processes: perception, memory, thought and imagination. Children have a significantly delayed development of the ability to see the detail or distinguish the most important detail from the big picture. Consequently, they are finding it very difficult to understand causality and rules that apply in different situations. Studies using Raven's progressive matrices revealed that children with intellectual development disorders solve problems in a different manner, comparable to methods usually used by children younger their age (Goharpey, Crewther & Crewther, 2013).

The empirical study showed that the average intelligence quotient of the participant sample was 96.4, as determined by the results of the CPM/S2 test (Raven's Progressive Matrices). There was a wide range of results, ranging from 66 up to 124. It can be concluded that at least five participants in the sample had adequate understanding and perception of form and size as well as a well-developed ability to analyse spatial relations (see Fig. 2). These children can understand and identify mutual features and logical connections. The results can be used to develop a base of cognitive resources during the study process.

Cognition as the core component of mental processes includes the ability to analyse and synthesise, arrive to decisions and make conclusions. Directed thinking, brain activity, is used for problem-solving and characterises each persons' individual way of thought (Глейтман, 2001).

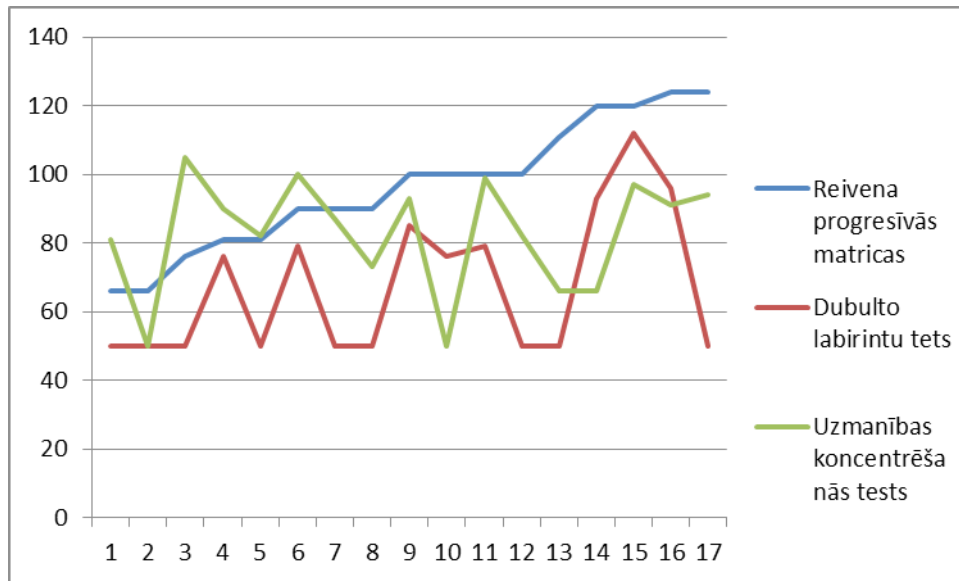


Figure 2. Cognitive development of the study sample.

Learning is not only a process of memorising facts and figures supported by the memory systems, but also perfection of skill supported by other processes of cognition. This is especially important when developing a curriculum for children with intellectual development disorders. Based on the more developed cognitive aspects, it is possible to develop a model that aimed at compensatory mechanisms and academic excellence (Roge & Mēlere, 2003).

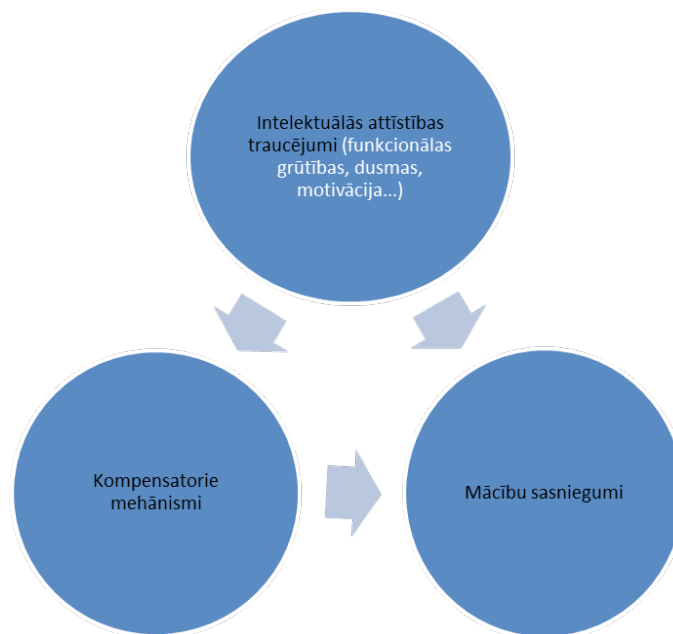


Figure 3. Compensatory mechanisms and academic achievement.

It is important to identify those cognitive aspects that are more developed in children with intellectual development disorders and, based on this information, develop a system of compensatory mechanisms (see Fig. 3). These compensatory mechanisms or a cognitive base creates the basis for optimisation of the teaching methods and, consequently, better academic achievement in total.

Conclusions

1. Cognition provides one with the ability to receive and analyse information and use it accordingly and appropriately, thus forming one's social understanding. Cognition allows to make conscious choices and decisions, voice thoughts and opinions and choose how to obtain any missing information.
2. Cognition is basis for one's ability to learn. It can also be improved by using adequate training methods.
3. Early diagnosis of the most developed cognitive aspects is important to successfully develop an individual cognitive resource base.
4. In the study sample, at least five participants have adequate understanding of form and size as well as the ability to analyse spatial relations and four participants have the cognitive resources to focus and switch attention.

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