



EDUCATION, ECONOMY, AND AI: MULTIDISCIPLINARY PERSPECTIVES FOR A DIGITAL FUTURE

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EDUCATION, ECONOMY, AND AI: MULTIDISCIPLINARY PERSPECTIVES FOR A DIGITAL FUTURE

Monograph

*Edited by Aleksander Ostenda
and Oleksandr Nestorenko*

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3.4. Sensory integration in pediatrics

Relevance of the study. The relevance of studying sensory integration in pediatrics cannot be overestimated in the modern world, where children's health and development are a priority for many parents, pediatricians, and society as a whole. Scientific research in the field of sensory integration helps to understand the nature of sensory disorders in children and their impact on development. They help to identify risk factors that may lead to the occurrence of such disorders, as well as effective methods of their diagnosis and treatment.

Research on sensory integration is also relevant from the point of view of pediatric practice. Pediatricians often encounter children with sensory issues, and their early detection and treatment can significantly improve the quality of life of these children and contribute to their optimal development. Research in this field is also of practical importance for parents of children with sensory problems. It helps parents understand the nature of these issues and provides guidance on how to support their child's sensory development at home.

Furthermore, the growing attention to sensory integration in pediatrics promotes the development of new methods of diagnosing and treating sensory disorders in children. This may include the use of new technologies, the development of innovative treatment programs, and providing pediatricians and parents with access to relevant information and resources in this field.

The purpose of the study was to understand and improve the practical aspects of sensory integration in pediatrics in order to ensure optimal child development.

In the modern world, more and more attention is paid to the study of sensory integration theory, which is actively developing. This applies not only to working with children with special needs, but also with children who develop according to their age norms. In the second half of the 20th century, the American psychologist Ayres A. J. from Oklahoma, conducting various studies, identified a problem that

slows down development in at least one in ten children. Until then, this issue had remained unnoticed by scientists. Ayres A. J. emphasized that most children with learning difficulties, behavioral issues, and communication challenges also have disorders in the functioning of sensory systems. Based on the works of the famous Italian educator M. Montessori, O. M. Holovenko points out that a child develops through social imitation (Головенко, 2020). Therefore, sensory culture is the result of a child's assimilation of the culture created by society; these are generally accepted ideas about objects, their color, texture, size, quantity, etc. Successful integration of sensory information creates the basis for social behavior and learning. This process actively develops from the prenatal period to preschool age.

Sensory processing disorders can occur for various reasons, such as structural and functional characteristics of the brain. In such cases, it is difficult to determine the importance of sensory information and respond adaptively to situations. Sensory integration disorders can manifest themselves in hypersensitivity or hyposensitivity to certain stimuli. The most favorable time for acquiring sensory experience – the period of sensitivity – lasts from birth to 5.5 years. This is the period when the child most actively perceives the world through sounds, smells, colors, shapes, and tactile sensations.

Studies by Miller L. J. et al. on sensory processing disorders (SPD) show that from 5 to 10% of children in the United States face these issues (Miller et al. 2009). Her in-depth study, conducted at the beginning of the 21st century, revealed that one in twenty children has difficulties due to SPD. T. V. Kondratieva believes that the peculiarity of sensory integration is understandable, since no part of the nervous system functions independently. Touch assists vision, vision helps maintain balance, balance helps sense the body's position in space and move, and movement helps learning. This emphasizes the importance of brain stimulation, which "excites" it and creates functional activity necessary for things like breathing, eating, speaking, and reading (Бадлю, 2020).

According to Dr. Z. Przyrowski and Dr. Grzybowska, sensory integration is the process of organizing the reception and processing of sensory information by the brain in order to adapt to the environment and generate responses. This process includes the recognition, storage, interpretation, and integration of information received from different sensory organs and previous experience to meet the needs of the environment. It is noted that sensory integration disorders can lead to various problems in childhood, such as difficulties in communication, social interaction, or the manifestation of abnormal behavior. Ayres A. J. & Robbins J. emphasize the importance of neurological connections between receptors, neural pathways, subcortical nuclei, and centers for perception (Ayres, & Robbins, 2024).

Sensory Integration Processes: Processing, Integration, and Modulation of Sensory Stimuli. Williamson G. G. & Anzalone M. E. identified five interrelated components that contribute to understanding the process of sensory integration: registration of sensory signals, orientation in the environment, interpretation of sensory information, organization of the response to the assimilated information, execution of the response in accordance with the perceived information (Williamson, & Anzalone, 2001).

Sensory integration affects self-regulation, comfort in the environment, motor planning, motor skills, attention, and readiness for learning.

Let us consider the particularly important aspects – self-regulation and motor planning. When talking about self-regulation, it means the ability to independently regulate one's activity. This means the ability to maintain the necessary level of activity, which develops through the regulation of sensory impressions from the surrounding environment. A normal level of activity requires the development of skills such as planning and organizing actions, impulse control, ability to concentrate, working memory, initiative, self-control, and emotional control. The level of activity can vary throughout the day, and children with sensory integration problems may have difficulty maintaining a normal level of activity due

to inadequate sensory modulation. This may lead to increased or decreased activity, which makes it difficult to cooperate in organized activities. Self-regulation problems can lead to negative behavioral responses, such as unstable attention, poor impulse control, etc. For children with poor self-regulation, it is difficult to maintain a calm active state necessary for learning and participation in other activities. However, there are new resources that offer strategies to support state regulation. Even nonverbal children with ASD can learn various strategies to improve their self-regulation.

Motor planning is the process of thinking about what you want to do and then carrying out that intention. This process involves conceiving, planning, coordinating, and executing actions. It helps us respond to sensory stimuli, navigating in space, and controlling our movements. It is a complex process that requires the interaction of different parts of the brain. Motor planning is based on sensory integration, which provides information about our body and environment to plan and execute movements.

Children learn to move by experimenting with their bodies and surroundings, and they create a body schema that helps them repeat movements later. They also learn to build different structures, which is another form of motor planning. Successful completion of these tasks depends on our ability to interact with objects and recognize their characteristics.

Motor planning helps us predict and control our movements through previous components and feedback mechanisms. When we learn something new, we focus and expend a lot of energy. But good motor planning allows us to master new skills faster and perform tasks efficiently, saving time and energy (Ковальчук, 2018).

Sensory integration affects the development of various cognitive functions, such as attention, perception, speech, memory, thinking, and decision-making. In order to help children with sensory integration problems develop these functions, it is important to use individualized approaches that take into account their sensory needs and challenges. This may include sensory integration activities, classes using

special sensory materials and techniques that promote the development of sensory skills, as well as specialized programs for the development of cognitive functions. Understanding the impact of sensory integration on the development of cognitive functions can help us better understand and support the development of children with sensory integration disorders (Єфіменко, 2019).

Sensory integration plays a key role in the formation of motor skills, as it helps a child perceive, understand, and use sensory information to perform various movements and tasks. For example, a child who processes sensory information correctly can easily control their movements, avoid injuries, and develop coordination skills.

One method of improving sensory integration and motor development is sensory therapy. These are exercises and games aimed at stimulating a child's sensory systems to improve their perception and processing of sensory information. For example, children can perform tasks using different textured materials, sounds, or movements to learn to more easily perceive and process different types of sensory information (Прокопчук, & Лук'янець, 2019).

Sensory integration also affects a person's social behavior. People with normal sensory integration can more easily perceive information from their environment, which facilitates their ability to communicate and interact with other people effectively. They can better understand the emotions of others and respond appropriately to them.

However, children with sensory integration disorders may have learning problems due to difficulties in perceiving and processing information. For example, a child with dyslexia may have problems with letter recognition and word formation due to impaired sensory integration. This can lead to learning delays and negatively affect their self-esteem (Гаврилова, 2015).

Sensory integration disorders are complex conditions that affect the way the body perceives and processes sensory information. These disorders can have

a significant impact on a person's development, behavior, and daily functioning. They can be caused by a variety of factors, including genetic, neurological, environmental, and sociocultural aspects. Understanding these causes and risk factors is important for developing effective methods for diagnosing, treating, and supporting individuals with sensory integration disorders (Бадлю, 2020).

Evaluating sensory integration through standardized tests and observations is a crucial component of the process of assessing the functioning of a child or adult, especially those suspected of having sensory impairments or disorders. Sensory integration is defined as the ability of the nervous system to process information from different sensory channels (such as visual, auditory, tactile, and proprioceptive) and respond to it effectively and appropriately. There are various methods for assessing sensory integration, including standardized tests and observations, that allow to assess the level of functioning of the sensory system and identify possible disorders.

Before conducting an assessment of sensory integration, it is important to consider the individual characteristics of each person, their age characteristics, medical history, as well as the characteristics of their environment, and daily functioning. Sensory integration can be assessed in both children and adults, taking into account their specific needs and possible limitations (Вороніна, 2019).

One method of assessing sensory integration is the use of standardized tests. These tests may include a variety of tasks and tasks aimed at assessing reactions to sensory stimuli. For example, the "Edge Corpus" test may require the participant to recognize and categorize different tactile stimuli, such as various textures or shapes. Other tests may include assessing reactions to auditory or visual stimuli, measuring the speed of reaction or the accuracy of information perception.

In addition to standardized tests, observations are also used to assess sensory integration. During observations, a specialist analyzes various aspects of the person's behavior and reactions to different sensory stimuli in real time. For example, a professional may observe how a person responds to changes in the sound

environment, how they interact with different textures, or how they respond to high levels of lighting in the room.

Sensory integration assessment may also include an assessment of functional skills related to sensory information processing. For example, a professional may assess a person's ability to self-care, interact with the environment, and participate in social games. These assessments can help determine how much sensory impairments affect daily activities and which specific areas require support and intervention.

Comprehensive sensory integration assessment can be a complex task, as it requires analyzing many different aspects of a person's functioning. Professionals conducting such an assessment should have extensive experience and competence in the field of sensory integration, as well as access to a variety of tools and methods to conduct the assessment. It is also important to remember that sensory integration assessment should be individualized and take into account the specific needs and characteristics of each individual (Нейман, 2008).

In conclusion, sensory integration assessment using standardized tests and observations is an important component of the process of evaluating the functioning of an individual with suspected sensory impairments or disorders. It allows professionals to understand the level of functioning of the sensory system and identify possible issues that require attention and support. Using a variety of methods and tools to conduct an assessment provides a comprehensive understanding of an individual's sensory functioning and to determine optimal intervention and support strategies.

Principles and Methods of Sensory Integration Therapy. Sensory integration therapy (SIT) is an important field in therapeutic practice aimed at improving the perception and processing of sensory information in individuals with various disorders, including autism, attention deficit hyperactivity disorder (ADHD), dyslexia, and others. The principles and methods of SIT are based

on an understanding of how our sensory systems work and how they interact with each other.

One of the main principles of SIT is the idea of an individual approach to each client. Each person has a unique set of sensory needs and characteristics, so the therapist must adapt his/her methods to the specific case. This means considering aspects such as age, level of development, degree of sensory sensitivity, and other individual characteristics (Гаврилюк, 2018).

Another important principle is the structure and consistency in conducting therapeutic sessions. The therapist should carefully plan each session, incorporating a variety of sensory exercises and tasks that will help integrate sensory information in the client. A gradual increase in the complexity of the tasks helps to develop sensory skills and improve the ability to perceive and process sensory impressions.

To achieve success in sensory integration therapy, it is also important to consider the game aspect. Sensory exercises and tasks can be presented in the form of engaging games, which helps to improve motivation and involve the client in the therapy process. Play as a means of communication helps to reduce tension and open the door to communication and cooperation.

An equally important aspect is the use of various sensory materials and toys during therapy. These can be objects with different textures, colors, shapes, and sounds that help stimulate sensory systems and develop the client's sensory skills. For example, balls of different sizes and weights, touching which helps to develop a sense of space and movement.

In addition, special techniques are used in therapy to regulate sensory vulnerability and reduce stress. One such technique is deep proprioception, which involves performing specific motor exercises aimed at increasing awareness of one's own body and its position in space. This helps to balance sensory impressions and reduce stress levels.

Another effective technique is the use of sensory diets, which include various sensory stimuli, such as massage, vibration, pressure, etc. These actions can help clients focus and relieve tension, contributing to better integration of sensory information.

Despite all the above methods and approaches, it is important to remember the individuality of each client and their unique needs. The therapist should be prepared to adapt their methods and approaches according to the reactions and needs of each specific client (Цікава, 2016).

In conclusion, sensory integration therapy is an important tool in working with individuals with various sensory disorders. Based on an individualized approach, structure and the use of game and stimulating methods, it promotes the development of sensory skills and improves the quality of clients' life. And, most importantly, it enables each person to find their own unique path to success and self-realization.

The Role of Parents and Pediatricians in Sensory Integration Work with Children. Sensory integration work with children is a key aspect of their development, especially at an early age. This approach aims to promote the harmonious development of the child through optimal processing of sensory information. The role of parents and pediatricians in this process is invaluable, as they play a key role in stimulating and supporting the sensory development of the child.

Parents are the first teachers of their children and have a great influence on their sensory development. They can contribute to this by creating a stimulating environment at home. This includes various sensory games, experiments, and activities that help the child develop their sensory skills. For example, using different materials for touch, sound, and vision can promote the development of a child's sensory systems. Parents can also help their child develop their sensory skills by using different types of toys and play situations (Воробйова, 2018).

However, it is important for parents to be aware of their child's sensory needs and to be able to respond to them. Some children may be hypersensitive to certain

sensory stimuli, while others may need more sensory stimulation. Parents should be attentive to the signals their child is giving and try to create a comfortable and stimulating environment for them that takes into account their individual needs.

Pediatricians also play an important role in sensory integration work with children. They may be the first to identify possible sensory development problems in a child and refer them for further evaluation and treatment. Pediatricians can conduct sensory development assessments for a child and provide advice to parents on how to support their child's sensory development at home.

Pediatricians can also work with other professionals, such as sensory integration therapists, to provide comprehensive support for children with sensory issues. This may include developing individualized treatment programs that consider each child's specific needs, as well as providing parents with advice on how to help their child develop sensory skills at home (Охріменко, 2017).

The overall goal of sensory integration work with children is to help them develop the ability to effectively process sensory information and interact with their environment. This can have a significant impact on their overall development and success in learning and social adaptation. Through joint efforts of parents and pediatricians, it is possible to provide optimal conditions for children's sensory development and help them reach their full potential.

Conclusions. Sensory integration in pediatrics is an important aspect of children's development that plays a key role in shaping their physical, emotional, social, and cognitive health. Based on literature analysis and scientific research, it can be concluded that sensory integration has a significant impact on the overall development of a child, as well as on their ability to adapt to the environment and function successfully in it.

First of all, sensory integration affects the physical development of a child, including their motor skills and movement abilities. Effective processing of sensory information helps children better control their movements, maintain balance, and

perform various physical tasks. In addition, sensory integration influences the emotional state of the child, helping them recognize and respond to their feelings, as well as interact effectively with other people.

One of the key tasks of pediatricians in the field of sensory integration is the detection and diagnosis of sensory disorders in children. Through careful observation and assessment, pediatricians can identify symptoms of sensory issues and refer the child for further examination and treatment in a timely manner. This allows to prevent further worsening of problems and contributes to the successful development of the child.

Furthermore, pediatricians provide parents with valuable advice and recommendations on how to support the sensory development of their child at home. They support parents in creating a stimulating environment for the child, where they can effectively explore the world around them and develop their sensory skills.

In general, sensory integration in pediatrics is an integral part of a comprehensive approach to ensuring children's health and development. It opens up new opportunities for improving the quality of life of children with sensory issues, helping them to reach their full potential and become active and successful members of society. Therefore, it is important to continue research in this area and develop new methods and approaches to support the sensory development of children in pediatric practice.

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Chapter 3. Integrating AI, security, and recovery into digital life

- 3.1. Mariia Nazarkevych, Victoria Vysotska, Nazar Nakonechnyi. Development of a model and method for detecting inaugural behavior of chat users.** With the development and spread of Internet technologies, the transfer of information has become much simpler and more efficient. At the same time, in addition to the positive aspects, this has contributed to the mass spread of fake news, which can have serious negative consequences for society, states and individuals. In view of this, an active fight against disinformation is being conducted. In particular, this problem has become even more relevant with the emergence of generative text models capable of quickly and in large quantities creating false content.
- 3.2. Tetiana Diuzhykova, Tetiana Chetvertak, Iryna Kulyk. Modern artificial intelligence technologies in chemistry education.** The introduction of artificial intelligence technologies into chemistry education enhances the effectiveness of student learning. By automating learning and assessment, planning, and administrative teaching work in chemistry education, artificial intelligence systems can free up teachers' time and energy for working with students. The paper considers tools based on artificial intelligence technologies: Chemistry Assistant (Easy-Peasy.AI), StudyMonkey, Chem AI: Chemistry Solver, Chemistry X10, OddityAI, Chemistry AI Homework Solver, HyperWrite Chemistry Assistant, Sizzle AI, Mathway, UPDF AI Assistant, Smodin. Solutions offered by artificial intelligence technologies allow accelerating innovations in chemistry education.
- 3.3. Mariia Nazarkevych, Vasyl Lytvyn, Andrii Nazarkevych. Analysis of methods for identification of combat vehicles based on convulsive neural networks taking into account the conduct of battle.** We present an intelligent visual surveillance system with real-time motion detection, classification and tracking capabilities. The system operates on color and grayscale video images from a stationary camera. In the proposed system, moving object detection is carried out using an adaptive background subtraction scheme, which we propose to use in combat. The combat scheme is described. It is shown how to identify moving objects. We present object detection schemes, time difference models and adaptive background mixture models to compare the efficiency and quality of detection.
- 3.4. Yevhenii Vlasov, Igor Holovchenko, Svitlana Danylchenko. Sensory integration in pediatrics.** The purpose of the study was to understand and improve the practical aspects of sensory integration in pediatrics in order to ensure optimal child development. Sensory integration disorders are complex conditions that affect the way the body perceives and processes sensory information. These disorders can have a significant impact on a person's development, behavior, and daily functioning. They can be caused by a variety of factors, including genetic, neurological, environmental, and sociocultural aspects. Understanding these causes and risk factors is important for developing effective methods for diagnosing, treating, and supporting individuals with sensory integration disorders.

Chapter 3. Integrating AI, security, and recovery into digital life

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