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Marta Szyszko, Aneta Woźniak

Sensory integration disorders – the cause of children's educational problems. A case study

Zaburzenia integracji sensorycznej przyczyną trudności dzieci w nauce szkolnej – opis przypadku

Department of Rehabilitation, National Institute of Geriatrics, Rheumatology and Rehabilitation, Warsaw, Poland
Correspondence: Marta Szyszko, Department of Rehabilitation, National Institute of Geriatrics, Rheumatology and Rehabilitation, Spartańska 1, 02-637 Warsaw, Poland, tel.: +48 609 904 064, e-mail: martablacharska@interia.pl

Abstract

Incorrect organisation of the areas receiving sensory stimuli in the nervous system is the cause of many problems occurring in children, such as difficulties with learning, reading, writing, drawing and attention. Anna Jean Ayres, the precursor of sensory integration therapy, believed that children are born with an internal urge for development and thanks to natural activity they provide themselves with an appropriate amount of adequate stimuli. The endpoint of normal psychomotor development is to achieve a certain level of motor performance – closely related to the psyche. Children with sensory integration disorders learn new skills more slowly, have problems with establishing friendships and low self-esteem, they also deal with adversities worse than other children. This paper describes a case of a girl experiencing educational problems at school. The article shows examples of exercises focused on the normalisation of sensory integration processes which are performed by a child not only in the office, but also at home. The aim of the paper is to draw the attention of parents, teachers and doctors to the fact that problems with schooling may be the result of disorders in sensory integration processes.

Keywords: sensory integration, child, learning, school, sensory stimuli

Streszczenie

Nieprawidłowa organizacja obszarów odbierania bodźców zmysłowych w układzie nerwowym jest przyczyną wielu problemów występujących u dzieci – często skutkuje trudnościami w uczeniu się, czytaniu, pisaniu, rysowaniu i koncentracji uwagi. Anna Jean Ayres, prekursorka terapii integracji sensorycznej, uważała, że dzieci rodzą się z wewnętrznym pędem do rozwoju i dzięki naturalnej aktywności same dostarczają sobie odpowiednich bodźców w odpowiedniej ilości. Finałem prawidłowego rozwoju psychoruchowego jest osiągnięcie określonego poziomu sprawności motorycznej – ściśle związanej z psychiką. Dzieci z zaburzeniami integracji sensorycznej wolniej opanowują nowe umiejętności, mają problem z nawiązywaniem przyjaźni i niską samoocenę, gorzej też radzą sobie z przeciwnościami. Praca zawiera opis przypadku dziewczynki doświadczającej problemów w nauce szkolnej. W artykule opisano przykłady ćwiczeń ukierunkowanych na normalizację procesów integracji sensorycznej i wykonywanych przez dziecko nie tylko w gabinecie, lecz także w domu. Celem pracy jest zwrócenie uwagi rodziców, nauczycieli i lekarzy na fakt, że problemy z nauką szkolną mogą być wynikiem zaburzeń procesów integracji sensorycznej.

Słowa kluczowe: integracja sensoryczna, dziecko, nauka, szkoła, bodźce zmysłowe

INTRODUCTION

Sensorimotor integration is a process in which the brain receives information from all the senses, recognises them, segregates them, and then integrates each information and previous experiences, and finally responds with an adequate response to the acting stimuli[1]. From the moment of birth, the child, using all the senses, learns new skills. However, improper functioning of the nervous system translates into abnormal development. Improper reception of stimuli is most often manifested as overresponsivity or underresponsivity. Overresponsivity to stimuli occurs when a small number of weak stimuli cause excessive, pathological reaction of the body to the signals received by the senses. Underresponsivity occurs when the response to stimuli is delayed or the strength and number of stimuli are insufficient.
Nowadays, learning disabilities of children with intellectual abilities higher than average, are more and more often noticed[2]. This is primarily influenced by factors affecting the foetus during the prenatal period. Przyrowski (2001) points out that sensory integration deficits present in children with learning disabilities include disorders in the registration and processing of stimuli mainly within the three basic sensory systems – tactile, proprioceptive and vestibular[acc. 3]:

1. The tactile system recognises sensory stimuli and builds up a body diagram. Too strong stimuli cause that the child becomes nervous, hyperactive, aggressive and has problems concentrating. However, the reduced sensitivity to stimuli causes that the child is constantly looking for stimuli that stimulate a given sensory system.
2. The proprioceptive system (deep sensation) covers the entire nervous system. Receptors located in the muscles, tendons and joints inform about the position of the body in space. The deep sensory system allows you to maintain a vertical posture, balance and proper muscle tone. It is also responsible for the smoothness of movement and the development of normal eye movements.
3. The vestibular system coordinates the movements of the eyes, head and the entire body. It balances the movements of both sides of the body and maintains the balance[2].

Harmonic psychomotor development is the physiological maturation of the central nervous system and sensory organs, their mutual stimulation and integration[4].
Incorrect sensations reception causes that children feel discomfort, which means they can not focus on the task and improve their skills. They often become nervous, impulsive, and contacts with peers replace virtual acquaintances and computer games. Because they feel that they do not meet expectations, they isolate themselves from the environment. The described process is accompanied by a decrease in self-esteem.

CASE STUDY

Parents with an 8-year-old girl who had sensorimotor disorders reported to the office. Diagnostics was carried out by a sensory integration specialist, a physiotherapist, using the clinical observation method[5] and the Southern California Sensory Integration Tests[6].
The girl was diagnosed with:

- difficulty in maintaining balance;
- impaired visual-motor coordination
- inability of differentiate the right side from the left side;
- reduction of muscle tone;
- difficulties with movement planning;
- problem with concentration;
- incorrect posture while writing and reading;
- incorrectly holding the pen;
- inverting letters while writing.

Parents were interviewed and they reported that the main problems of the child are poor school performance, learning difficulties, writing ("ugly writing"), reading and drawing. While doing homework, the girl can not concentrate on the task. She does not like going out to the playground, she reluctantly rides the bike and gets tired quickly. She does not want to participate in physical education lessons. She avoids wearing socks and clothing adhering to her body, she is irritated by clothes labels. The girl has angry outbursts, she is often sad and unhappy. She likes to spend her free time watching the TV or tablet. The child has a vision defect – hyperopia (right eye +11, left eye +10 dioptres), she has corrective glasses.
A physical examination showed that the girl also has a posture defects: a round back, rounded forward shoulders, protruding belly and valgus knees.
Written consent of the child's parents to conduct the test was obtained.
The proposed activities, conducted in the form of games, were aimed at regulating sensory integration processes. The intensity and character of sensory exercises were adapted to the girl's ability and comfort. Therapy plan included improved visual-motor coordination, normalisation of the tactile system, stimulation of vestibular and proprioceptive systems, work on equilibrium reactions, development of motor planning skills, correct posture, developing body schema perception (including differentiation of right and left sides), motor skills large and small.
The following exercises were used during the therapy:

- squeezing rehabilitation balls;
- exercises using Play-Doh and salt mass (using hands and feet) (Fig. 1);
- barefoot walking through the paths made of materials with different textures (Fig. 2);
- strong compressions with a rubber ball with protrusions and massage performed with objects of different texture (Fig. 3);
- tapping the table with fingertips;
- swinging with opened and closed eyes;
- rolling over;
- throwing and catching the ball with both hands;
- simultaneous painting with both hands;
- naming and showing parts of the body, also with closed eyes;

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Fig. 1. Exercise "Gniotek" ["Stress dough"] (exercise with play-dough)

Fig. 2. Exercise "Bridge" (walking on pathways of different texture)

- drawing shapes on the back of a child (guessing what shape it is);
- overcoming obstacle courses;
- flipping the balls lying on the right with the left hand to the left side and vice versa (Fig. 4);
- jumping on the trampoline (Fig. 5);
- jumping over obstacles using both feet (Fig. 6);
- walking on hands (with legs held up by an adult) (Fig. 7);
- standing on one leg (Fig. 8).

Fig. 3. Exercise "Hedgehog" (massage, compressions using a ball with insets)

Fig. 4. Exercise "Crane" (moving balls lying on the left side with the right hand to the right side and vice versa)

Classes were held twice a week for 6 months. During the game, the girl was stimulated and improved at the same time. Importantly, in addition to classes in the office she also practiced at home, with her parents – sensory integration therapy does not require expensive equipment, during the exercise, you can use various everyday objects[7]. Sensory exercises at home are the complement to the exercises conducted by the therapist.

The child willingly took a part in classes. Nervous processes were stimulated through play, which are reflected in specific skills – proper motor and emotional reactions appeared naturally as a consequence of improving the functioning of the central nervous system[3].

After 6 months of exercise, the parents informed that the girl eagerly goes to school, began to participate in physical

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Fig. 5. Exercise "Frog" (jumping on a trampoline)

education classes and is happy to spend time away from home. Muscle tone has normalised, which allows the child to take a stable posture while writing. The increase in muscle tone contributed to the decline of muscle fatigue, which in turn resulted in better concentration and the ability to focus attention on the task for a long time. As it's known, physical activity stimulates many mental processes and stimulates the development of the central nervous system[8]. Exercises focused over the efficiency of the hand caused that the girl has a better grip and when writing she correctly holds the pen. Balance, visual-motor coordination, space orientation, body schema perception and motor planning have improved. The normalisation of the three basic sensory systems – tactile, vestibular, proprioceptive – through the selection of appropriate exercises caused that the child assimilates learning easier and acquire knowledge faster, which was reflected in better school results. The result of the increase in the physical activity is the improvement of posture: the girl stopped slouching, the belly decreased, the shoulders are less protruded forward. The child has become calmer; drawing, writing and reading are less difficult for her. Also, an increase in self-esteem and an improvement in relationships with peers were noticed. Positive emotions favour learning – they positively influence the processes of attention, memory and thinking involved in problem solving, thanks to which a person experiencing these emotions becomes more creative and reacts more flexibly[9].

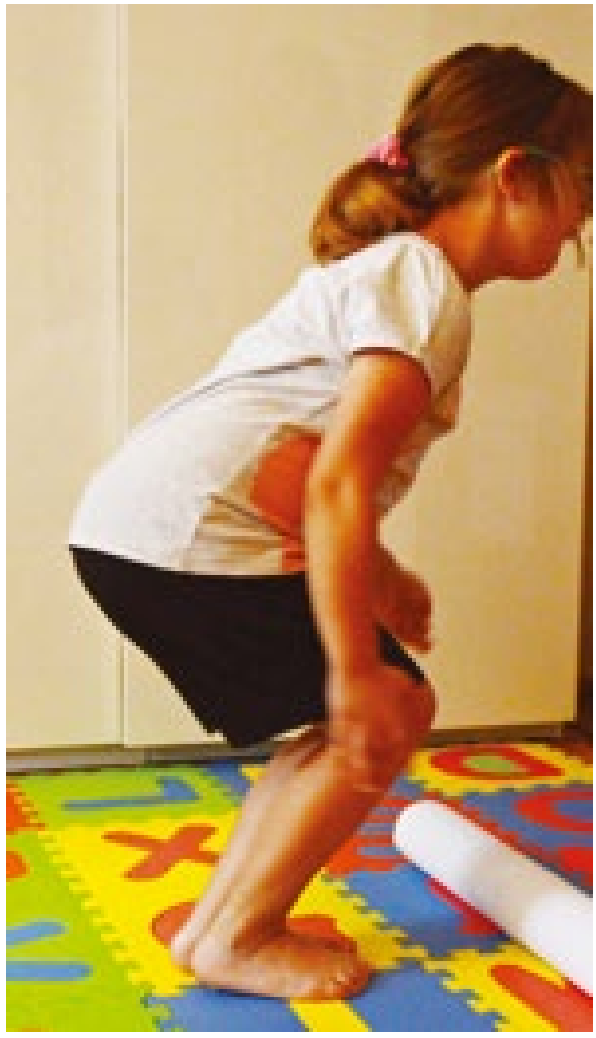

Fig. 6. Exercise "Fences" (jumping over an obstacle)

SUMMARY

Proper sensorimotor integration is a key condition for proper learning and adequate behaviour. The process of acquiring knowledge occurs due to information that reaches from the sense organs to the nervous system. Maturity of the nervous system – conditioned by the right amount of stimuli – makes the child can overcome the subsequent stages of schooling. Therefore, it is important to stimulate as many senses as possible with a variety of stimuli and at the same time to create opportunities for new motor experiences[10]. Senses, vestibular system and proprioceptive system develop already in the prenatal period. They are responsible for proper motor coordination, muscle tension and balance; they allow a person to make precise movements or follow the line of text. The lack of these skills results in problems with writing, reading and schooling. Parents and teachers often do not combine problems observed in a child with sensory integration disorders. The child, in turn, can not cope alone with the normalisation of stimuli, the reception of which was disturbed at

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Fig. 7. Exercise "Wheelbarrow" (walking on hands)

Fig. 8. Exercise "Stork" (standing on one leg)

a certain stage of development. This requires appropriate exercises – they affect the development of specific skills, which translates into improved self-esteem and self-awareness as well as relationships with peers. The child begins to deal better with learning and other everyday challenges. It should be remembered, however, that sensory integration therapy is effective only when the underlying impediments to learning are disturbances in the processing of sensory stimuli[11] – it will not be the right choice in every case. Anna Jean Ayres, precursor of sensory integration therapy, wrote that therapy may not be a real form of learning, but it can make learning easier. Therefore, parents, teachers and doctors should be aware that problems with schooling tend to result from disorders in sensory integration. It is also important to quickly make the right diagnosis.

Conflict of interest

The authors do not report any financial or personal connections with other people or organisations that could adversely affect the content of the publication or/and claim the right to this publication.

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