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The Role of a Sensory Diet in Improving the Quality of Psychosocial Functioning of Students in Inclusive Education

Abstract

Effective sensory processing is necessary for physiological regulation, the generation of appropriate behavioural responses and the development of academic skills. The physical environment in the classroom and at school can impact a child's ability to become engaged in education. By creating proper sensory diets and a sensory-friendly classroom, teachers can help children achieve an optimal level of arousal and become successful students.

That is why paying attention to the possibilities of creating a sensory-friendly environment is so essential as providing the appropriate amount of sensory stimuli tailored to students' needs and capabilities.

An in-depth literature review has been carried out to justify the role of a sensory diet and a sensory-friendly classroom.

Analysing the theoretical and scientific context justifies the development of sensory programs in inclusive education. It shows the possibilities for both using and adapting them to the needs of students.

Keywords: inclusive education, sensory diet, psychosocial functioning, special educational needs.

Introduction

Sensorimotor integration is a process in the central nervous system, consisting of organising sensory information to generate appropriate adaptive responses. It consists of receiving, segregating, recognising, comparing, interpret-

ing and merging information in the central nervous system to evoke a response to a given stimulus adequate to the situation. Without this feature of the central nervous system, humans would not be able to develop and, therefore, learn new, more complex skills. The correct development of sensorimotor integration depends on the efficient functioning of the central nervous system and the supply of an appropriate amount of stimuli from the body and the environment. Integrating information from the most basic and earliest developing sensory systems – vestibular (sense of balance), proprioceptive (deep feeling) and tactile – plays a vital role here. Thus, sensorimotor integration disorders may become a source of many problems for a child in terms of both motor development and cognitive and social development (Matyja, Osińska, Rejdak, Zawisza, 2006).

The reception and integration of information from the primary senses (touch, balance and proprioception with the senses of sight and hearing) constitute the basis for developing skills at higher sensorimotor functions. Gradually, the skills are becoming more and more complex and precise so that at the age of 6, the child could be ready to start school (Karga, 2006).

The development of sensorimotor integration processes takes place in four stages. The first stage is related to developing reflex activities and basic sense systems. Therefore, the tactile system is fundamental in the first months of a child's life. This stage secures the basic physiological and emotional needs as a source of satisfaction, e.g. when eating, cuddling, and forming an emotional bond with the mother. The gradually built tactile experiences shape the image of their own body and develop motor skills. It also has the function of informing about dangerous or unpleasant stimuli.

On the other hand, integrating vestibular-proprioceptive experiences allows for shaping the sense of gravitational security, postural reactions and eye movements, developing the essential ability to control the eyes at this stage. The first and second years of life are the second stages of sensory development, associated with developing gross motor skills, skills related to planning motor activities and bilateral coordination, and somatognosia. Speech is also developing as a result of ever more intense experiences. The third stage is related to the development of the ability to perform complex motor activities, eye-hand coordination, fine motor skills, and lateral domination of the body, and it occurs from 3 to 5 years of a child's life. The last – fourth stage covers developing all the skills that determine a proper school start – i.e. concentration, emotional stability, the ability to think and organise impressions for effective action (Wiśniewska, 2016).

Further development depends on the proper development and structure of the sensory organs, as well as the quantity and quality of the incoming stimuli from the environment in which the child explores, as well as the possibility of free exploration adequate to the child's abilities, skills and developmental age (Matyja, Domagalska, 2011, Wójcik, 2017).

Thanks to the maturation of sensory centres in the central nervous system, the perception functions are improved, informing the body about any environmental changes. This personal experience is enriched, which allows the child to react to more subtle and complex stimuli and to synthesise information about the surrounding reality (Wójcik, 2015).

Proper maturation of sensory integration determines the proper maturation of the child's body and psyche. Therefore, sensorimotor integration and the interaction of the vegetative and limbic systems are essential to development (Sadowska, 2001).

Different types of disorders, difficulties and disabilities and related reactions of children to environmental stimuli show that no single picture is typical for pupils with special educational needs. Every child will present a different sensory sensitivity and react differently to the same stimuli. What for one student will be neutral in reception, in the other, can cause severe discomfort and lead to inappropriate reactions and behaviours. This variety of cases can be a real challenge for the teacher, disorganising work and hindering education.

An essential skill of a teacher that can make his or her daily work with children much more accessible is the proper identification of the sensory needs of their pupils and providing them with the so-called appropriate sensory diet. It involves limiting or intensifying specific stimuli in contact with individual students. To do this, every educator must understand the specificity of each child's sensory functioning (Stańczyk, 2014).

Sensory diet and sensory-friendly school environment

Every person, regardless of age, is different in terms of individual needs. They depend not only on individual characteristics, such as temperament and personality but also on the influence of factors in the family and social environment. How these needs are met determines the behaviour and actions of each individual.

Each individual finds himself or herself differently in an environment full of stimuli. Each of us has a different limit for correctly receiving and interpreting stimuli, depending on our predispositions, the quality and intensity of stimuli from the environment and the ability to adapt and self-regulate.

Each person also requires a unique amount and type of sensory input to maintain an optimal level of arousal, regulate their mood and perform their daily activities (Wilbarger & Wilbarger, 1991).

Difficulties in this area may affect a student's ability to receive information, respond to requests, participate in social situations, write, play sports, and maintain normal arousal levels and work readiness. For students with special educational needs, the situation becomes even more complicated.

A child with special educational needs not only has limited opportunities to explore the world due to diseases, dysfunctions and disabilities but also very often cannot satisfy his or her sensory needs. Deprivation or excess stimuli may cause limitations in the perception of the surrounding reality. Sensory, intellectual, motor, specific disabilities, learning difficulties, and autism lead to various delays in the process of developing self-service activities, eye-hand coordination, spatial orientation, praxis, tactile, auditory, gustatory perception, etc., integration of reflexes, appropriate motor skills, which in turn may cause difficulties in dealing with emotions, interpersonal difficulties and, finally, difficulties at school (Kucharczyk, Olempska-Wysocka, 2017, p. 75–76).

That is why it is so important to know the sensory profile of each child – both those without disabilities and those with specific developmental and educational challenges. A sensory profile determines a specific child's area and degree of sensory sensitivity. The profile helps to understand a child's sensory processing patterns in everyday situations and how these difficulties affect functional performance (Dunn, Bennet 2002, Wiśniewska, 2016).

Qualifications and experience to carry out a specialised sensory integration diagnosis are required, but each teacher can try on their own, guided by intuition, to recognise the sensory needs of their students – some of them may have, for example, a particularly great need for movement, others will be hypersensitive to touch or hearing. It certainly requires sacrifice more time, but the investment seems very desirable. Thanks to such an analysis, the teacher can create a better environment for children and provide the right portion of experiences to those students who need sensory stimulation (Przyrowski, 2012).

Tools that show children's sensory difficulties and clearly will be helpful, including Sensorimotor Questionnaires by Przyrowki or Karga and Sensory Profiles by Dunn or Wiśniewska (Dunn 2002, Wiśniewska 2016, Przyrowski, 2021).

By understanding each context of situations with which a child interacts throughout the day and the associated specific child's behaviours that may impact learning, teachers can provide appropriate stimulation and environmental modifications that can be easily implemented in the classroom.

That is why, to increase students' success in the classroom, it is important to educate teachers in recognising sensory difficulties and disorders and implementing strategies based on sensory stimulation, which will allow for faster identification of the causes of a child's difficulties at school and development of a procedure that will meet the possible sensory needs of students.

Introducing a sensory diet is essential – an individualised sensory interaction program designed to help the child function better at home and school.

Wilbarger (1991) coined the term sensory diet to describe a strategy for developing individualised programs that provide planned and scheduled activities to address a person's sensory needs so that behaviour remains purposeful. It

refers to the need for an individual to have varied sensory experiences throughout the day, similar to a nutritional diet, to maintain an optimal level of arousal or alertness to meet environmental and task demands.

Parents, teachers and therapists need to know which natural daily routine activities provide the child's sensory stimuli that positively impact the state of arousal, emotions, the concentration of attention, coordination, perception and behaviour (Przyrowski, 2012, p. 186). A sensory diet is a therapeutic strategy aiming to introduce the nervous system to the appropriate stimulation level for a given person, enabling optimal functioning and social participation.

The Wilbargers (1991) recommended six components to be included in a sensory diet:

1. All activities in a sensory diet are prescribed after an in-depth assessment of the child's.
2. All activities should occur naturally within the child's ecology and are sustainable.
3. Sensory-based activities are prescribed that can be done quickly and are repeated periodically throughout the day.
4. Consistent routines are developed to increase predictability for the child, prepare for upcoming events, and help to seek out opportunities for sensory experiences that provide long-lasting effects. Teachers also need to be aware that interactions with people generate a lot of potentially disruptive sensory input for the child in the form of voice, odours, eye contact, and touch.
5. Environmental adaptation - safe play areas are created that provide spaces that the child can go to if overstimulated and reduce disruptive stimulation.
6. Participation in play and leisure activities that meet the child's sensory needs.

A vital element of the sensory diet approach is the introduction of weighing appropriate techniques for calming, organising or stimulating the central nervous system. It will allow for the implementation of specific therapeutic assumptions, teaching the child to use them at any time, depending on their individual needs, regardless of therapeutic meetings. Depending on the child's needs, priority is given to stimulating or calming activities.

Techniques leading to calming down and calming the body will include deep pressure massage, also used in the form of self-massage, joint compression, the use of equipment providing proprioceptive sensations (heavy rehabilitation pouffe, weighted vest or blanket, ankle and knee weights, etc.), tight-fitting clothes, body, rhythmic linear movement, "white noise" or quiet music with a stable rhythm, isolation from intense light.

Better organisation will, in turn, be influenced by proprioceptive games and exercises, vibration, providing oral stimulation (e.g. sucking hard candy, chew-

ing), and rhythm in activities. However, intense physical games (e.g. chasing and hide and seek), sitting or jumping on a ball, trampoline, etc. will increase arousal. Specific environmental conditions can also increase arousal: fast music, sudden sounds, bright light, fresh, cool air (Godwyn, Emmons, McKendry-Anderson 2006, Wójcik, 2014).

Providing the conditions necessary to meet sensory needs allows children to maintain focused attention longer and facilitates learning. In order to prevent sensory overload, it is essential to know about the reactivity of the child, adapt the number and type of activities to the needs of the person concerned, teach self-regulation strategies, create opportunities for real rest (also understood as free time, i.e. the time that the child/person can spend only on doing tasks that are pleasant for yourself, bring peace, relaxation and tranquillity, building a specific comfort zone) and sleep, which makes it possible to develop self-regulation habits (Wiśniewska, 2018).

Self-regulation is one of the factors linked to students' academic achievement. Acquiring competencies for academic and non-academic success is necessary, and disruptions in self-regulation skills may lead to maladaptive behaviours (Shields, Cicchetti, Ryan, 1994). Effective sensory processing is essential for developing self-regulation skills – physiological regulation and the generation of appropriate behavioural responses.

Sensorimotor experiences that the sensory diets provided may have met the participants' sensory needs, thereby improving their target behaviours related to sensory processing skills. These sensorimotor experiences may have helped participants produce appropriate adaptive responses and participate in daily occupations, as evidenced by positive changes in target behaviours related to psychosocial skills (maladaptive behaviours) and classroom engagement (off-task behaviours) (Pingale, Vidya, 2018).

The sensory environmental modification should be combined with sensory diets as a compensatory intervention in which a change is made in the intensity, complexity, or quality of one or more sensory elements in the ambient physical environment surrounding the child to support child functioning and participation (Bodison, Parham, 2018).

Reducing the excess sensory stimuli in the classroom is necessary - potential distractors that may disorganise children. Teachers must remember that the individual sensory perception of each student may condition distractors. Therefore, educators must bear in mind tactile distractors (the proximity of a friend, being bumped, pushed or touched by others may be unpleasant for a student. If we know this is a problem for children, let him sit in the first row or the corner of the room. During class activities and excursions, we should ensure that there is enough space. We should also take into account visual distractors in the form of excess visual stimuli - to eliminate them. We should ensure tidiness in the

room (cleaning the board, placing posters, display boards and other teaching aids at the side instead of right in front of the room). Examples include alterations in room lighting, elimination of extraneous visual stimuli, or changes to the sensory features of furniture or objects in a room, including colours, covered aids on shelves, and fixed classroom layout. In case of symptoms of excessive reactivity to auditory stimuli, we should make sure that the student sits away from the window, door, or noisy equipment, soundproofing a room. It is worth remembering that raising the voice while talking to a child with hypersensitive hearing will not make him or her listen more carefully but will only make him or her feel even more distracted. It is better to speak in a normal tone of voice and look the student in the eye. You can place your hand on the child's shoulders while talking to him or her to maintain contact with him or her (provided that the child is not overly reactive to tactile stimuli) (Przyrowski 2012, Bodison, Parham, 2018).

Modifying the environment should not focus only on eliminating distractors from the environment. However, it should also include all everyday school situations, e.g. implementation of tasks in individual school subjects (art and technology classes, physical education, desk work, break between classes, play, homework, meals, organisational tasks, dressing, taking care of hygiene) as well as activities performed at home (Nackley, 2009).

Although this topic is crucial from the point of view of learning and upbringing in inclusive education, the current evidence on the effect of sensory diets is limited. So far, little research has been carried out in the group of non-disabled students and their disabled peers, and if it has been carried out to a small extent, on a limited research group. Also, findings of the studies on the effects of sensory diets are mixed; their results often show contradictory results or include different points of view.

Pingale (2018) study investigated the effect of sensory diets on children's sensory processing skills, psychosocial skills, and engagement in classroom activities. This study used a single-subject ABCA design. Five children between the ages of five and eleven participated in the study. The study consisted of an initial baseline phase A₁, the control intervention phase B, sensory diets intervention phase C, and the second baseline phase A₂. Each phase lasted for seven days. The participants were videotaped during classroom group activities. Visual analysis of the data showed that sensory diets positively affected participants' sensory processing, psychosocial skills, and classroom engagement.

Pingale, Fletcher, and Candler (2019) also investigate the effect of sensory diets on children's psychosocial skills in the school environment. A single subject A-B-A design was used with three children attending 1st and 2nd-grade level special education classes in an urban public school. Three target behaviours individualised for each child were measured, each in a group and individual class-

room context. Visual analysis showed a decrease in problematic behaviours for the three participants with the introduction of the sensory diet. What is essential is that this decrease persisted after intervention withdrawal, which means that brief sessions of sensory diets during the school day effectively improve children's sensory processing, psychosocial, and classroom engagement behaviours and may have a continued beneficial effect.

The study by Sahoo and Senapati (2014) aimed to determine whether sensory diet and sensory integration therapy would exhibit more significant improvement in the functional behaviour of children with attention deficit hyperactive disorder (ADHD) than those who received the sensory integration therapy alone. Twenty-eight subjects aged 6–12 years were selected by screening with sensory profile and ADHD rating scale. The subjects were divided into two groups with equal no of subjects conveniently in a random order. The experimental subjects were provided a sensory diet through outdoor play and SI intervention, and the control group subjects were provided SI intervention only. The subjects in the experiment have shown improved functional behaviour in family, school, life skills, self-concept, social activities and decreased risky activities.

The purpose of Dodson-Norris study (2007) was to determine the effects of using sensory diet activities on the adverse behaviours of two students with severe cerebral palsy. Two students were selected for this study, one boy, age 16 and one girl, age 15, because they were not showing improvement in their adverse behaviours, which may be due to frequent staff changes in their previous classroom. The sensory diet activities included on the form were deep pressure brushing and joint compressions, hugs and squeezes, lotion with deep pressure massage, walking, bean bag mashing, swinging, rolling on the ball, using a vibrating bug, playing in tactile bins of rice/beans/popcorn, playing in wet tactile materials (e.g., Jell-O pudding, water), leg rolling, wrapping in a blanket, squeezing materials, bouncing on air mattress, wearing weighted vest, spinning, pushing in scooter chair, painting skin with various textured brushes, listening to calming music, and blowing bubbles. Students showed significant improvement in interaction with the staff and in many adverse behaviours. The results and interpretations of this qualitative study suggest that administrators, special educators, therapists and parents need particular strategies designed by the occupational therapist to support student success in the classroom.

Mora and Chapparo (2011) study examined the impact of using a sensory intervention within a home context to improve behavioural responses and functional outcomes for children with intellectual disability, behaviour problems and sensory defensiveness. Seventeen children aged 4½ to 11 years with a mean age of 6½ years participated in the study. Three of the children had a mild intellectual disability, ten of the children had a moderate intellectual disability, and four had a severe intellectual disability. Twelve out of the seventeen children also

had a diagnosis of autism. The sensory diet intervention was designed for 6 to 12 weeks. Interventions were activity-based and were scheduled into the children's daily routines to provide additional sensory input, e.g., arm wrestling at morning tea time; prepare a child for the coming event or interaction, e.g., wearing a weighted backpack to enter school; provide a space that the child could go to when overwhelmed, e.g., rolling wheel and also to participate in play activities, e.g., climbing frame at the playground. Results of this experimental study show that family life became manageable and community activities could occur without parents being concerned about their children's behaviour. These outcomes were all very positive and impacted the overall family functioning.

Another study used a single-subject ABCA experimental design with five children attending prekindergarten through fourth-grade special education in an urban public school. Positive and individualised changes in sensory processing, psychosocial, and classroom engagement behaviours were noted for the five children when sensory diets were administered in brief sessions throughout a school day. Changes did not occur in response to control intervention sessions, indicating that the sensory aspects of the intervention may have had an influence (Pinger, Fletcher, Candler, Pickens, Dunlap, 2021).

According to Thomson (2011, p. 203), sensory-based interventions have proven to positively impact the sensory processing abilities of individuals with varying forms of SPD research. Evidence has shown that access and participation in sensory environments as a supplement to daily routines can enhance the sensory awareness of individuals with neurological disabilities. The study also shows that maladaptive behaviours decreased, participation increased, and environmental barriers were broken down after allowing the individual to regulate his/her sensory systems.

Barrett, Zhang, Moffat, and Kobbacy (2013) aimed to explore environmental impacts on learning beyond solely visual stimuli. The observed results of the study demonstrated the negative impacts of electrical lighting. At the same time, cooler temperatures improve performance on learning assessments, allowing students to adapt to temperature-improved performance quickly; an appealing visual environment decreases behaviour outbursts, and student artwork on display improves the student's sense of ownership over the learning process. They also found that window size does not impact overall participation. However, the increased natural light in the environment and allowing students to use ergonomic and comfortable furniture significantly increased the student's ability to learn and focus on tasks in the classroom. According to researchers, there was an impact of classroom design on learning. It demonstrated the correlation between the display of student artwork/pictures and students' overall sense of autonomy and importance in their learning pursuits, allowing students to be more engaged in their learning and all other education-related tasks.

In-depth research studies, such as that completed by Mills et al. (2016), have also concluded a relationship between disruptive behaviours and unmet sensory needs.

Based on solid theoretical foundations, several authors (Bishop, 2010; McAllister, 2010; Lawlor, 2019; Stearns, 2022) have also developed proposals for sensory therapeutic interactions in school conditions and adjustments to the students, educational environment.

The proposals for sensory diets and adaptations of the environment to the child's sensory capabilities presented in these studies concerned primarily such aspects as:

1. A sensory diet tool bag with required tools might be helpful to implement the scheduled strategies to be sent from school to home daily. The contents that should be included in the bag are tools required to implement the sensory strategies planned in the sensory diet, e.g. a weighted vest (5% of the child's body weight), a personal CD player or an mp3 player with adaptive headphones, a soft bristle medical hand brush to perform the brushing protocol therapy) (Bishop, 2010).
2. Sensory diet can include activities that include vestibular and proprioceptive input – jumps prior to joining the rest of the class for extensive group learning, having a student always be the designated “helper” to push desks around when rearranging classroom, having a student assist with reaching high to point to words/pictures on the board when the teacher is learning (Stearns, 2022).
3. Various tactile and visual fidgets can help children self-regulate, increasing their ability to focus on education-related tasks. However, because of the distracting nature of fidget toys in general, it is essential to establish clear expectations for appropriate use in the classroom setting and use such tools only for regulatory purposes.
4. Give alternative seating strategies to regulate proprioceptive and vestibular input and regulate arousal (therapy ball, wobble seats, seat cushions, standing desks, lap desks and lower tables to use while seated on the floor can be a handy tool in helping students maintain focus on learning).
5. To support more independence in self-regulation regarding sensory needs, the Zones of Regulation Program might be helpful – it teaches self-regulation skills through cognitive behavioural therapy techniques to categorise different feelings and states of arousal into four coloured zones. The Zones of Regulation from highest level of arousal to lowest are as follows: Red, Yellow, Green, and Blue, with Green being the optimal level of arousal. This tool can be helpful to be used in conjunction with other sensory regulation techniques to help students identify their states of arousal and develop independence in self-regulation through using sensory tools to get back to the “green zone” (Stearns 2022, p. 53).

6. Remember about stretch breaks throughout the day to ensure that kids are not sitting for extensive periods.
7. The distractions of views-out are best dealt with by having blinds or curtains in the classroom.
8. Extra personal space is essential.
9. Using alternative lighting options such as lamps, open windows, or light covers helps improve the quality of the light, directly correlates to decreased stress for students and increases the ability to retain information presented by teachers.
10. Children's behaviour might differ in different room volumes – the children tend to be calmer in smaller rooms.
11. Using screens or shelving and storage units. Having a number of these on lockable castors is an excellent benefit in quickly changing the classroom layout to suit different needs and also bring change into the classroom (McAlister, 2010)
12. When decorating the walls of the sensory-friendly classroom, a teacher should be mindful of the number and placement of stimuli presented to students – too many anchor charts, colours, textures, decorations, etc. placed together in a small area create visual noise. It is better to slowly add visual accents on the walls over time to avoid overloading visual input too quickly.
13. The classroom should be easy to navigate, with open pathways between desks, tables, counters, chairs, etc. With more room to move and clear pathways to follow, children will evade collisions and unwanted sensory input from peers, such as touches, noises, and smells.
14. Consistency and structure are essential during the school days with exceptional learners. Establishing consistent routines and schedules will support students, who benefit from knowing what to expect each day (Lawlor, 2019).
15. A calm-down corner can be used for a variety of reasons. It can be a place to go for children demonstrating any complex or disruptive behaviours as a place to go and regulate themselves using sensory and social-emotional-based strategies. Sensory/fidget tools including but not limited (Stearn, 2022, p. 26–49).

All this may become the basis for creating new universal proposals for school sensory programs adapted to students.

Conclusion

Commonly used sensory input strategies can be used by both parents and professionals. The sensory diet can only be a powerful behavioural tool if adequately designed and implemented. Parents and professionals can make life

easier for themselves and their children by planning and implementing a balanced sensory diet that strengthens neurological development and improves self-help skills (Wilbarger & Wilbarger, 1991; Kranowitz, 2005).

The intensity and regularity of a sensory diet can be an inclusive and productive intervention in inclusive education, which helps organise surroundings and will improve the teacher's work and allow students to participate more fully in class life, education and social interactions. Diagnosis of sensory preferences should be part of the standard diagnostic procedure carried out by the teacher.

Yes, it requires acquiring additional knowledge using additional tools and work, but one must be aware that the benefits for both the student and the teacher will be disproportionately higher.

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Rola diety sensorycznej w podnoszeniu jakości funkcjonowania psychospołecznego uczniów edukacji włączającej

Streszczenie

Efektywne przetwarzanie sensoryczne jest niezbędne do regulacji fizjologicznej, generowania odpowiednich reakcji behawioralnych i rozwoju umiejętności akademickich. Środowisko fizyczne w klasie i szkole może mieć wpływ na zdolność dziecka do zaangażowania się w edukację. Tworząc odpowiednią dietę sensoryczną i przyjazną sensorycznie klasę, nauczyciele mogą pomóc dzieciom osiągnąć optymalny poziom pobudzenia, a co za tym idzie – odnieść sukces w nauce.

Dlatego tak ważne jest zwrócenie uwagi na możliwości tworzenia środowiska przyjaznego sensorycznie i zapewnienie odpowiedniej ilości bodźców zmysłowych, dostosowanych do indywidualnych potrzeb i możliwości uczniów.

Aby uzasadnić rolę diety sensorycznej i przyjaznej zmysłom sali lekcyjnej, przeprowadzono dogłębny przegląd literatury. Analiza kontekstu teoretyczno-naukowego pozwoli uzasadnić tworzenie programów sensorycznych w edukacji włączającej, ukazać możliwości i sposoby zarówno ich stosowania, jak i właściwego dostosowywania do potrzeb uczniów.

Słowa kluczowe: edukacja włączająca; dieta sensoryczna; funkcjonowanie psychospołeczne; specjalne potrzeby edukacyjne.