Supporting the Development of Children with Autism Spectrum Disorders in the Context of Family and the Natural Environment: An Integrated Psychological and Physiotherapeutic Approach Utilizing Forest Pedagogy

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ABSTRACT:

This paper discusses an integrated psychological and physiotherapeutic approach that utilizes forest pedagogy in the therapy of children with autism. This approach combines sensory integration (SI) therapy with psychological and physiotherapeutic elements in a natural forest environment, also involving the family. Furthermore, there is also the discussion on sensory processing disorders (SPD) in children with autism, their impact on development, and the history of research on this issue, and the role of SI therapy in minimizing the adverse effects of SPD is emphasized.

The authors highlight the benefits of forest therapy, including stress reduction, improved concentration, the development of social skills, and enhanced self-esteem.

Additionally, the concept of Shinrin-yoku ("forest bathing") and special Gestalt pedagogy, emphasizing their importance in a holistic approach to autism therapy, are also investigated.

The authors postulate further research on the effectiveness of forest therapy in combination with other therapeutic methods to optimize support for the development of children with autism.

Keywords: Sensory Processing Disorder (SPD), Sensory Integration (SI), Forest Therapy Autism

INTRODUCTION

Contemporary approaches in developmental and therapeutic work with children with special educational needs increasingly recognize the potential of the natural environment (Louv, 2005; Chawla, 2007; Faber Taylor & Kuo, 2009; Selhub & Logan, 2014; Soga & Gaston, 2016). A growing body of research indicates that interaction with nature has a positive impact on various aspects of development and functioning. In the context of Autism Spectrum Disorder (ASD), characterized by complex developmental challenges encompassing, inter alia, difficulties in physical development, communication, and social interaction (American Psychiatric Association, 2013; Volkmar & Klin, 2005; Baron-Cohen, 2009), integrated intervention methods that combine different therapeutic modalities are being sought (National Autism Center, 2009; Case-Smith & O'Brien, 2010; Christiansen & Baum, 2005).

This paper aims to present and discuss an integrated psychological-physiotherapeutic approach utilizing forest pedagogy (Bentsen et al., 2010; Li, 2017). Such an approach presupposes the collaboration of specialists from various disciplines (psychologists, physiotherapists, pedagogues) to develop and implement an individualized therapeutic plan for the child (Green et al., 2010), incorporating sensory integration therapy with psychological and physiotherapeutic elements within a forest environment (Schaaf & Miller, 2015), as well as the active involvement of the family in the therapeutic process (Fewell & Vadasy, 1986; Law et al., 1996). This engagement promotes the generalization of acquired skills and the long-term efficacy of the intervention.

Sensory Processing Disorder

Sensory Processing Disorder (SPD), according to Lucy Jane Miller, is a broadly defined concept describing difficulties in receiving, processing, and responding to sensory information, i.e., stimuli originating from the environment or the body (Ayres, 1972; Kranowitz, 2005; Dunn, 2007). Lucy Miller, a leading researcher in the field of sensory processing disorders, developed a model that classifies SPD into various subtypes, allowing for a better understanding of these disorders and tailoring therapy to the specific needs of each child (Miller et al., 2007; Melillo, 2017). Children with autism spectrum disorder present a range of abnormalities in sensory processes (Ben-Sasson et al., 2009; Bogdashina, 2019; Bobkowicz-Lewartowska, 2017; Dwyer et al., 2022); they may be hypersensitive or hyposensitive to sounds, touch, light, smells, tastes, or proprioceptive stimuli (concerning body awareness) and vestibular stimuli, related to balance and spatial orientation (Miller et al., 2007; Schoen et al., 2008).

According to Miller et al. (2007), these disorders can be classified into three main categories:

1. Sensory Modulation Disorder (SMD) – difficulties in regulating the intensity of responses to sensory stimuli (Kranowitz, 2005; Ben-Sasson et al., 2009).
2. Sensory Discrimination Disorder (SDD) – problems with distinguishing and interpreting sensory stimuli (Dunn, 2007; Kranowitz, 2012).
3. Sensory-Based Motor Disorder (SBMD) – difficulties with motor planning and postural control (Ayres, 1972; Kranowitz, 2005; Schoen et al., 2008).

Sensory modulation disorders concern problems with responding to the intensity, type, and complexity of stimuli. Children with this type of sensory processing disorder have difficulty regulating their reactions to sensory stimuli, which can lead to excessive, insufficient, or inconsistent responses (Ben-Sasson et al., 2009; Bogdashina, 2019). Within this area, we can distinguish sensory over-responsivity, sensory under-responsivity, and sensory seeking/craving (Kranowitz, 2005; Schoen et al., 2008). Children with over-responsivity overreact to sensory stimuli that are neutral or easily tolerated by others. Examples include fear of noise, avoidance of touch, or a strong reaction to light (Bogdashina, 2019). In the aspect of sensory over-responsivity, aversive behaviors to a specific stimulus are observed (Dunn, 2007). Children with sensory under-responsivity may have delayed or weak reactions to stimuli. They often do not react to sounds, touch, or pain, which makes them appear indifferent or withdrawn from the environment. Sensory seeking/craving in children manifests as a pursuit of various types of intense sensory experiences. They may frequently jump, spin, touch various objects, or interact with objects that provide them with intense sensations (Schoen et al., 2008).

Sensory discrimination disorders refer to difficulties in distinguishing sensory stimuli, causing children to have problems recognizing and interpreting sensory information (Kranowitz, 2012; Dunn, 2007). They may have difficulty determining what is touching them, localizing sounds, or distinguishing textures or tastes (Bogdashina, 2019). Discrimination disorders can affect any of the senses:

- Vision (difficulties in recognizing differences in shapes, sizes, colors),
- Hearing (difficulties in distinguishing sounds, speech, or auditory cues),

- Touch (problems with identifying textures, temperature, or pressure),
- Taste and smell (difficulties in distinguishing tastes and smells),
- Proprioception (problems with recognizing body position in space),
- Vestibular system (difficulties with balance and motor coordination).

In turn, sensory-based motor disorders affect a child's ability to plan and execute movements and coordinate the body (Ayres, 1972; Kranowitz, 2005). These disorders include two main subtypes: dyspraxia and postural disorders with a sensory basis (Schoen et al., 2008). Dyspraxia is a disorder concerning the planning and execution of motor sequences. Children with dyspraxia have difficulty organizing their movements, which leads to problems with coordination, learning new motor skills, and performing tasks that require precise movements, such as dressing, drawing, writing, or using cutlery. Postural disorders with a sensory basis refer to difficulties with controlling body position and maintaining balance (Miller et al., 2007). Children with this disorder may exhibit weakened muscle tone (hypotonia), difficulty maintaining a seated position, and a lack of body stability during movement, which can lead to problems with balance, coordination, and precise movements (Bobkowicz-Lewartowska, 2017). Examples of symptoms of sensory processing disorder include: problems with concentration in a noisy environment, difficulties maintaining balance while walking or running, reluctance to eat certain foods due to their consistency, a strong reaction to minor cuts that may seem insignificant to others, and seeking motor stimulation, e.g., constant spinning or climbing (Schoen et al., 2008).

Symptoms of Sensory Processing Abnormalities in Children with Autism Spectrum Disorder

Sensory integration (SI) disorders in children on the autism spectrum are a significant aspect of their developmental difficulties, affecting daily functioning and interactions with the environment (Ayres, 1972; Dunn, 2007). Children with autism often contend with problems in processing sensory information, meaning their brain does not adequately receive, organize, or respond to sensory stimuli from the environment and their own bodies (Kranowitz, 2005; Schoen et al., 2008). These disorders can manifest as hypersensitivity, hyposensitivity, or a seeking of stronger sensory stimuli, which consequently leads to difficulties in the emotional, social, communicative, and cognitive spheres (Ben-Sasson et al., 2009; Dwyer et al., 2022). In children with autism spectrum disorder, the process of sensory integration plays a crucial role, as it influences their ability to receive, process, and respond to sensory stimuli, which in turn determines their cognitive, social, emotional, and motor development (Bogdashina, 2019; Bobkowicz-Lewartowska, 2017). The process of sensory integration forms the basis for effective functioning in daily life, and disturbances in this process can lead to difficulties in various areas (Ayres, 1972; Dunn, 2007). Our brain receives thousands of stimuli from the environment every day, such as sounds, touch, smells, tastes, images, or movement. The sensory integration process enables the organization of these stimuli, allowing for an appropriate response to them. In typically developing children, this process occurs automatically and unconsciously; however, in neurodivergent children on the autism spectrum, it can be severely disrupted (Bogdashina, 2019).

Sensory integration disorders are among the most common problems accompanying the autism spectrum (Bogdashina, 2019; Bobkowicz-Lewartowska, 2017). It is estimated that 70% to 95% of children with autism experience difficulties in sensory processing, which significantly impacts their quality of life (Ben-Sasson et al., 2009; Schoen et al., 2008; Tavassoli et al., 2016). Research indicates that these disorders may occur in over 96% of children with ASD, and their presence is one of the diagnostic criteria for autism spectrum disorder (Bielec 2024). Meta-analyses have found that sensory over-responsivity is associated with both internalizing and externalizing problems. Specifically, meta-analyses and systematic reviews indicate that sensory hypersensitivity (hyper-reactivity) is reported by approximately 60-70% of autistic individuals, hyposensitivity (hypo-reactivity) affects about 30-40%, while sensory-seeking behaviors are observed in nearly 20-30% of the studied populations (Ben-Sasson et al., 2009; Tavassoli et al., 2016). It is estimated that in approximately 40-50% of children with ASD, sensory hypersensitivity leads to behavioral problems, such as temper tantrums or self-injurious behaviors (Green et al., 2010; Schoen et al., 2008). Each of these patterns can lead to different behaviors, from withdrawal and avoidance of stimuli to excessive seeking of intense sensory experiences. Hypersensitive children often complain that certain sounds, textures, or smells are unbearable for them, making their environment excessively burdensome and overwhelming (Kranowitz, 2005; Dunn, 2007). As a result, they may react with anxiety, irritation, and sometimes even aggressive behavior, attempting to escape stimuli that cause them discomfort. Very often in

children on the autism spectrum, we observe challenging behaviors that result from sensory processing and overload (Bobkowicz-Lewartowska, 2017). These behaviors can take various forms and affect the child's functioning in everyday situations, such as learning at school, social interactions, or daily family life. On the other hand, sensory hyposensitivity in children on the autism spectrum causes them to respond insufficiently to sensory stimuli. An interesting phenomenon often observed in children with autism spectrum disorder is also sensory seeking (Schoen et al., 2008). These children actively seek strong stimuli, engaging in repetitive, often intense activities such as hand-flapping, jumping, spinning in circles, or intensely touching objects. These stereotypical behaviors serve a self-regulatory function, helping the child to organize stimuli from the environment, which may seem like a way of coping with excessive arousal or insufficient stimulation (Bogdashina, 2019).

Sensory processing disorders in children on the autism spectrum have a profound impact on their social and emotional development (Dwyer et al., 2022). These difficulties can hinder relationship building with peers, participation in school activities, and also affect the ability to function independently in everyday situations (Bobkowicz-Lewartowska, 2017; Kranowitz, 2012). Correlational studies have shown that sensory difficulties are significantly associated with the severity of anxiety and depression in autistic children, with correlation coefficients reaching r=0.4–0.6 (Tavassoli et al., 2016). A child who avoids touch, noise, or specific places may be perceived as withdrawn or uncooperative, which often leads to misunderstandings and difficulties in understanding their behavior by others (Baranek, 2002).

Forest Therapy as a Holistic Approach in Special Pedagogy

Contemporary special pedagogy seeks innovative methods for supporting the development of individuals with disabilities (Case-Smith & O'Brien, 2010; Christiansen & Baum, 2005). Among these, forest therapy merits particular attention, its theoretical underpinnings deriving from diverse, interdisciplinary concepts such as Special Gestalt Pedagogy (Żłobicki, 2008; Paruzel-Czachura, 2015), Shinrin-yoku (Garcia & Miralles, 2018; Bentsen et al., 2010), the theory of sustainable development (UNESCO, 2017), and the concept of Nature Deficit Disorder (Louv, 2005). Indeed, the number of scientific publications dedicated to nature-based therapies has increased by over 300% in the last decade, reflecting growing empirical interest (Park & Miyazaki, 2018). The burgeoning interest in this form of therapy in Poland, confirmed by research conducted in educational and therapeutic institutions, prompts a deeper analysis of its assumptions and potential in working with children with special educational needs. In Europe, over 1,500 forest therapy and green therapy programs have been documented, with more than 30% targeting individuals with disabilities (White et al., 2020; World Health Organization, 2016).

THEORETICAL FOUNDATIONS OF FOREST THERAPY

Contemporary society, characterized by increasing urbanization and technologization, influences the lifestyle of children and adolescents, limiting their contact with the natural environment (Soga & Gaston, 2016). A consequence of this phenomenon may be the so-called Nature Deficit Disorder (NDD), a term introduced by Louv (2005) to describe the adverse effects of a lack of direct experiences with nature. It is estimated that children currently spend over 50% less time outdoors than their parents did at the same age, and the average screen time is over 7 hours per day (Louv, 2008; Rideout et al., 2010). Louv argues that NDD can manifest in various developmental problems, such as concentration difficulties, hyperactivity, emotional disorders, obesity, or weakened immunity (Louv, 2008). In this context, the theory of sustainable development, which emphasizes the importance of a harmonious relationship between humans and nature, promotes pro-ecological attitudes and actions for environmental protection, and is gaining increasing significance (UNESCO, 2017). In special pedagogy, both these approaches – the NDD concept and the theory of sustainable development – provide an important justification for the development of forest therapy as an innovative method for supporting children and adolescents with disabilities.

Benefits of Contact with Nature

Contact with nature is essential for the proper development of every human being, especially children and adolescents with disabilities (Faber Taylor & Kuo, 2009). Scientific research confirms the positive impact of spending time in nature on physical and mental health, as well as cognitive, emotional, and social development, and the formation of pro-ecological attitudes (Chawla, 2007). Meta-analyses indicate a reduction in cortisol levels by approximately 15% after exposure to the natural environment and an increase in positive mood by 20% (Park et al.,

2010). In children with ADHD, contact with green spaces was associated with a 20-30% reduction in symptoms (Faber Taylor & Kuo, 2009; Kuo & Faber Taylor, 2004). For individuals with disabilities, contact with nature can be particularly important, offering unique opportunities for stimulating sensory, motor, and social development in a natural and safe environment (Fjørtoft & Sageie, 2000). The forest environment, rich in sensory stimuli such as diverse sounds, smells, colors, and textures, stimulates the senses and enhances brain activity, which can contribute to improving the functioning of individuals with sensory processing disorders (Kranowitz, 2012).

Forest therapy, which utilizes the natural elements of the forest environment for therapeutic and educational purposes, enables the implementation of the assumptions of both the NDD concept and the theory of sustainable development. By providing children and adolescents with opportunities for direct experience of nature, forest therapy can contribute to:

- Reduction of NDD symptoms: improved attention (Taylor & Kuo, 2001), decreased hyperactivity (Faber Taylor & Kuo, 2009), emotion regulation (Bratman et al., 2015), strengthened immunity (Li, 2010). Studies show that the likelihood of depression and anxiety decreases by about 30% in individuals who regularly spend time in nature (Ulrich, 1984; Bratman et al., 2015).
- Supporting physical development: improvement of motor skills, motor coordination, balance (Fjørtoft & Sageie, 2000). For example, motor fitness can increase by 15-20% after forest therapy programs (Fjørtoft & Sageie, 2000).
- Stimulating cognitive development: developing observation skills, concentration, memory, and cause-and-effect thinking (Kuo & Sullivan, 2001).
- Supporting emotional development: stress reduction (Antonelli et al., 2019), anxiety, tension, strengthening the sense of security, building a positive self-image (Chawla, 2007). A decrease in cortisol levels by an average of 12-18% has been noted after short-term exposure to the forest (Antonelli et al., 2019; Ochiai et al., 2015).
- Supporting social development: developing communication, cooperation, and empathy skills (Ward Thompson et al., 2008).
- Shaping pro-ecological attitudes: building respect for nature, ecological awareness, and responsibility for the environment (Kuo & Sullivan, 2001).

Forest therapy constitutes an innovative tool in special education, providing holistic support for the development of children and adolescents with disabilities in a natural and safe environment. Further research on the effectiveness of this form of therapy in various groups of individuals with disabilities will contribute to the development of knowledge and practice in the field of special pedagogy and ecological education.

Shinrin-yoku – The Japanese Art of "Forest Bathing"

Shinrin-yoku, a term meaning "forest bathing" or "immersion in the forest atmosphere," originated in Japan in the 1980s and quickly gained recognition as an element of preventive and therapeutic medicine (Garcia & Miralles, 2018). In essence, Shinrin-yoku involves consciously and intensely experiencing the forest with all senses. This practice, rooted in Japanese tradition and culture, consists of unhurried walking in the forest, lasting at least 2 hours, during which participants engage their sight, hearing, smell, and touch, admiring the surroundings, listening to the sounds of nature, inhaling forest aromas, and feeling various textures on their skin. Shinrin-yoku can also be adapted to urban or domestic settings by incorporating elements of nature into everyday environments (Li, 2017; Garcia & Miralles, 2018; Wohlleben, 2016; Williams, 2017).

Numerous scientific studies, mainly conducted in Japan and South Korea, confirm the positive impact of Shinrin-yoku on human health. „Forest baths" provide benefits in terms of:

- Immune system functioning: They stimulate the activity of cells responsible for combating infections. Li (2010) demonstrated that regular forest walks increase the activity of Natural Killer (NK) cells, which are crucial for the body's immune system, and their number can increase by as much as 50% after a three-day forest bath.
- Blood pressure regulation: They lower blood pressure, reducing the risk of cardiovascular diseases. Physiological studies have shown a reduction in systolic blood pressure by an average of 4 mmHg and diastolic blood pressure by two mmHg after Shinrin-yoku sessions (Song et al., 2016).
- Stress reduction: They lower cortisol levels (stress hormone), influencing relaxation and emotional balance. In turn, a systematic review by Antonelli, Barbieri, and Donelli (2019) revealed that Shinrin-yoku lowers cortisol levels – the stress hormone – indicating its beneficial role in reducing mental tension; a decrease in cortisol levels by an average of 12-18% was noted (Antonelli et al., 2019; Ochiai et al., 2015).

- Mood improvement: They increase levels of serotonin and dopamine (neurotransmitters responsible for feelings of joy and satisfaction). Shinrin-yoku participants report a 25% increase in vitality (Ochiai et al., 2015).
- Increased concentration ability: They improve focus and reduce distractors.
- Improved sleep quality: They regulate the circadian rhythm and promote deep, regenerative sleep (Garcia & Miralles, 2018; Li, 2013). Participants report an average 30% improvement in sleep quality (Ochiai et al., 2015).

Research conducted mainly in Japan and South Korea confirms the positive impact of Shinrin-yoku (forest bathing) on human health. Li (2010) showed that regular walks in the forest increase the activity of Natural Killer (NK) cells, which are crucial for the body's immune system. Furthermore, a systematic review by Antonelli, Barbieri, and Donelli (2019) revealed that Shinrin-yoku lowers cortisol levels – the stress hormone – indicating its beneficial role in reducing psychological tension. Moreover, Song, Ikei, and Miyazaki (2016) confirmed various physiological benefits resulting from forest bathing, including lowered blood pressure, improved mood, and regulation of heart rate.

Special Gestalt Pedagogy – A Holistic Vision of Development

Special Gestalt Pedagogy is an innovative approach to working with individuals with disabilities, integrating selected elements of Gestalt pedagogy and therapy, Gestalt psychology, and classical special pedagogy (Żłobicki, 2008; Paruzel-Czachura, 2015; Sills et al., 1999; Lob, 2016). At the core of this concept lies a holistic perception of the human being, considering their multidimensionality and close interaction with the environment. The human is understood as a whole, in which physical, emotional, cognitive, social, and spiritual aspects mutually influence each other and cannot be considered in isolation (Godawa, 2017).

In working with children with special educational needs, Special Gestalt Pedagogy emphasizes:

- The natural drive towards homeostasis: Maintaining the body's internal balance.
- Conscious presence "here and now": Experiencing the present moment with full attention. Studies show that 80% of participants in the Gestalt program report an improved awareness of their own body and emotions (Sills et al., 1999).
- Acknowledging the role of the environment in child development: Shaping the environment to support individual needs.
- Functional diagnosis following the child's developmental needs: Identifying and meeting individual developmental needs.
- Functioning in reality and drawing from its natural resources: Utilizing the environment's potential in the development process.
- The organic tendency towards "closing the whole" (Gestalt formation): Striving for fullness and integration of experiences (Żłobicki, 2008).

Forest therapy, based on a holistic approach to human development and a harmonious relationship with nature, represents a promising perspective in special pedagogy. In the context of supporting children with special educational needs, forest therapy offers unique opportunities for stimulating sensory, motor, emotional, and social development in a natural and safe environment. Further research on the effectiveness of this form of therapy in various groups of individuals with disabilities will contribute to the development of knowledge and best practices in the field of special education.

Forest Therapy as Innovative Support for Children with Autism Spectrum Disorder

Contemporary therapeutic paradigms in working with children with Autism Spectrum Disorder (ASD) emphasize a holistic and individualized approach, considering the specific needs of the individual and the heterogeneity of manifested difficulties (Volkmar & Klin, 2005; Lord et al., 2020). Among innovative therapeutic methods, forest therapy merits particular attention, gaining increasing recognition as an effective form of supporting the development of children with ASD (Li, 2010). Research indicates a growing body of evidence confirming the benefits of nature-based interventions for neurodiverse populations (Tillmann et al., 2018).

Forest therapy, based on the concept of "forest bathing" (Shinrin-yoku) (Li, 2010; Park et al., 2010) and forest pedagogy (Bentsen et al., 2010; Knight, 2013), is founded on the premise that immersion in the natural forest environment fosters a deep and personal contact between the child and nature, stimulating their development in multiple dimensions (Bratman et al., 2015; Mygind et al., 2019). Meta-analyses confirm that contact with nature can significantly influence the improvement of cognitive functions and stress reduction in children (McCormick, 2017). In contrast to traditional, structured forms of therapy, forest therapy provides children with a space for free exploration, experience, and learning in a natural, immersive environment (Kaplan, 1995; Chawla, 2015).

Unique Attributes of the Forest Environment

The unique attributes of the forest, such as: reduction of external stimuli (Kaplan, 1995; Ohly et al., 2016), harmony of natural environment bioacoustics (Ulrich, 1984; Alvarsson et al., 2010), minimization of social pressure (Faber Taylor & Kuo, 2009), as well as the richness of natural sensory stimuli (smells, sounds, textures), create optimal conditions for the development of a child with ASD. The subtlety and homeostasis of stimuli emanating from the natural environment, compared to stimuli generated in clinical settings (Van den Berg & Koole, 2006; Jo et al., 2019), promote gradual and spontaneous sensory adaptation, minimizing the risk of sensory overload, especially in children with sensory hypersensitivity (Dunn, 2007; Pfeiffer et al., 2015). It is estimated that up to 90% of children with ASD experience atypical sensory processing (Ben-Sasson et al., 2009). The variability and unpredictability of the forest environment engage the child's sensory systems in a more natural and diversified manner, supporting sensory integration and neurological development (Kuo & Sullivan, 2001). In situ exploration stimulates intrinsic motivation, which is crucial in the therapeutic process for children with ASD who exhibit deficits in engaging in structured activities (Kasari et al., 2001; Schrandt et al., 2009).

Inclusion of the Family in the Therapeutic Process

It is worth emphasizing that forest therapy creates an opportunity to include the family in the therapeutic process. Joint activity in the natural environment strengthens family bonds and allows parents to observe the child in a natural context, which fosters a better understanding of their needs and the development of support strategies in everyday situations (Fewell & Vadasy, 1986; O'Haire, 2013). Meta-analyses of interventions involving parents in therapies for children with ASD indicate an improvement in social and communication skills in children and a reduction in parental stress (Parsons et al., 2017).

In the context of growing interest in forest therapy, questions arise regarding its effectiveness, impact on child development, and the potential for integration with other forms of therapy. Do children participating in forest therapy develop differently? Does the space in which they develop determine their development? How do parents and teachers assess the functioning of this type of support? What is the parents' motivation for choosing this type of therapy for their children? Can forest therapy be combined with psychotherapy and physiotherapy? The answers to these questions will define a research area significant for pedagogical practice, contributing to an interdisciplinary perspective on the rehabilitation and education of students with special educational needs, consistent with the ideas of Special Gestalt Pedagogy, sustainable development, Shinrin-yoku, and the Nature Deficit Disorder concept.

SYNTHESIS OF COMPLEMENTARY THERAPEUTIC INTERVENTIONS

Supporting children with Autism Spectrum Disorder (ASD) necessitates the application of a multidimensional therapeutic paradigm that considers the specific needs of the individual and the heterogeneity of manifested difficulties (Volkmar & Klin, 2005). A fundamental challenge is selecting appropriate intervention methods that optimize the child's development in the emotional, sensorimotor, and cognitive spheres. This comparative analysis focuses on two complementary approaches: Forest Therapy (FT) and Sensory Integration (SI) therapy. Both approaches, despite differing methodological assumptions, constitute a valuable set of tools for working with children with ASD, offering a spectrum of benefits that arise from their synergistic application.

The Role of the Family in the Therapeutic Process

The family plays a crucial role in every child's life, and its significance in the therapeutic process for children with Autism Spectrum Disorder (ASD) is fundamental. The inclusion of the family – understood as parents and caregivers – in the diagnostic process, intervention planning, and therapy itself not only enhances its effectiveness but also promotes the durability of achieved effects and the generalization of newly acquired skills by the child to everyday life situations. In a systemic approach, the family is treated as an integral element of the child's therapeutic environment. Parents are not only the primary observers of the child's behavior but also their closest guides, educators, and caregivers. It is they who daily face the child's challenges and have the opportunity to reinforce therapeutic effects in natural conditions – at home, during play, meals, or routine activities. Their involvement is therefore a prerequisite for the effectiveness and sustainability of therapeutic interventions.

Forest therapy, as a form of support based on activity in the natural environment, offers broad opportunities for family inclusion. Joint participation in sessions – both those led by therapists and those of an educational and integrative nature – fosters the strengthening of family bonds, improvement of relationships, better understanding of the child, and enhancement of parental competen-

cies. By observing the child in a natural context, parents can gain a deeper understanding of their child's sensory needs, patterns of responding to stimuli, and emotion-regulation mechanisms. Additionally, forest therapy provides a space for modeling parental behaviors, learning through observation, and direct experience. Therapists can offer parents guidance on supporting the child, for example, in organizing activities tailored to the child's sensory profile, managing difficult emotions, or facilitating communication. Consequently, the family transforms from a passive recipient of therapeutic recommendations into an active participant in the process of change.

Involving the family in therapy also strengthens their motivation and sense of agency. Parents who witness their child's progress in a natural environment are more inclined to demonstrate commitment and consistency in continuing therapeutic activities in daily life. This, in turn, translates into better therapeutic outcomes and greater emotional stability for both the child and the entire family system. In the context of children with ASD, whose functioning largely depends on environmental consistency and predictability of stimuli, therapeutic actions must extend beyond the clinic – to home, school, and the playground. The family acts as a bridge between therapy and everyday life. Including them in the planning and implementation of forest therapy facilitates the transfer of acquired effects to the child's natural environment, significantly increasing the likelihood of lasting changes. Therefore, it is recommended that every forest therapy program include a module for cooperation with the family, encompassing direct participation in sessions, as well as consultations, workshops, educational materials, or supervision. Only such an approach meets the needs of contemporary special pedagogy and ensures real, long-term support for children with ASD and their families.

Forest Therapy – A Return to Nature

Forest therapy, based on the concept of "forest bathing" – Shinrin-yoku (Li, 2010) and forest pedagogy (Bentsen et al., 2010), is gaining acceptance as a method supporting affective regulation and stress reduction in children with ASD (Bratman et al., 2015). The natural forest environment creates unique conditions conducive to relaxation and emotional self-regulation. Attributes such as the reduction of external stimuli (Kaplan, 1995), the harmony of natural environment bioacoustics (Ulrich, 1984), and the minimization of social pressure (Faber Taylor & Kuo, 2009) create a space where the child can explore the surroundings at their own pace and on their own terms.

Stimuli originating from the natural environment, e.g., the aromas of phytoncides (Song et al., 2016) – volatile organic compounds emitted by plants with bactericidal, fungistatic, and insecticidal properties – the rustling of leaves, the varied texture of the ground (moss, branches, leaf litter), are characterized by subtlety and homeostasis compared to stimuli generated in clinical settings (Van den Berg & Koole, 2006). For children with sensory hypersensitivity, such modulation of stimuli is particularly beneficial, enabling gradual and spontaneous adaptation to stimulation without the risk of sensory overload (Dunn, 2007). In contrast to artificially created therapeutic environments, the forest offers variability and unpredictability, stimulating sensory systems in a more natural and diversified manner. The smells, sounds, textures, and colors of the forest engage the senses of smell, hearing, touch, and sight, supporting sensory integration and neurological development (Kuo & Sullivan, 2001). *In situ* exploration stimulates intrinsic motivation, which is of crucial importance in the therapeutic process for children with ASD, who exhibit deficits in engaging in activities of a structured nature (Kasari et al., 2001). An additional advantage of FT is the opportunity to involve the family in the therapeutic process. Joint activity in the natural environment strengthens family bonds and provides parents with the opportunity to observe the child in a natural context, which fosters a better understanding of their needs and the development of support strategies in everyday situations (Fewell & Vadasy, 1986).

Research indicates that forest therapy can contribute to:

- Reduction of stress and anxiety levels: Spending time in the forest influences the lowering of cortisol levels (stress hormone) in children with ASD (Antonelli et al., 2019).
- Improvement of attention: The natural environment promotes sustained attention and reduces distractions, which is particularly important for children with ASD who often experience concentration difficulties (Taylor et al., 2001).
- Development of social skills: Joint activities in the forest, such as building dens, playing hide-and-seek, or treasure hunting, create natural opportunities for social interaction and the development of communication skills (Thompson et al., 2008).
- Strengthening of self-esteem: Successes in overcoming natural obstacles, such as climbing trees or crossing a stream, reinforce a sense of self-confidence and agency (Chawla, 2007).

Sensory Integration Therapy – Organization of Sensory Experiences

SI therapy is a recognized and empirically validated tool in interventions with children with ASD, especially in the context of sensory processing disorders. This method is based on purposeful and controlled sensory stimulation, tailored to the child's individual sensory profile. SI therapy facilitates systematic work on sensory modulation and the development of adaptive responses, which are crucial for the child's functioning in their environment. Monitoring the child's reactions to stimuli and dynamically adjusting the intensity of stimulation based on the child's current sensory tolerance are significant advantages of this method (Ayres, 1972). The structured nature of SI therapy provides the child with a sense of predictability and stability, which is particularly important for children with ASD, who are characterized by an elevated level of anxiety in new and unpredictable situations (Baron-Cohen, 2009).

SI therapy also encompasses the development of fine and gross motor skills, as well as visual-motor coordination, which translates into improved functioning in daily activities. Various tools and equipment are used within SI therapy, such as:

- Swings: for stimulating the vestibular system, which is responsible for balance and spatial orientation.
- Balance platforms: for practicing balance and motor coordination.
- Therapy balls: for proprioceptive stimulation, i.e., awareness of body position in space.
- Materials with different textures: for tactile stimulation.
- Climbing equipment: for developing gross motor skills and visual-motor coordination.
- Sensory games and toys: for stimulating various senses and developing cognitive skills (Schaaf & Miller, 2015).

Complementarity of Approaches – Synergy of Benefits

A comparative analysis of both approaches indicates their complementary nature. Forest therapy, offering a natural and less structured environment, constitutes a valuable supplement to formal SI sessions. Free exploration and the richness of natural stimuli stimulate motivation to undertake challenges and strengthen emotional self-regulation mechanisms. In turn, elements of structure characteristic of SI can be implemented in FT. The organization of *in situ* sensory activities, such as identifying leaves with different textures and walking on varied surfaces, integrates the benefits of both approaches (Fjørtoft & Sageie, 2000).

Combining forest therapy with SI therapy can bring many benefits to children with ASD:

- Increased therapy effectiveness: Combining different therapeutic methods enables a holistic approach to addressing the child's needs and maximizing the therapeutic effects (Case-Smith & O'Brien, 2010).
- Diversification of therapeutic activities: Introducing elements of forest therapy into SI therapy helps maintain the child's engagement and increase their motivation to participate in sessions (Christiansen & Baum, 2005).
- Generalization of skills: Practicing skills acquired during SI therapy in the natural forest environment promotes their generalization and application in everyday life (Law et al., 1996).

Interdisciplinary Collaboration

In interventions with children with Autism Spectrum Disorder (ASD), numerous studies and systematic literature reviews emphasize the fundamental role of interdisciplinary collaboration among specialists (Green et al., 2010; Reaven & Harris, 2020). This approach, grounded in the analysis of clinical data and therapeutic efficacy, integrates knowledge from psychology (encompassing emotion regulation and behavior modification strategies) with the sensorimotor competencies of physiotherapists and Sensory Integration (SI) therapists (Case-Smith & O'Brien, 2015). Such a holistic understanding of the child's needs is considered crucial for achieving optimal therapeutic outcomes, as confirmed by comprehensive compendia on evidence-based practices in ASD therapy (Straight et al., 2013; Volkmar et al., 2014). Statistical data on the effectiveness of interventions underscore the importance of integrated therapeutic programs.

Collaboration among specialists, in accordance with recommendations based on the analysis of data from numerous therapeutic programs and best practice standards, should encompass processes such as:

- Information exchange about the child: Systematic sharing of observations, diagnostic conclusions, and documentation of therapeutic progress forms the basis for coherent and personalized intervention planning. This is crucial in light of statistical data on the impact of effective communication on therapeutic team outcomes (Reaven & Harris, 2020).

- Joint therapy planning: Developing personalized therapeutic goals and selecting appropriate, empirically validated intervention methods requires consensus and the mutual complementing of perspectives from different disciplines. This is a characteristic feature of effective therapeutic programs for ASD, confirmed in evidence reviews (Straight et al., 2013).
- Collaboration during therapeutic sessions: Mutual support and flexible supplementation of competencies during direct work with the child allow for immediate adaptation of strategies to current needs. Such synergy, observed in efficacy study data, maximizes the effectiveness of each intervention.
- Monitoring the child's progress: Regular, data-driven assessment of therapy effects and the introduction of necessary modifications are essential for ensuring the dynamism and effectiveness of the therapeutic process. This is a standard in best clinical practices and intervention research, enabling continuous improvement of support for the child (Volkmar et al., 2014).

SUPPORTING THE DEVELOPMENT OF A CHILD WITH SPECIAL EDUCATIONAL NEEDS

The issue of supporting the development of a child with special educational needs requires an interdisciplinary approach, as previously discussed. This is facilitated by the implementation of various pedagogical innovations aimed at proposing new, improved solutions that enable personalized treatment and adaptation for children in diverse educational, social, and caregiving environments. This can be achieved by fostering the child's cognitive curiosity, reflectiveness, readiness to generate creative ideas, and courage to take on challenges. The concept of innovation includes novel programmatic, organizational, and methodological solutions that incorporate experiments and other pedagogical methods, in accordance with the Education Law Act of December 14, 2016 (Journal of Laws 2017, item 59, as amended). This enables the development of creativity and entrepreneurship, both in addressing one's own needs and in identifying opportunities for collaboration with others, such as through peer tutoring.

Given the multifaceted nature of cooperation and forms of support for children on the autism spectrum and their social environment, it is essential to introduce mixed innovations—those involving changes both in lesson organization and in the use of didactic tools and materials—which contribute to effective educational outcomes, as evidenced during the validation phase. Based on research conducted by Lachowicz (2023) from the Educational Research Institute, commissioned by the Ministry of National Education, innovations can be categorized as follows: micro-innovations, concerning modifications to selected classes or students in a specific group; meso-innovations, which adapt the diverse educational needs of students to a specific curriculum or subject area; macro-innovations, which entail systemic changes at the level of the entire education system or educational policy, aimed at implementing inclusive education. Such systemic changes are possible through the integration of stakeholders from the pedagogical, social, economic, and family policy sectors—at regional, national, or international levels. Today, inclusive education should replace traditional desk-bound practices with outdoor education approaches, such as forest-based learning (Tarwacki, 2015).

Due to the need for modern solutions that meet the needs of all education recipients, it is vital to implement innovations that adjust and reinforce practices in a way that minimizes discouragement and enhances motivation. In inclusive education, the integration of teaching processes by all educators, parents, special educators, physiotherapists, and medical professionals involved in therapy is crucial. This collaborative effort aims to consolidate outcomes as a systemic action within the framework of transformational pedagogy (Szczepkowska, 2019). Inclusion refers to the integration of individuals with disabilities into society without forming separate groups. As highlighted by Mittler (2000), the effectiveness of social integration can be measured by the coherence of expectations, assessment procedures, and the customization of support in teaching and learning. Such goals can be achieved in forest environments, where sensory stimuli are individually regulated. Moreover, the success of therapy and support for students on the autism spectrum depends heavily on the atmosphere, which should be conducive to achieving values and goals aligned with Shinrin-yoku, the Japanese practice of "forest bathing," as discussed earlier in the article.

Supporting students in the educational environment can also occur through formative assessment, which includes criteria such as success indicators, progress monitoring, opportunities for student reflection, and written feedback. Additionally, reinforcing the synthesis of information and using mnemonic techniques—such as mind maps, mini-projects, and motivating questions—is essential for improving student motivation (Szczepkowska, 2019).

METHODOLOGY

This paper adopts a qualitative research paradigm, motivated by the need to understand educational and social phenomena within their natural contexts deeply. Qualitative research enables the interpretation of meanings attributed to experienced practices and pedagogical changes by participants, especially in the context of inclusive education and pedagogical innovations implemented in schools. This approach is particularly useful for analyzing activities carried out under the "Accessible School" project, as it enables the capture of the multidimensional nature of organizational, methodological, and social changes.

As Denzin and Lincoln (2009) emphasize, qualitative research focuses on processes, relationships, and socio-cultural contexts, aiming to reconstruct the subjective world of individuals and groups. A key element of such research is the analysis of documents, including reports, educational projects, and best practice case studies—recognized as existing data—which helps explore the strategies behind implementing school innovations.

This study employed documentary analysis, drawing on the frameworks of Krippendorff (2013) and Bogdan & Biklen (2007), to identify key patterns, narratives, and institutional messages. The analysis included project documentation from the "Accessible School" program, pedagogical innovation proposals submitted to regional school boards, and educational inclusion-related publications. This method helped highlight both systemic conditions and grassroots examples of transformative educational efforts.

Methodologically, the research aligns with critical and participatory pedagogy, emphasizing the involvement of local communities—teachers, parents, and students—in educational change processes. The goal was not merely to describe phenomena but to formulate recommendations to improve inclusive education, accessibility, and pedagogical innovation practices.

Analysis of Good Practices and the "Accessible School" Program

An analysis of documents reflecting good practices in supporting educational, family, caregiving, and school environments highlights the nationwide, free program titled "Accessible School", which aims to make educational institutions more accessible to individuals with special and diverse needs, in accordance with the principles of universal design. Thanks to this model, the school becomes a welcoming space for children, parents, teachers, and other members of the local community—regardless of their individual requirements. The program supports the adaptation of architectural and information-communication standards, as well as modifications to the didactic process (Dostępna Szkoła, 2023).

A review of these documents reveals several practical improvements implemented in Polish educational institutions, e.g. i) in Primary School No. 8 in Wejherowo, a clearly marked route to an accessible entrance was created, and the height of curbs was lowered; ii) in the Special School Complex in Wieluń, the administrative office was equipped with a portable induction loop for individuals with hearing impairments; iii) in Primary Schools in Chmielno and Dobrzeń, corridors were equipped with tactile signs and typhlographic plans to support both visual and tactile literacy, and iv) in Primary School No. 2 in Opoczno, the walls were painted in a toned-down, differentiated color scheme, suited to the needs of students with concentration difficulties and autism spectrum disorders. This initiative aimed to assist with orientation across different building levels. Additionally, vertical wall markings were introduced to highlight door handle locations, and dangerous corridor corners were visually distinguished to enhance safety (Cabała et al., 2021).

These examples illustrate the vast array of support strategies necessary for fostering social inclusion and promoting the development of children, youth, and adults with diverse educational needs.

Pedagogical Innovations in Practice

Another confirmation of the effectiveness of tailored, nature-connected educational solutions comes from initiatives submitted to the Boards of Education in Poland. Several school-based pedagogical innovations embrace experiential learning and interdisciplinary approaches.

At Primary School No. 2 in Jastrzębia, teachers combined elements of environmental, social, and cultural education in the innovation titled "Little Explorers". In this program, students are encouraged to explore, discover, and investigate through direct experience. Real-time interaction with natural and social surroundings fosters appreciation for environmental and geographical diversity while stimulating students' natural curiosity. The program also promotes physical activity as a form of active recreation. It is compulsory for students in grades 1–3 and optional for older students.

Another noteworthy example is the initiative titled "Quiet and Relaxation Zone", aimed at students in grades IV–VIII and highly sensitive children. This project creates dedicated spaces for calming down during

breaks, reducing noise, and selecting personalized coping strategies to manage sensory overload. It also promotes social integration and helps students gain experience in emotional regulation during peer interactions. The innovation supports the development of tolerance, empathy, and self-awareness, enabling students to recognize how noise and chaos impact learning in relation to their nervous system needs (Kurpatwa, 2024).

At the same school, attention was also given to the need for regular "Forest Meditations"—another initiative submitted under the category of outdoor pedagogy. Educators focused on organizational and methodological innovations to foster environmental stewardship, sensitivity to nature, and the integration of mindfulness training with meditation in natural settings. This initiative led to improvements in students' concentration, stress reduction, and experiences of psychological and physical support, adapted to their individual developmental needs. Students reported improved well-being thanks to multi-sensory stimulation, which contributed to the formation of new neural connections.

This practice demonstrates the value of personalized and reflective approaches, including supporting students in self-awareness—understanding one's body, needs, emotions, and thoughts—while being immersed in natural stimuli. During forest activities, teachers also supported students in strengthening muscles and building physical resilience, following recommendations from physiotherapists working with special educators (Brzeska & Sławianowska, 2024).

Supporting student well-being and mental health within inclusive education, as well as developing the ability to work in diverse classroom teams, has been recognized as a key policy direction for the 2024/2025 academic year by the Polish Ministry of National Education (Ministerstwo Edukacji Narodowej, 2024). In this context, further qualitative research was conducted using document analysis, reaffirming the ongoing need to develop new models of support and best practices that strengthen dialogue, integration, and intergenerational responsibility.

CONCLUSIONS

Supporting student well-being and mental health within inclusive education, as well as developing the ability to work in diverse classroom teams, has been recognized as a key policy direction for the 2024/2025 academic year by the Polish Ministry of National Education (Ministerstwo Edukacji Narodowej, 2024). In this context, further qualitative research was conducted using document analysis, reaffirming the ongoing need to develop new models of support and best practices that strengthen dialogue, integration, and intergenerational responsibility/

The conducted analysis suggests that both FT (Forest Therapy) and SI (Sensory Integration) are valuable methods in working with children with ASD, and their synergistic combination generates unique benefits. Interdisciplinary collaboration optimizes the adaptation of interventions to the individual needs of the child and maximizes therapeutic efficacy. Future research should focus on identifying best practices for integrating both approaches and evaluating their long-term effects. Working with children with ASD requires flexibility, creativity, and openness to various therapeutic modalities. The inclusion of the family in the therapeutic process and the utilization of the natural environment's potential enhance intervention effectiveness, supporting the adaptation of children with ASD to the challenges of daily functioning.

The necessity for further research into the integration of forest therapy and Sensory Integration (SI) therapy stems from the growing interest in holistic approaches in working with children with Autism Spectrum Disorder (ASD). A randomized repeated-measures design appears to be the most adequate and realistic approach for verifying the long-term effects of this combined therapy.

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