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THE OLFACTOR THERAPY METHOD IN THE FIELD OF PEDAGOGICAL SCIENCES: IN NEURODIDACTICS, SPECIAL PEDAGOGY AND SPEECH THERAPY*

Introduction: The pedagogical field in this article refers to neurodidactics, special pedagogy, and speech therapy. In this fields there are searches for newer and newer methods of therapy aimed at supporting development, searching for new methods of teaching, leveling disorders or meeting the special educational needs of people with disabilities.

Research Aim: The characteristics of Agnieszka Hamerlińska's proprietary Olfactor Therapy Method, which originated at the base of neurodidactics and can be used in the pedagogical space, will be described.

Evidence-based Facts: To date, the use of the sense of smell in ongoing therapeutic-compensatory activities has received fairly little attention.

Summary: The Olfactor Therapy Method is a proprietary, innovative method that can be used in the pedagogical field: in special education and speech therapy as well as in other social sciences, such as psychology. The method primarily uses the sense of smell to enhance cognitive functions (memory, verbal fluency, speech), improve physical, emotional and social functioning of a person. Fundamental to the method is a novel olfactory stimulation device, the Olfactor, which is an essential invention for making diagnoses and therapeutic techniques. The Olfactor Therapy Method includes its three main components: educational, diagnostic and therapeutic. The method is aimed at people at any stage of life and with various disabilities (e.g. for children with intellectual disabilities; children with delayed speech development; children with special educational needs; for people with memory disorders – with Alzheimer's disease).

Keywords: Olfactor Therapy Method, device, neurodidactics, special education, speech therapy

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INTRODUCTION

Recent years in the social sciences have clearly indicated the necessity of combining everyday human functioning with a biological approach strictly related to brain anatomy and neurophysiology. Pedagogy, too, seeking contemporary theories about learning and teaching, has begun to open up to new lines of research, including neurodidactics (Juszczuk, 2012; Żylińska, 2013; Chojak, 2020). The founder of neurodidactics is considered to be Gerhard Preiss, who in 1988, recognized that pedagogy and didactics should appreciate the role of the brain in learning (Juszczuk, 2012, p. 46). Different structures of the central nervous system that work together are responsible for learning processes (Petlak, 2012, p. 62). According to Klus-Stańska (2018), neurodidactics is included in the group of objectivist paradigms, and among them, neurodidactics deals with learning, while the others deal with teaching.

The pedagogical field in this article refers to special pedagogy and speech therapy, for which neurodidactics is of significant importance. So far, quite rarely has attention been paid to the description of the sense of smell in the aforementioned sub-disciplines of pedagogy and, consequently, in the therapeutic-compensatory activities carried out. Perhaps this is related to the very approach to the subject of smell and its role in human life, which lasted for many years – it was believed that smell is of little importance to the average healthy person (Czerniawska and Czerniawska-Far, 2009, p. 12). When writing about the senses, even in textbooks on human physiology (Górski, 2010), the main focus is on sight and hearing. And yet, as Czerniawska and Czerniawska-Far (2009, p. 13) note, olfactory signals have advantages over visual and auditory signals because they can be delivered in the dark and in water, can be received in sleep, and can be received easily without concentrated attention, involuntarily or even unconsciously.

Interest in the issue of smell in the medical, social sciences (psychology, pedagogy, speech therapy) in particular began in 2004. At that time, Richard Axel and Linda Buck were awarded the Nobel Prize in Physiology or Medicine for their first research on the basis of odor recognition and memory (Rapiejko, 2006). Buck and Axel used the workshop of molecular biology to understand the organization of neural pathways carrying olfactory information from neurons with specific odorant receptors to higher levels of the brain (Skangiel-Kramska and Rogozińska, 2005; Hamerlińska, 2023).

In the pedagogical field there are searches for newer and newer methods of therapy aimed at supporting development, leveling disorders or meeting the special educational needs of people with disabilities. Against this background, the Olfactor Therapy Method has developed.

RESEARCH AIM AND QUESTION

This article will describe the characteristics of Agnieszka Hamerlińska's Olfactor Therapy Method. This is a method, in which the most important role is played by smell. The name of the method is associated with the creation in 2023 of an innovative device for diagnosing and conducting therapeutic techniques – the Olfactor.

EVIDENCE-BASED REVIEW

To begin this subsection, before explaining the connection of the unique relationship: “smell and pedagogy” (hereafter, neurodidactics), it would be appropriate to explain the anatomical and physiological aspects of smell.

The olfactory organ is located in the upper part of the nasal cavity (Sadowski, 2001). At least four different systems can be involved in the perception and transmission of olfactory signals: (main) olfactory system, trigeminal system, accessory olfactory system and terminal nerve. The olfactory system is the corresponding system for sensing volatile substances. Its function in human perception of non-odorous and non-volatile substances is unclear. The trigeminal system is responsible for the perception of cold, astringent or burning sensations, and the accessory olfactory system is responsible for the perception of pheromones (Stockhorst and Pietrowsky, 2004, p. 3). The first olfactory processing site is the olfactory bulb (Mydlikowska-Śmigórska et al., 2019). The second such site in the olfactory processing pathway is the primary olfactory cortex. The centers that make up the primary olfactory cortex have the largest number of connections to the olfactory bulb (Brunjes et al., 2005; Mydlikowska-Śmigórska et al., 2019).

When discussing the anatomy of the cerebrum, it is worth explaining the term “limbic system” (formerly called the “olfactory brain”), which is very much related to the sense of smell. It is a set of mammalian brain structures that regulate emotional and urge behavior. The limbic system includes: the olfactory bulb, an area of the olfactory cortex, the cingulate gyrus, the hippocampus, and subcortical structures, namely: the septum, the amygdala, part of the accumbens nucleus, and some nuclei of the thalamus and hypothalamus (Śmiałowska, 2009, p. 21). Brain neurophysiology shows that in learning, the onset of task performance is a key moment – this is when the limbic system decides to release neurotransmitters and initiate the learning process (Żylińska, 2013, p. 52). The axons of the olfactory cells terminate in synapses in the olfactory bulb, and from there they travel to the olfactory brain responsible for: receiving olfactory impressions, building memory traces, partially regulating the processes of wakefulness and sleep, and controlling emotions (Cieszyńska-Rożek, 2013). The aforementioned hippocampus is responsible for spatial orientation and learning new facts (Żylińska, 2013).

The baby comes into the world with the ability to distinguish pleasant from unpleasant odors and components of mixtures (Kornas-Biela, 2001). In an infant, the following are perceived: the ability to discriminate between odors, odor preferences, and odor recognition through, for example, motor responses like turning the head (Brzezińska et al., 2008). Differentiation of olfactory sensations occurs from about 3 years of age. Children at the age of 5–6 can already recognize odors and define their olfactory preferences (Odowska-Szlachcic, 2010). Full olfactory performance can be expected in children at the age of 7–8, but optimal sensitivity to aromas occurs in adolescence. Peak olfactory functioning occurs between the ages of 20–40 (Kovács et al., 1999). It is also worth noting that in the period after the age of 50, sensitivity to odorants gradually deteriorates (Bojarowicz et al., 2016, p. 155; Hamerlińska, 2019, 2023).

The role of smell is divided into basic and higher functions. Basic functions include sensing the aroma in the environment and indicating the intensity of the substance that is the source of the odor. In turn, higher tasks include distinguishing, identifying, remembering and integrating different aromas allowing the creation of new odorants (Rapiejko, 2006; Hamerlińska, 2023). Conscious perception of odorants is associated with the activation of higher cortical centers, where the emotional and motivational element that often accompanies odor impressions results from the function of the limbic system (Rapiejko, 2006; Hamerlińska, 2023). It has also been shown that smell, in addition to its typical roles, provides information that seemingly have nothing to do with it (Potargowicz, 2008; Hamerlińska, 2023).

The scientific literature increasingly recognizes the appreciation of smell in the context of, among other things, learning, thinking and everyday human functioning. Today, it is no longer possible to separate pedagogy from modern neurodidactics, which uses knowledge of the structure and functioning of the brain. Neurodidactics is “a new discipline that, based on brain research, aims to create new pedagogical concepts, and initiates the search for an educational system that is friendly to the brain and makes better use of its strengths” (Żylińska, 2013, p. 14). An attribute of the human mind is the ability to perform information selection (regardless of the source of information) and the ability to integrate it (Hankała, 1993, p. 92). The purpose of the following part of the article is to introduce the topic of smell in the pedagogical field. Therefore, here the focus will be on the connection of neurodidactics with smell and its role in cognitive processes and behavior.

The most important seems to be the explanation of the connection between smell and the process of learning and remembering. As has been pointed out earlier, the limbic system is responsible for the learning and memory process in the brain. This structure is directly linked to the sense of smell. Therefore, the following two theses would have to be made:

1. Stimulating the brain with smells can promote learning and memory.

2. Lack of smell or olfactory disorders can contribute to delayed learning and memory.

According to Sullivan and her team (2015), due to the interaction of smell with the limbic system and areas of the upper cortex, the stimulation of specific olfactory receptors promotes different emotional responses, pleasant or unpleasant, creating a long latency olfactory memory.

At this point, it is worth citing the concept of olfactory memory and the Proust effect, which are very much related. It turns out that "olfactory memory is unique, different and independent from memory in terms of other modalities" (Łukaszewicz and Czerniawska, 2005, p. 69). Memories recalled through smells have a stronger emotional saturation. The Proust effect is characterized by the ability to recall past memories through smelled aromas, which exemplifies the implication of the compatibility of the conditions of remembering and recalling (Łukaszewicz and Czerniawska, 2005; Hamerlińska, 2023).

Regarding thesis one: Many studies have found that naming smells increases memory achievement (Czerniawska and Czerniawska-Far, 2009). Schab (1991) conducted research on the relationship of smell to semantic-episodic memory and latent and explicit memory. In addition, he pointed to the role of olfactory training providing cognitive benefits. A 1997 study led by Bende and Nordin found that kippers generally performed better, for example, in distinguishing odors, but did not show higher than average olfactory sensitivity. The kippers did not show more general interest in olfactory traits than the control group. They appeared to have higher skills due to olfactory training (Bende and Nordin, 1997). Oleszkiewicz et al. (2022) described the results of an experiment among 55 people (28 women and 26 men) with olfactory disorders, who were subjected to olfactory training for a period of three months (one group – standard training twice a day, and the other group – intensive training four times a day). A semantic verbal fluency test was performed before and after the training. It was proven that the training has effects on sensing odors and improving verbal fluency. Moreover, there is a link between the role of the olfactory system and the quality of social interaction (Stockhorst and Pietrowsky, 2004). It is widely accepted that the intensity of emotions increases with the strength of the stimulus (de Groot et al., 2021).

Regarding the second thesis: It has long been known that there is a connection between memory and smell (Herz and Engen, 1996), and that loss of smell severely disrupts memory (Wilson and Stevenson, 2003). An example of this is a study conducted by Lehrner et al. in 1999, in which they examined 137 people between the ages of 4 and 90. The goal was to examine olfactory threshold, odor identification, consistency of label use and their relationship to odor memory in the context of semantic/episodic memory over a person's lifetime. The researchers found that children's olfactory sensitivity was well developed, although their odor naming and odor memory were weaker than adults. In the elderly population, olfactory

function gradually deteriorated, most notably in memory and odor identification. As Novakova et al. (2018) note, children's olfactory abilities mature as they grow up, but this is most likely due to increasing experience with odors and improving language skills, expanding working memory, improving recognition memory, changes in nasal aerodynamics and more effective inhalation of odor stimuli, rather than age itself (Novakova et al., 2018, p. 1).

Recently, there have been a number of scientific publications regarding olfactory loss and resulting deterioration of quality of life in people after COVID-19 (Walker et al., 2020; Coelho et al., 2021; Pieniak et al., 2022). There has been a shift of interest toward olfactory training, a non-pharmacological intervention involving systematic sniffing of a set of odoriferous substances, already described in 2009 by Hummel and collaborators. From the description of olfactory training, it appears that it targets people with hyposmia and anosmia due to a viral infection or mild head injury. The process of olfactory therapy involves repeated presentation of different odors through the nose to stimulate the olfactory system and consolidate its olfactory memory. It is best to start with at least four different scents (preferably the ones you remember best). The most recommended scents are rose (floral), lemon (fruity), clove (spicy) and eucalyptus (resinous). Each scent should be sniffed for 10 to 20 seconds at least once or twice a day. While sniffing, it is important to stay focused on the task at hand. After each scent, take a few breaths and then move on to the next scent. It is recommended to repeat this activity for at least 12 weeks (three months) (Hummel et al., 2009). Olfactory therapy is believed to work as a combination of the unique ability of the olfactory nerves to regenerate with improved brain connectivity (Hummel et al., 2009; Hamerlińska, 2023).

So far, looking for information on the use of smell in pedagogy, in the practical aspect as well, i.e. special pedagogy and speech therapy, one finds the most connections with aromatherapy. "Aromatherapy refers to the use of essential oils prepared from plants with the intention of improving health, maintaining health balance and wellbeing" (Walters, 2001, p. 8). According to Regner (2019), aromatherapy involves introducing essential oils into the body through the skin or respiratory tract by sniffing, inhalation and inhaling. Essential oils are extracts primarily from different parts of plants that are highly concentrated. Performing exercises related to providing multiple olfactory sensations provides an excellent opportunity to develop verbal memory and speech in children with developmental disorders and adults with certain disabilities. Massaging with essential oils stimulates not only the sense of smell, but receptors throughout the body, including the limbic system (Rumińska, 1973; Regner, 2019). According to Czerniawska and Czerniawska-Far (2009), using essential oils for therapeutic purposes can be effective, but under certain conditions. According to the authors, it is necessary to take into account a very important factor, which is the

attitude of the person being treated; it is undeniable that scents affect mood and the perception of pain. At the same time, the authors believe that it is difficult to find reliable scientific research on the effectiveness of aromatherapy, so, it should be approached with great caution, observing the reactions of one's body and the other person.

The importance of smell has also been written about in the context of the sensory integration method widely used with children with disabilities (Odowska-Szlachcic, 2010, p. 44). As part of sensory integration therapy, olfactory tasks can be conducted, especially with younger children. Two to four smells should be used during one session. What is more – the therapy should always end with a pleasant scent. A container of odorant should be passed directly under the nose for 3–6 seconds (Odowska-Szlachcic, 2010).

In speech therapy, too, one can find data on the use of olfactory training in therapy in particular in the context of people after laryngectomy (Hamerlińska, 2019; Hamerlińska, 2023). In 2000, Hilgers emphasized that comprehensive rehabilitation of people after laryngectomy should consist of respiratory, gustatory and olfactory rehabilitation. The so-called olfactory maneuver was introduced, which allowed laryngectomized people to effectively enhance their sense of smell (Hilgers, 2002; Risberg-Berlin et al., 2007; Longobardi et al., 2022).

The above-mentioned examples are proof that in the scientific literature and in therapeutic practice the subject of smell is present, although it is little appreciated and used. There should be a growing awareness among psychologists, educators, neurodidacticians, and speech therapists about the function of the sense of smell in human daily life and about the possibilities of improving, stimulating olfactory conditioning in the process of learning and memorization.

ABOUT THE OLFACTOR THERAPY METHOD – THEORETICAL BACKGROUND AND CHARACTERISTICS

Methodos from the Greek means “way”, “study”. According to Okoń (1998, p. 230), in pedagogical research, “a method is a system of purposeful activities and means for performing a given task or solving a specific problem. A given system of procedure consists of mental and practical activities, appropriately selected and performed in a specific order”. According to Cieszyńska-Rożek (2013, p. 108), the therapeutic method should be understood as the result of combining two aspects: research (scientific) and therapeutic (pragmatic). In addition, the author points out that the therapeutic method is the adopted philosophical conception of human being, the ways of researching knowledge (about normal development and its disorders) and conceptual representation of it; the ways of diagnostic, stimulating and corrective actions. The method as a system must have a coherent scientific

theory and, on its basis, constructed techniques for research and therapy, as well as measured effects of its application. Each method develops techniques to diagnose and guide stimulation.

Bereźnicki (2007, p. 79) unequivocally stated that organizing the learning process is based on organizing students' work in such a way that they have access to reality through active perception, independent thinking and action, and not only through the assimilation of ready-made content. What is more – the complex and multi-activity nature of learning requires multiple methods of education in their interconnection and orientation. By educational method, Bereźnicki (2007, p. 80) understands a purposeful, conscious and systematic way of working with students, enabling them to achieve their educational goals, and consisting mainly in directing the learning process. Klus-Stańska (2018), writing that neurodidactics focuses on learning, mentioned that there are two goals of neurodidactics: increasing the effectiveness of teaching and better understanding of learning. The idea behind the Olfactor Therapy Method, which is being created, is primarily to increase the learning effectiveness of people with various deficits or developmental difficulties.

The theoretical background for the Olfactor Therapy Method is the theory of biopsychosocial human development and the neurodidactic approach of teaching through multisensory brain stimulation. According to Odowska-Szlachcic (2010), providing multiple stimuli to the central nervous system is the most effective way to compensate for or reduce dysfunctions in development. According to Żylińska (2013, p. 16), good educational research should deal with the stage at which knowledge is created, which means that attention should not be focused primarily on didactic measurement-effects of education, but on the course of the learning process.

In neurodidactics, the concept of sensory modality emerges – this is the module within which stimuli of a specific category are received and processed. This is a reference, as Juszczyk (2012) points out, to Gardner's (2002) theory of multiple intelligences. The surrounding reality during learning is perceived through different sensory channels. There are four types of modality: visual, auditory, kinesthetic and tactile (sensory) (Juszczyk, 2012). Analyzing the previously presented scientific evidence on the role of smell in the learning and memory process, it would be appropriate to introduce the concept of olfactory modality as well, according to which it is the sense of smell that can be an important sense that helps learn and explore the world. Czerniawska and Czerniawska-Far (2009, p. 11) emphasize that humans learn about the world through many senses. Indeed, the authors emphasize that sight and hearing hold center stage, but the others (including smell, taste, and touch) are equally important.

The history of Hamerlińska's Olfactor Therapy Method at this point is not long. The beginning of the development of the method is associated with the conduct of an experiment by Hamerlińska (2019) among people after total laryngectomy. As

part of this study, it was presented that people after laryngectomy have hyposmia, meaning olfactory disorders, and are in the need of learning an alternative method of applying odors into the nose, or the so-called olfactory maneuvers. The use of these maneuvers somehow restored the sensation of odors, but still – odorants were not always felt and recognized.

Considering the difficulties of people who have had their larynx removed, Hamerlińska undertook the challenge of creating a device to diagnose and stimulate the sense of smell in people after total laryngectomy. After receiving a grant from the Nicolaus Copernicus University in Toruń's Innovation Incubator in 2022, an invention called "Olfactor" was created over the course of two years. In turn, in 2023, the researcher had the opportunity to make a consulting visit to a center for research on the role of smell in human life at the Universitätsklinikum Carl Gustav Carus, Klinik und Poliklinik für Hals-, Nasen- und Ohrenheilkunde in Dresden, Germany.

The Olfactor Therapy Method is a proprietary innovative method that can be used in the pedagogical field: in special pedagogy and speech therapy as well as in other social sciences, such as psychology. The method primarily uses the sense of smell to improve cognitive functions (memory, verbal fluency, speech), improve physical, emotional and social functioning of a person. Fundamental to the method is the olfactory stimulation device – Olfactor, which is an essential invention in this method for making diagnoses and therapeutic techniques.

In the description of the device one can find its following characteristics:

The olfactory stimulation device works by forcing a stream of air containing microparticles of odorant into the nasal chamber simultaneously through both nasal orifices. The purpose of the invention is to enhance the response of the olfactory receptors by aspirating the odorant and applying the odorant to the nasal cavity so that, as a result of stimulation of the olfactory epithelium, the odorant effectively reaches the olfactory center in the olfactory brain. The essence of the olfactory sense stimulation device is that it contains:

1. The chamber into which the fragrance material is inserted,
2. Air supply ducts containing microparticles of the fragrance substance,
3. Apparatus for ejecting aromatized air (mechanism or rubber pear).

The part with odor distribution channels and nasal tips are made of silicone or polyethylene terephthalate (PET). It is worthwhile that the absorbent material (which is placed in the chamber) is a sponge made of porous polyurethane. The device is simple to use, as the operation of this invention is based on direct injection of the scent into the nasal cavity. The device is non-invasive. With the ability to disconnect the individual components and wash them – they are reusable. Thanks to the invention, it is possible to smell solid, gaseous, liquid and loose products. (Hamerlińska, 2023, pp. 92–93)

Photo 1.

Olfactor– olfactory stimulation device

Source: Author's own resources.

The Olfactor Therapy Method consists of its three main components: part one – educational, part two – diagnostic and part three – therapeutic. The following teaching methods are used in the Olfactor Method: administering, problem-solving and practical. **The administering method** relates to the first part-educational, involves promoting knowledge among specialists, teachers, and parents about the

role of smell in human life and raising awareness over the inclusion of olfactory training in the therapeutic process of people with disabilities. This part includes the following topics:

1. Anatomy and function of the olfactory organ
2. Functions of smell in everyday life
3. Olfactory disorders
4. Diagnosis of olfactory disorders
5. Smell and hyposmia and selected cognitive disorders
6. Olfactory disability
7. Therapy of olfactory disorders

The problem method is associated with diagnosis. In the literature, there are several types of tasks for measuring smell and olfactory memory:

- test of olfactory sensitivity thresholds – checking at what lowest concentration of an odor the test subject smells it,
- testing the ability to identify aromas,
- assessing the ability to differentiate between odors,
- odor recognition – the subject's indication of whether or not he or she has had previous contact with a particular odor (it is not always necessary to name the odor) (Czerniawska and Czerniawska-Far, 2009, p. 58).

Within the described Therapy Method – the Olfactor device is used in the diagnosis. The purpose of the diagnosis is:

- assessing the ability to smell,
- assessing the ability to identify odors,
- assessing the ability to name odors.

The evaluation of the ability to smell involves performing diagnostic tests with the device. The test person is given six different aromas and two unscented sponges for 15 seconds each. The order of applying the aromas is as follows: orange aroma, mint aroma, unscented sponge, coffee aroma, rose aroma, unscented sponge, chocolate aroma, banana aroma. The subject's task is to answer if he or she can smell the aroma.

The assessment of the ability to identify odors involves placing illustrations of the following in front of the test person: orange, mint, coffee, rose, chocolate and banana. The person is then applied the aromas in the following order: orange, mint, coffee, orange, chocolate, banana, rose and coffee. The subject's task is to point to the illustration or name the aroma he or she smells.

The assessment of the ability to name odors involves the test person being applied aromas in the following order: orange, mint, coffee, orange, chocolate, banana, rose and coffee. The test person names the applied fragrances using the names on the list (without the support of illustrations).

The practical method is related to the therapeutic part and consists of ten different techniques: identification, naming, memorization, exclusion, inclusion, cat-

egorization, association, and following. The last two techniques are olfactory-emotional training and olfactory self-training (Table 1). It is worth mentioning here an article by Marciniak-Firadza (2021), in which the author described that olfactory therapy can include stimulation of the sense of smell by performing various exercises, such as: stimulating the sense of smell with different aromas; differentiating odorants; guessing and naming odorants; exercises in recognizing the intensity of odorants; looking for sources of odorants; and improving olfactory memory.

Table 1.
Olfactor Therapy Method – techniques used

| No. | Name of the technique | Implementation |
|-----|--------------------------|--|
| 1 | Identification technique | The participant sees illustrations in front of him (e.g. coffee, fish, cinnamon, curry, strawberry, grass). He is given a desired aroma using Olfactor – application time up to 15 seconds. The participant's task is to indicate with the help of the picture the aroma he or she smells.* |
| 2 | Naming technique | First, a list with the names of the fragrances is read out. Then the participant will have 6 fragrances applied. After the application of one fragrance lasting up to 15 seconds using the device – the participant's task is to give the name of the fragrance.* |
| 3 | Memorization technique | The therapist tells the participant what scents he will apply to him. He or she starts by giving two and asks the participant to name them. He or she slowly increases the number of aromas and, after the application, asks the participant which aromas were applied. Ideally, the participant should name in the same order as the scents were applied. The exercise is performed until participant's first wrong answer. |
| 4 | Exclusion technique | The therapist applies three aromas – two the same and one different (e.g. coffee, orange, coffee) – to the participant using Olfactor. The participant's task is to answer the question: which one is different? Application time is 5 seconds per aroma. |
| 5 | Inclusion technique | The therapist applies three aromas – two the same and one different – to the participant using Olfactor. The participant's task is to answer the question: which are the same? Application time is 5 seconds per aroma. |
| 6 | Categorization technique | The therapist presents the participant with categories of scents, e.g. fruits and spices. Using an Olfactor, he or she applies the fragrance to the participant (up to 5 seconds). The participant's task is to indicate the fragrance category. |
| 7 | Association technique | The therapist applies a scent (up to 15 seconds) to the participant using the device. The participant's task is to give as many associations/memories as possible with the applied scent. |
| 8 | Following technique | The therapist gives the participant the name of the aroma. The participant's task is to find that aroma among 10 fragrances. |

| | | |
|----|------------------------------|---|
| 9 | Olfactory-emotional training | The therapist applies a scent (such as garlic) to the participant. The participant's task is to determine to what extent this smell is pleasant for him or her. Then, the participant names the emotions that the smell evokes in him or her. |
| 10 | Olfactory self-training | This technique is performed by the participant himself – a technique aimed at people with, for example, olfactory hypersensitivity or food selectivity. The participant chooses scents that are pleasant and unpleasant to him or her. On a single day, using the device, the participant applies to himself or herself several times a day the unpleasant scent. At the beginning, the application may last from 1 to 2 seconds, at the very end up to 10 seconds. During the process, the participant thinks about the application of this smell in practice, e.g. he or she names a person who likes this smell, lists things, situations (preferably positive) with which this smell is associated. The next day the participant repeats the exercise, but with a pleasant smell. |

*The therapist records the results, when the participant identifies 4 odors correctly – another 6 odors can be selected. During one meeting, the number of odors should not exceed 3 series.

Source: Author's own study.

The goals of the therapeutic part of the Olfactor Therapy Method include:

- vocabulary development,
- improving verbal fluency,
- improving the condition of fresh and long-term memory,
- improving attention span,
- developing/training storytelling speech,
- improving emotional mood,
- increasing cognitive curiosity.

The Olfactor Therapy method is based on exercises leading to the acquisition of knowledge of brain anatomy and function using the sense of smell. The duration of one session should last no more than 45 minutes, with a frequency of once a week, preferably for a period of three months. After this period, it is advisable to perform reexaminations of individual cognitive functions to verify the effects achieved. Possible limitations to the use of the method should also be pointed out. It should certainly not be applied to people who do not want to use scents in their therapeutic process. Moreover, one should also be cautious with its use for people with epilepsy or schizophrenia. People with olfactory hypersensitivity will also certainly need more time in adapting when using the techniques. It is necessary to listen to the patient or student, not to impose on them the need to smell a particular aroma. The method should be used by specialists trained in it.

SUMMARY AND CONCLUSION

Pedagogy, as a science of learning, can draw a great deal from neurodidactics. Neurodidactics treats the brain as a unique organ, thanks to which a person can learn more efficiently (Petlak, 2012, p. 64). As Żylińska (2013, p. 20) points out, the role of neuropedagogues is to develop specific educational solutions and test them in school surroundings. Guided by these words, it is worth considering the dissemination of the Olfactor Therapy Method in the pedagogical field, especially in special pedagogy and speech therapy.

The Olfactor Therapy Method is aimed at people at all stages of life and with various disabilities. The role of smell in strengthening the condition of cognitive functions seems to be undeniable. Olfactory signals are important stimuli that influence communication and social interaction. For example, children and adults with autism spectrum often have hyperosmia, or olfactory hypersensitivity. In that case, the presence of unfamiliar odors can trigger undesirable behaviors. Unpleasant odors on the other hand cause an increase in the fright reflex. That is, when a stimulus triggers fear, the presence of an unpleasant odor intensifies the perception of that stimulus and enhances the reaction of fleeing from the threat. It would then be recommended in particular to use olfactory self-training.

The therapy method presented can be used in particular, for example, with children with intellectual disabilities; with delayed speech development; with special educational needs; with people with memory disorders such as those with Alzheimer's disease. In addition, this method supports the diagnostic process of people with disabilities with a very important aspect – the olfactory element. At present, intensive research is being carried out on the effectiveness of its application in practice, as well as training among specialists to increase their therapeutic competence.

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REFERENCES

- Bende, M., Nordin, S. (1997). Perceptual learning in olfaction: professional wine tasters versus controls. *Physiology and Behavior*, 62(5), 1065–1070. [https://doi.org/10.1016/S0031-9384\(97\)00251-5](https://doi.org/10.1016/S0031-9384(97)00251-5)

- Bereźnicki, F. (2007). *Dydaktyka kształcenia ogólnego*. Impuls.
- Bojarowicz, H., Ziółkowska, A., Krysiński, J. (2016). Wyjątkowość zapachu. *Hygeia Public Health*, 51(2), 154–160.
- Brunjes, P.C., Illig, K.R., Meyer, E.A. (2005). A field guide to the anterior olfactory nucleus (cortex). *Brain Research Reviews*, 50(2), 305–335.
- Brzezińska, A., Appelt, K., Ziółkowska, B. (2008). Psychologia rozwoju człowieka. In J. Strelau, D. Doliński (Eds.), *Psychologia. Podręcznik akademicki* (pp. 95–290). GWP.
- Chojak, M. (2020). Edukacja oparta na neurofaktach – wstępna analiza nowego protokołu badawczego opartego na metodologii pedagogiki i medycyny. *Lubelski Rocznik Pedagogiczny*, 39(3), 23–40. <http://doi.org/10.17951/lrp.2020.39.3.23-40>
- Cieszyńska-Rożek, J. (2013). *Metoda Krakowska wobec zaburzeń rozwoju dzieci. Z perspektywy fenomenologii, neurobiologii i językoznawstwa*. Omega Stage Systems – Jędrzej Cieszyński.
- Coelho, D.H., Reiter, E.R., Budd, S.G., Shin, Y., Kons, Z.A., Costanzo, R.M. (2021). Quality of life and safety impact of COVID-19 associated smell and taste disturbances. *American Journal of Otolaryngology*, 42(4), 103001. <https://doi.org/10.1016/J.AMJOTO.2021.103001>
- Czerniawska, E., Czerniawska-Far, J. (2009). *Człowiek w świecie zapachów*. Wydawnictwa Akademickie i Profesjonalne.
- de Groot, J.H.B., Kirk, P.A., Gottfried, J.A. (2021). Titrating the smell of fear: Initial evidence for dose-invariant behavioral, physiological, and neural responses. *Psychological Science*, 32(4), 558–572. <https://doi.org/10.1177/0956797620970548>
- Gardner, H. (2002). *Inteligencje wielorakie. Teoria w praktyce*. Media Rodzina.
- Górski, J. (Ed.) (2010). *Fizjologia człowieka*. PZWL.
- Hamerlińska, A. (2023). *Olfactor – an Invention for Olfactory Stimulation*. Jagielloński Instytut Wydawniczy.
- Hamerlińska, A. (2019). Applying nasal airflow – inducing maneuvers with patients with hyposmia after total laryngectomy. *Contemporary Oncology*, 23(3), 141–145. <https://doi.org/10.5114/wo.2019.86688>
- Hankała, A. (1993). Wybiórczość poznawcza umysłu w sferze pamięci. *Filozofia Nauki*, 1(4), 83–100.
- Herz, R.S., Engen, T. (1996). Odor memory: Review and analysis. *Psychonomic Bulletin & Review*, 3, 300–313. <https://doi.org/10.3758/BF03210754>
- Hilgers, F.J., Jansen, H.A., Van As, C.J., Polak, M.F., Muller, M.J., Van Dam, F.S. (2002). Long-term results of olfaction rehabilitation using the nasal airflow-inducing ('polite yawning') maneuver after total laryngectomy. *Archives of Otorhinolaryngology – Head & Neck Surgery*, 128, 648–654.
- Hummel, T., Rissom, K., Reden, J., Hähner, A., Weidenbecher, M., Huttenbrink, K. (2009). Effects of olfactory training in patients with olfactory loss. *Laryngoscope*, 119, 496–499. <https://doi.org/10.1002/lary.20101>
- Juszczyk, S. (2012). Neuronauki w edukacji. Nowe możliwości w procesie nauczania – uczenia się. *Chovanna*, 2(39), 39–59.
- Klus-Stańska, D. (2018). *Paradygmaty dydaktyki. Myśleć teorią o praktyce*. PWN.

- Kornas-Biela, D. (2001). Okres prenatalny. In B. Harwas-Napierała, J. Trempała (Eds.), *Psychologia rozwoju człowieka. Charakterystyka okresów życia człowieka* (pp. 17–42). PWN.
- Kovács, T., Cairns, N.J., Lantos, P.L. (1999). Beta-amyloid deposition and neurofibrillary tangle formation in the olfactory bulb in ageing and Alzheimer's disease. *Neuropathology and Applied Neurobiology*, 25(6), 481–491.
- Lehrner, J., Glück, J., Laska, M. (1999). Odor identification, consistency of label use, olfactory threshold and their relationships to odor memory over the human lifespan. *Chemical Senses*, 24(3), 337–346. <https://doi.org/10.1093/chemse/24.3.337>
- Longobardi, Y., Parrilla, C., Di Cintio, G., De Corso, E., Marenda, M.E., Mari, G., Paludetti, G., D'Alatri, L., Passali, G.C. (2020). Olfactory perception rehabilitation after total laryngectomy (OPRAT): Proposal of a new protocol based on training of sensory perception skills. *European Archives of Oto-Rhino-Laryngology*, 277(7), 2095–2105.
- Łukaszewicz, K., Czerniawska, E. (2005). Czy Proust miał rację? Zapachy jako wskaźniki pamięciowe. *Psychologia Rozwojowa*, 10(3), 69–78.
- Marciniak-Firadza, R. (2021). Zmysł węchu – istota, zaburzenia, diagnoza, terapia (na przykładzie logopedy pracującego z dziećmi). *Logopedia*, 50(2), 169–183. <https://doi.org/10.24335/zsxn-1e91>
- Mydlikowska-Śmigórska, A., Śmigórski, K., Rymaszewska, J. (2019). Specyfika funkcjonowania węchowego osób starszych. Różnice między starzeniem się fizjologicznym a patologią. *Psychiatria Polska*, 53(2), 433–446. <https://doi.org/10.12740/PP/92272>
- Nováková, L., Fialová, J., Havlíček, J. (2018). Effects of diversity in olfactory environment on children's sense of smell. *Scientific Reports*, 8, 2937. <https://doi.org/10.1038/s41598-018-20236-0>
- Odowska-Szlachcic, B. (2010). *Metoda integracji sensorycznej we wspomaganiu rozwoju mowy u dzieci z uszkodzeniami ośrodkowego układu nerwowego*. Harmonia.
- Okoń, W. (1998). *Nowy słownik pedagogiczny*. Żak.
- Oleszkiewicz, A., Bottesi, L., Pieniak, M., Fujita S., Krasteva N., Nelles G., Hummel, T. (2022). Trening węchowy z aromatyką: efekty węchowce i poznawcze. *European Archives of Otorhinolaryngology*, 279, 225–232. <https://doi.org/10.1007/s00405-021-06810-9>
- Petlak, E. (2012). Neuropedagogika i neurodydaktyka – tendencje XXI wieku. *Chovanna*, 2(39), 59–67.
- Pieniak, M., Oleszkiewicz, A., Avaro, W., Calejari, F., Hummel, T. (2022). Olfactory training – Thirteen years of research reviewed. *Neuroscience & Biobehavioral Reviews*, 141, 104853, 1–19. <https://doi.org/10.1016/j.neubiorev.2022.104853>
- Potargowicz, E. (2008). Węch – niedoceniany zmysł człowieka. *Postępy Higieny Medycyny Doświadczalnej*, 62, 87–93.
- Rapiejko, P. (2006). Zmysł węchu. *Alergoprofil*, 2, 4–10.
- Regner, A. (2019). *Wybrane techniki manualne wspomagające terapię ustno-twarzową*. Continuo.

- Risberg-Berlin, B., Möller, R. Y., Finizia, C. (2007). Effectiveness of olfactory rehabilitation with the nasal airflow-inducing maneuver after total laryngectomy: One-year follow-up study. *Archives of Otorhinolaryngology – Head and Neck Surgery*, 133(7), 650–654. <https://doi.org/10.1001/archotol.133.7.650>
- Rumińska, A. (1973). *Rośliny lecznicze. Podstawy biologii i agrotechniki*. PWN.
- Sadowski, B. (2001). *Biologiczne mechanizmy zachowania się ludzi i zwierząt*. PWN.
- Schab, F.R. (1991). Odor memory: taking stock. *Psychological Bulletin*, 109(2), 242–251. <https://doi.org/10.1037/0033-2909.109.2.242>
- Skangiel-Kramska, J., Rogozińska, K. (2005). Zmysł węchu – kodowanie zapachów – nagroda Nobla z fizjologii lub medycyny 2004 roku. *Kosmos. Problemy Nauk Biologicznych*, 54(2–3), 149–154.
- Stockhorst, U., Pietrowsky, R. (2004). Olfactory perception, communication, and the nose-to-brain pathway. *Physiology and Behavior*, 83(1), 3–11. <https://doi.org/10.1016/j.physbeh.2004.07.018>
- Sullivan, R.M., Wilson, D.A., Ravel, N., Mouly, A.M. (2015). Olfactory memory networks: from emotional learning to social behaviors. *Frontiers in Behavioral Neuroscience*, 9(36). <https://doi.org/10.3389/fnbeh.2015.00036>
- Śmiałowska, M. (2009). Budowa układu nerwowego zwierząt i ludzi. In R. Tadeusiewicz (Ed.), *Neurocybernetyka teoretyczna* (pp. 11–31). UW.
- Walters, C. (2001). *Aromaterapia. Ilustrowany przewodnik*. Konemann.
- Walker, A., Hopkins, C., Surda, P. (2020). Use of Google trends to investigate loss-of-smell-related searches during the COVID-19 outbreak. *International Forum of Allergy and Rhinology*, 10(7), 839–847. <https://doi.org/10.1002/ALR.22580>
- Walsh, E. (1966). *Fizjologia układu nerwowego*. PZWL.
- Wilson D., Stevenson, R. (2003). The fundamental role of memory in olfactory perception. *Trends in Neurosciences*, 26(5), 243–247. [https://doi.org/10.1016/S0166-2236\(03\)00076-6](https://doi.org/10.1016/S0166-2236(03)00076-6)
- Żylińska, M. (2013). *Neurodydaktyka. Nauczanie i uczenie się przyjazne mózgowi*. UMK

METODA TERAPII OLFACTOR W OBSZARZE NAUK PEDAGOGICZNYCH: W NEURODYDAKTYCE, PEDAGOGICE SPECJALNEJ I LOGOPEDII

Wstęp: Wymienianym obszarem nauk pedagogicznych w artykule jest neurodydaktyka, pedagogika specjalna i logopedia. W tych dziedzinach poszukuje się coraz to nowszych metod terapii ukierunkowanych na wspomaganie rozwoju lub nowych metod nauczania, w celu niwelowania zaburzeń czy też zaspokajania specjalnych potrzeb edukacyjnych osób z niepełnościami.

Cel badań: Opisano charakterystykę autorskiej Metody Terapii Olfactor, która powstała u podstaw neurodydaktyki i może być stosowana w przestrzeni pedagogicznej.

Stan wiedzy: Do tej pory wykorzystanie zmysłu węchu w bieżących działaniach terapeutyczno-kompensacyjnych spotkało się ze stosunkowo niewielkim zainteresowaniem.

Podsumowanie: Metoda Terapii Olfactor jest autorską, innowacyjną metodą, która może być

stosowana w obszarze nauk pedagogicznych: w pedagogice specjalnej i logopedii, a także w innych naukach społecznych, takich jak psychologia. Metoda ta wykorzystuje przede wszystkim zmysł węchu w celu wzmocnienia funkcji poznawczych (pamięć, płynność werbalna, mowa), poprawy funkcjonowania fizycznego, emocjonalnego i społecznego człowieka. Podstawą metody jest nowatorskie urządzenie do stymulacji węchowej, Olfactor, które jest niezbędnym wynalazkiem do stawiania diagnoz i stosowania technik terapeutycznych. Metoda Terapii Olfactor obejmuje trzy główne komponenty: edukacyjny, diagnostyczny i terapeutyczny. Metoda ta jest skierowana do osób na każdym etapie życia i z różnymi niepełnosprawnościami (np. dla dzieci z niepełnosprawnością intelektualną; dzieci z opóźnionym rozwojem mowy; dzieci ze specjalnymi potrzebami edukacyjnymi; dla osób z zaburzeniami pamięci – z chorobą Alzheimera).

Słowa kluczowe: Metoda Terapii Olfactor, urządzenie, neurodydaktyka, edukacja specjalna, terapia mowy