Sociability: The key to sensory processing disorder

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Abstract

Social communication and sensory processing disorder are two factors that interact with each other and the difficulties they find in them impact on different neurodevelopmental disorders such as autism. More specifically, sociability is shown to play a key role in dealing with sensory processing difficulties and the interventions related to it can be implemented in a school setting as well within a therapeutic setting and even at home. The design of these interventions with a focus on sociability aims on the one hand to reduce sensory difficulties and on the other hand to provide meaningful communication when working with children with autism or severe or generalized learning difficulties. This article's goal is to compile research findings regarding the impact of sociability on children with sensory difficulties through a literature review. Specifically, many interventions with pillars the social communication have been studied to help children with autism and other syndromes The outcomes demonstrated a direct link between sociability and sensory processing disorder with interventions and therapeutic programs implemented in many nations with favorable outcomes in many facets of how children with these issues behave. One of the most effective interventions that helps are Intensive Interaction with high contribution to the sensory regulation of children mainly with autism. Students with neurodevelopmental problems were the samples for the interventions' participants. Application of these programs on a weekly basis, two to three times, is helpful in the right direction.

Keywords: sociability, social communication, sensory processing disorder, neurodevelopmental disorders, autism.

Sociabilidade: A chave para o transtorno do processamento sensorial

Resumo

A comunicação social e o transtorno do processamento sensorial, são dois fatores que interagem entre si e as dificuldades que encontram neles, impactam em diferentes transtornos do neurodesenvolvimento como o autismo. Mais especificamente, a sociabilidade mostra-se como um papel fundamental para lidar com as dificuldades de processamento sensorial e as intervenções relacionadas a ela podem ser implementadas em ambiente escolar, bem como, em contexto terapêutico e até mesmo em casa. O desenho destas intervenções com foco principal na sociabilidade visa por um lado, reduzir as dificuldades sensoriais e, por outro, proporcionar uma comunicação significativa ao trabalhar com crianças com autismo ou dificuldades de aprendizagem graves ou generalizadas. O objetivo deste artigo foi registrar dados de pesquisa sobre o efeito da sociabilidade em crianças com dificuldades sensoriais por meio de uma revisão de literatura. Especificamente, intervenções com pilares na comunicação social, têm sido estudadas para ajudar crianças com autismo e outras síndromes. Os

resultados mostraram que existe uma correlação direta entre sociabilidade e transtorno do processamento sensorial com intervenções e programas terapêuticos implementados em vários países com resultados positivos em todos os aspectos do comportamento de crianças com essas dificuldades. Uma das intervenções mais eficazes que auxiliam, são a interação intensiva com alta contribuição para a regulação sensorial em crianças principalmente com autismo. Em relação aos participantes das intervenções, as amostras foram estudantes com transtornos do neurodesenvolvimento estudados. A frequência de aplicação destes programas dois ou três vezes por semana ajuda na direção correta.

Palavras-chave: sociabilidade, comunicação social, transtorno do processamento sensorial, transtornos do neurodesenvolvimento, autismo.

1. Introduction

Neurodevelopmental disorders such as autism (Autism Spectrum Disorder – ASD) are characterized by deficits in social communication and sensory difficulties processing and learning that makes their everyday life difficult in many aspects of their life (Matto; Nuernberg, 2011; Tomchek et al., 2015; Souza; Nunes, 2019). Due to the above difficulties, these people have a problem with social skills such as sociability and socialization, and learning disabilities (Nunes; Araújo, 2014). Additionally, due to sensory difficulties find it difficult to have a desired level of arousal for her realization of projects in their everyday life (Souza; Nunes, 2019).

There are several studies that highlight the high incidence of disturbances in sensory processing in people, including children with ASD. Each year, the percentage only increases, especially when assessing the functional performance of this study population, on the sensory changes that are considered one of the symptoms of ASD (Hazen et al., 2014).

This percentage is however higher with smaller samples showing an estimated 5-13% of primary school age children. Sociability is also considered the main thing and necessary element that treatments should target and the programs to deal with autism by extension of sensory difficulties. Sociability itself can contribute to therapeutic outcomes in children with sensory processing disorder and its regulatory factor. In the following sections, current studies are identified that analyze what is sociability health, and social communication models, what is sensory processing disorder and in what it is divided and finally the purpose of the literature review for the role of sociability and the positive effect it has on the sensory processing disorder (Helena et al., 2001; Capitao, 2011).

Additionally, sociability-focused interventions had a good impact on behavior modification, a higher degree of stimulation, and a more positive emotional and cognitive domain. Its outcomes of this review may serve as the foundation for development and evaluation of specialized prevention programs for autistic children to decrease sensory issues.

2. Materials and Methods

The present research consists of a bibliographic review whose bibliography is articles from international scientific journals with few exceptions. The Greek literature has many references to the article and more to the theoretical background of the research. The first stage of the research was to search, find and collect the articles through the databases from the internet, specifically from Google scholar, Mendeley and Researchgate. Specific keywords were defined for the search such as sociability, social communication. sensory processing disorder, neurodevelopmental disorders, autism, multisensory, models, syndromes. In the second stage the articles were divided into groups based on their content to derive the chapters and the articles of each group were divided into subgroups from which the sub-chapters were derived. The third stage was the writing of the paper and the interpretation of the conclusions.

3. Sociability

3.1 Sensory processing

The phrase "sensory processing" refers to how the human nervous system interprets the sensory data it receives (Shimizu; Miranda, 2012). The central nervous system's (CNS) management, incorporation, and assimilation of information from the sensory organs—visual, auditory, tactile, gustatory, olfactory, proprioceptive, and vestibular – Is referred to as sensory processing, according to Machado et al. (2017). The visual, auditory, and somatosensory systems are shown as the primary axes in Figure 1 which depicts the structure of multisensory

integration. According to Lai et al. (2011), the process also involves the adaptive behavioral reactions to these additional inputs beyond the organization, discrimination, integration, and regulation of sensory impulses.

That is, the way in which it registers, regulates, completes, and finally organizes the sensory information. Thus, sensory processing is defined as the neurological process that organizes sensory information, making possible the functioning of the body within the environment and which includes the use of multiple sensory inputs and systems such as vision, touch, taste, smell, hearing, the vestibular system, and proprioception (Schoen et al., 2009). According to Ayres (1985), new studies carried out, over 80% of the human nervous system participates in the processing and organization of the sensory information we receive from the external stimuli of the environment. That is, when the human brain adequately processes and regulates external stimuli, the individual reacts automatically, appropriately and controls his behavior in any condition or situation he finds himself in visual, auditory, and somatosensory information is integrated into multisensory integration (Crasta et al., 2020).

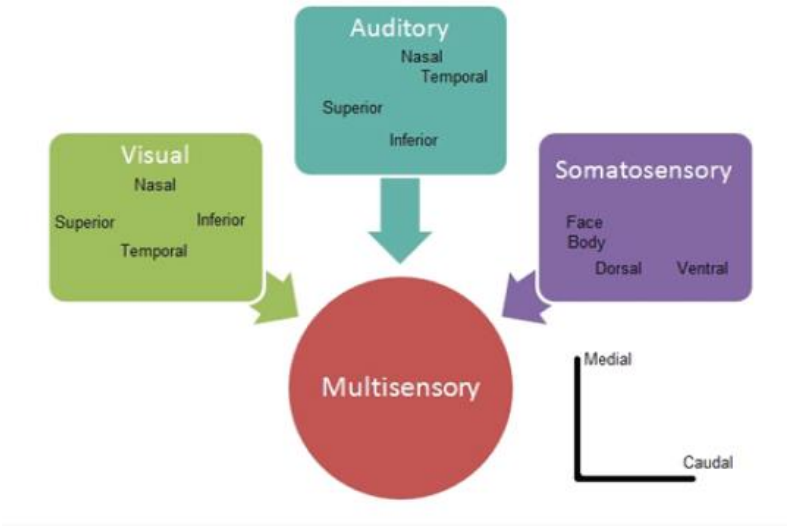

Figure 1. Multisensory integration. Source: Authors, 2022.

3.2 Sensory Processing Disorder (SPD)

Nowadays the term Sensory Processing Disorder (SPD) is increasingly common in the modern literature instead of Sensory Integration Disorder (SI). Sensory processing is the organization and interpretation of sensory stimuli coming from the body and the environment which are processed by the central nervous system of the brain and manifested in the appropriate reactions.

Thus, SPD is characterized as the lack of ability to use the information received correctly, functionally, and effectively in sequence in the activities of a person's daily life. In addition, sensory difficulties are a frequent and common criterion in ASD and are included in the Diagnostic and Statistical Manual of Mental Disorders (Association, 2013) as a manifestation of the diagnostic criteria, repetitive patterns of behavior, interests, or activities. SPD is difficult to diagnose and understand since one or more sensory systems are involved and affected together.

This result creates a wide variety of symptoms, each of which requires a different approach and alternative treatment strategies depending on the case. So, because of this heterogeneity, SPD includes subtypes that are classified by different models. The restricted, repetitive patterns of behavior, interests, or activities as manifested or from history with at least two of the following

Examples:

1. Stereotyped and repetitive movements, use of objects or speech;
2. Insistence on sameness, obsession with habits or ritualistic patterns in verbal and non-verbal behavior;
3. Attachment to extremely narrow interests which are abnormal in intensity and focus,

4. Hyper reactivity or hypo reactivity to sensory information or unusual interest in environmental sensory stimuli (Association, 2013).

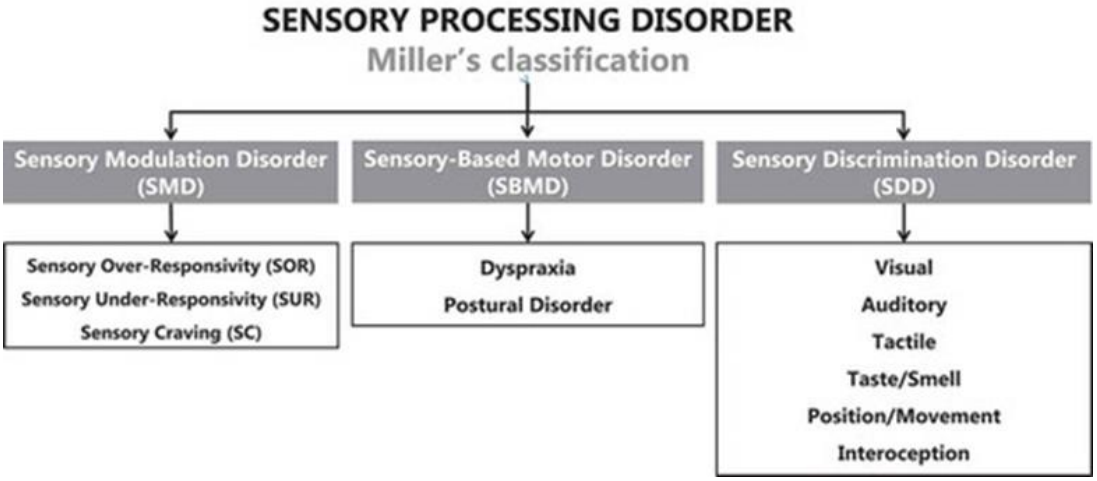

Figure 2. Miller's model of sensory processing that consists of Sensory Tuning Disorder, Sensory-Based Motor Disorder, and Sensory Discrimination Disorder (Lonkar; Heather, 2014).

3.3 Sensory processing disorder and autism

40% of children with autism show dysfunctions of sensory sensitivity (Rimland; Edelson et al., 2014) because of which they react in a strange and unusual way to the external stimuli they receive daily from the environment in which they live. We see the most unusual behaviors in tactile and auditory stimuli. For example, many times they give the impression of being deaf and do not react to normal stimuli, while in other cases they are disturbed even by the whispers or barking of a dog. As far as the tactile sensory system is concerned, there are cases where they cannot stand the texture of clothes (mainly winter clothes) and even labels, while in other cases they are not bothered by the cold, the heat to such an extent that they end up injuring themselves (Ludlow et al., 2016) Kanner & Bicchi were the first to characterize the sensory characteristics of ASD (2022).

The neurophysiological characteristics of sensory processing in ASD have been described in numerous subsequent research (Crasta, 2020). Unlike previous editions, adopted sensory (DSM-5) features as an ASD diagnostic standard (Association, 2013). In terms of hypersensitivity to sensory input, hyporeactivity to sensory input, or aberrant interest in sensory aspects of the environment, DSM-5 evaluates the atypical sensory characteristics of people with ASD. Thus, under the DSM-5, the diagnosis procedure can be complicated by ignoring anomalous sensory features. 90 percent of children with ASD are thought to have abnormal sensory traits, and 15 to 100 percent are said to have auditory hypersensitivity (Schaaf et al., 2014). Advocates need to be aware of how different all child's unusual sensory qualities are, as this makes it impossible to generalize about how severe everyone's symptoms and challenges are.

There are unusual sensory characteristics throughout several sensory domains (Schoen et al., 2009). ASD sensory abnormalities have been connected to many of the primary symptoms as well as other symptoms include anxiety, attention challenges, self-injury, behavioral issues, sleep disturbances, and gastrointestinal disorders (Schoen et al., 2009). Additionally, it has been asserted that sensory impairments are connected to emotional and behavioral problems, disturbances in day-to-day functioning, and other problems (Ahn et al., 2004). Because of this, early detection of sensory abnormalities in a baby and appropriate treatment may be helpful for later social and behavioral development. Patients with ASD have increased sensory modulation symptoms at various ages and degrees of severity. The sensory discrepancies between the ASD and normally developing groups were noted by participants aged 6 to 9 years (Boshoff et al., 2020), which presents a substantial challenge for educators who give instruction.

3.4 Characteristics of sociability

A very important stage of a child's development and more specifically of social skills is sociability which as will be identified in the next paragraph it is very connected and is a regulator factor of sensory processing. Sociability

is defined as the ability of individual to respond to different social changes from one to another first level and on the other hand his need to create friendly contacts taking part in joint activities with a group of people with the same similar interests. Sociability is the first and most valuable characteristic of the whole chain of social communication which must possesses a child so that emerge other skills such as socialization, communication, and learning (Vogindroukas et al., 2021). Special mention that should emphasized are the beneficial effects of its functions sociability in language and communication stages (play, imitation) both in children of typical development as well as those with developmental difficulties. According to Jiang et al. (2016) main and fundamental characteristic of sociability is the eye contact, which appears spontaneously often during approach face to face and is a sign of fully developed sociability. Its lack is found as we will see then in children with autistic disorder and is also part of criteria for the diagnosis of autism spectrum disorder (Association, 2013). Nowadays efforts are made to find the brains mechanisms governing the relationship between autistic traits and eye contact (Jiang et al., 2016).

3.5 Models of social communication and health

According to the integrated model of pragmatic and social communication (Zirnsak et al., 2016), which is analyzed in image 1, at the base of which it is social knowledge (theory of mind, thought recognition) and executive functions, the direct relationship and influence with the communicative functions is established skills, working memory, sensory regulation and correct processing of stimuli from the environment which is also the main intention to emerge from the specific bibliographic review. So, with this way the person can adjust their behavior by developing sociability and socialization and to be mentally flexible and to face with any sensory dysfunction that appears (Cordier et al., 2014).

A model that is often used is the biopsychosocial model health for many neurodevelopmental disorders and can help so to better understand the characteristics of each of them. With this one way the biological, psychological, and social aspects it carries are examined the person (Yette et al., 2017).

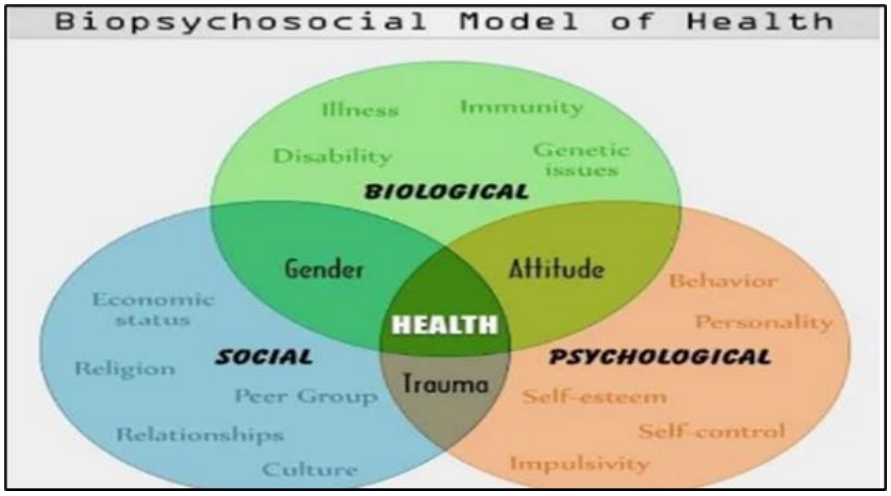

Figure 3. The health-related biopsychosocial model. The website perspectivesclinic.com/health-psychology is the source. 2018's JAPA, 26(4).

But what is the relationship between the Biopsychosocial model and the social. Communication and more specifically with the sociability considered in present paragraph?

One of the three factors that are distinguished and controlled are social such as culture and relationships between people. On the basis so this is where sociability is because without it, it will not be able to socialization, communication, and interaction in general. More specifically, according to this model neurodevelopmental disorders are better understood starting from a broad to a detailed field.

With that, healthcare professionals they can create an accurate and useful plan for the patient. Social interaction emerges through social factors because it is the determining factor that helps a person overcome every difficulty (Yette et al., 2017). One of them is sensory processing disorder which is analyzed in the following chapter.

3.6 Sociability and autism

Autistic disorder is characterized by early emerging impairment in domains of social communication and cognitive-behavioral flexibility. The symptoms are expressed and presented in a wide and continuous spectrum of severity and affect the developmental level of the individual (Nguyen, 2022).

It is observed, understandably, more than any other neurodevelopmental disorder or lack of sociability (Association, 2013). As a result of this difficulty directly affects Social learning, i.e., ability gathering knowledge from eye contact, sharing attention and interaction with other people. In addition, the difficulties in social learning in the same way negatively affect all cognitive functioning of autistic disorder.

According to a survey (Georgiades, 2013) infants with high family risk for ASD in the first 2 months of life show developmentally typical eye contact to their parents you follow from reduction of this between 2-6 months. This happens due to deviations in neurocognitive mechanisms through subcortical signal transduction area of the brain in a cortex that is responsible for supervision this to prevent voluntary social involvement. Another research (Jones et al., 2013) has demonstrated reduced sociability due to specific abnormalities in the brain's social network. Including areas of high activity in response to social vs. non-social rewards. The following image shows the system that elaborates on the social manifestations of ASD from the early days biological limitations to the expression of symptoms (Vivanti et al.,2018). Contact with the world during the early sensitive period (during which individuals develop experiences that affect the neurological process) influences behavior in the social domain.

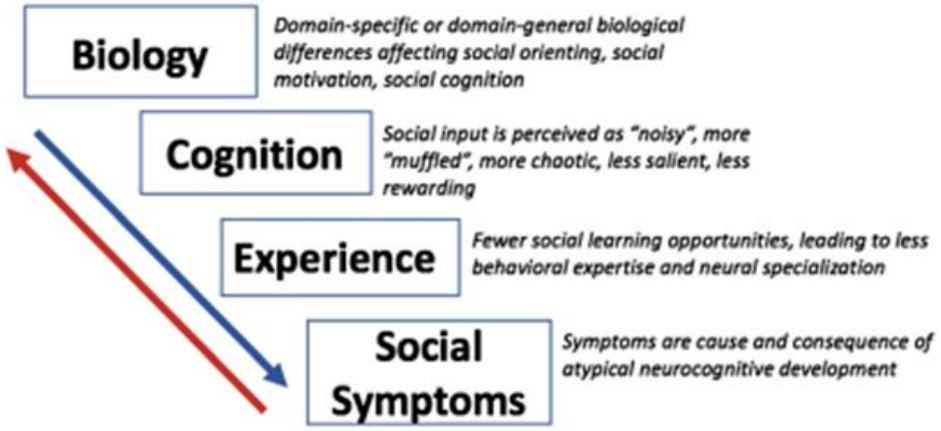

Figure 4. Edit ASD social events. Source: Vivanti et al. (2018).

3.7 Sociability and Williams syndrome

Unlike autistic disorder, to understand sociability in its entire range, Williams Syndrome (WS), which is a rarity neurodevelopmental disorder characterized by mild to moderate intellectual disability with visual-spatial and motor impairments difficulties, show increased mobility for interaction (Mohammad-Rezazadeh et al., 2016). For years, this view dominated until new research came to us demonstrate different approaches to the situation.

According to Brock et al. (2009) observed, despite hyper sociability, eye contact difficulties and attention sharing and overall social behavior. In addition, the area of the amygdala, which is responsible for feeling, an increase in its volume was observed, which shows us that the WS social phenotype reflects specific abnormalities social cognitive deficits with consequential consequences affecting the sociability (Lazaratou, 2021). In the following image (Vivanti et al., 2018) the reduced social inhibition leads to social cognitive abnormalities, which cause difficulty in relationships with the social world.

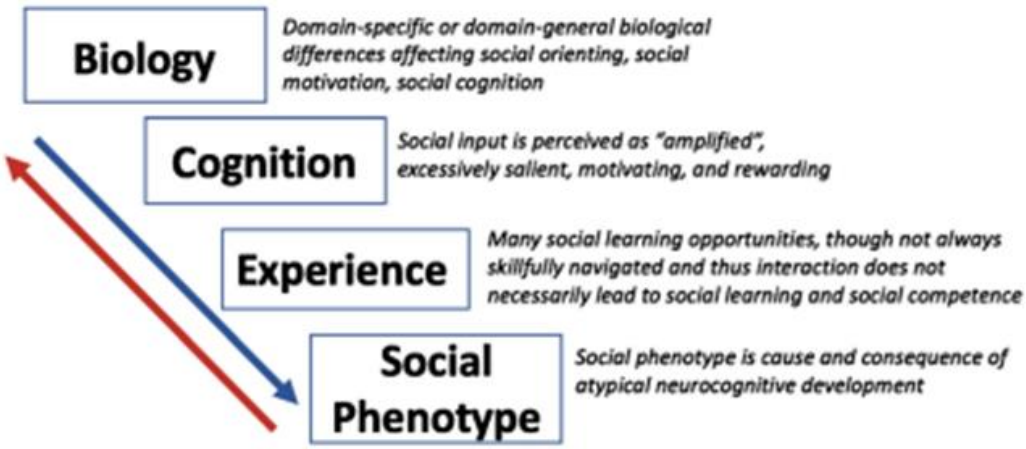

Figure 5. Edit of the social events of Williams syndrome. Source: Roberts et al. (2007).

3.8 Sociability as a regulatory factor of sensory processing

Sensory processing issues have been associated with social difficulties in children with ASD. Studies investigating the relationship of sensory processing abnormalities and social skills, indicate that higher intensities of sensory issues are strongly associated with lower adaptive functioning and social deficits. In addition, studies have shown that poor self-regulation is related to disruptive and aggressive behaviors, poor attention, and lower scores on cognitive measures (Roberts et al., 2007).

According to clinical research, specific sensory processing patterns differentially affect developmental skills and adaptive behavior in preschool children with ASD. In a particular study, interestingly, the only significant contribution to social behavior, receptive language, and gross and fine motor skills

was Sensory Seeking/Distractibility. Moreover, low energy/weak, tactical/movement sensitivity, taste/smell sensitivity, auditory/visual sensitivity and hypo-responsivity significantly contributed to receptive and expressive language scores (Tomchek et al., 2015). However atypical sensory symptomology has also been correlated with low empathy which could explain the social and communication difficulties (Tavassoli et al., 2018).

Researchers examining the relationship of social competence and sensory processing in high functioning ASD children, moderately related behaviors of low registration and sensation seeking with social responsiveness. According to Dunn's Model of Sensory Processing, children with low registration seem uninterested, dull in affect and self-absorbed which may lead them to miss social cues. While "sensory seekers" take pleasure in fidgeting, mouthing objects, repeating noises or words and other odd behaviors, which may discourage others from attempting to socialize with them (Hilton et al., 2007).

In another study which compared 6–9-year-old children with suspected SPD and their typically developing peers, the results showed that the play patterns of the two groups were generally similar. Although, no information was given if the children participated in therapeutic interventions. Naturalistic observations of both groups of children were during unstructured recess activities. Qualitative differences were observed more frequently in conflict in the SPD group. But both groups were engaged in cooperative and associative play and little time was spent with adults.

Studies have documented that the results of sensory integration therapy have been beneficial in children in autism. In a systematic review which evaluated the effectiveness of on Ayres Sensory Integration from 2006 to 2017 research, concluded that it met the criteria of evidence-based practice under certain circumstances. The authors considered that ASI is an effective intervention for autistic children 4-12 years old, with IQ above 65, if the professionals that provide the intervention adhere to the essential elements of ASI. Raising questions of its efficiency in other populations. An intervention known as the Ayres Sensory Integration approach targets the sensorimotor underpinnings of scholastic skills and other higher order talents (i.e planning and organization). In order to develop typical levels of alertness and security when engaging with the environment, the therapy offers the chance to acquire and digest improved sensory input while using a combination of equipment, such as scooters and swings (Kilroy et al., 2019). Although sensory processing issues make it difficult to keep attention and put kids at risk for behavioral and learning problems as well as social isolation, the physiological

mechanisms behind sensory modulation dysfunction are little understood (Schaaf et al., 2010). A study examining the effect of sensory integration therapy reported a significantly greater improvement in volition, habituation, communication, and occupational performance. But not in the domains of "emotional reactions" and "emotional/social responses" (Kashefimehr et al., 2018). The ability to integrate sensory information may play a role in regulating and functioning efficiently in the environment, however social interaction with caregivers and peers may reinforce the child's behavior to improve further.

A biopsychosocial intervention approach may be the key to improving sensory processing disorders. Previous literature which evaluates the effects of DIR/Floortime, which is based on a biopsychosocial development model, had positive effects on social communication and sensory regulation. (Boshoff, K., Bowen et. al., 2020) Even though outcomes of the approach have reported increased social emotional development, more evident research is needed to progress this intervention (Boshoff et al., 2020). Nevertheless, inter-subjective and relationship interventions that offer a large range of application, while promoting functional behavior, communicative capacity, and social skills, have been found to be effective (Papadopoulos, 2018). Since social reciprocity, refers to back and forth interaction that takes place in communication, actively engaging with pre-verbal communication and joint focus activities may enhance social exchanges (Hutchinson et al., 2015). Interventions that focus to develop higher levels of cognitive play, while addressing awareness of others should be supported from family members and professionals.

The intensive interaction approach has been noted to create frequent opportunities for a person to take part in face to face interactions allowing the development of non-verbal communication. Intensive interaction has been used by professionals for learners with the most severe difficulties and who pre-verbal or who are at early stages of social communication. This approach has increasing popularity in children with autism. The reason is because, even though people within the autism spectrum disorder may be verbal, yet not necessarily using speech in a meaningful and connected way for interpersonal communication.

According to the basic techniques of Intensive Interaction, the prerequisite for communication is social interaction and a safe communication environment. A safe environment creates the right conditions for people with communication difficulties to focus on the other person, process their behavior, try to interact with them and finally spontaneously imitate face expressions, words, actions, gestures (Nind et al., 2010).

3.9 The role of ICTs in sensory processing disorder (PSD)

The research, design, development, implementation, and support of computer information systems, particularly software applications, are all covered by the field of information and communication technologies (ICT). ICTs communicate, store, protect, process, transfer, and securely retrieve information using electronic hardware and software. All children have a right to an education, which is essential for everyone's personal growth. ICTs provide special education pupils with equal opportunity to meet educational objectives. For these reasons, teachers must get the necessary understanding of how new technologies can be used effectively in accordance with the culture and requirements of each country's educational system.

Recent studies have demonstrated that individuals with sensory and physical disabilities can enhance their quality of life by utilizing ICTs, which enables them to participate equally in the educational process and, as a result, in society. With the aid of technology, disabled students can become more independent in their academic and employment pursuits as well as in their participation in class activities and discussions. By being provided the chance to participate in the educational atmosphere, students effectively contribute to their sociability. ICT makes it possible for students to access information at any time and anywhere, which facilitates learning. ICT has shown to be more than just a teaching tool, serving as a basic tool for students with impairments that is comparable to a pencil and paper. On the other hand, a study conducted on 30 students with sensory processing disorder (PSD) regarding their addiction to social media is of great interest.

According to the research (Lonkar, Heather, 2014), it was observed that there is a connection regarding the levels of addiction and the effects of social media on the attention of children with sensory processing disorder. The results of the survey showed that out of 30 students aged 12-17 who attend in special school, 18 of them are highly addicted to social media, and 12 of them had a moderate addiction to social media. The study observed that due to their addiction most children have a high level of SPD but also conversely due to a high level of SPD students have a greater tendency of addictive behavior.

Additionally, major societal shifts have been noticed in recent decades that are connected to the influence of technology and artificial intelligence on people's day-to-day activities. The ability to communicate, disseminate,

handle information, and assimilate and use newly created knowledge are the most crucial of these. We must emphasize how beneficial digital technologies are to all facets of daily life, including the field of education. and successful, facilitate and improve the assessment, the intervention, decision making, the educational procedures and all the scientific and productive procedures via Mobiles (Stathopoulou et al., 2018, 2020, 2022; Kokkalia, 2016; Drigas; Pappanastasiou, 2014), various ICTs applications (Drigas et al., 2004, 2005, 2015, 2016; Drigas; Kokkalia, 2017; Pappas et al., 2018, 2019; Drigas; Leliopoulos, 2013; Papanastasiou et al., 2018, 2020; Alexopoulou et al., 2019; Kontostavlou; Drigas, 2019), AI & STEM (Vrettaros et al., 2009; Anastasopoulou et al., 2020; Lytra; Drigas, 2021) and games (Chaidi; Drigas 2022; Kokkalia et al., 2017; Drigas; Mitsea, 2021). The New Technologies (NT) and more specifically Digital Technologies provide the tools for access, the analysis and transfer of information and for its management and utilization new knowledge. Information and Communication Technologies (ICT), unprecedented technological capabilities of man, have a catalytic effect, create the new social reality, and shape the Information Society (Pappas; Drigas, 2015, 2016; Drigas; Koukiannakis, 2004, 2006, 2009; Drigas; Kontopoulou, 2016, Theodorou; Digas, 2017; Drigas; Kostas, 2014; Bakola et al., 2019, 2022; Drigas; Politi-Georgousi, 2019; Karyotaki et al., 2022).

To conclusion, it is important to note that the use of ICTs in conjunction with theories and models of metacognition, mindfulness, meditation, and the development of emotional intelligence accelerates and improves more than educational, productive, and decision-making practices and outcomes. (Drigas; Papoutsi, 2020; Drigas; Mitsea, 2020, 2021, 2022; Kokkalia et al., 2019; Pappas; Drigas, 2019; Pappoutsi; Drigas, 2016; Karyotaki; Drigas, 2015, 2016; Papoutsi et al., 2019, 2021; Chaidi; Drigas, 2020; Drigas; Karyotaki, 2019; Mitsea et al., 2020, 2021; Angelopoulou; Drigas, 2021; Tairimpampa et al., 2018; Kapsi et al., 2020; Drigas et al., 2021, 2022; Galitskaya; Drigas, 2021).

4. Conclusions

Issues related to sensory processing disorder and sociability often turn into an unknown factor for therapists, teachers and for this reason there must be proper information about them above to adequately frame the interventions in neurodevelopmental disorders. The basis for developing new intervention strategies based on evidence from an interdisciplinary perspective is provided by current research in these areas, which offers intriguing data on the role of sociability and in general social communication in the linked sensory problem. Additionally, there are models and interventions that successfully assist kids with neurodevelopmental issues in controlling their sensory perception, which is a crucial component of autonomy.

The findings of this article could potentially help generate guidelines or proposals for improving treatment capacity and care for these children given the intricacy of sensory processing disorder, its early onset, and the persistence of symptoms from the first development. Enhancing sociability will result in more positive emotional control and increased socialization of youngsters, as has been seen. As a last point, research on the relationship between social communication and sensory processing is expanding, and the preliminary findings are encouraging. To treat neurodevelopmental problems, it is important to develop novel intervention strategies where sociality is prominent, either on their own or in conjunction with existing treatments.

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