

Review Article

Sensory integration therapy addressing speech and language in children diagnosed with Autism Spectrum Disorder (ASD): scope review

Terapia de integración sensorial en el abordaje del habla y el lenguaje en niños diagnosticados con Trastorno del Espectro Autista (TEA): revisión de alcance

Terapia de Integração Sensorial na abordagem da fala e linguagem em crianças diagnosticadas com Transtorno do Espectro Autista (TEA): revisão de escopo

Ximena Donneys-Valencia^a , María José Varela-Bejarano^a 

^aUniversidad Santiago de Cali, Santiago de Cali, Colombia.

How to cite: Donneys-Valencia, X., & Varela-Bejarano, M. J. (2026). Sensory integration therapy addressing speech and language in children diagnosed with Autism Spectrum Disorder (ASD): scope review. *Cadernos Brasileiros de Terapia Ocupacional*, 34, e4034. <https://doi.org/10.1590/2526-8910.cto411040342>

Abstract

Introduction: Autism Spectrum Disorder (ASD) involves challenges in sensory processing. These sensory difficulties can affect the development of speech and language and the Sensory Integration Therapy (SIT) is emerging as an approach to improve communication and social skills in children with ASD. **Objective:** To analyze, through a scoping review, the available evidence supporting the use of sensory integration therapy in speech and language interventions for individuals with ASD. **Methods:** A scoping review was conducted following the PRISMA-ScR extension criteria. Studies from various databases—including PubMed, Web of Science, ScienceDirect, Springer, and Academic Search Ultimate—were analyzed, covering articles in Spanish, English, and Portuguese, with no restrictions on publication year. **Results:** SIT has shown to be an effective approach for treating children with ASD, particularly in areas such as speech and language. Several studies reported improvements in various areas, including children's pragmatic, semantic, morphosyntactic, and phonological skills. **Conclusion:** While initial

Received on Jan. 22, 2025; 1st Revision on Feb. 10, 2025; Accepted on Oct. 26, 2025.



This is an Open Access article distributed under the terms of the Creative Commons Attribution license (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

results are promising, current evidence remains limited and lacks studies with consistent methodologies. Additionally, the scarcity of research in Latin America and the urgent need for collaboration between several professionals and family are highlighted to enhance therapeutic outcomes in the communicative development of children with ASD

Keywords: Autism Spectrum Disorder, Perception, Speech Therapy, Occupational Therapy.

Resumen

Introducción: El trastorno del espectro autista (TEA) implica desafíos en el procesamiento sensorial. Estas dificultades sensoriales pueden afectar el desarrollo del habla y el lenguaje y la Terapia de Integración Sensorial (TIS) se presenta como un enfoque para mejorar la comunicación y habilidades sociales en niños con TEA.

Objetivo: Analizar por medio de una revisión de alcance la evidencia disponible que respalda el uso de la terapia de integración sensorial en las intervenciones de habla y lenguaje en individuos con TEA. **Métodos:** Se realizó una revisión de alcance de acuerdo con los criterios de la extensión PRISMA-ScR, en la cual se analizaron investigaciones provenientes de diversas bases de datos, tales como Pubmed, Web of Science, Scencedirect, Springer, Academic Search Ultimate, entre otras, en los idiomas español, inglés y portugués, sin restricción de año. **Resultados:** La TIS ha mostrado ser un enfoque efectivo en el tratamiento de niños con TEA, particularmente en aspectos como el habla y el lenguaje. Varios estudios han señalado mejoras en diversas áreas, como las habilidades pragmáticas, semánticas, morfosintácticas y fonológicas de los niños. **Conclusión:** Aunque los resultados iniciales son prometedores, la evidencia actual sigue siendo limitada y carece de estudios que utilicen metodologías consistentes. Además, se resalta la falta de investigaciones en América Latina y la necesidad urgente de fomentar la colaboración entre diversos profesionales y familia, con el fin de mejorar los resultados terapéuticos en el desarrollo comunicativo de los niños con TEA.

Palabras clave: Trastorno del Espectro Autista, Percepción, Logopedia, Terapia Ocupacional.

Resumo

Introdução: O transtorno do espectro autista (TEA) implica desafios no processamento sensorial. Essas dificuldades sensoriais podem impactar o desenvolvimento da fala e da linguagem e a Terapia de Integração Sensorial (TIS) apresenta-se como uma abordagem para melhorar a comunicação e as habilidades sociais em crianças com TEA. **Objetivo:** Analisar, por meio de uma revisão de escopo, as evidências disponíveis que apoiam o uso da terapia de integração sensorial nas intervenções de fala e linguagem em indivíduos com TEA. **Métodos:** Foi realizada uma revisão de escopo de acordo com os critérios da extensão PRISMA-ScR, na qual foram analisadas pesquisas provenientes de diversas bases de dados, como PubMed, Web of Science, ScienceDirect, Springer, Academic Search Ultimate, entre outras, nos idiomas espanhol, inglês e português, sem restrição de ano. **Resultados:** A TIS demonstrou ser uma abordagem eficaz no tratamento de crianças com TEA, particularmente em aspectos relacionados à fala e à linguagem. Diversos estudos indicaram melhorias em áreas como habilidades pragmáticas, semânticas, morfosintácticas e fonológicas das

crianças. **Conclusão:** Embora os resultados iniciais sejam promissores, as evidências atuais ainda são limitadas e carecem de estudos que utilizem metodologias consistentes. Além disso, destaca-se a falta de pesquisas na América Latina e a necessidade urgente de promover a colaboração entre vários profissionais e familiares, a fim de melhorar os resultados terapêuticos no desenvolvimento comunicativo de crianças com TEA.

Palavras-chave: Transtorno do Espectro do Autismo, Processamento Sensorial, Terapia da Fala, Terapia Ocupacional.

Introduction

According to Alcalá & Ochoa (2022, p. 3), Autism Spectrum Disorder (ASD) is defined as “a neurodevelopmental disorder characterized by diminished social interaction and deficits in the development of verbal and nonverbal communication, as well as behavioral inflexibility, with the presence of repetitive behaviors and restricted interests”. In addition, children with ASD frequently experience sensory processing difficulties, which may manifest as hypersensitivity to certain sensory stimuli or, conversely, as a reduced response to stimuli such as food textures, fabrics, various materials, and lights and sounds (Angulo et al., 2020; Oliveira & Souza, 2022).

Language disorganization is commonly observed in children with sensory processing difficulties and can negatively affect the development of both comprehension and verbal expression. Development is known to depend on the coordination of multiple systems, including hearing, vision, and other sensory receptors; therefore, the proper functioning of these systems is essential to ensure effective communication (Álvarez et al., 2010).

According to the World Health Organization (WHO), approximately 1 in 160 children is estimated to have ASD, although prevalence rates vary considerably across studies. Over the past five decades, the global incidence of these disorders has increased, as reported in epidemiological studies. This rise may be attributed to several factors, including increased awareness and the expansion of diagnostic criteria (Organización Mundial de la Salud, 2022).

On the other hand, according to the Centers for Disease Control and Prevention (Centro para el Control y la Prevención de Enfermedades, 2023), several studies conducted in Asia, Europe, and North America have reported that the prevalence of ASD ranges between 1% and 2%. However, in Latin America, epidemiological data are more inconsistent due to differences in the interpretation and classification of the disorder. For instance, Levy et al. (2009) indicate that prevalence rates may vary between 25 and 116 cases per 10,000 children, depending on the criteria used, while Baird (2006, as cited in Baron-Cohen et al., 2008) reports that approximately 1% of the population presents autistic characteristics. In Brazil, a pilot study conducted in 2011 in the city of Atibaia, São Paulo, identified a prevalence of 27.2 cases of ASD per 10,000 children, corresponding to approximately 1 case per 368 children (Paula et al., 2011). It is important to note that these figures are estimates and that the 2022 Demographic Census, which for the first time included questions related to autism, is expected to provide more accurate data on the prevalence of ASD in Brazil. These results are expected to be available by 2025. In Colombia, although exact and official figures are not available, it is estimated that there are approximately 115,000 cases nationwide (Reviriego Rodrigo et al., 2022).

From an etiological perspective, Arberas & Ruggieri (2019) highlight that the heritability of ASD is considerably high, with estimates ranging from 56% to 95%, indicating a substantial genetic contribution to its development. This wide range reflects the complexity of the disorder and suggests the absence of a single causal gene, pointing instead to the involvement of multiple genetic variants. Nevertheless, the role of environmental factors in the development of ASD should not be disregarded. Although their contribution is smaller compared to genetic factors, it is estimated that environmental influences may account for between 5% and 44% of cases. These factors include prenatal exposure to toxins, infections during pregnancy, obstetric complications, and other environmental conditions which, in combination with genetic susceptibility, may contribute to the development of the disorder (Arberas & Ruggieri, 2019).

The diagnosis of Autism Spectrum Disorder (ASD), according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) of the American Psychiatric Association (2013), is based on the identification of specific criteria, including persistent difficulties in communication and social interaction, as well as the presence of restricted and repetitive patterns of behavior, interests, or activities. One of the most relevant criteria emphasizes the impact of sensory processing on the development of communication and social interaction skills.

For this reason, it is essential to identify effective approaches that promote sensory stimulation and integration, thereby contributing to individuals' development in their daily lives and social interactions (Muñoz Phi, 2023).

At the same time, the eleventh edition of the International Classification of Diseases ICD-11 (Organización Mundial de la Salud, 2019) introduced a substantial change in the conceptualization of neurodevelopmental disorders by grouping categories that were previously considered separately under the single term "Autism Spectrum Disorder." This integration recognizes that, despite variations in the clinical expression of symptoms, these conditions share common characteristics, such as difficulties in establishing social relationships, communication impairments, and a tendency toward rigid routines or repetitive behaviors. This broader and more dimensional perspective allows the diagnosis to be adapted to the diversity of clinical presentations observed among individuals, facilitating both the identification of the disorder and the design of personalized interventions (Kamp-Becker, 2024).

Regarding Sensory Integration (SI) theory, it was proposed in the 1960s by Jean Ayres, who defined it as a neurobiological process that organizes sensations from both the body and the environment, enabling effective interaction between the two (Santander, 2016). The main objective of this theory is to understand and address sensory processing difficulties in individuals with Autism Spectrum Disorder (ASD), as Ayres identified challenges in stimulus regulation and perception, as well as limitations in motivation within this population (Abelenda and Armendariz, 2020).

As a result of this theoretical framework, Sensory Integration Therapy (SIT) emerged as a therapeutic modality designed to help individuals—particularly children—process and respond efficiently to bodily and environmental sensory input. This approach is grounded in the premise that sensory processing is essential for optimal growth and functioning. In practice, Sensory Integration Therapy (SIT) involves exposing individuals, in an organized and gradual manner, to a variety of sensory stimuli, including touch, movement, balance, sound, and vision. In the context of Autism Spectrum Disorder (ASD), many children experience sensory processing difficulties,

which may manifest as exaggerated or diminished responses to stimuli such as touch, sound, light, and movement. SIT aims to support the regulation and integration of sensory information, thereby contributing to improvements in behavior, motor skills, and social and emotional development (Ayres, 1972).

Recent research has supported these benefits. In particular, Schoen et al. (2018) evaluated the effects of sensory integration therapy (SIT) and found favorable results in children with autism spectrum disorder (ASD). The data obtained reveal that this methodology facilitates the achievement of personalized goals related to sensorimotor development, positively impacting typical behaviors of the spectrum, as well as the participants' communicative and social abilities. In addition, studies that apply rigorous methodological designs, such as randomized clinical trials, confirm that the benefits of SIT become evident when the therapy is developed according to its fundamental principles and is applied by professionals trained in this specific technique. Furthermore, the research by Fazlıoğlu & Baran (2008) also documents significant improvements after the application of a sensory integration program in children diagnosed with ASD. The participants who received the intervention showed remarkable progress in regulating their responses to sensory stimuli, especially regarding tactile hypersensitivity and the reduction of stereotyped behaviors. Likewise, an increase in tolerance to physical contact, improvements in motor coordination, and greater participation in daily activities were observed. These advances were validated through comparisons between pre- and post-treatment assessments, demonstrating a significant increase in sensory integration capacity.

The sensory variations experienced by children with ASD can trigger sensory irritability, in addition to difficulties in communication and social interaction. To address these areas, various interventions are applied, with speech and language therapy being one of the most prominent (Muñoz Phi, 2023). However, these difficulties are not limited to these aspects alone, but also affect other areas such as motor skills, perception, intellectual development, and academic performance, among others. This is where the use of Sensory Integration Therapy (SIT) and the presence of an interdisciplinary team of professionals from the health and education fields—such as speech-language pathologists, occupational therapists, psychologists, educational psychologists, and teachers, among others—play a fundamental role. These professionals work in coordination with the family to provide comprehensive and personalized care for children with Autism Spectrum Disorder (ASD).

Considering the above, a scoping review was undertaken, based on the need to explore the role of SIT within the context of interventions for children diagnosed with ASD and with specific speech and language difficulties. Current scientific literature reveals a gap in the understanding of how SIT can enhance the outcomes of speech and language interventions in this specific group of patients. Therefore, this scoping review aims to analyze the available evidence supporting the use of sensory integration therapy in speech and language interventions for individuals with ASD.

Methodology

Design

A scoping review was conducted to examine the scientific evidence supporting the use of speech-language therapy (SLT) for the treatment of speech and language disorders in individuals diagnosed with Autism Spectrum Disorder (ASD). According

to Peters et al. (2015), a scoping review is an “exploratory” process that systematically maps the available literature on a given topic in order to identify key concepts, relevant theories, sources of evidence, and research gaps. This review was conducted following the methodological framework proposed by Arksey and O’Malley (2005), the guidelines of the Joanna Briggs Institute (Peters et al., 2020), and the PRISMA-ScR checklist (Tricco et al., 2016).

Search strategy

For the development of the scoping review, Health Sciences Descriptors (DeCS), Medical Subject Headings (MeSH), and Boolean operators (OR and AND) were used. A specific search equation was formulated using the terms “(Autism OR Autistic Disorder OR Autism Spectrum Disorders) AND (Sensory Processing) AND (Speech Therapy OR Language Therapy).” Initially, data collection was restricted to a limited number of databases and a defined time frame. However, after analyzing the initial results, it became evident that the available information was insufficient to provide a comprehensive understanding of the topic. As a consequence, the search strategy was expanded to include a broader range of databases and no date restrictions, allowing access to a larger volume of studies and a wider diversity of perspectives. In total, 17 relevant health-related databases were included in the final search.

Eligibility criteria

The inclusion of research articles was based on the PCC strategy, as presented in Table 1.

Table 1. Inclusion criteria based on PCC strategy.

PCC	DEFINITION
Population	Children diagnosed with ASD
Concept	Sensory integration therapy in speech and language interventions.
Context	Research articles with no date restrictions. Articles retrieved from the following databases: PubMed, Web of Science, ScienceDirect, Springer, Academic Search Ultimate, Virtual Health Library (VHL), BioMed Central, Canadian Newsstream, ERIC, Health & Medical Collection, Linguistics Database, SAGE Journals, Scopus, Taylor & Francis, Oxford University Press, Dialnet, and the National Library of Medicine. Open-access articles. Articles written in Spanish, English, or Portuguese. Articles addressing intellectual disability in relation to speech and/or language in children with Autism Spectrum Disorder (ASD). Studies employing various research designs, including case studies, case series, pre- and post-intervention studies, experimental and quasi-experimental studies, as well as scoping reviews, systematic reviews, exploratory reviews, and meta-analyses.

Source: Authors’ own elaboration.

Data analysis

To analyze the collected information, the selected articles were read and reviewed in detail. Key data were extracted, including the article title, year of publication, country of origin, and the database from which each study was retrieved. This process aimed to

ensure systematic organization and in-depth analysis of the information. The extracted data were recorded in an analysis matrix specifically designed for this study, using Microsoft Excel.

Results

Initially, 19,218 records were identified across the selected databases. After the removal of 15 duplicate records, a total of 19,203 studies remained. The eligibility criteria were then applied, resulting in the exclusion of 9,743 records and leaving 9,460 articles for further screening. During this stage, 5,214 studies were excluded based on title screening, 3,624 based on abstract screening, and 614 following full-text review. Ultimately, eight studies met all the established eligibility criteria and were included in the analysis. The complete process of study identification, screening, eligibility assessment, and inclusion is illustrated in Figure 1.

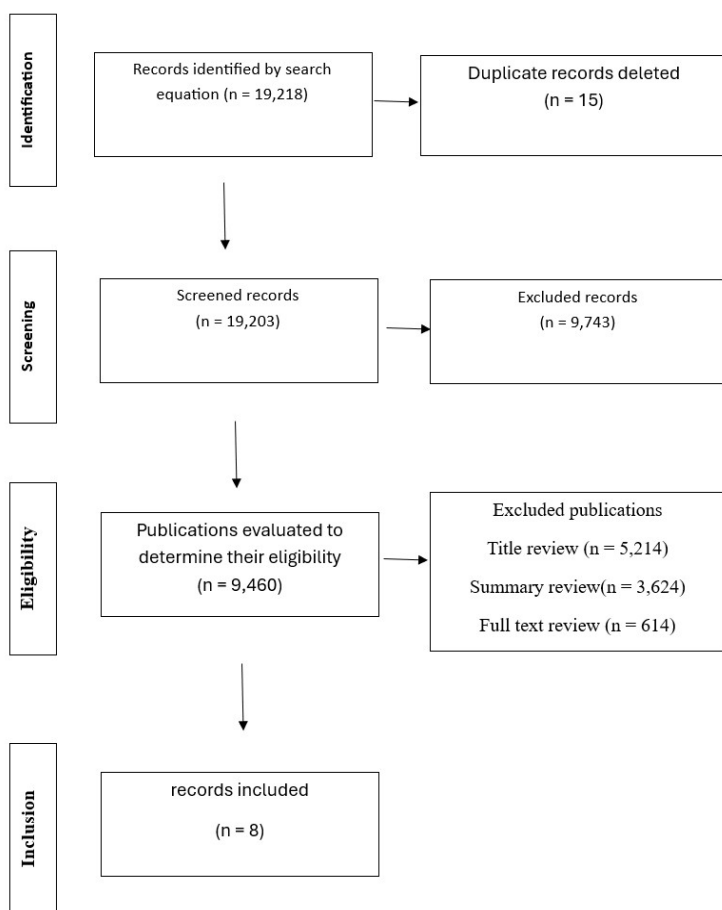


Figure 1. Study inclusion process.

The characteristics of the included studies are presented below, focusing initially on general aspects to provide an overview of their main features and context. Subsequently, a detailed analysis of the content of the selected studies is conducted in order to address the primary objective of the research.

Bibliometric characterization

A bibliometric analysis was conducted on eight articles. Regarding country of origin, 12.5% of the studies were from Egypt, another 12.5% from China, and the remaining 75% from the United States, which was the most represented country in the sample. With respect to databases, 12.5% of the articles were indexed in Scopus and the same percentage in Health & Medical Collection. The remaining articles were evenly distributed, with 25% each, comprising two articles indexed in Academic Search Ultimate, two in Linguistics Database, and two in SAGE Journals. In terms of study design, 12.5% corresponded to observational studies and another 12.5% to narrative literature reviews, while the remaining 25% was evenly distributed among experimental studies, case studies, and systematic reviews, with two articles in each category. Regarding year of publication, one article was included from each of the following years: 2023, 2022, 2015, 2014, 1988, and 1987, each representing 12.5%, while two articles published in 1999 were included, accounting for 25% of the total. All these data are summarized in a matrix presented in Table 2.

Study analysis

The following section presents the main findings highlighting how Sensory Integration Therapy (SIT) can serve as a positive intervention for addressing speech and language difficulties in children with Autism Spectrum Disorder (ASD).

Pragmatic skills

Mauer (1999) conducted a comprehensive literature review to evaluate the effectiveness of Sensory Integration (SI) interventions in children with language disorders and learning difficulties. Multiple studies were analyzed to examine the consistency of SI definitions, as well as the diversity of assessment and intervention approaches employed.

The findings indicated significant improvements in pragmatic language skills among children who received SI interventions. Notable gains were observed in the ability to initiate and maintain conversations, as well as in the understanding and application of social communication norms. Participants also demonstrated improved interpretation of social cues and more appropriate responses during interactions with peers and adults. Furthermore, an increase in the frequency of spontaneous communicative interactions was reported, suggesting that SIT not only contributed to sensory regulation but also fostered a more favorable context for the development of pragmatic communication skills.

Por otro lado, Thompson & Blanche (2015) realizaron un estudio en el que participaron cinco niños diagnosticados con TEA, cuyas edades fluctuaban entre 1.9 y 4.6 años. Todos ellos presentaban dificultades en la comunicación espontánea y en la formulación de solicitudes. La intervención consistió en sesiones de terapia ocupacional llevadas a cabo en dos clínicas ubicadas en Los Ángeles. Para recolectar datos, los autores desarrollaron un sistema de codificación que contemplaba 239 comportamientos organizados en nueve categorías distintas, incluyendo experiencias sensoriales, comportamientos sociales, planificación motora e interacciones con el terapeuta, todas relevantes para la TIS.

Similarly, Thompson & Blanche (2015) conducted a study involving five children diagnosed with Autism Spectrum Disorder (ASD), aged between 1.9 and 4.6 years,

Table 2. Article matrix.

TITLE	AUTHORS YEAR	COUNTRY	DATABASE	TYPE OF STUDY	OBJECTIVE	POPULATION
Efficacy of the sensory integration therapy on language development in autism spectrum disorder children.	Fouad et al. (2023)	Egypt	Scopus	Experimental study	To determine the impact of Sensory Integration Therapy (SIT) on language development in children with Autism Spectrum Disorder (ASD).	68 children diagnosed with Autism Spectrum Disorder (ASD), aged between 3 and 10 years.
Sensory integration training and social sports games integrated intervention for the occupational therapy of children with autism	Wang et al. (2022)	China	AcademicSearch Ultimate	Experimental study	To evaluate the effectiveness of sensory integration training combined with social sports games on the development of expressive language in children diagnosed with Autism Spectrum Disorder (ASD).	12 children with autism, aged between 4 and 18 years old.
The effects of vestibular activity during sensory integration intervention on spontaneous affect and communication within the therapy session	Thompson & Blanche (2015)	USA	Health & Medical Collection	Observational study	To examine the effects of Sensory Integration Therapy (SIT), through vestibular stimulation, on language development and social interactions in children diagnosed with Autism Spectrum Disorder (ASD)..	5 children diagnosed with Autism Spectrum Disorder (ASD), aged between 1.9 and 4.6 years.
The effects of sensory integration therapy on verbal expression and engagement in children with autism	Preis & McKenna (2014)	USA	AcademicSearch Ultimate	Case study	To determine whether Sensory Integration Therapy (SIT) improved communication skills in children with autism, specifically in terms of spontaneity, utterance complexity, and engagement.	4 participants diagnosed with autism, aged between 3.5 and 6.10 years.

Source: Authors' own elaboration.

Table 2. Continued...

TITLE	AUTHORS YEAR	COUNTRY	DATABASE	TYPE OF STUDY	OBJECTIVE	POPULATION
Is sensory integration effective for children with language-learning disorders?: A Critical Review of the Evidence	Griffier (1999)	USA	LinguisticsDatabase	Systematic review	Examine relevant studies on the effectiveness of treatment involving sensory integration over the past thirty years.	Not applicable
Issues and applications of sensory integration theory and treatment with children with language disorders	Mauer (1999)	USA	LinguisticsDatabase	Systematic review	To promote an understanding of the theoretical and practical principles of Sensory Integration Therapy (SIT).	Not applicable
The effectiveness of self-initiated vestibular stimulation in producing speech sounds in an autistic child	Ray et al. (1988)	USA	SAGE	Case Study	To determine the effect of vestibular stimulation on the vocalizations of a child diagnosed with autism.	A nine-year-old child with a confirmed diagnosis of autism, presenting difficulties such as dyspraxia, dysarthria, low muscle tone, and reduced activity levels.
Occupational therapy for speech and language disordered children: a sensory integrative approach	Kelly (1987)	USA	SAGE	Literature review	To evaluate the effectiveness of Sensory Integration Therapy (SIT) on speech and language development in children diagnosed with Autism Spectrum Disorder (ASD).	Not applicable.

Source: Authors' own elaboration.

all of whom presented difficulties in spontaneous communication and request formulation. The intervention consisted of occupational therapy sessions conducted at two clinics in Los Angeles. For data collection, the authors developed a detailed coding system encompassing 239 behaviors grouped into nine categories, including sensory experiences, social behaviors, motor planning, and therapist–child interactions, all relevant to SIT.

The results demonstrated that SIT, particularly vestibular input, had a positive effect on language pragmatics in children with ASD. An increase in the frequency of spontaneous communicative behaviors was observed during intervention sessions, leading to improvements in both the quantity and quality of social interactions. These findings suggest that vestibular stimulation may facilitate more effective communication and appropriate language use in social contexts. Additionally, improvements in attention and eye contact were reported, both of which are essential components of pragmatic language functioning.

In addition, Griffer (1999) conducted a literature review on SIT and its application in the treatment of children diagnosed with Autism Spectrum Disorder (ASD). This review included empirical studies published over a 30-year period, with a primary focus on research assessing the effectiveness of SIT in improving speech and language skills.

The results revealed that speech therapy intervention (STI) had a limited impact on improving pragmatic language skills in children with Autism Spectrum Disorder (ASD). Although some parents and therapists reported positive changes in children's attention and behavior following the intervention, the empirical evidence supporting these findings was considered insufficient and inconclusive. Standardized tests did not provide adequate data on how SIT affected children's daily lives, and improvements in test scores were not consistently reflected in meaningful changes in pragmatic communication. This suggested that, although language learning difficulties might improve, better academic or functional performance was not necessarily achieved. Therefore, it was concluded that further comprehensive research is needed to assess the actual effectiveness of SIT in speech and language treatment for children with ASD, particularly with regard to pragmatic skills.

In this context, a prospective study conducted by Fouad et al. (2023) included 68 children diagnosed with ASD between August 2019 and August 2022. Participants, aged between 36 and 114 months, were assessed for their communicative level using the Modified Preschool Language Scale. The results indicated that many of the children presented significant delays in language development. In addition, the severity of ASD ranged from mild to severe. The children were randomly assigned to two groups of 34 participants each. Both groups underwent two assessment phases: one prior to the intervention and another one year later. Group I received SIT sessions in combination with speech therapy, whereas Group II received speech therapy only. SIT was administered once a week for one year, and speech therapy was provided twice weekly. Children's performance was assessed using the Stanford-Binet Intelligence Scale (Fifth Edition, Arabic version), the Childhood Autism Rating Scale (CARS), and the Modified Preschool Language Scale (PLS-4, Arabic version).

The results showed improvements in language skills in both groups; however, gains in receptive language skills were greater in Group I. Despite this, the difference did not reach statistical significance. The study suggested that, although Sensory Integration Therapy (SIT) may contribute to the development of foundational skills for learning, its

direct effect on improving language pragmatics was less evident. The authors concluded that improvements in language skills were more closely associated with the language rehabilitation program than with SIT. This indicates that, while SIT may support sensory and attentional skills, its specific impact on pragmatic language development in children with ASD may be limited. Consequently, the authors suggested that SIT should be combined with other therapeutic approaches to achieve more comprehensive outcomes in language and communication development.

Semantics and morphosyntax

Regarding this topic, Preis & McKenna (2014) conducted a study that evaluated the effectiveness of Sensory Integration Therapy (SIT) on verbal spontaneity, grammatical complexity—measured by mean length of utterance (MLU)—and participation in four young children diagnosed with Autism Spectrum Disorder (ASD), aged between 18 months and 7 years. Prior to the SIT intervention, the children exhibited a significant level of communicative impairment, as evidenced by low scores on expressive and receptive language scales. Participants were recruited from a private school specializing in children with autism and met specific inclusion criteria, including a diagnosis of autism based on the DSM-IV-TR and an MLU of at least 1.5 at the beginning of the study. The intervention was conducted in an occupational therapy setting, using equipment designed to promote sensory integration. Expressive language skills and participation were compared between a pre-treatment phase (Phase A) and a treatment phase (Phase B). Language samples were analyzed using the Systematic Analysis of Language Transcripts (SALT) software to assess verbal spontaneity and language complexity.

The results indicated significant improvements. In terms of semantics, increases in verbal spontaneity and complexity were observed during and after the intervention, reflected in a higher number of words and a more diverse vocabulary. Regarding morphosyntax, an increase in mean length of utterance (MLU) was recorded during therapy sessions, indicating greater grammatical complexity in the children's verbal productions. Participants produced longer and more complex sentences, using a wider range of grammatical structures. In addition, participation levels were higher both during and after the intervention, suggesting that the structured play intervention (SPI) not only supported language performance but also promoted a more interactive and engaging learning environment.

Additionally, Wang et al. (2022) conducted an experimental study in which structured play-based interventions were implemented to promote expressive language skills in children diagnosed with Autism Spectrum Disorder (ASD). The study included twelve children with autism, aged between 3 and 6 years, who presented low levels of communicative skills, characterized by limited verbal initiation and a predominance of stereotyped behaviors. All participants were classified as having mild ASD. Each child received a total of 28 intervention sessions over several weeks, during which structured games aimed at promoting social interaction and language use were implemented. Following each intervention session, free-play periods were conducted, during which participants' expressive language performance was recorded. Changes in language skills were assessed through language sample analysis, and a follow-up assessment was carried out one week after the end of the intervention to observe retention of the acquired skills.

The findings of this second study revealed significant improvements in the children's expressive language skills following the intervention. Regarding the semantic

component, a substantial increase was observed in the total number of words used, as well as greater vocabulary variety among the participants. In addition, an increased frequency in the use of words related to their experiences and contexts was recorded, indicating an improvement in their ability to communicate ideas and emotions more effectively.

With respect to morphosyntax, the results showed significant progress in the complexity of the sentences produced by the children. An increase in mean sentence length and in the variety of grammatical structures used was noted. The children began to produce more complex sentences, incorporating elements such as conjunctions and modifiers, suggesting improvements in their application of grammatical rules and in their ability to combine words coherently.

Phonetic/phonological components – *enhables* approach

Kelly (1987) conducted a literature review to analyze the impact of speech therapy on language development in children with communication disorders. The review included children with difficulties in speech, language, and motor coordination. The findings indicated that the application of speech therapy was associated with a significant increase in phonological awareness, reflected in an improved ability to identify and manipulate sounds within words. The children demonstrated better skills in segmenting words into syllables and phonemes, which is fundamental for the development of reading and writing. In addition, improvements in speech fluency were observed, with a reduction in pauses and blocks during communication.

With regard to articulation, the results showed notable improvements in the clarity and precision of the children's speech. A reduction in articulatory errors was documented, particularly in phonemes commonly reported as challenging for children with ASD, such as /s/, /k/, /t/, /d/, /r/, and /l/. For example, children who previously had difficulty producing the phoneme /r/ in words such as "ratón" and "carro" demonstrated improvement, achieving clearer and more precise articulation. Likewise, an increase in speech fluency was observed, enabling the children to communicate more effectively and with greater confidence. These improvements contributed not only to more accurate articulation but also to greater participation in conversations and social interaction.

In contrast, Ray et al. (1988) conducted a study focusing on a 9-year-old boy diagnosed with Autism Spectrum Disorder (ASD) who presented significant developmental delays. In terms of language, the child was able to produce only three recognizable words and also exhibited limitations in motor skills and socialization. To investigate the effects of vestibular stimulation on vocalization, an oscillation device was used, specifically a South Paw Model PS-IBOO oscillation platform with a rebound attachment. The intervention consisted of stimulation sessions conducted once daily over a four-week period, totaling 17 days of intervention.

To assess the impact of vestibular stimulation on sound production, audio recordings were obtained during each session. Therapists familiar with the child analyzed the recordings to calculate the percentage of time spent vocalizing and verbalizing. Vocalizations were defined as any sound produced, whereas verbalizations were defined as sounds that could be understood by the therapists. This procedure allowed for a quantitative assessment of changes in sound production over time.

The study results revealed a significant increase in the percentage of vocalizations produced by the child during periods of vestibular stimulation compared to the periods

before and after stimulation. Specifically, the child spent considerably more time vocalizing while using the oscillation platform. This increase in vocalizations indicates that vestibular stimulation was associated with a higher level of sound production during the intervention periods.

Over the four-week study period, the child not only demonstrated an increase in the number of vocalizations but also spontaneously acquired 13 new words. This development is noteworthy, considering that at the beginning of the study the child was able to produce only three recognizable words. This finding highlights the observed association between SIT, through vestibular stimulation therapy (VST) and changes in language-related behaviors in a child diagnosed with Autism Spectrum Disorder (ASD).

Discussion

The objective of this review was to analyze the existing evidence in the literature regarding the use of Sensory Integration Therapy (SIT) for the treatment of speech and language disorders in children diagnosed with Autism Spectrum Disorder (ASD). The literature review indicated that this therapeutic approach is predominantly applied in Western countries, with the United States presenting the strongest scientific support for the use of SIT in addressing speech and language difficulties in individuals with ASD. The limited number of studies conducted in Latin America is noteworthy and aligns with the findings of Montiel-Nava et al. (2020), who highlight a substantial lack of research on ASD in the region, representing a significant challenge to understanding and addressing the needs of this population.

Although SIT has emerged as a relevant approach for individuals with ASD, with the aim of optimizing the neurophysiological processing of sensory stimuli and thereby promoting better performance in daily activities, the results reported in the literature remain inconclusive. While its potential benefits are promising, existing studies highlight limitations in the empirical evidence supporting its effectiveness, mainly due to the scarcity of research employing rigorous methodologies, large sample sizes, and long-term follow-up capable of conclusively demonstrating its efficacy (Watling & Hauer, 2015). Nevertheless, more recent studies, such as that by Schoen et al. (2019), indicate that sensory interventions are widely used in children with ASD to address sensory difficulties that affect emotional regulation, social skills, and concentration, thereby supporting the development of coping strategies to manage these challenges and facilitating adaptation to daily environments.

Regarding the findings of the present review, the most relevant results suggest that sensory intervention has a positive impact on language development. In relation to pragmatic skills, increases were observed in communicative intent and in the frequency of spontaneous communicative behaviors, as well as improvements in the understanding and use of social norms and, more broadly, in the ability to interact with peers and adults (Mauer, 1999; Thompson & Blanche, 2015). These findings are consistent with the research of Vitásková & Tabachová (2018), who argue that sensory integration plays an essential role in addressing language pragmatics in children with ASD. According to these authors, alterations in sensory perception can negatively affect communicative and social skills, and interventions aimed at improving sensory integration may promote the development of pragmatic abilities. This, in turn, allows children to interact more effectively in different social contexts, fosters a better understanding of

communication norms, and enhances their confidence and motivation to participate in social interactions.

However, research offers differing perspectives on the effectiveness of STI in improving pragmatic skills. For example, Griffer's study (1999) concluded that STI had limited effects on the development of pragmatic language abilities. Although positive changes were observed in the attention and behavior of some children, the empirical evidence was considered scarce and inconclusive. In line with these findings, the study by Fouad et al. (2023) revealed that, while language skills improved in both groups of children with Autism Spectrum Disorder (ASD), the group receiving STI in combination with speech therapy showed greater progress in receptive language skills; however, this difference was not statistically significant. This suggests that, although STI may facilitate the acquisition of basic learning skills, its direct impact on the improvement of language pragmatics was less evident, indicating that improvements in language skills were more closely related to the language rehabilitation program than to STI.

Regarding semantics and morphosyntax, the results obtained through the application of Sensory Integration Therapy (SIT) were favorable, highlighting an increase in the number of words used, a notable expansion in vocabulary diversity, an increase in mean length of utterance, and greater use of varied grammatical structures (Preis & McKenna, 2014; Wang et al., 2022). In relation to phonetic–phonological components and, more broadly, speech intervention through SIT, increases in phonological awareness and speech fluency were observed, along with a reduction in pauses, blocks, and articulatory errors, as well as an increase in the percentage of vocalizations and the acquisition of new words (Kelly, 1987; Ray et al., 1988). These findings indicate that SIT can be a tool for enhancing linguistic skills in children with ASD, particularly in those who experience difficulties in the semantic, morphosyntactic, and phonetic–phonological domains.

In addition to the reported benefits in speech and language, Sensory Integration Therapy (SIT) has also been positively valued by families. Piller et al. (2024) explored caregivers' perceptions and experiences, considering the impact of SIT on families of children who received this intervention. The authors identified that SIT influences family routines, parental responsiveness to children's sensory needs, and participation in family activities, and that it leads to improvements in family participation outside the home as a result of the therapy.

Within this context, it is relevant to consider the role of speech-language pathologists in sensory integration. As noted by Raubenheimer et al. (2022), these professionals not only contribute to the identification and management of sensory difficulties that affect children's communicative development, but also have the capacity to collaborate in interventions aimed at improving both communication and self-regulation. This highlights the importance of interdisciplinary collaboration, in which speech-language pathology is fully integrated with occupational therapy and family involvement to provide more comprehensive interventions tailored to the specific needs of children with ASD.

This concept of a collaborative approach aligns with the work of Otero et al. (2010), who argue that interdisciplinary practice allows for a more comprehensive understanding of the child's needs. In this regard, occupational therapists contribute their expertise in identifying and managing sensory processing difficulties (Matsukura, 2010), while speech-language pathologists provide targeted strategies to address communication

disorders. Likewise, other professionals, such as teachers, may collaborate in the implementation of SIT strategies. Leong et al. (2013) reported, in a study conducted in Malaysia and Singapore involving special education teachers (163 from Malaysia and 78 from Singapore), that the majority of the teachers surveyed applied sensory integration strategies and considered them effective or extremely effective (70.1% and 77.1%, respectively).

Despite the concerns raised by Watling & Hauer (2015) regarding the lack of studies supporting the effectiveness of Sensory Integration Therapy (SIT), authors such as Schoen et al. (2019), Vitásková & Tabachová (2018), Mauer (1999), Thompson & Blanche (2015), Griffer (1999), Fouad et al. (2023), Kelly (1987), Ray et al. (1988), Raubenheimer et al. (2022), and Otero et al. (2010) offer diverse perspectives on this topic. While some studies suggest that SIT does not always yield consistent results in the treatment of speech and language difficulties, particularly when compared with more traditional approaches, the arguments presented by other researchers highlighting the potential of this therapy to improve sensory processing and communication skills in children with Autism Spectrum Disorder (ASD) cannot be disregarded.

Conclusion

This study has enabled an in-depth exploration of the relationship between Sensory Integration Therapy (SIT) and speech and language development in children with Autism Spectrum Disorder (ASD), highlighting the relevance of this therapeutic approach for improving communicative abilities in this population. In addition to promoting emotional and sensory regulation, SIT contributes to the creation of a favorable environment for learning and social interaction, which are essential elements in the holistic development of individuals with ASD.

The literature review revealed the need for further research on the effectiveness of SIT across different contexts and populations, as the current findings remain inconclusive and limited. Nevertheless, the evidence reviewed suggests opportunities for speech-language pathology to collaborate with this type of intervention within interdisciplinary teams.

The results obtained indicate that the implementation of sensory integration strategies may serve as a valuable complement to intervention programs aimed at improving linguistic and communicative abilities. By addressing sensory difficulties, these strategies may facilitate greater receptiveness and participation in speech and language activities among children with ASD.

References

- Abelenda, A. J., & Armendariz, E. R. (2020). Evidencia científica de integración sensorial como abordaje de terapia ocupacional en autismo. *Medicina-buenos Aires*, 80(Suppl. 2), 41-46.
- Alcalá, G. C., & Ochoa, M. G. (2022). Trastorno del espectro autista (TEA). *Revista de la Facultad de Medicina*, 65(1), 7-20. <https://doi.org/10.22201/fm.24484865e.2022.65.1.02>.
- Álvarez, B., Moreno, M., & Zea, P. (2010). Percepciones de terapeutas ocupacionales sobre el lenguaje y la comunicación de los niños con déficit de integración sensorial. *Revista de la Facultad de Medicina (Caracas)*, 58(4), 263-271.
- AMERICAN PSYCHIATRIC ASSOCIATION – APA. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing, Inc.

- Angulo, R. F., Zuleta, N. M., Crissien-Quiroz, E., & Blumtritt, C. (2020). Perfil sensorial en niños con trastorno del espectro autista. *Zenodo*, 39(1), 101-111.
- Arberas, C., & Ruggieri, V. (2019). Autismo: aspectos genéticos y biológicos. *Medicina*, 79(Suppl. 1), 16-21. PMID:30776274.
- Arksey, H., & O'Malley, L. (2005). Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology*, 8(1), 19-32. <https://doi.org/10.1080/1364557032000119616>.
- Ayres, A. J. (1972). *Sensory integration and the child*. Los Angeles: Western Psychological Services.
- Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J., & Clubley, E. (2008). The Autism-Spectrum Quotient (AQ): evidence from asperger syndrome/high functioning autism, males and females, scientists and mathematicians. *Journal of Autism and Developmental Disorders*, 31(1), 5-17. PMID:11439754. <https://doi.org/10.1023/A:1005653411471>.
- CENTRO PARA EL CONTROL Y LA PREVENCIÓN DE ENFERMEDADES (2023). *Informe Comunitario del 2021 sobre el Autismo*. Recuperado el 22 de enero de 2025, de <https://archive.cdc.gov/#/details?url=https://www.cdc.gov/ncbddd/spanish/autism/addm-community-report/index.html>
- Fazlıoğlu, Y., & Baran, G. (2008). A sensory integration therapy program on sensory problems for children with autism. *Perceptual and Motor Skills*, 106(2), 415-422. PMID:18556898. <https://doi.org/10.2466/pms.106.2.415-422>.
- Fouad, N., Hafez, N., Gebaly, H. H. E., & Fahiem, R. A. (2023). Efficacy of the sensory integration therapy on language development in autism spectrum disorder children. *Egyptian Journal Of Ear Nose Throat And Allied Sciences*, 24(24), 1-8. <https://doi.org/10.21608/ejentas.2023.180257.1586>.
- Griffer, M. R. (1999). Is sensory integration effective for children with language-learning disorders?: A critical review of the evidence. *Language, Speech, and Hearing Services in Schools*, 30(4), 393-400. PMID:27764349. <https://doi.org/10.1044/0161-1461.3004.393>.
- Kamp-Becker, I. (2024). Autism spectrum disorder in ICD-11: a critical reflection of its possible impact on clinical practice and research. *Molecular Psychiatry*, 29(3), 633-638. PMID:38273107. <https://doi.org/10.1038/s41380-023-02354-y>.
- Kelly, G. (1987). Occupational therapy for speech and language disordered children: a sensory integrative approach. *British Journal of Occupational Therapy*, 50(4), 128-131. <https://doi.org/10.1177/030802268705000404>.
- Leong, H. M., Stephenson, J., & Carter, M. (2013). The use of sensory integration therapy in Malaysia and Singapore by special education teachers in early intervention settings. *Journal of Intellectual & Developmental Disability*, 39(1), 10-23. <https://doi.org/10.3109/13668250.2013.854876>.
- Levy, S. E., Mandell, D. S., & Schultz, R. T. (2009). Autism. *Lancet*, 374(9701), 1627-1638. PMID:19819542. [https://doi.org/10.1016/S0140-6736\(09\)61376-3](https://doi.org/10.1016/S0140-6736(09)61376-3).
- Matsukura, T. S. (2010). A aplicabilidade da terapia ocupacional no tratamento do autismo infantil. *Cadernos Brasileiros de Terapia Ocupacional*, 6(1), 1-24. Recuperado el 22 de enero de 2025, de <https://www.cadernosdeterapiaocupacional.ufscar.br/index.php/cadernos/article/view/309>
- Mauer, D. M. (1999). Issues and applications of sensory integration theory and treatment with children with language disorders. *Language, Speech, and Hearing Services in Schools*, 30(4), 383-392. PMID:27764348. <https://doi.org/10.1044/0161-1461.3004.383>.
- Montiel-Nava, C., Cukier, S., Garrido, G., Valdez, D., Paula, C. S., García, R., Rosoli, A., Irrarázaval, M., & Rattazzi, A. (2020). Service encounters across the lifespan in individuals with autism spectrum disorders: results from a multisite study in Latin America. *Research in Autism Spectrum Disorders*, 79, 1-13.
- Muñoz Phi, P. (2023). Efectividad de la integración sensorial en intervenciones del habla y lenguaje para personas con el trastorno espectro autista: una revisión sistemática. *Revista Ciencias de la Conducta*, 38(1), 26-40.
- Oliveira, P. L., & Souza, A. P. R. (2022). Terapia com base em integração sensorial em um caso de transtorno do espectro autista com seletividade alimentar. *Cadernos Brasileiros de Terapia Ocupacional*, 30, e2824. <https://doi.org/10.1590/2526-8910.ctoRE21372824>.

- ORGANIZACIÓN MUNDIAL DE LA SALUD – OMS. (2019). *Clasificación internacional de enfermedades para estadísticas de mortalidad y morbilidad, 11.a revisión*. Recuperado el 22 de enero de 2025, de <https://icd.who.int/>
- ORGANIZACIÓN MUNDIAL DE LA SALUD – OMS. (2022). *Autismo, los Trastornos de Espectro Autista*. Organización Mundial de la Salud. Recuperado el 22 de enero de 2025, de <https://www.who.int/es/news-room/factsheets/detail/autism-spectrum-disorders>
- Otero, B. Á., Angarita, M. M., & Arias, P. Z. (2010). Percepciones de terapeutas ocupacionales sobre el lenguaje y la comunicación de los niños con déficit de integración sensorial. *Revista de la Facultad de Medicina (Caracas)*, 58(4), 263-271.
- Paula, C. S., Ribeiro, S. H., Fombonne, E., & Mercadante, M. T. (2011). Brief report: prevalence of pervasive developmental disorder in Brazil: a pilot study. *Journal of Autism and Developmental Disorders*, 41(12), 1738-1742. PMID:21337063.
- Peters, M. D. J., Godfrey, C. M., McInerney, P., Soares, C. B., Khalil, H., & Parker, D. (2015). *The Joanna Briggs Institute reviewers' manual 2015: methodology for JBI scoping reviews*. Adelaide: The Joanna Briggs Institute. Recuperado el 22 de enero de 2025, de http://joannabriggs.org/assets/docs/sumari/Reviewers-Manual_Methodology-for-JBI-Scoping-Reviews_2015_v2.pdf
- Peters, M. D., Marnie, C., Tricco, A. C., Pollock, D., Munn, Z., Alexander, L., McInerney, P., Godfrey, C. M., & Khalil, H. (2020). Updated methodological guidance for the conduct of scoping reviews. *JBI Evidence Synthesis*, 18(10), 2119-2126. PMID:33038124.
- Piller, A., Osborne, B., & McHugh Conlin, J. (2024). Impacto percibido de la terapia de integración sensorial en la familia. *OTJR: Occupation, Participation and Health*, 45(4), 519-526. PMID:39308182.
- Preis, J., & McKenna, M. (2014). The effects of sensory integration therapy on verbal expression and engagement in children with autism. *International Journal of Therapy and Rehabilitation*, 21(10), 476-486.
- Raubenheimer, M., Geertsema, S., Roux, M. L., & Graham, M. A. (2022). Sensory based interventions by speech language pathologists. *Advances in Communication and Swallowing*, 25(2), 129-149.
- Ray, T. C., King, L. J., & Grandin, T. (1988). The effectiveness of self-initiated vestibular stimulation in producing speech sounds in an autistic child. *The Occupational Therapy Journal of Research*, 8(3), 186-190.
- Reviriego Rodrigo, E., BayónYusta, J. C., Gutiérrez Iglesias, A., & Galnares Cordero, L. (2022). *Trastornos del Espectro Autista: evidencia científica sobre la detección, el diagnóstico y el tratamiento* (Informes de Evaluación de Tecnologías Sanitarias). Ministerio de Sanidad. Servicio de Evaluación de Tecnologías Sanitarias del País Vasco. Recuperado el 22 de enero de 2025, de https://redets.sanidad.gob.es/documentos/OSTEBA_TEA.pdf
- Santander, O. A. E. (2016). La integración sensorial, concepto, dificultades y prevalencia. *Revista de Psicología GEPU*, 7(2), 173-193.
- Schoen, S. A., Lane, S. J., Mailloux, Z., May-Benson, T., Parham, L. D., Roley, S. S., & Schaaf, R. C. (2019). A systematic review of ayres sensory integration intervention for children with autism. *Autism Research: Official Journal of the International Society for Autism Research*, 12(1), 6-19. PMID:30548827.
- Schoen, S. A., Lane, S. J., Mailloux, Z., May-Benson, T., Parham, L. D., Roley, S. S., & Schaaf, R. C. (2018). A systematic review of ayres sensory integration intervention for children with autism. *Autism Research: Official Journal of the International Society for Autism Research*, 12(1), 6-19. PMID:30548827.
- Thompson, B. L., & Blanche, E. I. (2015). The effects of vestibular activity during sensory integration intervention on spontaneous affect and communication within the therapy session. *American Occupational Therapy Association*, 38(2), 1-4.
- Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Kastner, M., Levac, D., Ng, C., Sharpe, J. P., Wilson, K. A., Kenny, M., Warren, R., Wilson, C., Stelfox, H. T., & Straus, S. E. (2016). A scoping review on the conduct and reporting of scoping reviews. *BMC Medical Research Methodology*, 16, 15. PMID:26857112.

- Vitásková, K., & Tabachová, J. (2018). The Evaluation of sensory integration and partial pragmatic communication abilities in children with autism spectrum disorder with the application of a new evaluation material. *Logopedia Silesiana*, (7), 17-35.
- Wang, Z., Gui, Y., & Nie, W. (2022). Sensory integration training and social sports games integrated intervention for the occupational therapy of children with autism. *Occupational Therapy International*, 2022(1), 9693648. PMID:36110198.
- Watling, R., & Hauer, S. (2015). Effectiveness of ayres sensory integration® and sensory-based interventions for people with autism spectrum disorder: a systematic review. *The American Journal of Occupational Therapy*, 69(5), 6905180030p1-12. PMID:26356655.

Author's Contributions

Ximena Donneys-Valencia and María José Varela-Bejarano contributed to the conception and development of the article and approved the final version.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Corresponding author

Ximena Donneys-Valencia
e-mail: ximenaaph@hotmail.com;
ximena.donneys00@usc.edu.co

Section editor

Prof. Dr. Patrícia Leme de Oliveira Borba