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Occupational therapy Approaches for sensory integration in autism spectrum disorder: scoping review

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Abstract:

Sensory treatment for children on the autism spectrum is one of the most prominent thorny topics that studies in all its forms have dealt with. Reliance was placed on presenting the latest theories that dealt with this topic, and what therapists have provided from 2014 to 2023 for children with their various types. The work aims to examine the sensory patterns and processing systems in children, and was completed. Treatment through a literary review of relevant literature from 2014 to 2023 through a database of databases published online in this field (PubMed, Eric, Web of Science, Google Scholar, and Scopus). (16) studies were extracted from Among them is one study in Arabic that was translated into English.

Following the submission, the inclusion criteria for 16 studies were analysed. The search was conducted by combining the keywords (autism), (sensory processing) (sensory processing disorder), and the results showed that children with autism show atypical sensory processing more than children who typically develop. natural.

**** Noura Sadeki***

1. Introduction

Autism spectrum disorder (ASD) has become a highly prevalent condition in recent years, with a significant amount of research being dedicated to it. According to statistics, approximately one in every 68 eight-year-old children is affected by ASD (Babak Kashefimehr, etc, 2017, p75). The characteristics of ASD vary significantly from person to person, as outlined in the Diagnostic and Statistical Manual of Mental Disorders. People with ASD have trouble communicating, which is a key part of the disorder. This includes speaking. It also includes things that are not said. It means looking someone in the eye. It also means knowing how to talk to other people. People with ASD also show signs like being very focused, doing things over and over, and being very sensitive to sensory stimuli, which can make it hard for them to do everyday things (Elise M. Liddane, 2021, p2) .

Occupational therapy is an important treatment for people with autism because it helps them learn a lot of different skills, especially how to move and feel things. This therapy is full and made just for the person's needs and goals. It wants to help them get better at things they do every day, like playing, being social, and following family rules. By recognizing the challenges individuals with autism face due to their skill deficits, occupational therapy seeks to develop effective interventions that enhance employment skills, movement, behaviors, and sensory processing, ultimately promoting a more functional and independent daily life. (Danielle Daoud, 2023, p4)

Despite autisme was discovred a decate ago;no ocure has been found till now due to overlapping groupe of disorders of (ASD)And their concomitent with other other physical disabilities,And since most countries not aware about (OT) treatment specially arab countries;this scoping review aims to deleved into a map of knowledge and evidence of (OT) and

(SIT).The fact that the results obtained from the selected studies suggested an positive effect of occupational therapy and sensory integration theory with children and adolescent with (ASD) in developing the capabilities and reducing unwanted behaviors.We hilight the importance of this article collected studies after the new classification Stipulated in DSM-5(2013).Each study has addresed one of the autism disorders,trying to reduce or improve it depending on the goal of studies.and the type of the disorder.However,These studies recommended conducting more accurate and comprehensive research. Sensory Integration (SI) theory is a framework that connects observable behaviors to underlying neural processes, and is used in clinical settings to understand behaviors, develop interventions, and predict changes in individuals. This theory emphasizes the significance of learning through the acquisition, processing, and application of sensory information derived from movement and the environment to strategize and coordinate actions. Because of this, sensory integration (SI) interventions aim to give people better sensory experiences that help them do things on purpose. The main goal of these interventions is to help the central nervous system process sensory information more easily (Stacey Reynolds, Tara J., et al., 2017, p. 1).

The main topic is sensory integration therapy, which is based on Ayres's 1972 theory. Therapists often use this method to help people better process and integrate sensory information. This helps people act in a more organized and flexible way. Therapists have recorded positive outcomes of sensory integration therapy by identifying distinct sensory patterns in children, particularly those with autism spectrum disorders, leading to improved performance. (Babak Kashefimehr, Hülya Kayihan, and Meral Huri, 2016, p. 2)

Sensory integration therapy (SIT) has been shown to improve outcomes for children with autism who have trouble processing and integrating sensory information. For example, a study by May-Benson and Koma in 2010 looked at the SIT technique and found that it helped with attention, socialization, and motor skills. SIT has also been shown to help people read, play games, reach their goals, and feel better about themselves, all of which are closely related to developing motor skills (Babak Kashefimehr, Hülya Kayihan, & Meral Huri, 2016, p. 2).

2. DATA AND METHODS

The current study reviewed existing literature on the topic in full, summarizing key sources, theories, mechanisms, and research gaps, as outlined in Table 1 of the appendices.

A scoping review was employed to chart the existing evidence and provide an overview of the topic. This approach was suitable because it allowed for the inclusion of studies with diverse methodologies and designs published between 2014 and 2023. The review focused on American and British journals and research. The review examined various information related to the topic, emphasizing the results described in the aforementioned studies.

The review involves a six-stage process, with the first five stages being mandatory and the sixth stage optional. In this case, the sixth stage was omitted because it requires direct communication with study participants, which is difficult to achieve, especially given the current reliance on electronic meetings.

3. Procedure

This study outlines the procedures used to conduct an updated effectiveness review of sensory integration approaches for addressing sensory challenges in children with autism spectrum disorder (ASD). The review adheres to the methods outlined in the healthcare program manual and the guidelines set by the Agency for Healthcare Research and Quality for conducting effectiveness analyses and comparisons.

4. Studies Selection

The review process involved evaluating each of the 16 identified studies' abstracts individually using a standardized abstract review form. The form contained a series of questions that helped determine whether each study met the inclusion or exclusion criteria. Based on their abstracts, the most relevant studies were selected, and the final list is presented in Table 1 of the study's appendices. The appendices also provide the inclusion and exclusion criteria, as well as the reasons for excluding certain studies. The Systematic Review Data Repository also makes the extracted data from each study available.

5. Data Extraction

Data extraction forms were created to collect basic information from the studies. This allows us to understand each study well and assess its quality. The forms were carefully designed to capture basic information relevant to the study objectives and extract key data, which is then organized into tables to facilitate analysis and comparison of study results.

6. Data Synthesis

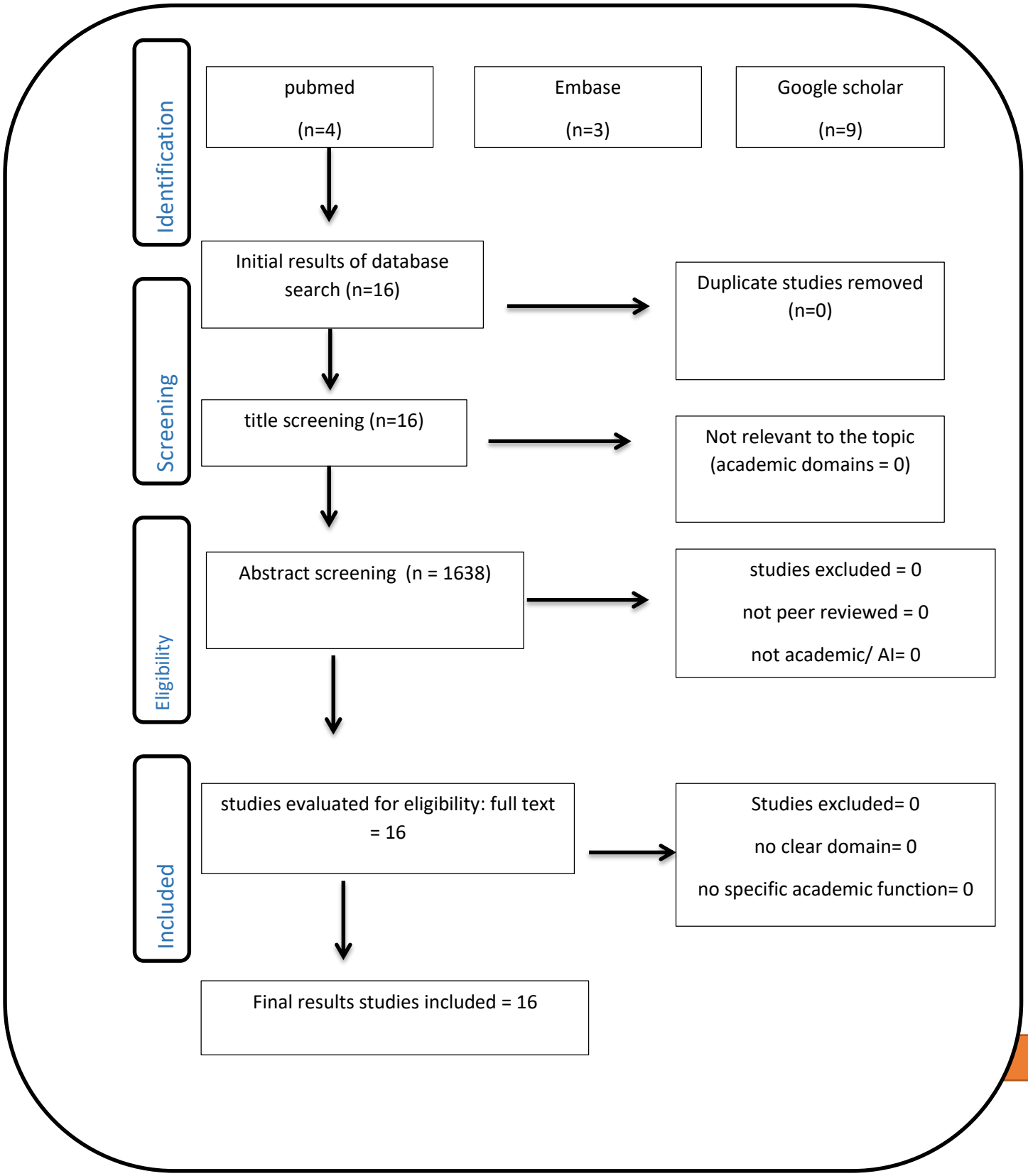
From November 2014 to January 2024, a comprehensive search of online databases was conducted to identify studies and articles related to sensory processing and autism. This search was conducted on prominent

websites, including PubMed, ERIC, Web of Science, Google Scholar, and Scopus. A set of specific keywords, including "autism" and "sensory processing disorders," was used to capture relevant studies in the search strategy. Moreover, the search included studies involving individuals diagnosed with autism spectrum disorder. This search yielded 16 publications, which were filtered using predetermined criteria.

1. Publications should include keywords appropriate to the topic.
2. Publications must be in English.
3. The publication should be reviewed and published on the basis of the research that was conducted in it.

This review was included in the study because it met the specified criteria, particularly the requirement that publications must include concrete measures of sensory processing. On the other hand, 10 publications were excluded due to the lack of concrete measures of sensory processing. Another 19 publications were excluded because they relied on self-reported autism diagnoses that were not confirmed by the end of the research. Additionally, 5 duplicate publications and 9 publications that fell outside the study's specified time frame (2014-2023) were also excluded.

Figure 1. PRISMA Flow Diagram



7. RESULTS

A total of 16 publications were included in this review, featuring a group of participants with autism and sensory processing issues. The total number of children with autism across these studies was 2,554, with a total of 1,638 participants. The age range of the participants varied, with one group consisting of children between 4-8 years old and another group consisting of individuals between 18-24 years old. In terms of gender, four studies specified the number of females (12) and males (56), while other studies did not provide gender information. The included studies were conducted by various researchers, including Nagwan Fouad Mohammed (2023), Renee Watling and Sarah Hauer (2015), Jane Case-Smith, Lindy L Weaver, and Mary A Fristad (2015), and Jenna Bartunek, Kaitlyn Dittloff, and Laura Gerd (2021).

The autism diagnosis methods used in the studies were based on various criteria, including the ICD-10 scale for specialists in two studies, and DSM-IV or DSM-V diagnosis in others. Additionally, one study used the SRS-2 to assess autism symptoms.

Table 1. Summary of studies included in the review

	Authors	Participants (N)	Age range	Middle age	Sex/ Gender	of autism Measures sensory processing	Method	results
1	Teddie Buchner, Jennifer Fortuna, Natalie Lindsay	79	12	19	Female/ male	Sensory-based therapies involve treatments designed to help children use their senses effectively. Completing important and necessary activities of daily life Self-care Participation in school activities	The study adopted four scientific guidelines to obtain articles defining sensory integration interventions used by therapists	It was drawn from eleven articles to identify sensory integration interventions used by pediatric occupational therapists
2	Renee Watling, Sarah Hauer	885	3	12	chilled	Relying on occupational therapy as an intervention approach made a difference	The study adopted the methodology of published literature starting from 2006 to 2013 and treated it with extended effectiveness with sensory interventions within the scope of occupational therapy for practitioners.	The study concluded that the results of children's sensory modalities are mixed
3	Stacey Reynolds Virginia , Tara J. GlennonQ uinnipiac, Karla Ausderau, Roxanna M.	0	-	-	-	Research-based intervention methods that can be used in concert	The study's methodology was based on a descriptive design of sensory therapeutic methods and documentation of these methods	The study concluded that Iris's sensory integration is the only approach that can be used to treat the problem of autism, relying on therapeutic visualizations to meet their needs.

4	Kashefimehr, B., Kayihan, H., & Huri, M.	24	3	8	chilled	Use the child's short occupational profile, use the sensory profile, and exclude emotional reactions and social/emotional responses	-The study relied on conducting a randomized controlled trial for each of the control groups. -Each intervention group is homogeneous in terms of work and diagnosis and requires significant support.	-The study concluded that SIT interventions can improve occupational performance and sensory processing abilities. -She believes that SIT is a useful approach to occupational therapy.
5	Schoen, S. A., Lane, S. J., Mailloux, Z., May-Benson, T., Parham, L. D., Smith Roley, S., & Schaaf, R. C.	19	4	12	chilled	Social Activities Scales/Secondary Outcomes Scale for Children's Assessment and Disability Inventory	The study conducted a three-stage methodology that included collecting a database, using search terms, and proposing an approach to sensory integration.	The study concluded, through verified experiments, that ASI can be considered an evidence-based practice for children with autism.
6	Case-Smith, J., Weaver, L. L., & Fristad, M. A.	90	3	21	chilled	Self-regulation targeting arousal/sensory-based sensory dependence/psychiatry/self-regulation/developmental disorders	The study relied on several strategies for identifying studies for review, conducting a computerized search for references between the years 2000 and 2012, and relying on a combination of psychology and behavioral sciences.	The study concluded that the majority of SBI studies lacked rigorous implementation, although protocols varied widely. I also found that sensory interventions with the SIT technique for children with autism spectrum

								disorder and sensory processing problems demonstrate positive effects with the child's individual goals.
7	Simin Asadi, Hosein Sourtiji	3	4	12	chilled	Developmental Skills/Socio-Cognitive Skills Training/Behavioral and Intensive Interventions/Early Start Denver Model (ESDM), Pivotal Response Training (PRT)	The study collected a database, the inclusion criteria included articles in the English language and the main topic was professional intervention to treat people with autism spectrum disorder, and selected keywords to search regularly.	The study concluded that it is possible to identify occupational therapy interventions for people with autism spectrum disorder. Based on the Early Start Denver Model (ESDM), Pivotal Response Training (PRT).
8	Jennifer Bell	0	-	-	teenage	Addressing systemic flaws/focusing on challenging behaviours	The study was based on the Iris Occupational Therapy Scale, an attempt to develop the sensory integrated treatment approach through the use of SIT.	The study concluded that the positive effects on children with autism and their general performance through the Iris theory approach
9	Hind M Edrees	242	-	-	Female/ male	Use all sensory interventions and treatments	The study designed sensory treatments and also provided experimental support for	The study indicated insufficient evidence to support the use of all types of

							sensory treatments.	sensory interventions and treatments.
10	Bartunek, J., Dittloff, K., Gerdts, L., Huepfel, A., & Sievert, W. (2024).	0	-	-	children	Enhancing exercise and training impact on children's quality of life	The study method was based on a systematic review and meta-analysis of data collected through "primary qualitative, psychological, quantitative" studies.	The study concluded that it is necessary to provide neurophysiol ogical profiles of sensory processing in autism spectrum disorder that reflect valuable biomarkers for diagnosing and monitoring therapeutic interventions.
11	Justice, H., Haines, D., & Wright, J. (2021).	13	-	-	children	Use approaches informed by sensory integration in units of measurement, assessment, and treatment	The study relied on the Delphi equation to collect and explore data, synthesize the opinions of occupational therapists, survey opinions via the Internet, and provide qualitative comments.	The study concluded a series of knowledge related to how occupational therapists work and how they work with people with intellectual disabilities and difficulty with sensory integration.
12	S. Domínguez-Lucio, L. M. Compañ-Gabucio, L. Torres-Collado &	660		18	teenage	One measure (KaTid-Child and Time Parent) was highlighted as it had not been used previously	The study was reviewed and scoped by following the Cochrane Handbook standards, and the PRISMA Supplement	The study concluded the effectiveness of NT techniques used in operational treatment for children and

	M. García de la Hera						recommendations for scoping review	adolescents with autism spectrum disorder
13	Petty, T., Carpenter, A., Bland, A., & Brown, A. (2022).	117	2	19	Chilled/teenage	Sensory terminology was relied upon to evaluate the treatment of autism spectrum disorder in children	The study systematically reviewed five studies using qualitative analysis, the first to provide a database for research through specific sentences, the second to analyze the titles of articles and examine their relevance to the research question, the third to analyze the texts based on inclusion criteria, the fourth to extract the included data, and finally to summarize the results for the sensory model.	The study concluded that occupational therapy practitioners need to use a theoretical basis for consistent sensory modulation terminology to assess and treat children with autism spectrum disorder.
14	Barros, V. de M., Folha, D. R. da S. C., Pinheiro, R. C., & Della Barba, P. C. de S.	31	0	7	Chilled	The (OT Seeker) scale was relied upon to score average scores/raise scientific evidence regarding the relationship between sensory processing and professional engagement.	-The study conducted a systematic review using the descriptors "sensory therapy, engagement, and occupational therapy." -These descriptors were	-The study concluded from nine articles that the evaluation of the OT Seeker scale reported scores of average size -She also pointed out the need for professional

							combined by an AND operation on the most famous databases, including PubMed	investment to help specialists in occupational therapy and expand the scope of research on this topic
15	FOUAD, Hafez, El-Gebaly, & Fahiem,	68	6	36	Chilled/ female - male	The focus was on preparing the child's primitive abilities to attend and learn as an alternative to practicing and exploring target behaviors	-The study enrolled sixty-eight children with autism, and they were divided into two groups, the first group received language therapy sessions and the second group received sensory integration therapy. The children also went through two stages of evaluation after receiving their sessions one year apart. -Each child takes the Stanford Scale, which is a statement of intelligence	- Improvement in linguistic abilities was observed equally between the two study groups -This improvement was linked to their linguistic abilities due to their connection to the language rehabilitation programme
16	Cátia Couço Lucas, MScORC ID Icon, Ana Paula da Silva Pereira,Icon, Leandro da Silva Almeida	323	0	6	chilled	Evaluation of sensory integration for children	-The study incorporated developmental monitoring at ages 9, 18, and 30 months. -It also evaluated the family routine for each child based on natural contexts	-The study concluded, through the tools used, that focusing on stages of growth or developmental states could miss sensory problems in addition to participation.

							-I focused on the strengths, weaknesses and challenges of SI	-She also considered that the early intervention approach, including routine procedures, depends primarily on the family.

8. Sensory processing for children with autism

Individuals with autism exhibit distinct behavioral differences related to sensory processing, which are rooted in the neural mechanisms underlying autism spectrum disorders.

Recent neurophysiological research has yielded conflicting findings on the sensory processing mechanisms in autism, suggesting that core features of the condition, such as language delay related to auditory processing and difficulties with flexible visual processing, may be rooted in these mechanisms. (Elysa Jill Marco,2012)

A 2014 study by Teddie Buchner, Jennifer Fortuna, and Natalie Lindsay references the ASI theory, which is grounded in both neuroscience and professional practice, and explores how the interaction between sensory input, the central nervous system, and a child's behavioral response develops.

Interventions focused on sensory integration are the most sought-after and widely used treatment approach for children with autism spectrum disorders. However, numerous studies have also emerged that question the effectiveness of ASI interventions, with varying opinions and theories on their usefulness. (Teddie Buchner, Jennifer Fortuna, Natalie Lindsay,2014).

Research conducted over the past four decades has driven investigations into sensory processing in individuals both with and without autism spectrum disorder, aiming to elucidate how the brain handles sensory information in a broad spectrum of developmental disorders.

Iris Sensory Integration (ASI),is intervention designed to improve academic skills and higher-level abilities such as planning and organization by targeting their sensorimotor in the foundation.the study comfirmes the involving patients with special equipment allowing individuals to processe rich sensory in put ,and

enhance their sence of security. (Emily Kilroy, Lisa Aziz-Zadeh, and Sharon Cermak,2019) The view of the ASI intervention approch centers that (ASD) is characterized By a complex interaction between genetic,enviremental and neurodevlopmental factors.As a results,a deverse challenges in processing in the brain and sences reflecting the different degrees of functions and levels of impairments. . (Teddie Buchner, Jennifer Fortuna, Natalie Lindsay,2014).

A study from 1970s on twins with autism spectrum disorder hilighted the strong role of genetics showing that identical twins shared 100% genetics similarity,exhebited a strong correlation in traits.(Emily Kilroy, Lisa Aziz-Zadeh, and Sharon Cermak,2020).

Research suggests that rare genetic mutations significantly contribute to the development of autism spectrum disorder, leading to cognitive impairments such as intellectual disability. Furthermore, the maternal genetic component is a major contributor to these mutations. To better understand and diagnose autism spectrum disorder, large-scale studies are necessary to establish clear diagnostic criteria that encompass the diverse range of phenotypes exhibited by affected individuals, thereby ensuring equal diagnostic opportunities for each case. (Joseph D. Buxbaum, David J. Cutler, Mark J. Daly, Bernie Devlin, Kathryn Roeder, Stephan J. Sandersm,2020)

Establishing diagnostic criteria is just the beginning. It's also crucial to develop a quantitative standard for phenotypes that are continuously distributed. Examples of such traits include behavioral, cognitive, and neurological traits. These are typically measured on a spectrum rather than as discrete categories.

9. DISCUSSION

A review of current research and literature indicates that sensory processing difficulties are prevalent among children with autism. A 2014 study by Teddie et

al. found that children with autism spectrum disorder (ASD) often exhibit behaviors that hinder their capacity to adapt, impacting both their social interaction and learning abilities. The study also emphasizedthe scarsity of theoretical models and evidence available to explain the deverse functional outcomes of autism across different envirements life circumstances.

occupational therapy (OT) effectivness for children with autism spectrum disorder,examinede by A study of (Rene&Sarah;2015)found the importance of evidence-based (OT) services is crucial for children with (ASD).also the study included a comprehensive review of available literature suggests thet need of intensive,individualized interventions are needed to inhance functional outcomes for individuals with autism spectrum disorder.

The study of (Stacey Reynold, 2017) identified a key therapeutic approaches has been focused for intervention plans, specially designed for specific methods that are most effective for children with distinct categories or subtypes of sensory processing difficulties,conditions commonly associated with autism spectrum disorder and attention deficit disorder.

The SIT interventions based in treatment significantly improved to communication skills among the intervention group,aligning with the s of 2017 findings study of Babak;et al.the study also showed that the SIT test had a positively addressed a fumdamental component of both communication and and social development by children with autism spectrum disorder.

A 2018 study by Sarah A. Schoen, Shelly J. Lane, Zoe Mailloux, Teresa May-Benson, L. Dianne Parham, Susanne Smith Roley, and Roseann C. Schai found that sensory integration intervention, as used by therapists in special education settings, yielded results that met the standards of practice for individuals with autism spectrum disorder.

10.Conclusion

The research presented in the paper reveals that children with autism exhibit distinct differences in sensory processing patterns and sensory systems, with more pronounced results in 2018 and 2022 compared to 2014.

The study concludes that sensory integration therapy, a common approach in occupational therapy for individuals with autism spectrum disorder, is effective in addressing sensory processing issues by providing controlled sensory experiences to enhance adaptive responses, which involves activities that stimulate various sensory systems, including touch, sight, sound, movement, and proprioception.

Research on the effectiveness of sensory integration therapy for individuals with autism spectrum disorder has produced equivocal results. This is due to the use of varied methods and measures, which have led to conflicting outcomes in the studies conducted. Occupational therapists typically customisethis therapy adapting it to each persons sensory profile.and working with family to devlop personalized functional treatment plans.

Effective sensory integration therapy for individuals with autism spectrum disorder depends on collaboration of various professionals,such as occupational therapists,speech therapists, psychologists,and teachers,to comprehensively understanding of the individual's needs and design intervention strategies and plan. Furthermore, the field of (SI) based on (OT) in autism spectrum disorder may see significant development,with the mergence of new updated therapeutic techniques, although further research is necessary to assess their effectiveness and practicality.

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Appendix

Table (1)

1	Teddie Buchner, Jennifer Fortuna, Natalie Lindsay	2014
2	Renee Watling, Sarah Hauer	2015
3	Stacey ReynoldsVirginia , Tara J. GlennonQuinnipiac, Karla Ausderau, Roxanna M.	2017
4	Babak Kashefimehr, Hülya Kayihan, and Meral Huri	2017
5	Sarah A. Schoen , Shelly J. Lane, Zoe Mailloux, Teresa May-Benson, L. Dianne Parham, Susanne Smith Roley, and Roseann C. Schaaf	2018
6	Jane Case-Smith, Lindy L Weaver, and Mary A FristadView all authors and affiliations	2019
7	Simin Asadi, Hosein Sourtiji	2020
8	Jennifer Bell	2020
9	Hind M Edrees	2021
10	Jenna BartunekSt, Kaitlyn Dittloff,St., Laura GerdtsSt.,Angela Huepfel,St.,William SievertSt,	2021
11	Helen Justice	2021
12	S. Domínguez-Lucio, L. M. Compañ-Gabucio, L. Torres-Collado & M. García de la Hera	2022
13	Tanner Petty; Amanda Carpenter, PhD; Anna Bland; Andrea Brown, OTR/L.	2022
14	Vanessa de Melo Barros a, Débora Ribeiro da Silva Campos Folha a, Raquel Cristina Pinheiro a, Patrícia Carla de Souza Della Barba a.	2023
15	Nagwan Fouad Mohammed, Nirvana Gamal El-Dine Hafez, Howida Hosny El- Gebaly, Reham Ahmed Fahiem	2023

16	Cátia Couço Lucas, MScORCID Icon, Ana Paula da Silva Pereira,Icon, Leandro da Silva Almeida	2023

Table (2)

	Patient	Articles
1	79	11
2	885	313
3	0	0
4	24	31
5	19	3
6	90	19
7	3	3
8	0	0
9	242	7
10	0	0
11	13	0
12	660	968
13	117	1
14	31	11
15	68	0
16	323	271
total	2554	1638