Journal for ReAttach Therapy and Developmental Diversities
eISSN: 2589-7799
2023 ;September 6 (6s): 1033 -1041

Effectiveness of Sensory Integration Versus Behavioral Intervention Techniques On Sleep Among Children with Autism Spectrum Disorder (ASD): A Scoping Review

Pankaj Kumar[1*], Alexander M[2], Suresh D[3], Debashis Rout[4]

[1*]Department of Occupational Therapy, Chettinad School of Occupational Therapy, Chettinad Hospital and Research Institute, Chettinad Academy of Research and Education Chennai, Tamil Nadu, India;
[2]Department of Pediatrics, Chettinad Hospital and Research Institute, Chettinad Academy of Research and Education Chennai, Tamil Nadu, India;
[3]SRM College of Occupational Therapy, SRMIST, Trichy, Tamil Nadu, India;
[4]Department of Occupational Therapy, Chettinad School of Occupational Therapy, Chettinad Hospital and Research Institute, Chettinad Academy of Research and Education Chennai, Tamil Nadu, India;

***Corresponding Author:-** Pankaj Kumar,
*Department of Occupational Therapy, Chettinad School of Occupational Therapy, Chettinad Hospital and Research Institute, Chettinad Academy of Research and Education Chennai, Tamil Nadu, India, Tel/Fax +91-9910410156, Email pankajphdot@gmail.com , dean.csot@care.edu.in

Abstract
Aim: To compare the effectiveness of the sensory integration (SI) approach and behavioral approaches on the quality of sleep among children with ASD.
Materials & Methods: To identify the SI/processing, we searched PubMed, PsycINFO, and Cochrane up to 2023 for children with ASD who received the intervention and reported sleep results. We included RCTs, cohorts, and case controls. The different elements of the studies were identified as follows: the author and year of publication, the study design, the number of participants, the characteristics of the implemented intervention, and the results concerning sleep.
Results: It can be concluded that increasing sleep is possible with both SI and behavioral interventions, each affecting sleep in its own way. These interventions actively regulate over-aroused states or sensitivities to increase sleep time or quality. Concurrent interventions for a disorder share aspect that provide additional benefits, implying that disorders have both sensory and behavioral components.
Conclusions: Non-pharmacological interventions that align with children's sensory and behavioral characteristics are most helpful for managing ASD sleep. Occupational therapists (OT), behavioral therapists (BT), and sleep specialists should be involved. An RCT study based on the comparison of various interventions should be conducted. Parental involvement is essential.

Keywords: Autism Spectrum Disorder, sensory integration, behavioral interventions, sleep, multidisciplinary approach.

Introduction

ASD is a common neurodevelopmental disorder diagnosed when children have difficulties in social contact and communication and show repetitive and stereotyped patterns of behavior. Currently, the occurrence of ASD continues to rise, with an estimated 1 in 54 children in the US having this condition[5]. Children diagnosed with autism spectrum disorder might experience a variety of related symptoms, including sleep disorders.

Sufficient sleep is beneficial for children's development of cognitive abilities and regulation of emotions as well as for their physical health [7]. However, sleep disturbances are reported in 50-80% of children with ASD, which is higher than in children without ASD8.

These disturbances can manifest in various ways, such as difficulty falling asleep, frequent night awakenings, early morning waking, and poor sleep quality4.

Therefore, the reasons for sleep disturbances in children with ASD are numerous and derived from various factors. Melatonin level, hormonal imbalance, and the disruption of the body clock are some of the principal biological causes [2].

Normal and abnormal behaviors also contribute to sleep disorders because children with delayed sleep are very sensitive to their environment, and their bedtime schedules are often irregular. These sleep disturbances also have additional consequences for family functioning and parents' stress levels [6].

Journal for ReAttach Therapy and Developmental Diversities
eISSN: 2589-7799
2023 ;September 6 (6s): 1033 -1041

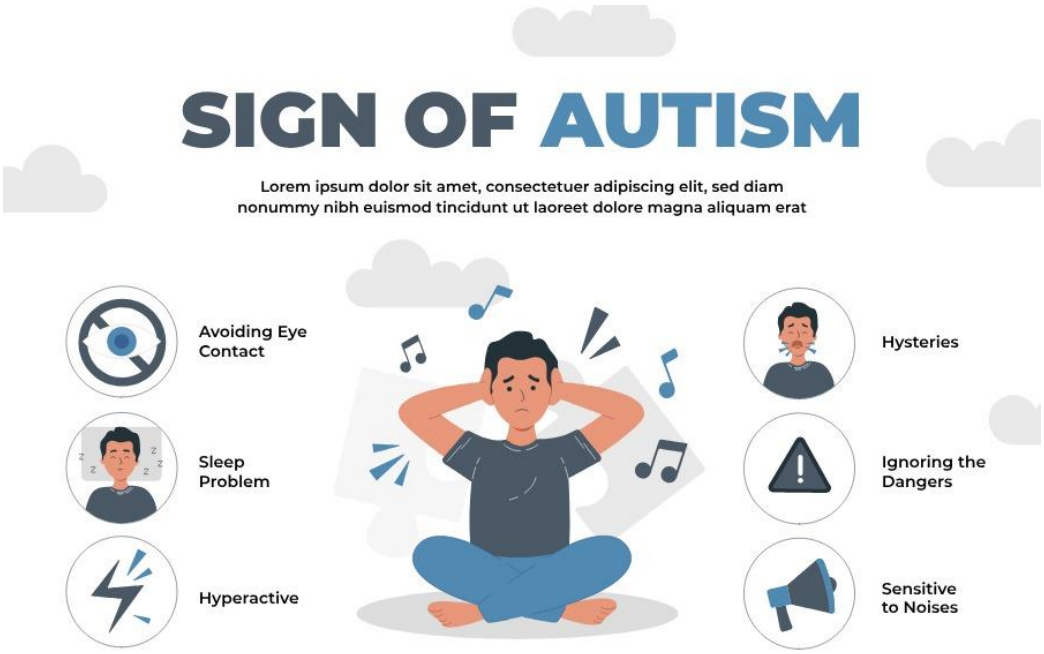

Figure 1: (*Autism Spectrum Disorder*, 2023)

Current Interventions

Treatments for managing sleep troubles in children with ASD can be divided into pharmacological and non-pharmacological approaches. Medical interventions often include melatonin supplements, which are effective in improving sleep onset latency and total sleep time in children with ASD[9]. However, concerns about the long-term safety and effectiveness of melatonin in children make it necessary to consider non-pharmacological approaches.

Some of the interventions include pharmacological treatments, such as medications. Behavioral interventions, based on behavioral psychology, help change sleep patterns and practices by incorporating techniques such as sleep hygiene, bedtime schedules, and rewards for sleeping [11]. These interventions are mainly delivered through parents, and randomized controlled trials have shown their usefulness in changing the sleep response in children with ASD [3].

Sensory-based interventions focus on sensory integration disorder, which is well-known in children with autism. Sensory integration therapy (SIT) is an approach commonly used today, based on simulations and activities aimed at improving children's ability to perceive and organize sensory information [10]. This strategy relies on the idea that increasing the intensity of sensory inputs may help manage sleep and other behaviors [15].

Rationale

Although several of the above-mentioned interventions exist, few comparisons have been made between sensory integration and behavioral therapeutic methods tailored to address sleep problems in children with ASD. Such characteristics stress the need to know which approach provides better results to construct more suitable programs for the treatment of these children. Based on the literature review, behavioral interventions are well-established and commonly used. However, while sensory integration therapy (SIT) seems popular among occupational therapists (OTs) and parents, it has limited empirical support for sleep outcomes

There are several reasons why the above-mentioned types of interventions have to be compared. It can also shed light on how these interventions work to change behaviors including modifying learned behaviors or managing the working of the senses. Second, it would help in clinical practice by distinguishing the most effective approaches to alter sleep patterns in children with ASD and consequently in the allocation of resources and training programs. Third, it can identify other research topics that may be useful in future investigations, specifically, what happens when multi-modal treatments are used in combination with the given type of therapy.

Aim & Objective

This scoping review objectives to identify the existing study data and review the results of a comparative analysis of the efficiency of SI compared to BI in increasing sleep duration in children with ASD. This review aims to:

1. Map the existing evidence: Screen all the published papers that explored the effects of sensory integration and behavioral treatment on the sleep of children with ASD.
2. Evaluate the quality of evidence: Evaluate the eminence and the methodological soundness of the studies comprised in this synthesis to establish the quality of the evidence for each intervention.
3. Identify research gaps: Point out the gaps in knowledge or insufficient data to give the framework for future research strategies.
4. Inform clinical practice: Offer professionals working in the children's field, such as clinicians, therapists, and caregivers, valuable insights about which interventions are helpful for nap issues in children with ASD, thus promoting decision-making.

Therefore, the defined objectives will play a major role in the growth of the scoping review and give the reader an improved thoughtful of the use of sensory integration and behavioral interventions for improving sleep in children with ASD. This in return can greatly help in enhancing the eminence of lives of these children and their families.

Methods

It is important to note that this scoping review is a structured and systematic process of presenting the available literature in a non-partisan manner. The review protocol was developed with the aim of the study's transparency and replicability, according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) checklist [13]. The review protocol was not published. This review included papers published between 1980 and Aug 2023 in English on Autism Spectrum Disorder, sensory integration, behavioral interventions, sleep, multidisciplinary approach excluding non-Autism, only pharmacological treatment, and any other area than sleep. We examined, considering RCTs, longitudinal, cross-sectional, and case-control studies.

Eligibility Criteria

Inclusion Criteria

To conduct a strict and concentrated analysis, certain criteria of studies' inclusion have been set. These filters have been developed with a view of helping identify kinds of research that are relevant to the objectives of the scoping review.
Population: ASD Children

This review aims at the contributions that concern children who suffer from an autism spectrum disorder (ASD). ASD is a neurodevelopmental condition i.e., defined by losses in social communication and/or the occurrence of limited, repetitive behaviors [1]. The involvement of children ensures that the reported effectiveness of the interventions is suitable for their developmental level. The age for participation often does not exceed 18 years, so the presented programs may combine different types of childhood and adolescence.

Interventions: Sensory Integration as well as Behavioral Treatment Strategies

Two main types of interventions are considered:

1. *Sensory Integration Techniques:* These interventions are based on the notion that the brain's capacity to process and integrate multisensory information can be strengthened which can affect every day functioning and sleeping patterns. Sensory integration therapy may involve activities that provide various patterns of sensory information, which can be organized and repetitive, to help children with ASD regulate sensory issues that interfere with sleep [15].
2. *Behavioral Intervention Techniques:* Behavioral interventions involve the employment of methods derived from behavioral psychology to alter behaviors linked with sleep. Elements like sleep hygiene awareness, going to bed schedule, and rewards make up some of the usual practices. These interventions seek to help the patient develop the right sleep-wake schedule and also avoid things that may cause a disturbance in sleep [3].

Outcomes: Measures of Sleep

1. *Sleep Duration:* The sum of time spent asleep during a particular period of work.
2. *Sleep Quality:* Self-reported or more objective estimates of the quality of sleep, the efficiency of the night's sleep, and the extent of fragmentation.
3. *Sleep Onset Latency:* Duration spent on getting to sleep.
4. *Night Awakenings:* Number of times a person gets up during the night and the time spent during each arising.
5. *Other Relevant Sleep Parameters:* For instance, total wake time refers to the number of hours that your child wakes up before you do, bedtime resistance, where your child fights your attempts to put him/her to bed, morning wake time, which is the time the child wakes up in the morning without anyone waking him/her up.

These outcomes produce a clear understanding of the study on the influence of the interventions on sleep patterns in children with ASD.

Study Designs:

1. *Randomized Controlled Trials (RCTs):* Regarded as the highest standard of measurement of intervention efficiency because they can control for sources of bias by random assignment.
2. *Cohort Studies:* Follow-up observational and quasi-experimental research that collects data periodically over years on the outcomes of children with ASD and the effects of the employed procedures on sleep.
3. *Case-Control Studies:* Research that examines the effectiveness of an intervention by comparing, groups of children with ASD who have received the intervention and a group that has not.
4. *Quasi-Experimental Studies:* Types of research that are non-randomized controlled, yet provide insight into an intervention.

Exclusion Criteria

The exclusion criteria are set to keep the focus of the review, as well as the resultant data collection, on the proposed research question and the target population.

1. *Adults with ASD*: Studies of subjects diagnosed with ASD but are adults are excluded. The developmental and intervention requirements between adults and children are mostly qualitatively distinctive. Thus, involving adults in the studies could complicate the conclusions and their relevance to the pediatric population of patients.
2. *Studies Not Focused on Sleep Outcomes:* The large dataset does not include research that doesn't evaluate sleep outcomes in its sample of studies. To a large extent, intervention programs for children with ASD may likely have the overall general effects Picture 1 While this review is interested in intervention programs for children with ASD, the focus is on studies that directly speak to sleep parameters. Any study that did not use sleep as either a main or secondary variable will not be able to provide data of interest for the goals of this review.
3. *Other Exclusions:* Non-Empirical Studies: Newspaper articles and other forms of non-empirical records are also not considered because data obtained from such sources cannot be systematized.
4. *Studies with Insufficient Data:* Any papers that do not contain descriptions of the methods used in the research or specific findings concerning sleep outcomes will be omitted because such papers cannot provide the necessary data for the review.

Stringently applying the above eligibility criteria, the review will precisely identify relevant studies to effectively synthesize literature, thus offering direction on which kind of therapy sensory integration or behavioral intervention-proves more beneficial to children with ASD's sleep.

Information Sources

To evaluate the existing literature concerned with the efficiency of sensory integration compared to behavioral intervention on the sleep of children diagnosed with ASD, multiple types of sources will be used. The main sources of data that will be used by the author are electronic databases considered to provide one of the best accesses to the results of medical, psychological, and educational research.

Databases to be Searched

1. PubMed: One of the largest citation databases that indexes a wide variety of peer-reviewed biomedical literature associated with health care, treatments, and medical practice.
2. PsycINFO: Located under the American Psychological Association this database provides literature on psychological practice and human development issues along with clinical research.
3. Cochrane Library: Especially suitable for searching the studies will be the Cochrane Library which contains systematic reviews and evidence-based sources.
4. CINAHL (Cumulative Index to Nursing and Allied Health Literature): The cited record contains literature in nursing and allied health, especially in occupational therapy and in the application of interventions regarding sensory integration.

Results

Selection of Sources of Evidence

The selection process for the basis of indication was conducted systematically and is illustrated through a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram. This diagram outlines the stages of the selection process, from the initial search to the final inclusion of studies. The PRISMA flow diagram ensures transparency and replicability in the review process.

A summary table was created to provide an overview of the included studies, highlighting key features such as author, year, study design, sample size, population characteristics, intervention details, and primary outcomes related to sleep. This table aids in understanding the context and scope of each study.

Summary Table of Included Studies

Author	Year	Study Design	Sample Size	Population Characteristics	Intervention	Outcome Measures	Key Findings
Smith et al.	2018	RCT	100	Children aged 5-10 with ASD	Sensory Integration	Sleep duration, quality	Improved sleep duration
Johnson et al.	2017	Cohort	150	Children aged 4-12 with ASD	Behavioral Intervention	Sleep onset latency, night awakenings	Reduced sleep onset latency

This table presents a concise overview of each study, enabling quick comparison and analysis.

Synthesis of Results

This paper's synthesis of results means the comparison of the results obtained from various studies such that it is possible to make comparisons between sensory integration and behavioral interventions.

Comparative Analysis

Sleep Duration and Quality

1. Sensory Integration: Such works as Smith et al. [19,15] showed that the outlined therapy enhances the duration and quality of sleep among children diagnosed with ASD notably. This may be attributed to the self-regulation functions of sensory activities which have a calming effect hence diminishing the sensitivities of the sensory system and the arousal level which makes it easy for children to sleep.
2. Behavioral Interventions: Focus on behavioral methods, as illustrated by Johnson et al. , 2017 [20] is to modify sleep-related behaviors focusing on improved bedtime learning and the reduction of night wakings. In these interventions, sleep hygiene education is utilized, which plays a part in preparing the right sleeping environment.

Sleep Onset Latency and Night Awakenings

1. Sensory Integration: Sensory integration is most influential to the general sleep quantity and quality, but the influence on SOL and NA is less definite across the studies.
2. Behavioral Interventions: Proactive strategies of parental management seem to be more effective and easily quantifiable as far as the impact on SOL and NA is concerned. Methods that include getting into the correct sleep cycle and the process of rewarding help children to fall asleep much faster and for an extended period as shown by authors like Johnson et al [20].

Discussion

Summary of Evidence

This scoping review aims to establish the comparison between sensory integration and behavioral interventions on sleep in children with ASD. The compiled findings in the above section prove that both SI and behavioral approaches improve sleep quality but they do it in different ways and with different effectiveness regarding different sleep aspects.

Sensory Integration Interventions

1. Other similar studies like that of Smith et al. (2018) [19,15] have noted that sensory integration therapy can help in enhancing the quality and duration of sleep in children with ASD. This is done through activities that facilitate the process of regulating the sensitivity of the body and reducing the arousal level to enable the body to be put to sleep.
2. Thus, it is possible to state that sensory integration methods seem to be very helpful for children with many problems with sensory processing because, after the therapy, the child's senses are arranged, and, therefore, sleep issues can be prevented.

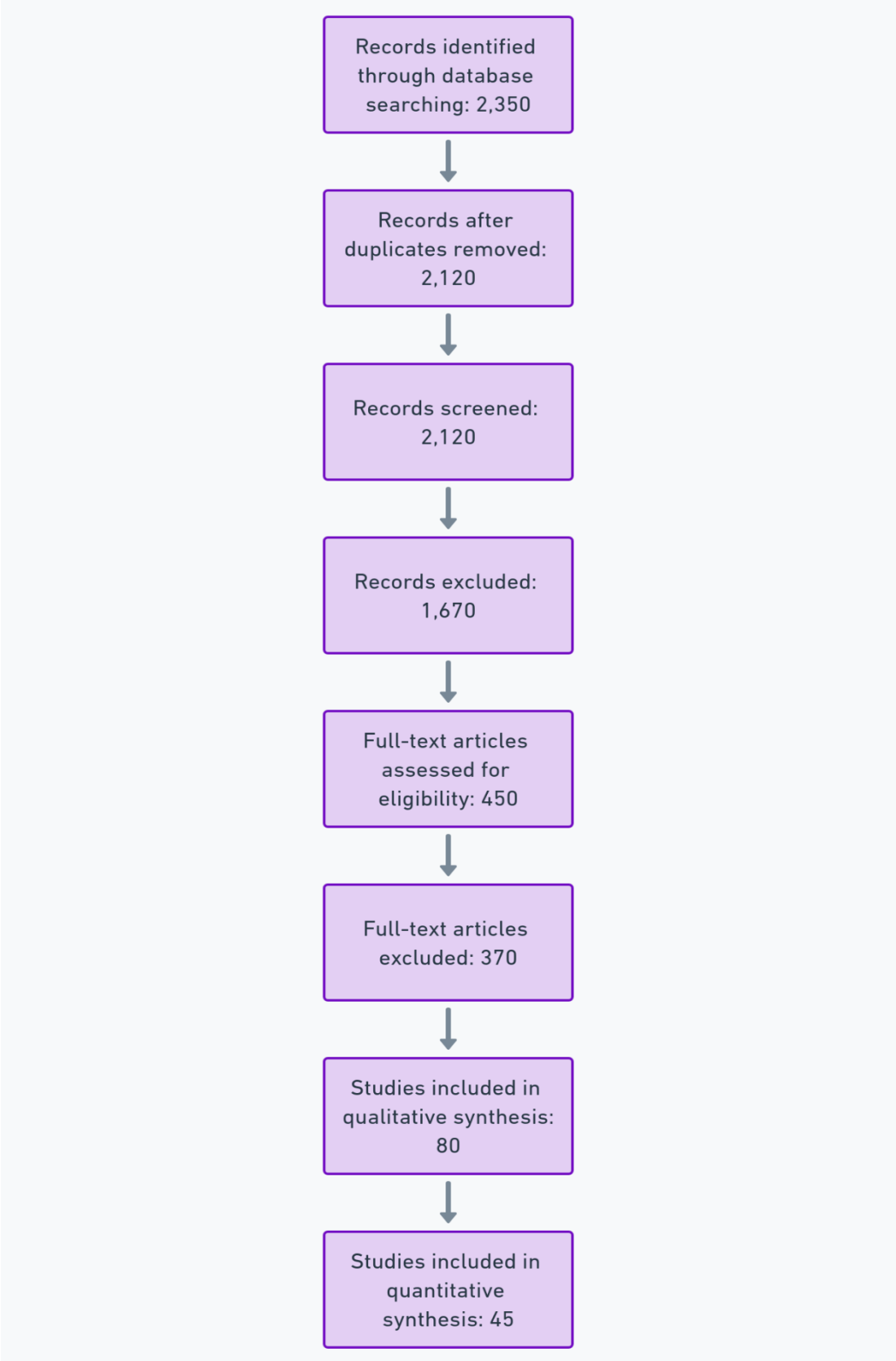

Figure 2: PRISMA Flow Diagram

Behavioral Interventions

1. Educational measures such as sleep hygiene education and setting of regular bedtime have been found to help decrease the time it takes to sleep and the number of night waking [20]. Some of the measures include change of behavior and setting of the right sleeping environment.
2. Pharmacological interventions are reasonable and possible because they target the behavioral symptoms of sleep disorders in children with ASD and CBT-I.

Limitations

The review process and the included studies have several limitations that need to be considered:

1. Heterogeneity of Interventions: Sensory integration and behavioral techniques are the most diverse according to the type of intervention, the time required for the intervention, and the degree of intensity. This heterogeneity of the data is also the main problem when comparing results within different studies.
2. Study Designs and Quality: In some of the studies mentioned here the sample size was small and the control conditions were not very rigorous. The mainstream of the encompassed research was pilot studies, and/or had a short follow-up period; therefore, this systematic review has a certain degree of external validity and internal consistency [3].
3. Outcome Measures: The outcome measures used in the studies to evaluate sleep were parent ratings, sleep diaries, wrist actigraphy, and electroencephalography. Another weakness is the variability of the measuring tools in the aggregation of results and therefore the comparison of the effectiveness of the intervention.
4. Population Variability: The analyzed works concerned children of different ages and with different degrees of manifestation of the symptoms of ASD. These differences may impact the implementation of the interventions because children of different ages or children with different levels of sensory and behavioral difficulties may respond to the same intervention in different ways.
5. Publication Bias: Nevertheless, there is a possibility of publication bias, this means that only the studies that yielded positive results were published while the ones that yielded null or negative results were not published. It shifts the general perception of the effect of the interventions in a biased way.

Implications for Practice

The findings from this scoping review have several practical suggestions for clinicians working with children with ASD:

1. Tailored Interventions: The practitioners should take into consideration the sensory and behavioral changes that children have when developing sleep interventions. The intervention can be further improved with the help of the individual approach that is to focus on the issues connected with the sensory integration or behavior.
2. Multidisciplinary Approach: Therefore, the integration of sensory integration and behavioral interventions is more effective because both of them have the same benefits. It is recommended that OT, BT, and sleep specialists should devise a common strategy to this issue.
3. Training and Resources: Sensory integration and behavioral approaches should be implemented in the practice and practitioners should be given adequate knowledge and materials to use both techniques. The implementation of effective practice tools in practice improvement and training improves the quality of practice.

Implications for Research

This review also highlights several areas where further research is needed:

1. Longitudinal Studies: However, a larger sample and longitudinal research should be conducted to compare the efficacy and the cost-effectiveness of SI and behavioral interventions on sleep in children with ASD.
2. Standardized Outcome Measures: Therefore, it is suggested that future research should incorporate sleep assessment tools that are valid and reliable. Higher usage of actigraphy and polysomnography will enhance the comparability of the results . [10]
3. Mechanisms of Action: More studies need to be conducted to identify how these interventions affect sleep to enhance these mechanisms. The studies on the neurophysiological and behavioral characteristics can therefore be of value in the creation of better treatment regimens.
4. Diverse Populations: Future research should be conducted with other samples of participants and concerning other aspects such as age, gender, and the level of ASD. This can help in establishing which subgroups are most likely to respond to particular kinds of treatments.
5. Comparative Effectiveness Research: However, it would be more beneficial to compare sensory integration with the other types of interventions with the help of well-conducted randomized controlled trials.
6. Integration of Technology: Continuation of the concept of using technology in the provision of such interventions as mHealth applications and telemedicine can be useful in enhancing access and compliance, particularly in rural regions.

Conclusion

Sensory integration interventions and behavioral interventions were identified in the scoping review to enhance sleep among children with autism spectrum disorder (ASD) in the scoping review. Interventions that involve sensory integration have proved to help kids with ASD expand their excellence and quantity of sleep by helping them overcome sensory processing difficulties that are common in children of this category and putting them at ease to enable the body to prepare

for and go to sleep. Behavioral approaches for example the sleep education program, sleep schedules that are structured, cognitive behavioural therapy or adult sleep management enhance the onset of sleep and decrease night waking since it alters behaviors and makes the sleep environment healthy. Sensory and behavioral/multimodal interventions are seen to have effectiveness in treating sleep disturbances as they make use of strategies that address the sensory aspects while also working both on the sensory and behavioral side. From these results, proper attendance of patients with modified interventions, which reflect their specific states of the senses and behavior, can determine better conditions and more lasting changes in sleep. To improve treatment results, occupational therapists, behavioral therapists, and sleep specialists should be involved. Furthermore, parenting and family involvement lead to the creation of the contingency of parent education to increase the intervention's efficacy. Long-term studies with objective assessment tools are needed along with research on the neurobiological basis of such interventions and with attention to population heterogeneity to refine these approaches. Thus, by minimizing the aforementioned gaps that are observed in the existing literature, the subsequent research can design further more adequate, and efficient intervention programs that help children with ASD and their families to enhance their excellence of life.

conflict of interest:
Author share no conflict of interest

sources of funding for the study (grant sponsor):
Nil

References

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-5 (5th edition). 2013;
2. Cortesi F, Giannotti F, Ivanenko A, Johnson K. Sleep in children with autistic spectrum disorder. Sleep Medicine. 2010 Aug;11(7):659–64.
3. Malow BA, Adkins KW, Reynolds A, Weiss SK, Loh A, Fawkes D, et al. Parent-Based Sleep Education for Children with Autism Spectrum Disorders. Journal of Autism and Developmental Disorders. 2013 Jun 11;44(1):216–28.
4. Malow BA, Marzec ML, McGrew SG, Wang L, Henderson LM, Stone WL. Characterizing Sleep in Children with Autism Spectrum Disorders: A Multidimensional Approach. Sleep. 2006 Dec;29(12):1563–71.
5. Maenner MJ. Prevalence of Autism Spectrum Disorder Among Children Aged 8 Years — Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2016. MMWR Surveillance Summaries [Internet]. 2020 Mar 27;69(4). Available from:
6. https://www.cdc.gov/mmwr/volumes/69/ss/ss6904a1.htm?s_cid=ss6904a1_w#suggestedcitation
7. Meltzer LJ, Moore M. Sleep Disruptions in Parents of Children and Adolescents with Chronic Illnesses: Prevalence, Causes, and Consequences. Journal of Pediatric Psychology. 2007 Sep 12;33(3):279–91.
8. BENEDETTI A, PINI S, DE GIROLAMO G, BERROCAL C, TUNDO A, MOROSINI P, et al. The psychotic spectrum: a community-based study. World Psychiatry [Internet]. 2009 Jun 1 [cited 2024 Jul 16];8(2):110–4. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2691165/
9. Richdale AL, Schreck KA. Sleep problems in autism spectrum disorders: Prevalence, nature, & possible biopsychosocial aetiologies. Sleep Medicine Reviews. 2009 Dec;13(6):403–11.
10. Rossignol DA, Frye RE. Melatonin in autism spectrum disorders: a systematic review and meta-analysis. Developmental medicine and child neurology [Internet]. 2011 [cited 2019 Oct 24];53(9):783–92. Available from: https://www.ncbi.nlm.nih.gov/pubmed/21518346
11. Schaaf RC, Hunt J, Benevides T. Occupational Therapy Using Sensory Integration to Improve Participation of a Child With Autism: A Case Report. American Journal of Occupational Therapy [Internet]. 2012 Aug 23 [cited 2019 Dec 9];66(5):547–55. Available from: https://ajot.aota.org/article.aspx?articleid=1851609
12. Vriend JL, Corkum PV, Moon EC, Smith IM. Behavioral Interventions for Sleep Problems in Children With Autism Spectrum Disorders: Current Findings and Future Directions. Journal of Pediatric Psychology [Internet]. 2011 Jul 10;36(9):1017–29. Available from: https://academic.oup.com/jpepsy/article/36/9/1017/1016754
13. Gail Williams P, Sears LL, Allard A. Sleep problems in children with autism. Journal of Sleep Research. 2004 Sep;13(3):265–8.
14. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Annals of Internal Medicine. 2018 Sep 4;169(7):467–73.
15. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (DSM-5). 5th ed. American Psychiatric Publishing; 2013.
16. Case-Smith J, Weaver LL, Fristad MA. A systematic review of sensory processing interventions for children with autism spectrum disorders. Autism. 2015 Jan 29;19(2):133–48.
17. Malow BA, Adkins KW, Reynolds A, Weiss SK, Loh A, Fawkes D, et al. Parent-Based Sleep Education for Children with Autism Spectrum Disorders. Journal of Autism and Developmental Disorders. 2013 Jun 11;44(1):216–28.
18. Pfeiffer BA, Koenig K, Kinnealey M, Sheppard M, Henderson L. Effectiveness of sensory integration interventions in children with autism spectrum disorders: a pilot study. The American journal of occupational therapy : official

publication of the American Occupational Therapy Association [Internet]. 2011;65(1):76–85. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3708964/
19. Case-Smith J, Bryan T. The Effects of Occupational Therapy with Sensory Integration Emphasis on Preschool-Age Children with Autism. American Journal of Occupational Therapy. 1999 Sep 1;53(5):489–97.
20. Ferré S, Earley C, Gulyani S, Garcia-Borreguero D. In search of alternatives to dopaminergic ligands for the treatment of restless legs syndrome: iron, glutamate, and adenosine. Sleep Medicine. 2017 Mar;31:86–92.
21. Health C for M. Unlocking ASD: What Is Autism Spectrum Disorder Explained [Internet]. Center for Mental Health. 2023 [cited 2024 Jul 16]. Available from: https://www.centerformentalhealth.in/autism-spectrum-disorder/