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Sensory Based Interventions for Children with Autism Spectrum Disorder: An Evidence-Based Practice Project

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**Sensory Based Interventions for Children with Autism Spectrum Disorder: An Evidence-
Based Practice Project**

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Introduction

Evidence Based Practice

Evidence based practice is defined as the integration of knowledge from professional and clinical expertise, patient/client unique values and circumstances, and best research evidence (Straus, Richardson, Glasziou, & Haynes, 2005). The EBP courses in the St. Catherine University occupational therapy programs emphasizes skill building in finding, analyzing, and synthesizing research.

A definition of Evidence-Based Practice (EBP)



(Straus, Richardson, Glasziou & Haynes, 2005)



The EBP Project

Occupational therapy graduate students at St. Catherine University complete an EBP project in partial fulfillment of the requirements for a course on Evidence-Based Practice.

The EBP Process

- Begins with a practice dilemma
- Dilemma is framed as an EBP question and PICO
P (population/problem) I (intervention) C (comparison group) O (outcome(s) of interest)
- Background learning
- Search for the best evidence
- Initial appraisal and critical appraisal of the evidence
- Summary of themes from the evidence
- Recommendations for practice
- Next steps – implementation in practice

EBP Practice Dilemma: Evidence Based Practice Case Scenarios

The overall focus of each of case scenarios are related to assessment or interventions that are related to Choosing Wisely Campaign® items 1, 2, 3, 5, 8, 10. Case scenarios were developed related to each initiative with clientele and conditions across the lifespan in various practice settings. Practice settings included school district, outpatient pediatric, primary care, skilled nursing facility, work rehabilitation, and acute care.

Six EBP Projects: Choosing Wisely Campaign Initiative

The six projects are representative of 6 campaign items for the Choosing Wisely Campaign® and initiatives. There are a total of 10 campaign item initiatives promoted by the American Occupational Therapy Association.

Thing 1: Don't provide intervention activities that are non-purposeful (e.g., cones, pegs, shoulder arc, arm bike).

Thing 2: Don't provide sensory-based interventions to individual children or youth within documented assessment results of difficulties processing or integrating sensory information.

Thing 3: Don't use physical agent modalities (PAMS) without providing purposeful and occupation-based intervention activities.

Thing 5: Don't provide cognitive-based interventions (e.g., paper and pencil tasks, table-top tasks, cognitive training software) without direct application to occupational performance.

Thing 8: Don't use reflex integration programs for individuals with delayed primary motor reflexes without clear links to occupational outcomes.

Thing 10: Don't provide ambulation or gait training interventions that do not directly link to functional mobility.

Background on Choosing Wisely Campaign®

The Choosing Wisely started in 2012 by American Board of Internal Medicine (ABIM) and *Consumer Reports*®, which includes 75 health care provider organization partners, including the American Occupational Therapy Association (AOTA) being one of the organizations. Choosing Wisely aims to promote meaningful conversations between health care practitioners and clients to ensure that appropriate and quality care is being provided (AOTA, 2021). The mission is

helping health care providers and clients in making informed and effective health care decisions, promote effective health care resources, and improve quality and safety of health care in the United States (AOTA, 2021). More specifically, campaign promotes assessment and interventions are evidence based, effective, necessary, safe, and not duplicated among health care providers including occupational therapy practitioners. Experts within this campaign developed and published 10 things providers and clients should question with occupational therapy services across various practice settings (Table 1).

Table 1

10 Things Patients and Providers Should Question

Thing	Related Item
1	Don't provide intervention activities that are non-purposeful (e.g., cones, pegs, shoulder arc, arm bike).
2	Don't provide sensory-based interventions to individual children or youth within documented assessment results of difficulties processing or integrating sensory information.
3	Don't use physical agent modalities (PAMS) without providing purposeful and occupation-based intervention activities.
4	Don't use pulleys for individuals with hemiplegic shoulder.
5	Don't provide cognitive-base interventions (e.g., paper and pencil tasks, table-top tasks, cognitive training software) without direction application to occupational performance.
6	Don't initiate occupational therapy interventions without completion of the client's occupational profile and setting collaborative goals.
7	Don't provide interventions for autistic persons to reduce or eliminate "restricted and repetitive patterns of behavior, activities, or interests" without evaluating and understanding the meaning of the behavior to the person, as well as personal and environmental factors.
8	Don't use reflex integration programs for individuals with delayed primary motor reflexes without clear links to occupational outcomes.
9	Don't use slings for individuals with a hemiplegic arm that place the arm in a flexor pattern for extended periods of time.
10	Don't provide ambulation or gait training interventions that do not directly link to functional mobility.

Note. American Occupational Therapy Association. (2021). 10 Things Patients and Providers Should Question

Resources Regarding Choosing Wisely Campaign®

What is the AOTA Choosing Wisely Campaign?

Website Link: <https://www.aota.org/Practice/Researchers/choosing-wisely.aspx>

Implementing the Choosing Wisely Recommendations

Website Link: <https://www.aota.org/Publications-News/otp/Archive/2019/implementing-choosing-wisely.aspx>

Ten Things Patients and Providers Should Question (Updated July 2021)

Website Link: <https://www.choosingwisely.org/societies/american-occupational-therapy-association-inc/>

AOTA Choosing Wisely Campaign Resources (Select Clinical Application Resources)

Website Link: <https://www.aota.org/Practice/Researchers/choosing-wisely.aspx>

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American Occupational Therapy Association. (2021). *AOTA's Involvement with Choosing Wisely®*. Retrieved from <https://www.aota.org/practice/researchers/choosing-wisely.aspx>

Appraisals of Best Evidence, Themes, and Recommendations

After searching and finding evidence available from library databases and alternative sources, students conducted an initial appraisal to evaluate the quality and relevance of the evidence and select the best research for further review. Then they conducted critical appraisals of the best formal reviews of primary research (e.g., systematic reviews, meta-analyses) and/or primary/original research studies. One of the steps in the CAP process is to evaluate the strength or level of the research design and the types of conclusions that are possible from each design.

Initial Appraisal

- Quality of the evidence
 - type of evidence and research design
 - investigator qualifications and journal/publication/website
 - journal/publication/website
- Relevance of the evidence

Critical Appraisal

- Appraisal of methods, results, and implications
- Classification of type of research study
 - Reviews of primary research (e.g., systematic reviews, meta-analyses)
 - Qualitative studies
 - Psychometric studies
 - Primary quantitative research studies
 - Level 1: randomized controlled trials
 - Level 2: two groups, nonrandomized/cohort and case control
 - Level 3: nonrandomized, pretest/posttest and cross-sectional
 - Level 4: single subject
 - Level 5: case report or series

After completing initial and critical appraisals, themes are summarized related to the EBP question and other findings that emerged from the evidence. Recommendations for practice and reflection on participating in an EBP project are identified in the conclusions.

Evidenced-based Practice Question

What are the current sensory-based interventions for elementary-age children diagnosed with autism spectrum disorder to support academic engagement in the classroom?

Presentation Slides

Choosing Wisely® Campaign: Thing # 2

Sensory Based Interventions for Children with Autism Spectrum Disorders: An Evidence-Based Practice Project

Presenters: Jenna Bartunek, Kaitlyn Dittloff, Laura Gerds, Angela Huepfel, William Sievert, Victoria Walczynski, Athena Yang

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Choosing Wisely® Campaign

"Don't provide sensory-based interventions to individual children or youth without documented assessment results of difficulties processing or integrating sensory information"

AOA American Occupational Therapy Association

Choosing Wisely®
An initiative of the ANMF Foundation

(American Occupational Therapy Association, 2021)

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Case Scenario

Scenario: You work in a school district that has noted **increased** referrals for children diagnosed with **autism spectrum disorders (ASD)**. The elementary age children are often referred for **sensory** as well as performance and participation needs in the classroom as well as at home. Your school's principal is asking you to **identify** and summarize the **evidence** regarding the current **interventions** that can be used to regulate **sensory behaviors**.

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What are the current sensory-based interventions for elementary age children diagnosed with autism spectrum disorders to support academic engagement in the classroom?

Person	Elementary-aged children with autism spectrum disorders
Intervention	Sensory based interventions
Comparison	Sensory based interventions vs. no intervention
Outcome	Academic engagement in the classroom

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Rationale for Evidence

- Importance of Evidence-Based Practice
 - Informed decision making
 - Supported interventions
- Increase in Prevalence
 - Appropriate therapies

(American Occupational Therapy Association, 2021)

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Background Knowledge

Preliminary Review

- 1 in 54 children have ASD
- Sensory processing difficulties impact occupations throughout the lifespan
- Sensory based interventions promote sensory integration
- Interventions performed in many settings

(American Occupational Therapy Association, 2018; CDC, 2020; Foster et al., 2017; Pells et al., 2021)

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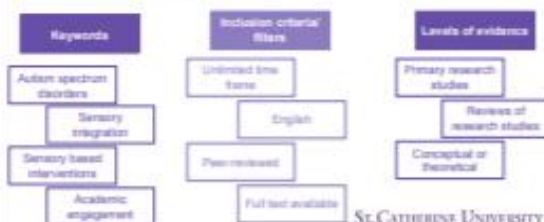
Search Process: Tools

- Date of Search
 - November 2021
- Database Search
 - MEDLINE/PUBMED, CINAHL, PSYCHInfo, ERIC, Science Direct, ProQuest, OTSeeker, PEDro
- Alternative Search
 - Google Scholar, American Journal of Occupational Therapy



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Search Process: Details



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Overview of Initial Appraisals

- Several Level I articles
- Most of the methodology consisted of systematic reviews
- Stakeholders included OT, educational professionals & parents
- Article Categories
 - 1: Evidence of ASI vs. other interventions
 - 2: ASI & SBI effectiveness
 - 3: Effectiveness of SBI in the schools



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Critical Appraisal #1

Level I Evidence
Relevance focuses on ASI based practice
Methodology is a systematic review
Findings show ASI are effective
ASI are effective in children with ASD

A systematic review of Ayres Sensory Integration® Intervention for children with autism

Schoen et al. (2019)

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Critical Appraisal #2

Level I Evidence
Relevance is about SBI effectiveness
Methodology is a systematic review
Findings show ASI is supported by evidence while not all SBIs are
ASI is an effective intervention for children with ASD

Effectiveness of Ayres Sensory Integration® and sensory-based interventions for people with autism spectrum disorder: A systematic review

Watling and Hauer (2015)

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Critical Appraisal #3

Level IV Evidence
Relevance to SBIs in school
Methodology is a qualitative analysis
Findings show a need for educational & social participation
Occupational Therapy practitioners can support student's educational participation, especially in affect and self-regulation

Sensory-based intervention in the schools: A survey of occupational therapy practitioners

Benson et al. (2019)

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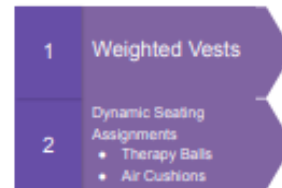
Theme One: Sensory Based Interventions (SBIs) Supported



(Bodison & Parnham, 2018; Grapo et al., 2020; Miller-Kuhaneck & Welling, 2017; Schoen et al., 2018; Welling & Hauer, 2015)

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Theme Two: Sensory Based Interventions (SBIs) Not Supported



(Sensory Processing Disorder Parent Support, n.d.)

(Ragotz et al., 2010; Grapo et al., 2020; Ouellet et al., 2021; Stephenson & Carter, 2009; Welling & Hauer, 2015)

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Theme Three: Assessments Before Interventions



(Benson et al., 2018; Gault-Oudener et al., 2017; Schaeffer et al., 2012; Spierdijk et al., 2018)

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Summary

To summarize the information and relate it back to the case scenario, when receiving referrals for children diagnosed with autism spectrum disorders (ASD), school-based occupational therapy practitioners must assess children with sensory difficulties before implementing interventions. When arriving at the intervention process, applying Ayres Sensory Integration and other sensory evidence-based interventions can promote academic performance and participation in the classroom.

(Benson et al., 2018; Bodison & Parnham, 2018; Grapo et al., 2020; Miller-Kuhaneck & Welling, 2017; Schoen et al., 2018; Welling & Hauer, 2015)

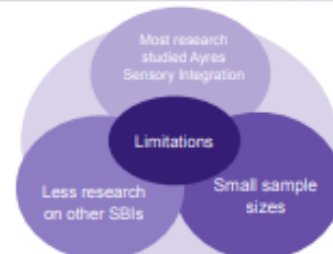
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Implications For Practice



(Ragotz et al., 2010; Benson et al., 2018; Grapo et al., 2020; Ouellet et al., 2021)

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Recommendations



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Conclusion

- Students with ASD often have trouble processing sensory information
- Evidence-based interventions can help
- Use Choosing Wisely® Campaign as a guide

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Themes

In an average classroom, students are presented with a multitude of stimuli. While processing the input of the walls covered in colorful posters, the sound of their peers' side chatter, and the feeling of the chair on their legs, students are expected to divert their attention to their schoolwork. Receiving and processing sensory input in the classroom can be especially overwhelming for elementary students with autism spectrum disorders (ASD) and sensory processing disorders. In fact, 40 to more than 90% of people with ASD have difficulties with sensory integration (Bodison & Parham, 2018; Gentil-Gutiérrez et al., 2021; Watling & Hauer, 2015). As sensory processing disorders are common amongst children with ASD, it is important for occupational therapy (OT) practitioners to provide proper assessments and interventions for this population. This evidence-based paper identifies sensory based interventions (SBIs) that are supported by evidence, SBIs that are not supported by evidence, necessary assessments prior to intervention implementation, and recommendations for future practice.

Sensory Based Interventions Supported by Evidence

There are a variety of SBIs within the field of occupational therapy that have been shown to be effective for children with ASD. Currently, the evidenced-based interventions to address sensory processing deficits in children with ASD include Ayres Sensory Integration (ASI) intervention, multisensory SBIs, Qigong massage, yoga, coaching, and parent training (Bodison & Parham, 2018; Grajo et al., 2020; Miller-Kuhaneck & Watling, 2017; Schoen et al., 2019; Watling & Hauer, 2015).

ASI is designed to target neurophysiological mechanisms that are involved in processing sensation, such as arousal, sensory detection and perception, and modulation (Watling & Hauer, 2015). Multiple researchers conducting systematic reviews found that ASI intervention can lead

to a variety of positive outcomes for children with ASD (Watling & Hauer, 2015; Schoen et al., 2019). According to Watling and Hauer (2015), ASI helped improve individualized goals, improved sleep, decreased stereotypical movements of ASD, and reduced caregiver burden. The researchers found that three out of four studies had meaningful and positive effects on individualized goals and decreased stereotypical movements of ASD. In addition, Schoen et al. (2019) found that ASI interventions meet the criteria for evidence-based practice for 4- to 12-year-old children with ASD. Although ASI is one of the most widely known SBIs, there are a few other effective interventions that are important to note.

Yoga was found to enhance educational performance and classroom communication among children with ASD (Grajo et al., 2020). Another unique intervention is Qigong massage, which has been found to be effective in helping children with ASD with self-regulatory behaviors, tactile abnormalities, ASD symptoms, and it can be effective in helping with the stress of parenting (Bodison & Parham, 2018). Lastly, Watling and Hauer (2015) found that SBIs that promote active participation in multisensory experiences were more powerful than single-sensory interventions to improve functional skills in children with ASD. This means that focusing on a variety of sensory experiences is more beneficial to a child with ASD rather than isolating one specific sense.

Incorporating a well-rounded array of evidence based SBIs is vital when providing OT services to children with ASD. Throughout any intervention that is provided by an occupational therapist, it is important to remember that family-centered care is considered to be best practice because families play the main role in promoting their child's development (Miller-Kuhaneck & Watling, 2017). This family-centered care includes developing children and family strengths and ensuring that information is shared with all caregivers. Parent training and coaching

interventions can help a parent understand their child's difficulties, improve specific areas of deficits, and encourage the parent to maintain their own health and wellness (Miller-Kuhaneck & Watling, 2017). Although there are many SBIs that are supported by evidence, it is important to note there are a number of SBIs that are not supported by evidence.

Sensory Based Interventions Not Supported by Evidence

In the scope of occupational therapy practice, there are a variety of interventions that are commonly used by practitioners when working with children with ASD; however the efficacy of these interventions are questioned and not supported by evidence-based practice.

Weighted vests are common SBIs that have previous claims to have positive outcomes for children with ASD. Watling and Hauer (2015) found that weighted vests for children with ASD had mixed results. Some of the children that were participants within the research showed mild behavioral improvements while others showed no improvements. The researchers of this systematic review had high variability and inconclusive results, which means the weighted vests are not supported by evidence (Watling & Hauer, 2015). Similarly, Grajo et al. (2020) reported that weighted vests have insufficient evidence to support educational participation and academic achievement for children with ASD. Both researchers found that previous studies supporting the use of weighted vests for children with ASD consisted of small sample sizes and often lacked control groups. In addition, Stephenson and Carter (2009) found that there was not a consistently positive effect among children with ASD when wearing a weighted vest. Their study included 20 students with ASD or other developmental disorders who wore weighted vests for 11-25 sessions. The focus of the study was to analyze the intervention of weighted vests among therapists who use sensory integration therapy. Given the lack of evidence to support the

intervention of weighted vests, OT practitioners should be wary of choosing weighted vests to address sensory processing deficits in children with ASD.

In addition to weighted vests, a different SBIs various types of dynamic seating assignments have been promoted in the OT field to increase academic participation in children with ASD. The seating assignments ranged from an air cushion to a dynamic seating position. Through the appraisal, Bagatell et al. (2010) and Ouellet et al. (2021) delineated that seating positions do not have a positive impact on the children's participation. Specifically, Bagatell et al. (2010) completed a single design study of children with ASD confidently concluded that therapy balls used in the classroom environment do not support classroom participation. Ouellet et al. (2021) arrived at the same conclusions about air cushions being used as an intervention for children with ASD. The researchers found that the cushions did not provide a significant difference in school participation compared to a normal seating assignment. Due to the lack of evidence to support different seating assignments as an intervention for children with ASD, practitioners need to be aware of the other therapies that are supported by evidence. Before any intervention is implemented, OT practitioners must assess the student's sensory processing needs.

Assessments are Necessary before Implementing Interventions

It is essential for all occupational therapy practitioners to administer an assessment on a child prior to starting SBIs. This guides school-based occupational therapy practitioners to gain additional knowledge on what sensory needs must be met for a child to perform well in school (Benson et al., 2019). A research survey was conducted in Pennsylvania among 94 school-based OT practitioners to examine their role in practicing SBIs. According to Benson et al. (2019), the OT practitioners reported that sensory assessments in schools were a major key factor for

understanding a child's sensory needs. Though this was a small sample size, the evidence still supports the role of SBIs in the school system from the perspective of school-based OT practitioners. However, among these OT practitioners, only 55.56% reported being comfortable in providing sensory-based assessments, and 13.33% revealed that there was a lack of training to conduct a sensory-based assessment and intervention (Benson et al., 2019).

For school-based OT practitioners to effectively offer sufficient services to children, it is necessary to be informed about the various ways to deliver an assessment. An assessment to implement is the Sensory Profile-2 (SP-2) questionnaire, which was based on Dunn's sensory processing model (Gentil-Gutiérrez et al., 20212). This is used to assess a child's specific behaviors in familiar environments and situations by using a Likert scale to document the frequencies of those behaviors. Another questionnaire assessment, Short Sensory Profile (SSP) is a caregiver-completed profile that reports the frequency of the child's behaviors to various sensory experiences (Liu, 2013). Evaluating these sensory processing patterns can guide additional well-established tools for assessments such as the Sensory Profile and the Sensory Processing Measure to help apply sensory integration and SBIs in practice (Watling & Hauer, 2015). Similarly, Schaaf et al. (2012), also highlights the Sensory Integration and Praxis Tests as the gold standard to assess children's ability to assimilate perception, motor planning, and spatial actions. Watling & Hauer (2015) also suggests that an intensive sensory integration program can help enhance participation for children with ASD who have difficulty processing and integrating sensory information.

When looking at the survey created by Benson et al. (2019), school-based OT practitioners often reported using clinical observation to assess data on sensory processing behaviors. However, the OT practitioners did not specifically list what observational tools they

used. Sparapani et al. (2016) used the Classroom Measure of Active Engagement (CMAE) to examine educational engagement in students with ASD and found that children participated in classroom activities less than half of the time and often lacked productive and independent work. Looking at the study results of school-based OT practitioners in Pennsylvania, the researchers gathered that the OT practitioners suggest assessing self-regulation because it impacts classroom participation (Benson et al., 2019). When comparing these two research studies, the ultimate goal was to support academic engagement for children with ASD and sensory processing disorders. A second goal of the research was to determine the effectiveness of assessments before applying SBIs, so that OT practitioners can critically evaluate the client to decide which sensory interventions are appropriate to use in practice (Schoen et al., 2019; Watling & Hauer, 2015). Utilizing effective assessments allows OT practitioners to have a clear objective on how to support a student's role in attention, self-regulation, and educational participation so that they can be successful in the classroom (Benson et al., 2019). Although there is ample information about interventions and assessments, there are still topics that need to be addressed in future research.

Recommendations for Future Practice

As for the future practice and research of sensory interventions in elementary-age children with ASD at school, there are gaps yet to be filled of the practices which are most beneficial to each individual. There is additional research needed to determine the effectiveness of occupational therapy interventions that claim to support educational participation in children with ASD (Grajo et al., 2020).

The first area to be analyzed includes the factors that promote academic achievement for children with ASD. One potential factor that merits further research is social functioning as it

may be an important contributor to academic achievement in children with ASD (Estes et al., 2011). Future research should also consider collecting data with more females, as most of the participants have been males in previous studies. Research should focus on comparing children with neurotypical development to those with ASD to better evaluate what areas are most affected in children with ASD (Liu, 2013).

Additional research should also consider the idea of reviewing any current interventions. Extended research should conclude whether the intervention is effective and if it can be generalized to other populations (Pfeiffer et al., 2011). Common interventions such as weighted vests, slow linear swinging, Qigong massage, sensory enrichment, and sensory environmental modifications should be further evaluated with larger sample sizes and different settings of elementary children (Bodison & Parham, 2018). It is an occupational therapy practitioner's responsibility to be fully informed on the use of correct terminology when researching and talking about sensory interventions and documenting these interventions (Watling & Hauer, 2015).

As for the future practice of occupational therapy, it is essential that they continue education with additional training, conferences, sensory-based courses, and mentorships to meet current sensory integration approaches in schools. Many occupational therapists also have advocated that it's vitally important for them to educate administrators, educators, and parents about SBIs in order to see maximal results in children with ASD (Benson et al., 2019). The need for future research for sensory integration in elementary children with ASD has several areas of improvement to advance interventions. Though many intervention ideas have been tested, there's a significant amount of opportunities for further findings in evidence based practice of occupational therapy.

Conclusion

Students with ASD commonly have difficulties with processing sensory information, therefore it is important to use effective interventions to improve their ability to participate in classroom activities amid all of the distractions. It is important to use assessments to confirm that a particular student has sensory processing issues before administering interventions. Some interventions are supported by evidence, and some are not, so it is important to use evidence in intervention decision making. Interventions with a strong evidence base include Ayres Sensory Integration (ASI), Qigong massage, yoga, and parent training and coaching. Additionally, better outcomes can be achieved by using interventions that address many senses rather than just one. Conversely, weighted vests and seating arrangements such as therapy balls are not currently supported by evidence or have mixed results. As research continues, the understanding of which interventions are best may change and become more refined resulting in more effective help for children with sensory processing disorders. As research-based interventions are used more frequently with elementary students with ASD, it is the hope that academic engagement will increase.

Executive Summary

The American Occupational Therapy Association (AOTA) Choosing Wisely Campaign[®] aims to spark conversations about ensuring occupational therapy interventions and assessments are supported by evidence. There are multiple recommendations in the Choosing Wisely Campaign[®]; however, this project is focused on one recommendation: “don’t provide sensory based interventions to individual children or youth without documented assessment results of difficulties processing or integrating sensory information” (American Occupational Therapy Association, 2021). With this recommendation as the focus, the purpose of this project is to answer the following question: What are the current sensory-based interventions for elementary age children diagnosed with autism spectrum disorder (ASD) to support academic engagement in the classroom?

Take-Home Message

While there are many interventions that address sensory processing in children with ASD, it is vital that they are supported by evidence. Ayres Sensory Integration (ASI) intervention, yoga, Qigong massage, and parent training and coaching have all shown positive outcomes for children with ASD (Bodison & Parham, 2018; Grajo et al., 2020; Miller-Kuhaneck & Watling, 2017; Schoen et al., 2019; Watling & Hauer, 2015). Before implementing any sensory based interventions (SBI), it must be determined through assessment that sensory processing deficits are the underlying issue.

Findings

There are a variety of SBIs within the field of OT that have been shown to be effective for children with ASD and are evidence-based. Conversely, there are many interventions that are not supported by evidence to be effective interventions. We found a lack of evidence to support

weighted vests and different types of dynamic seating assignments. With a lack of evidence, we conclude that use of weighted vests and dynamic seating assignments are not evidence-based interventions to implement as SBIs.

In addition to evidence-based SBIs, we recommend using assessments such as the Sensory Profile-2, the Sensory Processing Measure, and the Sensory Integration and Praxis Tests. Administering assessments before implementing SBIs helps identify sensory processing delays. These assessments evaluate sensory processing patterns, guiding OT practitioners to have purposeful interventions to support a student's role. We also suggest the use of observational tools such as the Classroom Measure of Active Engagement (CMAE), to examine how a child participates in the classroom and assess self-regulation to increase learning and engagement in school (Benson et al., 2019). Our research discovered many effective interventions and assessments to apply in practice; however, our findings recognized several strengths and limitations.

Strengths and Limitations

Through the analysis of available literature, our group found several strengths and limitations within the studies concerning sensory interventions for children with ASD. One strength of the literature was the use of multiple systematic reviews. This promotes high levels of evidence as the researchers analyzed thousands of previous research studies to draw accurate conclusions. Another strength across literature was the amount of information and support for ASI theory. Therefore, occupational therapy practitioners commonly implement this theory for children with ASD.

However, while ASI was vastly present among our articles and supported by evidence, sensory integration (SI) was not as commonly addressed. Due to the lack of information

pertaining to SI, the interventions are mainly focused on the specific ASI theory rather than the SI framework. Another weakness in the literature was the low sample sizes that were used in many of the studies. This is not ideal because low sample sizes make it difficult to generalize the findings to the larger population of elementary students with ASD. Taking the strengths and limitations of our appraised articles into consideration, we were able to draw insightful implications and recommendations.

Implications and Recommendations

For occupational therapists to provide valuable services, some implications and recommendations are to continue education in research to support sensory-based interventions. In addition, educating administrators, educators, and parents about SBIs is an important endeavor (Benson et al., 2019). We recommend that OT practitioners stay up to date with the appropriate terminology when discussing SI and SBIs through continuing education. While many interventions have been shown to be effective, more research is still needed for SBIs that are not supported by evidence within the scope of occupational therapy.

Future Considerations

As for future practice and research of sensory interventions in elementary-aged children with ASD, more research is still needed in the scope of sensory integration. Some of these areas include ensuring the effectiveness of existing interventions to conclude whether the intervention it can be generalized to other populations. Other considerations include analyzing the factors that promote academic achievement for children with ASD, ASD and sensory integration in female students, and comparing neurotypical development among elementary-aged children.

Conclusion

Students with ASD commonly have difficulties with processing sensory information. Therefore, it is important to use effective evidence-based interventions to improve their ability to participate in classroom activities amid numerous distractions. We discussed four interventions supported by evidence and two interventions not supported. As research continues, the understanding of which interventions are best may change and become more refined resulting in more effective help for children with sensory processing disorders.

Evidenced-based Resources

Table 1

Government and Major Foundation Resources

Title Name	Brief Description	Source
Center for Disease Control and Prevention (CDC)	The CDC provides information about health concerns in America. It is part of the Department of Health and Human Services. This government program stays up to date on health, safety, and security threats.	https://www.cdc.gov
Individuals with Disabilities Education Act (IDEA)	IDEA is the United States Special Education Law. It ensures students with a disability are provided with a free appropriate public education that is tailored to their individual needs. IDEA hopes to prepare students for further education, careers, and living independently.	https://sites.ed.gov/idea/regs/b/a/300.8/c/1 https://sites.ed.gov/idea/
MedlinePlus	MedlinePlus is part of the National Library of Medicine. Their goal is to present high quality medical information. They also aim to provide information that can be trusted and easy to understand.	https://medlineplus.gov/
Minnesota Department of Education - Related Services	MDE provides developmental, corrective, and supportive services that assist a child with a disability to benefit from special education. Related services within MDE include a variety of services, including occupational therapy, that will help the individual succeed. MDE also provides resources and information that assist the related service professionals to meet the needs of students that are receiving special education services.	https://education.mn.gov/MDE/dse/sped/relsvs/
National Institute of Mental Health (NIMH)	NIMH has four main goals. The first goal is to advance science related to mental illness. The second goal is to chart mental illness. The third goal is to highlight therapeutic interventions. The last goal is to translate people's knowledge into practice.	https://www.nimh.nih.gov/

Table 2*Occupational Therapy Resources*

Title Name	Brief Description	Source
American Journal of Occupational Therapy (AJOT)	The AJOT releases a monthly journal on the most up-to-date research and information. It's published through the American Occupational Therapy Association. There are many articles from the most recent journal, volume 75 issue 5, on autism and sensory integration.	https://research.aota.org/ajot/issue/75/5
American Occupational Therapy Association (AOTA)	They provides handouts on how campaign #2 can be used in practice. They provide a visual sensory evaluation decision chart. They provide an overview of the Choosing Wisely Campaign and clinical application resources.	https://www.aota.org/Practice/Researchers/choosing-wisely.aspx
British Journal of Occupational Therapy	Publishes peer-reviewed articles with international relevance. These articles advance knowledge in research, practice, education, and policy in occupational therapy. They are published monthly. This will be useful in our research when we are looking for specific OT interventions for children with autism spectrum disorder.	https://journals.sagepub.com/home/bjo
Canadian Occupational Therapy Journal	The mission of the journal is to provide a place for leading-edge occupational therapy scholarship. This is to advance theory, practice, research, and policy. It includes journals with empirical findings and theoretical/conceptual arguments which will be useful when looking for information about autism that applies directly to occupational therapy.	https://journals.sagepub.com/home/cjoc
OTSeeker	The OT seeker stands for the systematic evaluation of evidence. It contains a wide variety of reviews, trails, and further information on interventions. This one source provides full access to a wide range of information on occupational therapy and related topics.	http://www.otseeker.com/

Table 3*Interdisciplinary Journals, Databases, Professional Association Resources*

Title Name	Brief Description	Source
Autism Research Institute (ARI)	The ARI is a website that provides in depth research on sensory integration and autism. ARI supports the health and well-being of people with autism through innovative, impactful research, and education. The ARI is non-profit organization focused on conducting and sponsoring research to improve the lives of children and adults with autism.	https://www.autism.org/sensory-integration/
Journal of the American Medical Association (JAMA)	JAMA is a comprehensive database that provides many articles from all medical areas. This includes many studies about different aspects of autism. Searches can be narrowed by looking in particular journals such as the journal of pediatrics.	https://jamanetwork.com/
National Library of Medicine (NLM)	The National Library of Medicine is a comprehensive database of the many different disciplines in healthcare. The database has an entire section of articles on Autism. There are over 2000 articles published around the topic of Autism.	https://www.nlm.nih.gov/
New England Journal of Medicine	The New England Journal of Medicine is a journal database that has articles from many different specialties. The Journal has many different specialties, specific to us is Neurology. The articles that are provided on Autism highlight the interdisciplinary work and research that has been done.	https://www.nejm.org/
Sensory Therapies And Research (STAR) Institute	Established in 2016 from two merging organizations called the Sensory Processing Disorder (SPD) Foundation and Sensory Therapies and Research (STAR) Center. It provides treatment, education, and research for children, adolescents, and adults with SPD. STAR has a goal to promote practice and training to clinicians to impact the quality of life of children with SPD.	https://sensoryhealth.org/landing-page/treatment

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Appendix A. Initial Appraisal

Primary Research Studies

	Overview of Article
Type of article	Overall Type: Primary Research Study (qualitative, quantitative, etc.) Specific Type: It is a cross-sectional descriptive study.
APA Reference	Gentil-Gutiérrez, A., Cuesta-Gómez, J. L., Rodríguez-Fernández, P., & González-Bernal, J. J.(2021). Implication of the sensory environment in children with autism spectrum disorder: Perspectives from school. <i>International Journal of Environmental Research and Public Health</i> , 18(14), 1-8. https://doi.org/10.3390/ijerph18147670
Abstract	“(1) Background: Children with Autism Spectrum Disorder (ASD) frequently have difficulties in processing sensory information, which is a limitation when participating in different contexts, such as school. The objective of the present study was to compare the sensory processing characteristics of children with ASD in the natural context of school through the perception of professionals in the field of education, in comparison with neurodevelopmental children (2) Methods: A cross-sectional descriptive study as conducted with study population consisting of children between three and ten years old, 36 of whom were diagnosed with ASD and attended the Autismo Burgos association; the remaining 24 had neurotypical development. The degree of response of the children to sensory stimuli at school was evaluated using the Sensory Profile-2 (SP-2) questionnaire in its school version, answered by the teachers. (3) Results: Statistically significant differences were found in sensory processing patterns ($p = 0.001$), in sensory systems ($p = 0.001$) and in school factors ($p = 0.001$). Children with ASD who obtained worse results. (4) Conclusions: Children with ASD are prone to present sensory alterations in different contexts, giving non adapted behavioral and learning responses” (p. 1)
Author	Credentials:. Occupational Therapist, Spain Position and Institution: Department of Health Science at University of Burgos Publication History in Peer-Reviewed Journals: 7 published articles
Publication	Type of publication: Scholarly peer-reviewed journal. Publisher: International Journal of Environmental Research and Public Health Other: Publishes articles about Environmental Sciences and Engineering, Public Health, Environmental Health, Occupational Hygiene, Health Economic and Global Health Research, etc.
Date and Citation History	Date of publication: July 19, 2021 Cited By: 1
Stated Purpose or Research Question	“the main objective being to compare the characteristics of sensory processing of children with autism in the natural context of school through the perception of professionals in the field of education, in comparison with neurodevelopmental children” (p. 2).

Author's Conclusion	“ After comparing the sensory profile of children with ASD with neurotypical children, statistically significant differences were found in sensory processing patterns, sensory systems and school factors, with children Int. J. Environ. Res. Public Health 2021, 18, 7670 7 of 8 with ASD having the worst results. These data facilitate adapting the school environment to personal needs, since a change of perspective is considered essential in which it is the school establishment that understands and adapts to the needs of children with ASD” (pp. 7-8).
Overall Relevance to your EBP Question	Overall Relevance of Article: Good Rationale: The study's aim was to compare sensory processing of children with ASD in a school setting which relates very well to the topic of this project.
Overall Quality of Article	Overall Quality of Article: Good Rationale: The study was recently published and the main author is an occupational therapist. The methods of the study were also sound because they included participants with autism and neurotypical development.

	Overview of Article
Type of article	Overall Type: Primary Research Study (quantitative) Specific Type: within-subjects crossover design
APA Reference	Oriel, K. N., George, C. L., Peckus, R., & Semon, A. (2011). The effects of aerobic exercise on academic engagement in young children with autism spectrum disorder. <i>Pediatric Physical Therapy</i> , 23(2), 187-193. https://doi.org/10.1097/PEP.0b013e318218f149
Abstract	PURPOSE: To determine whether participation in aerobic exercise before classroom activities improves academic engagement and reduces stereotypic behaviors in young children with autism spectrum disorder. METHODS: This study employed a within-subjects crossover design, using a treatment condition (aerobic exercise) and a control condition, across 4 classrooms. The treatment condition included 15 minutes of running/jogging followed by a classroom task. The control condition included a classroom task not preceded by exercise. The number of stereotypic behaviors, percentage of on-task behavior, and correct/incorrect responses were measured. The Wilcoxon signed rank test was used to compare differences between conditions. RESULTS: Statistically significant improvements were found in correct responding following exercise ($p < 0.05$). No significant differences were found for on-task behavior or stereotypic behaviors. CONCLUSIONS: Consistent with findings in older children, these results indicate that aerobic exercise prior to classroom activities may improve academic responding in young children with autism spectrum disorder.
Author	Credentials: PT, EdD Position and Institution: Professor at Lebanon Valley College Publication History in Peer-Reviewed Journals: 23
Publication	Type of publication: Peer-reviewed journal Publisher: Wolters Kluwer Health Lippincott Williams & Wilkins and the Section on Pediatrics of the American Physical Therapy
Date and Citation History	Date of publication: 2011 Cited By: 249
Stated Purpose or Research Question	"The purpose of this study was to determine whether participation in aerobic exercise before classroom activities improves academic engagement and reduces stereotypic behaviors in young children with ASD." (p. 188)
Author's Conclusion	"Results of this study indicate that aerobic exercise prior to classroom activities may improve academic responding in young children with ASD." (p. 192)
Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Rationale: It is moderately relevant because it discusses the ability for students to engage in classroom responding.
Overall Quality of Article	Overall Quality of Article: Poor Rationale: The article is poor because it only included 9 participants.

	Overview of Article
Type of article	Overall Type: Primary Research Study (quantitative) Specific Type: Single group pre post with descriptive survey data
APA Reference	Black, D. S., & Fernando, R. (2014). Mindfulness Training and Classroom Behavior Among Lower-Income and Ethnic Minority Elementary School Children. <i>Journal of Child and Family Studies</i> , 23(7), 1242–1246. http://dx.doi.org/10.1007/s10826-013-9784-4
Abstract	This field intervention trial evaluated the effect of a 5-week mindfulness-based curriculum on teacher-ratings of student classroom behavior at a Richmond, CA public elementary school, and examined if the addition of more sessions provided added benefit to student outcomes. Seventeen teachers reported on the classroom behaviors of 409 children (83 % enrolled in a California free lunch program and 95.7 % ethnic minority) in kindergarten through sixth grade at pre-intervention, immediate post-intervention, and 7 weeks post-intervention. Results showed that teachers reported improved classroom behavior of their students (i.e., paying attention, self-control, participation in activities, and caring/respect for others) that lasted up to 7 weeks post-intervention. Overall, improvements were not bolstered by the addition of extra sessions, with the exception of paying attention. The implications of this study are limited due to the lack of a mindfulness program-naïve control group, yet findings suggest that mindfulness training might benefit teacher-based perceptions of improved classroom behavior in a public elementary school, which has practice implications for improving the classroom learning environment for lower-income and ethnically-diverse children.
Author	Position and Institution: Associate Professor of Population and Public Health Sciences, Keck School of Medicine of University of Southern California Publication History in Peer-Reviewed Journals: 70
Publication	Type of publication: Peer reviewed journal Publisher: Springer Nature, Germany
Date and Citation History	Date of publication: 2014 Cited By: 390
Stated Purpose or Research Question	“We hypothesized that the mindfulness intervention would improve teacher-reported scores of students’ classroom behaviors, and that the addition of more sessions would provide an added benefit to students’ classroom behaviors.” (p. 1243)
Author’s Conclusion	“While these limitations are important to consider, this study suggests that mindfulness training may improve classroom behaviors among ethnically-diverse and lower-income school children, which may have implications for enhancing the classroom learning environment in schools.” (p. 1245)
Overall Relevance to your EBP Question	Overall Relevance of Article: <i>Moderate</i> Rationale: This is moderately relevant because it discusses measures of class participation.

Overall Quality of Article	Overall Quality of Article: <i>Moderate</i> Rationale: This study is moderate in quality. It did not use a validated scale. However, they did use 409 participants.
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	Overview of Article
Type of article	Overall Type: Primary Research Study (quantitative) Specific Type: “a 3-yr, adequately powered, cluster-randomized, controlled trial”
APA Reference	Szabo-Reed, A. N., Willis, E. A., Lee, J., Hillman, C. H., Washburn, R. A., & Donnelly, J. E. (2017). Impact of 3 years of classroom physical activity bouts on time-on-task behavior. <i>Medicine and science in sports and exercise</i> , 49(11), 2343-2350. https://doi.org/10.1249/MSS.0000000000001346
Abstract	<p>Participation in classroom physical activity (PA) may improve time-on-task (TOT); however, the influence of sustained moderate-to-vigorous PA (MVPA) on TOT is unknown. PURPOSE: To explore the influence of classroom PA delivered with academic lessons on TOT, determine if the relationship between classroom PA and TOT differs by age, sex, race/ethnicity, weight or baseline fitness, and identify the influence of MVPA on TOT when controlling for demographic variables. METHODS: Teachers in intervention schools were asked to deliver two 10-minute PA lessons per day, 5 d/wk. PA was observed in both intervention and control schools to determine the amount and intensity of PA. Time-on-task was observed before and immediately after PA. Anthropometrics and fitness were assessed at baseline and end of the school year for 3 yr. Multilevel modeling was used to estimate overall group difference, change over the study, and group difference in change while accounting for covariates. RESULTS: Students who participated in PA lessons engaged in significantly more MVPA than those in the control schools in all 3 yr (all $p < 0.001$). There was a significant linear increase in the percent of TOT before PA lessons for both control and intervention groups over the 3-yr period ($p < 0.001$), with no group difference. The intervention group spent significantly more TOT ($p = 0.01$) after PA than the control group. The percent of time spent in MVPA was significantly associated with the percent of TOT ($p < 0.01$). CONCLUSIONS: Results indicate that children who received PA lessons participated in significantly more MVPA than those who did not and that PA was significantly associated with more TOT. These findings provide support for classroom PA as a means of increasing TOT in elementary age children.</p>
Author	<p>Credentials: Ph.D. Position and Institution: Research Assistant Professor for physical activity and weight management. Publication History in Peer-Reviewed Journals: 77</p>
Publication	<p>Type of publication: Peer-reviewed journal Publisher: Medicine & Science in Sports & Exercise</p>
Date and Citation History	<p>Date of publication: 2017 Cited By: 42</p>
Stated Purpose or	“Therefore, the objectives of the present investigation were to use data from a 3-yr cluster randomized PA intervention, ‘Academic Achievement and Physical Activity Across the Curriculum’ (A + PAAC, NCT01699295, described below)

Research Question	to: 1) explore the influence of classroom based PA bouts delivered through academic lessons on the proportion of on and off-task behavior; 2) determine if the relationship between classroom PA and TOT differs by age, sex, race/ethnicity, weight or baseline fitness; and to 3) identify the influence of PA intensity for on- and off-task classroom behavior when controlling for key demographic variables.” (p. 2344)
Author’s Conclusion	“Overall, these findings provide support that physically active classroom lessons do not have a negative impact on classroom attention in elementary age children, which has been found to be a main concern about schools and teachers in this matter.” (p. 2349)
Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Rationale: It is moderately relevant because the focus on the study talks about whether exercise affects how long an elementary school student can remain focused on a school task.
Overall Quality of Article	Overall Quality of Article: Good Rationale: A large sample size of 17 elementary schools was used. They adhered to the standard of minimum necessary exercise recommended by the Institute of Medicine. Teachers were the administrators. They were provided with instruction and written guides. The study took place over 3 years.

	Overview of Article
Type of article	Overall Type: Primary Research Study (quantitative) Specific Type: “A randomized controlled trial of Student Success Skills (SSS) was conducted...”
APA Reference	Webb, L., Brigman, G., Carey, J., Villares, E., Wells, C., Sayer, A., Harrington, K., & Chance, E. (2019). Results of a randomized controlled trial of the Student Success Skills program on grade 5 students’ academic and behavioral outcomes. <i>Journal of Counseling & Development</i> , 97(4), 398–408. https://doi.org/10.1002/jcad.12288
Abstract	A randomized controlled trial of Student Success Skills (SSS) was conducted to determine the effect of the classroom program on Grade 5 students’ (N = 4,305) standardized test scores and proximal socioemotional variables associated with academic achievement. The SSS program was delivered by school counselors and reinforced through cueing and coaching by classroom teachers, which reflects the advocating student-within-environment approach to school counseling (Lemberger-Truelove & Bowers, 2018). Hierarchical linear modeling analyses revealed the SSS program affected the treatment students’ behavioral engagement, disruption, assertion, cooperation, and test anxiety but did not result in a statistically significant difference on the participants’ reading and mathematics test scores. Implications for practice and further research are discussed.
Author	Credentials: Doctoral Degree in School Counseling and Guidance Position and Institution: Center for Higher Education, Research, Teaching, and Innovation, Florida State University Publication History in Peer-Reviewed Journals: 10
Publication	Type of publication: Popular source Publisher: American Counseling Association
Date and Citation History	Date of publication: 2019 Cited By: 9
Stated Purpose or Research Question	“Research Question 1: Does Student Success Skills, delivered in a classroom setting, result in increases in students’ academic achievement as measured by changes in standardized test scores? Research Question 2: Does Student Success Skills, delivered in a classroom setting, result in significant changes in proximal socioemotional variables known to be associated with academic achievement?” (p. 400)
Author’s Conclusion	“Our study found that SSS in classroom format resulted in significant improvements in students’ socioemotional Student Success Skills Program functioning, including increased behavioral engagement and improved classroom behavior, and decreased test anxiety. Although these changes ought to be reflected in increased academic achievement, the present study failed to find significant treatment–control differences on the FCAT reading and mathematics scores.” (p. 406-407)
Overall Relevance	Overall Relevance of Article: Good

to your EBP Question	Rationale: It is very relevant because it directly talks about students' success in an academic environment.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: This study used a large sample size of over 4,000 students. Teachers were trained to implement the program. A power analysis was conducted.

	Overview of Article
Type of article	Overall Type: Primary Research Study (qualitative, quantitative, etc.) Specific Type: This is a retrospective study.
APA Reference	Smith-Roley, S., Mailloux, Z., Parham, L. D., Schaaf, R. C., Lane, C. J., & Cermak, S. (2014). Sensory integration and praxis patterns in children with autism. <i>The American Journal of Occupational Therapy</i> , 69(1), 1-8. https://doi.org/10.5014/ajot.2015.012476
Abstract	“OBJECTIVE. We sought to characterize sensory integration (SI) and praxis patterns of children with autism spectrum disorder (ASD) and discern whether these patterns relate to social participation. METHOD. We extracted Sensory Integration and Praxis Tests (SIPT) and Sensory Processing Measure (SPM) scores from clinical records of children with ASD ages 4–11 yr (N 5 89) and used SIPT and SPM standard scores to describe SI and praxis patterns. Correlation coefficients were generated to discern relationships among SI and praxis scores and these scores’ associations with SPM Social Participation scores. RESULTS. Children with ASD showed relative strengths in visual praxis. Marked difficulties were evident in imitation praxis, vestibular bilateral integration, somatosensory perception, and sensory reactivity. SPM Social Participation scores were inversely associated with areas of deficit on SIPT measures. CONCLUSION. Children with ASD characteristically display strengths in visuopraxis and difficulties with somatopraxis and vestibular functions, which appear to greatly affect participation” (p. 1).
Author	Credentials: OTD, OTR/L, FAOTA Position and Institution: Adjunct Assistant Professor of Clinical Occupational Therapy, Mrs. T. H. Chan Division of Occupational Science and Occupational Therapy, University of Southern California Publication History in Peer-Reviewed Journals: Extensive
Publication	Type of publication: scholarly peer-reviewed journal Publisher: American Occupational Therapy Association Other: American Journal of Occupational Therapy
Date and Citation History	Date of publication: December 24, 2014 Cited By: 87
Stated Purpose or Research Question	“Therefore, we sought to answer two specific research questions: (1) What are the characteristic SI and praxis features and patterns of children with ASD? and (2) What are the relationships between these SI and praxis features and patterns and social participation in children with ASD?” (p. 2)
Author’s Conclusion	“The results of this study show that children with ASD characteristically displayed difficulties with imitation praxis, vestibular bilateral functions, somatosensory perception, and sensory reactivity” (p. 5).
Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Rationale: The article is about sensory integration, praxis, and ASD. However, it does not discuss sensory integration interventions.

Overall Quality of Article	Overall Quality of Article: Good Rationale: The author has their doctorate in occupational therapy and the article is published by the American Occupational Therapy Association. The methods of the study were also appropriate to meet the purpose of the study.
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	Overview of Article
Type of article	Overall Type: Primary Research Study Specific Type: Quantitative Descriptive Survey Design
APA Reference	Thompson-Hodgetts, S., & Magill-Evans, J. (2018). Sensory-based approaches in intervention for children with autism spectrum disorder: Influences on occupational therapists' recommendations and perceived benefits. <i>American Journal of Occupational Therapy</i> , 72(3), 1-8. http://dx.doi.org/10.5014/ajot.2018.024729
Abstract	“OBJECTIVE. We investigated factors that influenced occupational therapists' beliefs about and use of sensory-based approaches for children with autism spectrum disorder (ASD). METHOD. Occupational therapists working with children with ASD (N 5 211 from 16 countries) completed an online survey addressing their work experience, training, use of sensory-based approaches, and beliefs and perceptions about the effects of the approaches. Linear regression was used to determine predictors of use of and beliefs about sensory-based approaches. RESULTS. Most respondents (98%) used sensory-based approaches for children with ASD and would recommend the approaches for 57% of the children they treated. Having a mentor who promoted sensory based approaches and practicing outside North America and Australia predicted greater use and perceived effectiveness of these approaches. Less than 5 yr of occupational therapy experience predicted less use of the approaches. CONCLUSION. Respondents selectively used sensory-based approaches for children with ASD and were influenced by country of residence, clinical experience, and mentorship.” (p. 1)
Author	Credentials: PhD, OT Position and Institution: Assistant Professor, Department of Occupational Therapy, University of Alberta, Edmonton, Alberta, Canada Publication History in Peer-Reviewed Journals: Limited (5 additional articles)
Publication	Type of publication: Scholarly peer-review journal Publisher: American Occupational Therapy Association Other: The American Journal of Occupational Therapy
Date and Citation History	2018 Cited By: 15
Stated Purpose or Research Question	“The purpose of this study was to explore why and when occupational therapists use sensory-based interventions with children with ASD. Our research objectives were to <ul style="list-style-type: none"> • Describe current practice patterns related to occupational therapists' use of sensory-based interventions • Examine the extent to which occupational therapists think sensory-based modalities are effective • Examine the outcomes for which occupational therapists think sensory-based modalities are effective

	<ul style="list-style-type: none"> ● Examine therapist, practice, and training or mentorship factors that predict whether occupational therapists recommend sensory-based modalities.” (p. 2)
Author’s Conclusion	<p>“This study explored occupational therapists’ use of sensory-based approaches with children with ASD. Respondents recommended sensory-based approaches for about half of the children with ASD with whom they worked. They most often recommended sensory diets and weight or pressure modalities, followed by SI therapy and auditory therapies. Choosing these interventions may reflect therapists’ perspectives on how best to address the participation restrictions associated with ASD. These sensory-based approaches appear to address the sensory processing differences common in children with ASD and to target underlying mechanisms. As noted earlier, several reviews have concluded that some of these approaches have inconclusive support as EBP.” (p. 4)</p>
Overall Relevance to your EBP Question	<p>Overall Relevance of Article: Good Relevance</p> <p>Rationale: This article directly relates to our EBP question about sensory based interventions for children with ASD and discusses how often OTs use sensory based approaches.</p>
Overall Quality of Article	<p>Overall Quality of Article: Good Quality</p> <p>Rationale: Reputable journal and publisher. Publication within the last 5 years.</p>

	Overview of Article
Type of article	Overall Type: Primary Research Study Specific Type: Experimental Case Series
APA Reference	Smith, S. A., Press, B., Koenig, K. P., & Kinnealey, M. (2005). Effects of sensory integration intervention on self-stimulating and self-injurious behaviors. <i>American Journal of Occupational Therapy</i> , 59(4), 418–425. https://doi.org/10.5014/ajot.59.4.418
Abstract	“This study compared the effects of occupational therapy, using a sensory integration (SI) approach and a control intervention of tabletop activities, on the frequency of self-stimulating behaviors in seven children 8–19 years of age with pervasive developmental delay and mental retardation. Daily 15-min videotape segments of the subjects were recorded before, immediately after, and 1 hour after either SI or control interventions performed during alternating weeks for 4 weeks. Each 15-min video segment was evaluated by investigators to determine the frequency of self-stimulating behaviors. The results indicate that self-stimulating behaviors were significantly reduced by 11% one hour after SI intervention in comparison with the tabletop activity intervention ($p = 0.02$). There was no change immediately following SI or tabletop interventions. Daily ratings of self stimulating behavior frequency by classroom teachers using a 5-point scale correlated significantly with the frequency counts taken by the investigators ($r = 0.32$, $p < 0.001$). These results suggest that the sensory integration approach is effective in reducing self-stimulating behaviors, which interfere with the ability to participate in more functional activities.” (p. 418)
Author	Credentials: ScD Position and Institution: Director, Neuromuscular Function Laboratory, Department of Occupational Therapy, Temple University, 3307 North Broad Street, Philadelphia, Pennsylvania Publication History in Peer-Reviewed Journals: Limited
Publication	Type of publication: Scholarly peer-review journal Publisher: American Occupational Therapy Association Other: The American Journal of Occupational Therapy
Date and Citation History	2005 Cited By: 204
Stated Purpose or Research Question	“The purpose of this study was to compare the effects of sensory integration intervention and a control intervention on self-stimulating and self-injurious behaviors in children and adolescents with severe and profound pervasive developmental disorder and mental retardation. It is assumed that a reduction of these behaviors will contribute to a calm alert state, which will allow for learning functional skills and social participation. We hypothesized that sensory integration intervention will reduce the frequency of engagement in self-stimulating and self-injurious behaviors compared to a control intervention, in children and adolescents with pervasive developmental disorder and mental retardation.” (p. 420)

Author's Conclusion	<p>“This study found the frequency of self-stimulating and self-injurious behaviors remained relatively the same before and after both the sensory integration and control interventions. However, 1 hour after sensory integration intervention the frequency of self-stimulating behaviors declined. The results provide evidence that sensory integration intervention was effective overall in reducing self-stimulating and self injurious behaviors in the classroom, which interfere with function and participation. Activities that were rich in vestibular, tactile, and proprioceptive input that specifically addressed the individual’s sensory processing needs were most beneficial in reducing the maladaptive behaviors when compared to the control conditions.” (p. 423)</p>
Overall Relevance to your EBP Question	<p>Overall Relevance of Article: Poor relevance Rationale: This article discusses self-stimulating behaviors that are often apparent in children with ASD, however, the study does not explicitly include participants that are children with ASD.</p>
Overall Quality of Article	<p>Overall Quality of Article: Moderate Quality Rationale: Reputable journal and publisher. Publication within the last 15 years. Only used 7 participants (low sample size).</p>

	Overview of Article
Type of article	Overall Type: Primary Research Study Specific Type: Utilize survey research methods and researchers designed a questionnaire to answer the research question.
APA Reference	Benson, J. D., Breisinger, E., & Roach, M. (2019). Sensory-based intervention in the schools: A survey of occupational therapy practitioners. <i>Journal of Occupational Therapy, Schools, & Early Intervention</i> , 12(1), 115–128. https://doi.org/10.1080/19411243.2018.1496872
Abstract	<p>“Aim: The primary purpose of this study was to investigate the role of sensory-based intervention in school-based occupational therapy. The research questions are: 1. How do school-based occupational therapists (OTs) describe the role of sensory-based intervention (SBI) in an educational setting? 2. Which current practice trends influence sensory-based occupational therapy practice?</p> <p>Methods: Descriptive statistics were generated to summarize current school-based practice trends. Qualitative analysis resulted in the identification of categories related to school-based practice. Participants (N = 94) reported the positive impact of sensory-based interventions in the schools, the challenge of the school context, the value of both teacher and team collaboration, the limitations and challenges to parent collaboration, and the sensory resources within the school context.</p> <p>Results: Results indicate that school-based practitioners should focus on educational and social participation of the students.</p> <p>Conclusion: Outcomes indicate the primary means of improving student participation is via team education and advocacy” (p. 115).</p>
Author	<p>Credentials: EdD, OTR/L</p> <p>Position and Institution: Department of Occupational Therapy, Duquesne University, Pittsburgh, PA, USA</p> <p>Publication History in Peer-Reviewed Journals: This article is limited to two articles.</p>
Publication	<p>Type of publication: Scholarly peer-reviewed journal</p> <p>Publisher: Taylor & Francis Group</p> <p>Other: Journal of Occupational Therapy, Schools, & Early Intervention</p>
Date and Citation History	<p>Date of publication: 2019</p> <p>Cited By: 11</p>
Stated Purpose or Research Question	“The primary purpose of this study was to investigate the role of sensory-based intervention in school-based occupational therapy. The research questions are: 1. How do school-based occupational therapists (OTs) describe the role of sensory-based intervention (SBI) in an educational setting? 2. Which current practice trends influence sensory-based occupational therapy practice?” (p. 115).
Author’s Conclusion	“To use sensory-based intervention (SBI) effectively within a school context, knowledge and collaboration is vital. The results equip school-based OTs to advance the use of SBIs in the school setting and to foster the collaboration and education that is involved with a student’s optimal performance and learning” (p. 124).

Overall Relevance to your EBP Question	Overall Relevance of Article: Good Relevance Rationale: This article discusses the focus of the school-based OT to support children's role as a student through educational participation by using sensory based interventions within the school setting.
Overall Quality of Article	Overall Quality of Article: Good quality Rationale: This article simply observes the impact of sensory-based interventions and why it is needed for school-based OT. This article reflects current practices.

	Overview of Article
Type of article	Overall Type: Primary research study Specific Type: Qualitative research
APA Reference	Oki, M., Akizuki, S., Bourreau, B., Takahashi, I., Aoki, Y., Yamamoto, J., & Suzuki, K. (in press). Supporting collective physical activities by interactive floor projection in a special-needs school setting. <i>International Journal of Child-Computer Interaction</i> . https://doi.org/10.1016/j.ijcci.2021.100392
Abstract	“This paper presents an algorithm to provide floor projection feedback according to the local distance and density of individuals. It is realized by a large-space floor projection system with a feedback function based on human tracking with laser ranging image sensors. The purpose is to support the cognition of spatial-temporal structures of groups of adolescents with neurodevelopmental disorders (NDs) that are conducting organized physical activity (PA). Observation and evaluation of behavioral changes in adolescents with NDs, when they were active with or without the floor projection based on the proposed algorithm, were conducted to validate its effectiveness. We observed that the proposed algorithm can be implemented in different organized PAs. It had the effect to help individuals in a behavior to keep a close distance to each other as a group rather than to keep the same distance apart from each other while walking” (p. 1).
Author	Credentials: PhD. Student Position and Institution: Artificial Intelligence Laboratory, University of Tsukuba, Ibaraki, Japan Publication History in Peer-Reviewed Journals: Limited to one article.
Publication	Type of publication: In press peer-reviewed article Publisher: ScienceDirect/Elsevier Other: International Journal of Child-Computer Interaction
Date and Citation History	Date of publication: 2021 Cited By: 0
Stated Purpose or Research Question	“In this study, we propose an algorithm to provide floor projection feedback according to the local distance and density of individuals, in order to support the cognition of spatial-temporal structures of groups of individuals. This is supposed to lead to the success of a certain predetermined task in organized physical activity” (p. 2).
Author’s Conclusion	“We observed that the proposed algorithm can be implemented in different organized collective physical activities. The proposed algorithm demonstrated significantly positive results for the support of walking together (WT), and although no significant positive effect was observed for walking apart (WA), it was shown in delivery service game (DSG) that a similar application of the algorithm as WA was effective for a better achievement level in DSG” (p. 11).
Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Relevance Rationale: This article is how floor projections can be helpful for children with disabilities to participate in tasks that involve physical activity, and to develop therapeutic reasons, physical, and social development by supporting cognition of spatial-temporal structures.

Overall Quality of Article	Overall Quality of Article: Good Rationale: This article is overall good because it provides research on how to improve function in children with neurodevelopmental disorders. This article discusses on adjusting and structuring the environment to support cognitive abilities by using floor projections
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	Overview of Article
Type of article	Overall Type: Primary Research Study - Qualitative Specific Type: Randomized Control Trial- 2 groups
APA Reference	Randell, E., McNamara, R., Delpont, S., Busse, M., Hastings, R. P., Gillespie, D., Williams-Thomas, R., Brookes-Howell, L., Romeo, R., Boadu, J., Ahuja, A. S., McKigney, A. M., Knapp, M., Smith, K., Thornton, J., & Warren, G. (2019). Sensory integration therapy versus usual care for sensory processing difficulties in autism spectrum disorder in children: study protocol for a pragmatic randomised controlled trial. <i>Trials</i> , 20(1), 113-123. https://doi.org/10.1186/s13063-019-3205-y
Abstract	Autism spectrum disorder (ASD) is a common lifelong condition affecting 1 in 100 people. ASD affects how a person relates to others and the world around them. Difficulty responding to sensory information (noise, touch, movement, taste, sight) is common, and might include feeling overwhelmed or distressed by loud or constant low-level noise (e.g. in the classroom). Affected children may also show little or no response to these sensory cues. These ‘sensory processing difficulties’ are associated with behaviour and socialisation problems, and affect education, relationships, and participation in daily life. Sensory integration therapy (SIT) is a face-to-face therapy or treatment provided by trained occupational therapists who use play-based sensory-motor activities and the just-right challenge to influence the way the child responds to sensation, reducing distress, and improving motor skills, adaptive responses, concentration, and interaction with others. With limited research into SIT, this protocol describes in detail how the intervention will be defined and evaluated. (pg.1)
Author	Credentials: Elizabeth Randell- Research Fellow- Project Manager Position and Institution: Cardiff University- Researcher Publication History in Peer-Reviewed Journals: 8- Limited Journals
Publication	Type of publication: Scholarly- Peer Reviewed Publisher: Trials Other: Published in the UK
Date and Citation History	Date of publication: February 11th, 2019 Cited By: 2
Stated Purpose or Research Question	“The key aims of this trial are to: 1) evaluate the effectiveness of manualised Ayres Sensory Integration® therapy (SIT) on behavioural problems and adaptive skills, socialisation, carer stress, quality of life, and cost; and 2) describe current usual care (UC) in trial regions and clearly differentiate this from the proposed intervention (SIT).”(p. 1)
Author’s Conclusion	“This research will benefit the NHS in terms of providing clear evidence regarding the clinical effectiveness and cost effectiveness of this type of intervention, thereby informing clinical practice for this population.” (p. 6) This is an ongoing clinical trial.

Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Rationale: This research article is an ongoing clinical trial that is implementing sensory based interventions in children. Since the trial is not finished, the results are limited.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: The article's authors have a strong background in research on ASD and sensory integration. The background section of the article had extensive information on Ayres sensory integration.

	Overview of Article
Type of article	Overall Type: Primary Research Study Specific Type: Case Study
APA Reference	Parham, L. D., Clark, G. F., Watling, R., & Schaaf, R. (2019). Evidence Connection—Occupational therapy interventions for children and youth with challenges in sensory integration and sensory processing: A clinic-based practice case example. <i>American Journal of Occupational Therapy</i> , 73(1), 1-9 https://doi.org/10.5014/ajot.2019.731002
Abstract	“The purpose of this Evidence Connection article is to demonstrate how the findings of systematic reviews are useful in clinical decision making when providing occupational therapy to children with participation challenges related to sensory integration and processing. Recently, the Evidence-Based Practice Project of the American Occupational Therapy Association sponsored a series of systematic reviews that critically examined the findings and quality of research evidence addressing effectiveness of diverse occupational therapy interventions for children and youth with sensory integration and processing difficulties. The review examined several types of interventions within the scope of occupational therapy practice, including Ayres Sensory Integration® (ASI) intervention (Schaaf et al., 2018), specific sensory techniques and sensory environmental modifications (Bodison & Parham, 2018), parent and teacher education and coaching (Miller-Kuhaneck & Watling, 2018), and cognitive and occupation-based interventions (Pfeiffer et al., 2018). The results of these systematic reviews were collectively summarized in Watling et al.’s (2018) Occupational Therapy Practice Guidelines for Children and Youth With Challenges in Sensory Integration and Sensory Processing. In this article, we present a case study to demonstrate how these systematic reviews are useful in practice..” (p. 1)
Author	Credentials: Parham, PhD, OTR/L, FAOTA Position and Institution: Professor in Occupational Therapy Graduate Program at University of New Mexico, Albuquerque Publication History in Peer-Reviewed Journals: 4990 Extensive
Publication	Type of publication: Scholarly- Peer- reviewed Publisher: American Occupational Therapy Association (AOTA) Other: American Journal of Occupational Therapy Association (AJOTA)
Date and Citation History	Date of publication: January 18th, 2019 Cited By: 6
Stated Purpose or Research Question	“The purpose of this Evidence Connection article is to demonstrate how the findings of systematic reviews are useful in clinical decision making when providing occupational therapy to children with participation challenges related to sensory integration and processing.”(p.1)
Author’s Conclusion	“Alejandro’s parents felt that his engagement in homework was not affected by use of the weighted vest, and they decided to discontinue its use.” (p. 7)

Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Rationale: This article is extremely relevant to our EBP project as it looked specifically at sensory based interventions and academic performance., but I marked it as moderate because it is only based on one child.
Overall Quality of Article	Overall Quality of Article: Good Rationale: The overall quality of this article is good because the authors have extensive research in OT and have produced other research.

	Overview of Article
Type of article	Overall Type: Primary Research Study Specific Type: Pilot Study
APA Reference	Pfeiffer, B. A., Koenig, K., Kinnealey, M., Sheppard, M., & Henderson, L. (2011). Effectiveness of sensory integration interventions in children with autism spectrum disorders: A pilot study. <i>The American Journal of Occupational Therapy</i> , 65(1), 76–85. https://doi.org/10.5014/ajot.2011.09205
Abstract	The purpose of this pilot study was to establish a model for randomized controlled trial research, identify appropriate outcome measures, and address the effectiveness of sensory integration (SI) interventions in children with autism spectrum disorders (ASD). Children ages 6-12 with ASD were randomly assigned to a fine motor or SI treatment group. Pretests and posttests measured social responsiveness, sensory processing, functional motor skills, and social-emotional factors. Results identified significant positive changes in Goal Attainment Scaling scores for both groups; more significant changes occurred in the SI group, and a significant decrease in autistic mannerisms occurred in the SI group. No other results were significant. The study discusses considerations for designing future outcome studies for children with ASD. (p.1)
Author	Credentials: Pfeiffer PhD, OTR/L, BCP Position and Institution: Associate Professor in the Department of Occupational Therapy at Temple University Publication History in Peer-Reviewed Journals: Extensive
Publication	Type of publication: Scholarly Peer- Reviewed Publisher: American Occupational Therapy Association (AOTA) Other: American Journal of Occupational Therapy Association (AJOTA)
Date and Citation History	Date of publication: January 1st, 2011 Cited By: 455
Stated Purpose or Research Question	“The purpose of this pilot study was to establish a model for randomized controlled trial research, identify appropriate outcome measures, and address the effectiveness of sensory integration (SI) interventions in children with autism spectrum disorders (ASD).” (p.1)
Author’s Conclusion	The results of the study were mixed yet demonstrated significant changes in the autistic mannerisms (a component of social progress toward individualized goals in the areas of sensory processing and regulation, social–emotional function, and FM skills. (pp. 81-82)
Overall Relevance to your EBP Question	Overall Relevance of Article: Good Rationale: The overall relevance of this article to our EBP questions is good as it specifically looks at sensory interventions for engagement in social participation, but also academic.
Overall Quality of Article	Overall Quality of Article: Good Rationale: The overall quality of this article is good. It is peer-reviewed and the authors have extensive publications in occupational therapy.

	Overview of Article
Type of article	<p>Overall Type: Primary Research Study</p> <p>Specific Type: “Significant discrepancies between children's actual academic achievement and their expected achievement based on their intellectual ability were found in 27 of 30 (90%) children. Both lower than expected and higher than expected achievement was observed” (p. 1044). One group was observed through parent report and social functioning through teacher report at age 6 and 9. Qualitative</p>
APA Reference	<p>Estes, A., Rivera, V., Bryan, M., Cali, P., & Dawson, G. (2011). Discrepancies between academic achievement and intellectual ability in higher-functioning school-aged children with autism spectrum disorder. <i>Journal of Autism and Developmental Disorders</i>, 41(8), 1044-1052. http://dx.doi.org/10.1007/s10803-010-1127-3</p>
Abstract	<p>“Academic achievement patterns and their relationships with intellectual ability, social abilities, and problem behavior are described in a sample of 30 higher-functioning, 9-year-old children with autism spectrum disorder (ASD). Both social abilities and problem behavior have been found to be predictive of academic achievement in typically developing children but this has not been well studied in children with ASD. Participants were tested for academic achievement and intellectual ability at age 9. Problem behaviors were assessed through parent report and social functioning through teacher report at age 6 and 9. Significant discrepancies between children’s actual academic achievement and their expected achievement based on their intellectual ability were found in 27 of 30 (90%) children. Both lower than expected and higher than expected achievement was observed. Children with improved social skills at age 6 demonstrated higher levels of academic achievement, specifically word reading, at age 9. No relationship was found between children’s level of problem behavior and level of academic achievement. These results suggest that the large majority of higher-functioning children with ASD show discrepancies between actual achievement levels and levels predicted by their intellectual ability. In some cases, children are achieving higher than expected, whereas in others, they are achieving lower than expected. Improved social abilities may contribute to academic achievement. Future studies should further explore factors that can promote strong academic achievement, including studies that examine whether intervention to improve social functioning can support academic achievement in children with ASD” (p. 1044).</p>
Author	<p>Credentials: Annette Estes, Ph.D researcher and director of the UW autism center</p> <p>Position and Institution: Director of UW autism center and research professor of department of Speech and Hearing Sciences, University of Washington, Seattle</p> <p>Publication History in Peer-Reviewed Journals: 25+; extensive</p>

Publication	Type of publication: Peer reviewed scholarly journal Publisher: Springer Other: Journal of Autism and Developmental Disorders
Date and Citation History	Date of publication: August 2011 Cited By: 283
Stated Purpose or Research Question	“The present study investigated academic achievement in a sample of children with ASD who were part of a larger longitudinal study. Academic achievement was assessed directly when the children were 9 years of age. Level of problem behavior was based on parent report whereas level of social functioning was based on teacher report at ages 6 and 9 years. It was hypothesized that (1) children with ASD would be more likely to demonstrate observed academic achievement scores that were discrepant from predicted academic achievement scores. A discrepancy was defined as the absolute difference between observed academic achievement and predicted academic achievement, with predicted achievement based on intellectual ability, (2) children with increased problem behaviors at age 6 and 9 would have decreased academic achievement, after controlling for IQ, (3) children with decreased social functioning at age 6 and 9 would have lower academic achievement, after controlling for IQ” (p. 1046).
Author’s Conclusion	“Results showed that school-aged children with ASD demonstrate significant discrepancies between their actual academic achievement and the level of academic achievement predicted from their overall intellectual ability. This highlights the need for continued intervention that extends to the early elementary years, even after early intervention in the toddler and preschool years, has ceased” (p. 1050-1051).
Overall Relevance to your EBP Question	Overall Relevance of Article: moderate Rationale: Our question addresses what current sensory-based interventions are available for elementary age children diagnosed with autism spectrum disorder to support academic engagement in the classroom. This article addresses how much academic achievement was observed for children with ASD and will be a useful resource to refer to throughout our project.
Overall Quality of Article	Overall Quality of Article: moderate Rationale: This article accurately identified discrepancies between children's actual academic achievement and their expected achievement based on their intellectual ability. While this was a useful article to use about academic achievement in children with autism spectrum disorder, it is 10 years old, therefore a more recent article should be considered to further support it.

	Overview of Article
Type of article	Overall Type: Primary Research Study Specific Type: “The purpose of the current study was to quantify active engagement in students with ASD within classroom activities using a multicomponent observational measure that was designed to address the learning challenges students with ASD face in the classroom” (p. 784).
APA Reference	Sparapani, N., Morgan, L., Reinhardt, V., Schatschneider, C., & Wetherby, A. (2016). Evaluation of Classroom Active Engagement in Elementary Students with Autism Spectrum Disorder. <i>Journal of Autism & Developmental Disorders</i> , 46(3), 782–796. https://doi.10.1007/s10803-015-2615-2
Abstract	“This study evaluated the classroom measure of active engagement (CMAE), an observational tool designed to measure active engagement in students with autism spectrum disorder (ASD). Participants included 196 students with ASD and their educators (n = 126) who were video-recorded at the beginning of the school year. Findings documented limited active engagement overall, with students spending less than half of the observation well regulated, productive, or independent and infrequently directing eye gaze and communicating. Confirmatory factor analysis indicated that the structure of the CMAE was represented by a 5-factor model. These findings underscore the need for improved active engagement in students with ASD and show promise for a tool to measure behaviors associated with positive educational outcomes in students with ASD” (p. 782).
Author	Credentials: Nicole Sparapani, Ph.D Position and Institution: Nicole Sparapani, Ph.D., is an assistant professor within the School of Education and the MIND Institute at UC Davis. Publication History in Peer-Reviewed Journals: 25+; extensive
Publication	Type of publication: scholarly peer-reviewed journal Publisher: Springer Other: Journal of Autism and Developmental Disorders
Date and Citation History	Date of publication: October 3, 2015 Cited By: 63
Stated Purpose or Research Question	“The purpose of the current study was to quantify active engagement in students with ASD within classroom activities using a multicomponent observational measure that was designed to address the learning challenges students with ASD face in the classroom. For this study, active engagement was measured using the classroom measure of active engagement (CMAE), a research tool developed for use with students with ASD” (p. 784).

Author's Conclusion	“Similar to Ruble and Robson’s (2007) findings, this study found that students with ASD spent less than half of the observed time productively and independently participating in classroom activities” (p. 791)
Overall Relevance to your EBP Question	Overall Relevance of Article: moderate Rationale: While this study looks at how often children with ASD participate in classroom activities, it does not address specific OT interventions that may be useful.
Overall Quality of Article	Overall Quality of Article: good Rationale: This quality of this article is good as it addresses the limitations, reliability and validity of the models that were utilized. Additionally, it assessed the reliability and validity of the models that were utilized to evaluate classroom participation.

	Overview of Article
Type of article	Overall Type: Primary Research Study Specific Type: Qualitative
APA Reference	Schaaf, R. C., Hunt, J., & Benevides, T. (2012). Occupational therapy using sensory integration to improve participation of a child with autism: A case report. <i>American Journal of Occupational Therapy</i> , 66(5), 547–555. https://doi.org/10.5014/ajot.2012.004473
Abstract	“In this case report, we describe the changes in adaptive behaviors and participation of 1 child with autism during a 10-wk program of intensive occupational therapy using a sensory integrative approach (OT–SI) following a manualized protocol. This case is part of a larger study examining the efficacy of the OT–SI approach. We found improvement in sensory processing, as measured by the Sensory Integration and Praxis Tests, as well as enhanced participation in home, school, and family activities, as indicated on parent-rated goal attainment scales” (p. 1).
Author	Credentials: Roseann C. Schaaf, PhD, OTR/L, FAOTA Position and Institution: Professor and Vice Chair, Department of Occupational Therapy, Jefferson School for Health Professions and Faculty, Farber Institute for Neurosciences Publication History in Peer-Reviewed Journals: 387, extensive
Publication	Type of publication: Scholarly peer-reviewed journals Publisher: American Occupational Therapy Association (AOTA) Other: American Journal of Occupational Therapy (AJOT)
Date and Citation History	Date of publication: September/October 2012 Cited By: 87
Stated Purpose or Research Question	“... occupational therapy using a sensory integrative approach (OT–SI) following a manualized protocol. This case is part of a larger study examining the efficacy of the OT–SI approach. We found improvement in sensory processing, as measured by the Sensory Integration and Praxis Tests, as well as enhanced participation in home, school, and family activities, as indicated on parent-rated goal attainment scales” (p.1).
Author’s Conclusion	“This case report provides preliminary evidence of the efficacy of occupational therapy using a manualized protocol based on the principles of sensory integration for a child with autism. Given the relatively brief intervention period of 10 wk, these findings are particularly interesting and may be strengthened even further with a longer intervention period. In addition, this report demonstrates the implementation of a manualized protocol with hypothesis generation and testing and fidelity measurement as a model for best practice” (p.8).
Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Rationale: This study considered an intervention that looked at a wide variety of key principles that guided the detailed assessment. It related to children, ASD, and interventions in the schools to encourage participation.

Overall Quality of Article	Overall Quality of Article: Moderate Rationale: This article was limited as it was a 10-week program with a single child.
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	Overview of Article
Type of article	Overall Type: Primary Research Study Specific Type: Quantitative
APA Reference	Liu, T. (2013). Sensory processing and motor skill performance in elementary school children with autism spectrum disorder. <i>Perceptual and Motor Skills</i> , 116(1), 197–209. https://doi.org/10.2466/10.25.pms.116.1.197-209
Abstract	“Research to examine both sensory processing and motor skill performance in children with autism spectrum disorder (ASD) is limited. This study assessed whether children with ASD would show sensory and motor delays compared to typically developing children and examined the relationship between sensory processing and motor performance. 32 children diagnosed with ASD were assessed using the Short Sensory Profile (SSP) and the Movement ABC–2 (MABC–2). The SSP measures children's sensory processing in daily life and the MABC–2 measures children's fine and gross motor skill performance. Overall, the samples' scores on the SSP indicated atypical sensory processing and scores on the MABC–2 showed poorer fine and gross motor performance as compared to age-matched norms. Furthermore, the samples' scores for sensory processing were positively correlated with their motor performance. The results suggest that fine and gross motor difficulties of children with ASD may be related to their delayed sensory processing to visual, auditory, tactile, and movement stimuli, and that this hypothesis needs to be tested in future research” (p.1).
Author	Credentials: Ting Liu Position and Institution: Texas State University - San Marcos Publication History in Peer-Reviewed Journals: 25+, extensive
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: Sage Journals Other: Perceptual & Motor Skills
Date and Citation History	Date of publication: February 1, 2013 Cited By: 55
Stated Purpose or Research Question	“Hypothesis 1. Children with ASD would have delays in sensory processing and motor skill performance. Hypothesis 2. A positive correlation will be found between sensory processing and motor performance in children with ASD” (p.4).
Author's Conclusion	“It was found that children with ASD had atypical sensory processing compared to a normative sample from the SSP. When a child obtains a poor SSP score (i.e., in the definite difference range), it suggests the possibility that they may have inaccurate or insufficient sensory information” (p.8).
Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Rationale: This article relates to ASD in children related to sensory processing and interventions that may improve SSP scores in their performances.

Overall Quality of Article	Overall Quality of Article: Good Rationale: This article considered unique aspects such as SSP scores, and considered atypical sensory processing skills. It looked further into senses such as auditor and movement.
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	Overview of Article
Type of article	Overall Type: Primary Research Study Specific Type: Quantitative
APA Reference	Smith Roley, S., Bissell, J., & Frolek Clark, G. (2015). Occupational therapy for children and youth using sensory integration theory and methods in school-based practice. <i>The American Journal of Occupational Therapy</i> , 69(Supplement_3) 1-20. https://doi.org/10.5014/ajot.2015.696s04
Abstract	“The American Occupational Therapy Association (AOTA) recognizes that occupational therapists and occupational therapy assistants working within public school settings may provide intervention to students in general and special education programs. When the processing and integrating of sensory information interferes with a child’s performance in school activities, occupational therapy practitioners may use sensory-based interventions or a sensory integration (SI) approach (Ayres, 1972a) to support the child’s ability to participate in his or her educational program. Evidence to support SI and sensory processing interventions can be found in Watling, Koenig, Davies, and Schaaf (2011) and also in Dunn (2014). Occupational therapy practitioners working in schools use evidence-based sensory-based interventions or a SI approach when sensory-related issues are identified and affect a child’s ability to benefit from his or her education. Studies have identified atypical sensory reactivity within the general population of between 5% and 16.5% (Ahn, Miller, Milberger, & McIntosh, 2004; Ben-Sasson, Carter, & Briggs-Gowan, 2009). The incidence of sensory modulation disorders increases to 35% in a Head Start sample, with 45% of those children showing extreme differences in under-reactive or seeking behaviors (Reynolds, Shepherd, & Lane, 2008). In a study of children with autism spectrum disorder, approximately 95% of the sample demonstrated some degree of sensory processing dysfunction (Tomchek & Dunn, 2007). Given that sensory reactivity is only one of the several patterns of sensory integrative deficits (Parham & Mailloux, 2010), estimates of school age children with all types of sensory difficulties who require occupational therapy may be even higher. The research suggests that sensory-based interventions may be necessary for these students to participate in school” (p.1).
Author	Credentials: Susanne Smith Roley, OTD, OTR/L, FAOTA Position and Institution: The Commission on Practice for the Representative Assembly Coordinating Council Publication History in Peer-Reviewed Journals: 747, extensive
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: American Occupational Therapy Association (AOTA) Other: American Journal of Occupational Therapy (AJOT)
Date and Citation History	Date of publication: November/December 2015 Cited By: 38
Stated Purpose or	This study suggests that sensory-based interventions may be necessary for these students with ASD to participate in school as 95%+ have demonstrated some degree of sensory processing dysfunction (p.1).

Research Question	
Author's Conclusion	When children demonstrate sensory, motor, or praxis deficits that interfere with their ability to access the general education curriculum, occupational therapy using an SI approach is appropriate (p.14).
Overall Relevance to your EBP Question	Overall Relevance of Article: Good Rationale: This article relates well to ASD in children and interventions. It's considering the OT's role in a school setting and how different interventions can make an impact on students by trying different activities.
Overall Quality of Article	Overall Quality of Article: Good Rationale: This study in general talks about several excellent points by considering many previous studies that contribute good information to the overall goal of finding beneficial interventions in the schools for children with ASD.

	Overview of Article
Type of article	Overall Type: Primary Research Study Specific Type: Utilize survey research methods and researchers designed a questionnaire to answer the research question.
APA Reference	Benson, J. D., Breisinger, E., & Roach, M. (2019). Sensory-based intervention in the schools: A survey of occupational therapy practitioners. <i>Journal of Occupational Therapy, Schools, & Early Intervention</i> , 12(1), 115–128. https://doi.org/10.1080/19411243.2018.1496872
Abstract	<p>“Aim: The primary purpose of this study was to investigate the role of sensory-based intervention in school-based occupational therapy. The research questions are: 1. How do school-based occupational therapists (OTs) describe the role of sensory-based intervention (SBI) in an educational setting? 2. Which current practice trends influence sensory-based occupational therapy practice?</p> <p>Methods: Descriptive statistics were generated to summarize current school-based practice trends. Qualitative analysis resulted in the identification of categories related to school-based practice. Participants (N = 94) reported the positive impact of sensory-based interventions in the schools, the challenge of the school context, the value of both teacher and team collaboration, the limitations and challenges to parent collaboration, and the sensory resources within the school context.</p> <p>Results: Results indicate that school-based practitioners should focus on educational and social participation of the students.</p> <p>Conclusion: Outcomes indicate the primary means of improving student participation is via team education and advocacy” (p. 115).</p>
Author	<p>Credentials: EdD, OTR/L</p> <p>Position and Institution: Department of Occupational Therapy, Duquesne University, Pittsburgh, PA, USA</p> <p>Publication History in Peer-Reviewed Journals: This article is limited to two articles.</p>
Publication	<p>Type of publication: Scholarly peer-reviewed journal</p> <p>Publisher: Taylor & Francis Group</p> <p>Other: <i>Journal of Occupational Therapy, Schools, & Early Intervention</i></p>
Date and Citation History	<p>Date of publication: 2019</p> <p>Cited By: 11</p>
Stated Purpose or Research Question	“The primary purpose of this study was to investigate the role of sensory-based intervention in school-based occupational therapy. The research questions are: 1. How do school-based occupational therapists (OTs) describe the role of sensory-based intervention (SBI) in an educational setting? 2. Which current practice trends influence sensory-based occupational therapy practice?” (p. 115).
Author’s Conclusion	“To use sensory-based intervention (SBI) effectively within a school context, knowledge and collaboration is vital. The results equip school-based OTs to advance the use of SBIs in the school setting and to foster the collaboration and education that is involved with a student’s optimal performance and learning” (p. 124).

Overall Relevance to your EBP Question	Overall Relevance of Article: Good Relevance Rationale: This article discusses the focus of the school-based OT to support children's role as a student through educational participation by using sensory based interventions within the school setting.
Overall Quality of Article	Overall Quality of Article: Good quality Rationale: This article simply observes the impact of sensory-based interventions and why it is needed for school-based OT. This article reflects current practices.

	Overview of Article
Type of article	Overall Type: Primary research study Specific Type: Qualitative research
APA Reference	Oki, M., Akizuki, S., Bourreau, B., Takahashi, I., Aoki, Y., Yamamoto, J., & Suzuki, K. (in press). Supporting collective physical activities by interactive floor projection in a special-needs school setting. <i>International Journal of Child-Computer Interaction</i> , 100392. https://doi.org/10.1016/j.ijcci.2021.100392
Abstract	“This paper presents an algorithm to provide floor projection feedback according to the local distance and density of individuals. It is realized by a large-space floor projection system with a feedback function based on human tracking with laser ranging image sensors. The purpose is to support the cognition of spatial-temporal structures of groups of adolescents with neurodevelopmental disorders (NDs) that are conducting organized physical activity (PA). Observation and evaluation of behavioral changes in adolescents with NDs, when they were active with or without the floor projection based on the proposed algorithm, were conducted to validate its effectiveness. We observed that the proposed algorithm can be implemented in different organized PAs. It had the effect of helping individuals in a behavior to keep a close distance to each other as a group rather than to keep the same distance apart from each other while walking” (p. 1).
Author	Credentials: PhD. Student Position and Institution: Artificial Intelligence Laboratory, University of Tsukuba, Ibaraki, Japan Publication History in Peer-Reviewed Journals: Limited to one article.
Publication	Type of publication: In press peer-reviewed article Publisher: ScienceDirect/Elsevier Other: <i>International Journal of Child-Computer Interaction</i>
Date and Citation History	Date of publication: 2021 Cited By: 0
Stated Purpose or Research Question	“In this study, we propose an algorithm to provide floor projection feedback according to the local distance and density of individuals, in order to support the cognition of spatial-temporal structures of groups of individuals. This is supposed to lead to the success of a certain predetermined task in organized physical activity” (p. 2).
Author’s Conclusion	“We observed that the proposed algorithm can be implemented in different organized collective physical activities. The proposed algorithm demonstrated significantly positive results for the support of walking together (WT), and although no significant positive effect was observed for walking apart (WA), it was shown in delivery service game (DSG) that a similar application of the algorithm as WA was effective for a better achievement level in DSG” (p. 11).
Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Relevance Rationale: This article is how floor projections can be helpful for children with disabilities to participate in tasks that involve physical activity, and to develop therapeutic reasons, physical, and social development by supporting cognition of spatial-temporal structures.

Overall Quality of Article	Overall Quality of Article: Moderate Rationale: This article is overall moderate because it provides research on how to improve function in children with neurodevelopmental disorders. This article discusses adjusting and structuring the environment to support cognitive abilities by using floor projections; however, it is a student work, so it is not as strong compared to a more experienced researcher.
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Review of Research Studies

	Overview of Article
Type of article	Overall Type: Review of Research Study Specific Type: systematic review
APA Reference	Case-Smith, J., Weaver, L. L., & Fristad, M. A. (2014). A systematic review of sensory processing interventions for children with autism spectrum disorders. <i>Autism, 19</i> (2), 133–148. https://doi.org/10.1177/1362361313517762
Abstract	“Children with autism spectrum disorders often exhibit co-occurring sensory processing problems and receive interventions that target self-regulation. In current practice, sensory interventions apply different theoretic constructs, focus on different goals, use a variety of sensory modalities, and involve markedly disparate procedures. Previous reviews examined the effects of sensory interventions without acknowledging these inconsistencies. This systematic review examined the research evidence (2000–2012) of two forms of sensory interventions, sensory integration therapy and sensory-based intervention, for children with autism spectrum disorders and concurrent sensory processing problems. A total of 19 studies were reviewed: 5 examined the effects of sensory integration therapy and 14 sensory-based intervention. The studies defined sensory integration therapies as clinic-based interventions that use sensory-rich, child directed activities to improve a child’s adaptive responses to sensory experiences. Two randomized controlled trials found positive effects for sensory integration therapy on child performance using Goal Attainment Scaling (effect sizes ranging from .72 to 1.62); other studies (Levels III–IV) found positive effects on reducing behaviors linked to sensory problems. Sensory-based interventions are characterized as classroom-based interventions that use single-sensory strategies, for example, weighted vests or therapy balls, to influence a child’s state of arousal. Few positive effects were found in sensory-based intervention studies. Studies of sensory-based interventions suggest that they may not be effective; however, they did not follow recommended protocols or target sensory processing problems. Although small randomized controlled trials resulted in positive effects for sensory integration therapies, additional rigorous trials using manualized protocols for sensory integration therapy are needed to evaluate effects for children with autism spectrum disorders and sensory processing problems” (p. 133).
Author	Credentials: EdD,OTR/L,FAOTA Position and Institution: Professor and Director of the Occupational Therapy Division of the College of Medicine at The Ohio State University Publication History in Peer-Reviewed Journals: Extensive
Publication	Type of publication: scholarly peer-reviewed journal Publisher: Autism Other: It is an international, interdisciplinary journal.
Date and Citation History	Date of publication: January 29, 2014 Cited By: 368

Stated Purpose or Research Question	“This systematic review examined the research evidence (2000–2012) of two forms of sensory interventions, sensory integration therapy and sensory-based intervention, for children with autism spectrum disorders and concurrent sensory processing problems” (p. 133)
Author’s Conclusion	“This systematic review of sensory interventions found that SIT for children with ASD and sensory processing problems demonstrates positive effects on the child’s individualized goals; however, additional studies are needed to confirm these results” (p. 145)
Overall Relevance to your EBP Question	Overall Relevance of Article: Good Rationale: The article is about sensory integration interventions and children with ASD which is relevant to our research topic since our research topic is regarding sensory based interventions for elementary school students with ASD.
Overall Quality of Article	Overall Quality of Article: Good Rationale: The main author is a registered occupational therapist and the study was published less than ten years ago. Since this is a systematic review, the findings are based on analysis of multiple articles.

	Overview of Article
Type of article	Overall Type: Review of Research Study (qualitative) Specific Type: “discussing the development of the Classroom Engagement Inventory (CEI)” It reviews survey research.
APA Reference	Wang, Z., Bergin, C., & Bergin, D. A. (2014). Measuring engagement in fourth to twelfth grade classrooms: The Classroom Engagement Inventory. <i>School Psychology Quarterly</i> , 29(4), 517–535. https://doi.org/10.1037/spq0000050
Abstract	Research on factors that may promote engagement is hampered by the absence of a measure of classroom-level engagement. Literature has suggested that engagement may have 3 dimensions— affective, behavioral, and cognitive. No existing engagement scales measure all 3 dimensions at the classroom level. The Classroom Engagement Inventory (CEI) was developed to fill this gap. In Study 1, exploratory and confirmatory factor analyses were conducted on data from 3,481 students from the 4th to 12th grade. The results suggested a 4-factor model of the CEI. Using these results, in Study 2 several items were revised and data were collected 1 year later from 4th to 12th grade students in the same school district as Study 1. Analyses were conducted on data from 3,560 students after data cleaning. A series of potential models was tested. The final results suggest a 5-factor 24-item CEI: (1) Affective Engagement, (2) Behavioral Engagement–Compliance, (3) Behavioral Engagement–Effortful Class Participation, (4) Cognitive Engagement, and (5) Disengagement. Results advance understanding of the construct of classroom engagement. The CEI fills a significant gap in measurement of engagement. The CEI is classroom level, measures multiple dimensions of engagement, uses self-report, is relatively short, and can be readily administered in classrooms from the 4th to 12th grade. (PsycINFO Database Record (c) 2019 APA, all rights reserved)
Author	Position and Institution: Associate Professor of Statistics, Measurement, and Evaluation in Education at University of Missouri Publication History in Peer-Reviewed Journals: 54
Publication	Type of publication: Peer-reviewed journal Publisher: School Psychology Quarterly
Date and Citation History	Date of publication: 2014 Cited By: 166
Stated Purpose or Research Question	“The purpose of this article is to fill this gap by discussing the development of the Classroom Engagement Inventory (CEI) in two sequential studies.” (p. 517)
Author’s Conclusion	“In summary, the CEI is a relatively brief, self-report measure of classroom-level engagement that has demonstrated good psychometric properties and validity. It is a practical tool for measuring all dimensions of engagement—cognitive, affective, and behavioral—in classrooms from the fourth to 12th grade.” (p. 533)
Overall Relevance	Overall Relevance of Article: Good

to your EBP Question	Rationale: This article is very relevant because it explicitly talks about factors that are important to consider for classroom engagement.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: While the Classroom Engagement Inventory is not a previously used measurement tool, the lead researcher is an expert in the area of large-scale assessment in education and scale development. This lends a lot of credibility.

	Overview of Article
Type of article	Overall Type: Review of Research Study Specific Type: systematic review.
APA Reference	May-Benson, T. A., & Koomar, J. A. (2010). Systematic review of the research evidence examining the effectiveness of interventions using a sensory integrative approach for children. <i>The American Journal of Occupational Therapy</i> , 64(3), 403–414. https://doi.org/10.5014/ajot.2010.09071
Abstract	“Twenty-seven studies were systematically reviewed to identify, evaluate, and synthesize the research literature on the effectiveness of sensory integration (SI) intervention on the ability of children with difficulty processing and integrating sensory information to engage in desired occupations and to apply these findings to occupational therapy practice. Results suggest the SI approach may result in positive outcomes in sensorimotor skills and motor planning; socialization, attention, and behavioral regulation; reading-related skills; participation in active play; and achievement of individualized goals. Gross motor skills, self-esteem, and reading gains may be sustained from 3 mo to 2 yr. Findings may be limited by Type II error because of small sample sizes, variable intervention dosage, lack of fidelity to intervention, and selection of outcomes that may not be meaningful to clients and families or may not change with the amount of treatment provided. Replication of findings with methodologically and theoretically sound studies is needed to support current findings” (p. 403).
Author	Credentials: ScD, OTR/L Position and Institution: Research Director, The Spiral Foundation, and Clinical Director, OTA–Watertown Publication History in Peer-Reviewed Journals: 63, moderate
Publication	Type of publication: scholarly peer-reviewed journal Publisher: American Occupational Therapy Association Other: American Journal of Occupational Therapy
Date and Citation History	Date of publication: May/June 2010 Cited By: 283
Stated Purpose or Research Question	“This study examined the following research question: What is the effectiveness of interventions using the SI approach (including the effect of context [cultural, physical, social, personal, spiritual, temporal, and visual]) to create, promote, establish, restore, maintain, modify, and prevent future limitations in ADLs, IADLs, education/transition, play/leisure, and social participation in children and adolescents whose SI and processing patterns are interfering with everyday life Participation?” (p. 404).
Author’s Conclusion	“This review suggests that, despite low power in most studies, there is a trend toward positive evidence to support the SI approach” (p. 413)

Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Rationale: The study reviews sensory integration interventions for children. However, it did not specifically examine children with ASD.
Overall Quality of Article	Overall Quality of Article: Good Rationale: The main author is a registered occupational therapy and the study is published by American Occupational Therapy Association.

	Overview of Article
Type of article	Overall Type: Review of Research Study Specific Type: Systematic review
APA Reference	Watling, R., & Hauer, S. (2015). Effectiveness of Ayres Sensory Integration® and sensory-based interventions for people with autism spectrum disorder: A systematic review. <i>The American Journal of Occupational Therapy</i> , 69(5), 1-12. https://doi.org/10.5014/ajot.2015.018051
Abstract	“This systematic review examines the literature published from January 2006 through April 2013 related to the effectiveness of Ayres Sensory Integration® (ASI) and sensory-based interventions (SBIs) within the scope of occupational therapy for people with autism spectrum disorder to improve performance in daily life activities and occupations. Of the 368 abstracts screened, 23 met the inclusion criteria and were reviewed. Moderate evidence was found to support the use of ASI. The results for sensory-based methods were mixed. Recommendations include performing higher level studies with larger samples, using the Fidelity Measure in studies of ASI, and using carefully operationalized definitions and systematic methods in examination of SBIs.” (p. 1)
Author	Credentials: PhD, OTR/L, FAOTA Position and Institution: Visiting Assistant Professor, School of Occupational Therapy, University of Puget Sound, Tacoma, WA Publication History in Peer-Reviewed Journals: Moderate (12 additional articles)
Publication	Type of publication: Scholarly peer-review journal Publisher: American Occupational Therapy Association Other: The American Journal of Occupational Therapy
Date and Citation History	2015 Cited By: 161
Stated Purpose or Research Question	“Sought to clarify inclusion criteria by using clear definitions that align with those in the published literature and that are consistent with definitions used by experts in sensory integration and sensory-based approaches and to update the 2008 review completed as part of the American Occupational Therapy Association (AOTA) Evidence-Based Practice (EBP) Project. The question examined in this review was, ‘What is the evidence for sensory integration intervention and SBIs within the scope of occupational therapy practice to improve performance in daily life activities and occupations for children with autism spectrum disorders?’” (p. 3).
Author’s Conclusion	“A growing body of literature has provided moderate evidence that intensive, individualized clinic-based ASI intervention can improve individualized functional outcomes. Assessment with well-established tools such as the Sensory Profile and the Sensory Processing Measure can meet this charge. On the basis of current evidence, using personalized measures such as GAS is essential when applying ASI in an evidence-based manner. Other similar measures such as the Canadian Occupational Performance Measure may also be

	effective. Current evidence does not support the use of weighted vests or sound therapies for outcomes relevant to occupational therapy.” (p. 10)
Overall Relevance to your EBP Question	Overall Relevance of Article: Good Relevance Rationale: This article directly relates to our EBP question about sensory-based interventions (SBI) in children with ASD to improve performance in daily life activities. It provides evidence about assessments that are appropriate to use and how SBI can be effective.
Overall Quality of Article	Overall Quality of Article: Good Quality Rationale: Established author. Reputable journal and publisher. Publication within last 10 years

	Overview of Article
Type of article	Overall Type: Review of Research Study Specific Type: Systematic Review
APA Reference	Schoen, S. A., Lane, S. J., Mailloux, Z., May-Benson, T., Parham, L. D., Smith Roley, S., & Schaaf, R. C. (2019). A systematic review of Ayres sensory integration intervention for children with autism. <i>Autism Research</i> , 12(1), 6–19. https://doi.org/10.1002/aur.2046
Abstract	“Sensory integration is one of the most highly utilized interventions in autism, however, a lack of consensus exists regarding its evidence base. An increasing number of studies are investigating the effectiveness of this approach. This study used the Council for Exceptional Children (CEC) Standards for Evidence-based Practices in Special Education to evaluate the effectiveness of research from 2006 to 2017 on Ayres Sensory Integration (ASI) intervention for children with autism. A systematic review was conducted in three stages. Stage 1 involved an extensive database search for relevant studies using search terms related to sensory integration and autism, interventions suggesting a sensory integration approach, and high-quality study designs. Searches yielded 19 studies that were evaluated in Stage 2. Six of these met inclusion criteria of being peer-reviewed, written in English, description of intervention this is consistent with ASI intervention, and comparison group design or single subject method employed. Prior to analysis using CEC standards, three articles were excluded because intervention details were not consistent with the core principles of ASI, or because of major methodological flaws. In Stage 3, the remaining three studies were rated using the CEC quality indicators and standards for an evidence-based practice. Two randomized controlled trials respectively met 100% and 85% of the CEC criteria items. One additional study met more than 50% of the criteria. Based on CEC criteria, ASI can be considered an evidence-based practice for children with autism ages 4–12 years old.” (p. 6)
Author	Credentials: PhD, OTR/L Position and Institution: STAR Institute, Greenwood Village, CO Publication History in Peer-Reviewed Journals: Limited (3 additional articles)
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: Wiley Periodicals Other: Official Journal of The International Society for Autism Research
Date and Citation History	2019 Cited By: 34
Stated Purpose or Research Question	“This article addressed the question: Does ASI intervention meet the CEC criteria for an evidence-based practice for children with autism spectrum disorders (ASD)? To answer this question, we conducted a systematic review of research studies that examined the effectiveness of ASI intervention for children with ASD. We then analyzed the quality of each included study using the CEC Standards for Evidence-based Practices in Special Education” (p. 8)

Author's Conclusion	<p>“Ayres Sensory Integration intervention is frequently requested by parents and is often utilized by occupational therapists for children with autism spectrum disorders, including those served in special education settings. The results of this systematic review indicate that it meets the criteria for an evidence-based practice according to the CEC Standards for Evidence-Based Practices in Special Education. It also appears to meet the criteria for an evidence-based practice as defined by the United States Preventive Services Task Force [2012] and the FPG Child Development Institute Guidelines [Wong et al., 2015]” (p. 17)</p>
Overall Relevance to your EBP Question	<p>Overall Relevance of Article: Good Relevance Rationale: This article directly relates to our EBP question about sensory-based interventions (SBI) in children with ASD to improve performance in daily life activities. It provides evidence about how Ayres sensory integration intervention is a valid intervention for children with ASD.</p>
Overall Quality of Article	<p>Overall Quality of Article: Good Quality Rationale: Established author. Reputable journal and publisher. Publication within last 5 years</p>

	Overview of Article
Type of article	<p>Overall Type: Review of Research Study</p> <p>Specific Type: Systematic review</p> <p>“The studies finally included in this systematic review were rated by research design using the hierarchies of evidence described by Cox (2005): Level 1 = systematic review/meta-analysis of high level/randomized controlled trial [RCT] studies, Level 2 = well designed RCT, Level 3 = treatment studies not randomized, Level 4 = non-treatment studies, Level 5 = case studies, and Level 6 = expert comments. All five studies included in this systematic review” (p. 11)</p>
APA Reference	<p>Van der Kruk, Y., Wilson, WJ, Downing, C., Palghat, K., Harper-Hill, K., & Ashburner, J. (2017). Improved signal-to-noise ratio and classroom performance in children with Autism Spectrum Disorder: A systematic review. <i>Review Journal of Autism and Developmental Disorders</i>, 4(3), 243-253. https://doi.org/10.1007/s40489-017-0111-7</p>
Abstract	<p>“Purpose: To systematically review the literature to determine if improving the signal-to-noise ratio (SNR) improves classroom performance in students with autism spectrum disorder (ASD). Methods: Six databases were searched for acoustics, signal-to-noise ratio, classroom and ASD. Five studies were found that met the selection criteria. Results: All five studies reported improving the SNR benefitted students with ASD in the classroom. Benefits included improved listening behaviours, increased on-task behaviours, improved speech recognition, and reduced listening stress. Conclusion: The evidence is suggestive that improving the SNR improves classroom performance in students with ASD. Limitations included the small number of studies and limited range of technologies considered. Further research should consider other technologies that could mitigate tactile sensitivities present in some students with ASD” (p. 2).</p>
Author	<p>Credentials: Yolanda Van der Kruk, psychologist</p> <p>Position and Institution: PhD scholar, School of Health & Rehabilitation Sciences, The University of Queensland, Australia</p> <p>Publication History in Peer-Reviewed Journals: 12 peer reviewed journals in google scholar</p>
Publication	<p>Type of publication: Scholarly peer-reviewed journal</p> <p>Publisher: Springer</p> <p>Other: Journal of Autism and Developmental Disorders</p>
Date and Citation History	<p>Date of publication: August 2017</p> <p>Cited By: cited 14 times</p>

Stated Purpose or Research Question	“To systematically review the literature to determine if improving the signal-to-noise ratio (SNR) improves classroom performance in students with autism spectrum disorder (ASD)” (p. 2)
Author’s Conclusion	The evidence is suggestive that improving the signal to noise ratio improves classroom performance in students with ASD (p. 2)
Overall Relevance to your EBP Question	Overall Relevance of Article: good Rationale: This article evaluates a specific intervention that improves classroom participation in children with ASD, which directly relates to our EBP question.
Overall Quality of Article	Overall Quality of Article: good Rationale: This article evaluated numerous past studies that addressed the effectiveness of the signal to noise ratio interventions. It was a reliable and valid systematic review that clearly addressed limitations and areas of improvement and where additional research is needed.

	Overview of Article
Type of article	Overall Type: Review of Research Study Specific Type: Systematic Review
APA Reference	Case-Smith, J., & Arbesman, M. (2008). Evidence-based review of interventions for autism used in or of relevance to occupational therapy. <i>The American Journal of Occupational Therapy</i> , 62(4), 416–429. https://doi.org/10.5014/ajot.62.4.416
Abstract	“Occupational therapy practitioners are among the professionals who provide services to children and adults with autism spectrum disorder (ASD), embracing both leadership and supportive roles in service delivery. The study’s primary aims were as follows: (1) to identify, evaluate, and synthesize the research literature on interventions for ASD of relevance to occupational therapy and (2) to interpret and apply the research literature to occupational therapy. A total of 49 articles met the authors’ criteria and were included in the review. Six categories of research topics were identified, the first 3 of which are most closely related to occupational therapy: (1) sensory integration and sensory-based interventions; (2) relationship-based, interactive interventions; (3) developmental skill-based programs; (4) social cognitive skill training; (5) parent-directed or parent-mediated approaches; and (6) intensive behavioral intervention. Under each category, themes supported by research evidence and applicable to occupational therapy were defined. The findings have implications for intervention methods, communication regarding efficacious practices to professionals and consumers, and future occupational therapy research.” (p. 416)
Author	Credentials: EdD, OTR/L, FAOTA Position and Institution: Professor and Chair, Division of Occupational Therapy, School of Allied Medical Professions, The Ohio State University, Columbus, OH Publication History in Peer-Reviewed Journals: Extensive (46 additional articles)
Publication	Type of publication: Scholarly peer-review journal Publisher: American Occupational Therapy Association Other: The American Journal of Occupational Therapy
Date and Citation History	2008 Cited By: 416
Stated Purpose or Research Question	“This study was initiated and supported by the AOTA as part of the Evidence-Based Literature Review project. The goal of the project is to promote evidence-based practice through a variety of dissemination efforts, including publication of the results of systematic reviews in peer-reviewed journals. The following research question guided selection of research studies for the review and interpretation of the findings: What is the evidence for the effect of interventions used in or of relevance to occupational therapy in children and adolescents with autism spectrum disorder?” (p. 417)

Author's Conclusion	“Occupational therapy is well aligned with the philosophical and conceptual basis of the interventions for ASD that have been researched and have demonstrated effectiveness; however, our contribution to these interventions is not apparent and certainly not visible to the public. Participation and leadership in research of autism should be a priority for occupational therapists who work with children with ASD and occupational therapy scholars. Important strides in developing efficacious interventions for autism have been made, and occupational therapy researchers should increase their contribution to this positive momentum.” (p. 427)
Overall Relevance to your EBP Question	Overall Relevance of Article: Good Relevance Rationale: This article directly relates to our EBP question about sensory-based interventions (SBI) in children with ASD to improve performance in daily life activities. It provides evidence about how sensory based intervention is a valid intervention for children with ASD.
Overall Quality of Article	Overall Quality of Article: Good Quality Rationale: Established author and strong research methods using a clear systematic review. Reputable journal and publisher. Publication within last 15 years

	Overview of Article
Type of article	Overall Type: Review of Research Study Specific Type: Scoping review. Establishing a group of guidelines for designing therapeutic gardens.
APA Reference	Barakat, H. A.-E.-R., Bakr, A., & El-Sayad, Z. (2019). Nature as a healer for autistic children. <i>Alexandria Engineering Journal</i> , 58(1), 353–366. https://doi.org/10.1016/j.aej.2018.10.014
Abstract	“The reason for many symptoms of autistic children is sensory integration, it is the power to understand, organize and feel sensory data from the environment and body. The issues surrounding sensory integration are presented in hyposensitive and hypersensitive reactions by children with autism to the vestibular, proprioception, tactile, audio, visual, and olfactory senses. The aim of this paper is establishing a group of guidelines for designing a therapeutic garden for children with Autism Spectrum Disorder to treat the sensory integration problems of children with ASD by designing a sensory garden which should focus on therapeutic interference. By using the elements and principles of design, guidelines for this garden focused on producing calming effects for hyper reactive children with ASD and stimulating effects for hypo reactions.” (p. 353)
Author	Credentials: N/A Position and Institution: Architecture Department, Alexandria University, Alexandria, Egypt Publication History in Peer-Reviewed Journals: This article is limited to two.
Publication	Type of publication: Scholarly Peer Reviewed Publisher: ScienceDirect/Elsevier Other: Alexandria Engineering Journal at the Faculty of Engineering Alexandria University
Date and	Date of publication: 2019

Citation History	Cited By: 10
Stated Purpose or Research Question	“Design a sensory garden for children with ASD to test the guidelines that have been confirmed in this study. Post-occupancy study must be completed to determine success in meeting the needs of parents, students, teachers, staff, and therapists” (p. 366).
Author’s Conclusion	“The design is based on information from a variety of multi-disciplinary sources and is intended to provide a basis for forming theory regarding how the outdoor environment can be used in therapeutic ways and the effects of the outdoor spaces on children with ASD, therefore, the Sensory Garden was created as a solution to supplement and utilize the outdoor space of any center, hospital or just a therapeutic garden” (p. 366).
Overall Relevance to your EBP Question	Overall Relevance of Article: Poor Relevance Rationale: Although this journal discusses ASD in children and implementing sensory integration to the environment. This is only a guideline. It is still very helpful, and can be used to briefly mention therapeutic gardening, but it is not recommended for a deep search for children with ASD.
Overall Quality of Article	Overall Quality of Article: Good quality Rationale: Provides great graphs and tables for therapeutic gardening suggestions. It breaks down the categories of sensory problems, therapies, and design principles. Excellent visuals and distinguished specific sensory behaviors for children with ASD.

	Overview of Article
Type of article	Overall Type: Review of Research Specific Type: Class analysis approach
APA Reference	Garcia, J. M., & Hahs-Vaughn, D. L. (2021). Health factors, sociability, and academic outcomes of typically developing youth and youth with autism spectrum disorder: A latent class analysis approach. <i>Journal of Autism and Developmental Disorders</i> , 51(4), 1346–1352. https://doi.org/10.1007/s10803-020-04572-7
Abstract	“To identify profiles of both typically developing (TD) children and children with autism spectrum disorder (ASD) based on health indicators, and academic/social engagement. Latent class analysis was conducted to identify profiles of children from the 2016 National Survey of Children’s Health, based on physical activity, screen time, sleep, and academic/social engagement. A three-profile solution was the best fitting model, with children in profile 3 characterized as having excellent health, and academic/social outcomes, compared to profiles 1 and 2. Compared to TD youth, a greater percentage of youth with ASD fit into the poorer health profiles. Studies should examine whether health interventions for youth with ASD can improve factors, such as academic engagement and social interaction” (p. 1346).
Author	Credentials: Assistant professor Position and Institution: Department of Health Sciences, University of Central Florida, Orlando, FL Publication History in Peer-Reviewed Journals: 4 published articles
Publication	Type of publication: Peer-reviewed, scholarly periodical Publisher: Springer Nature Other: Journal of Autism and Developmental Disorders
Date and Citation History	Date of publication: 2021 Cited By: 5
Stated Purpose or Research Question	“The primary purpose of this study was to identify profiles of children based on health indicators, ability to make friends, and level of school engagement and to then examine the extent to which the proportions of children in the profiles were similar for TD children and children with ASD” (p. 1347).
Author’s Conclusion	“In comparison to TD youth in this study, a greater percentage of youth with ASD fit the profile of poorer health behaviors, more difficulty making friends, and lower levels of academic engagement. Although over 50% of youth with ASD fit the category of poor health, these adolescents did not fit the profile demonstrating the highest levels of screen time. This finding suggests that future interventions should focus on other modifiable behaviors, such as MVPA or sleep quality, to improve physical, social, and academic behavior outcomes” (p. 1351).
Overall Relevance to your EBP Question	Overall Relevance of Article: Good. Rationale: This article relates because it uses the latent class analysis (LCA) to identify health, social, and academic factors in both typically developing youth and youth with ASD.

Overall Quality of Article	Overall Quality of Article: Good Rationale: This article observes children with ASD and their social participation in school while also looking if their engagement were similar with typically developing children.
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	Overview of Article
Type of article	Overall Type: Review of Research Study Systematic Review of Sensory Integrations. Specific Type: Comparison Study
APA Reference	Simmons, C., A. (2019). Systematic review of sensory integrations with autism spectrum disorder. Williams Honors College, Honors Research Projects. 921. https://ideaexchange.uakron.edu/honors_research_projects/921
Abstract	Autism Spectrum Disorder is a developmental disorder that can affect communication and behavior. In children a sensory diet is utilized in order to address these issues. Research has been completed over the years looking into the effects of different sensory integrations on classroom behavior and participation. This is a comparison study of various integrations including, but not limited to, vestibular swinging, therapy balls, and therapy cushions. It is often up to an Occupational Therapist to create a sensory diet for each student on a caseload. The purpose of this study was to discover if there is one treatment that can be utilized as a generalized integration for all students suffering with classroom behavior and/or on the Autism Spectrum. This would then allow for a baseline sensory diet for therapists to utilize while developing a rapport with the students. This would especially be helpful when maintaining a larger case load or when appointments are short. It would allow for sensory integrations to begin prior to testing and observations in order to aid in correcting classroom behaviors earlier, limiting missed content throughout the school year. (p.3)
Author	Credentials: Simmons- Student Position and Institution: Student at University of Akron (Honors Project) Publication History in Peer-Reviewed Journals: 0 Limited
Publication	Type of publication: Honors Project Publisher: University of Akron Other: Honors Project
Date and Citation History	Date of publication: August 25th, 2021 Cited By: 0 Limited
Stated Purpose or Research Question	“This paper analyzes six peer-reviewed research articles studying different sensory interventions, including proprioceptive interventions such as therapy cushions and therapy balls, tactile interventions such as weighted blankets and weighted vests, and vestibular interventions such as the platform swing.”(p. 4)
Author’s Conclusion	“Overall, there needs to be additional research completed on all sensory interventions, especially in relation to those with ASD.” (p. 26)
Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Rationale: I would consider this article moderate in it’s overall relevance to our EBP questions. It is a systematic review of sensory based interventions used to promote engagement in the classroom.
Overall Quality of Article	Overall Quality of Article: Poor

	<p>Rationale: The overall quality of this article in my opinion would be considered poor. It is a systematic review for a students honors project that has not been published.</p>
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	Overview of Article
Type of article	Overall Type: Review of Research Study Specific Type: Systematic Review
APA Reference	Smith, J., (2012) A review of the evidence for sensory interventions in the treatment of ASD. Golden Valley State University. Honors Research Projects. 154. http://scholarworks.gvsu.edu/honorsprojects/154
Abstract	“It is estimated that Autism Spectrum Disorder (ASD) affects 1 in 88 children (CDC, 2012). Given this rapid and little understood increase in prevalence, the study of ASD and the search for effective treatments has become an area of intense interest. While there are many treatments available, controversy abounds as to which approach is most effective. Occupational therapists have long endorsed Sensory Integration Therapy (SIT) as the vehicle for helping children with ASD regulate sensory experiences and thus alleviate the symptoms of ASD. While SIT is a commonly used intervention and evidence exists to suggest that SIT is effective, it has not reached a level of consensus in the scientific community. The goal of this paper is to review the evidence for and against using SIT for the treatment of ASD and to discuss the role of the occupational therapist in the future research of this methodology.” (p. 2)
Author	Credentials: Smith- Honors Student Position and Institution: Honors Student at Grand Valley State University Publication History in Peer-Reviewed Journals: Semantic Scholars and Grand Valley State University- 0 Limited
Publication	Type of publication: Honors Project Publisher: Grand Valley State University Other: Semantic Scholars
Date and Citation History	Date of publication: 2012 Cited By: 0
Stated Purpose or Research Question	“The goal of this paper is to review the evidence for and against using SIT for the treatment of ASD and to discuss the role of the occupational therapist in the future research of this methodology” (p. 2)
Author’s Conclusion	Thus, there is a great need for new ways of measuring outcomes in children with ASD that are both useful for data analysis but also able to be tailored to individual needs, such as GAS.” (p.20)
Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Rationale: This article is a comprehensive review of sensory based interventions that are available. It is specific to our EBP question, specifically the sensory based interventions for occupational therapists.
Overall Quality of Article	Overall Quality of Article: Poor Rationale: This article is considered poor overall in quality as it is an honors project. The content, however, is very relevant to our topic.

	Overview of Article
Type of article	<p>Overall Type: Review of Research Study</p> <p>Specific Type: Systematic review</p> <p>“This systematic review provides occupational therapy practitioners with evidence on the use of activity-based and occupation-centered interventions to increase children’s participation and learning in school” (p. 1)</p>
APA Reference	<p>Grajo, L. C., Candler, C., & Sarafian, A. (2020). Interventions within the scope of occupational therapy to improve children’s academic participation: A systematic review. <i>American Journal of Occupational Therapy</i>, 74(2), 1-32. https://doi.org/10.5014/ajot.2020.039016</p>
Abstract	<p>“Importance: Occupational therapy practitioners evaluate students’ ability to participate in school and may provide services to improve learning, academic performance, and participation.</p> <p>Objective: To examine the effectiveness of interventions within the scope of occupational therapy practice to improve academic participation of children and youth ages 5–21 yr.</p> <p>Data Sources: We searched MEDLINE, PsycINFO, CINAHL, OTseeker, and Cochrane databases for articles published from 2000 to 2017 using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.</p> <p>Study Selection and Data Collection: Within the scope of occupational therapy practice and focused on children ages 5–21 yr.</p> <p>Findings: Forty-six studies were included, based on three themes: (1) interventions to support participation and learning in the classroom; (2) interventions to support motivation and participation in literacy, including combined reading, written expression, and comprehension; and (3) interventions to support handwriting. Low strength of evidence supports the use of weighted vests and stability balls, and moderate strength of evidence supports the use of yoga to enhance educational participation. Moderate strength of evidence supports the use of creative activities, parent-mediated interventions, and peer-supported interventions to enhance literacy participation. Strong evidence supports therapeutic practice for handwriting intervention, and low strength of evidence supports various handwriting programs as replacement or additional instructional strategies to enhance handwriting abilities.</p> <p>Conclusions and Relevance: More rigorous studies are needed that are conducted by occupational therapy practitioners in school-based settings and that use measures of participation and academic outcomes.</p> <p>What This Article Adds: This systematic review provides occupational therapy practitioners with evidence on the use of activity-based and occupation-centered interventions to increase children’s participation and learning in school” (p. 1)</p>

Author	<p>Credentials: Lenin C. Grajo, PhD, EdM, OTR/L</p> <p>Position and Institution: Director, Post-Professional Doctor of Occupational Therapy Program, and Assistant Professor, Programs in Occupational Therapy, Department of Rehabilitation and Regenerative Medicine, Vagelos College of Physicians and Surgeons, Columbia University, New York</p> <p>Publication History in Peer-Reviewed Journals: 25+; extensive</p>
Publication	<p>Type of publication: Peer-reviewed journal</p> <p>Publisher: American Occupational Therapy Association</p> <p>Other: American Journal of Occupational Therapy</p>
Date and Citation History	<p>Date of publication: March/April 2020</p> <p>Cited By: cited by 11</p>
Stated Purpose or Research Question	<p>“The purpose of this systematic review was to provide occupational therapy practitioners with evidence on the use of activity-based or occupation-centered interventions to increase children’s participation and learning in school. This study aimed to answer the question, “What is the evidence for the effectiveness of interventions within the scope of occupational therapy practice to improve learning, academic achievement, and successful participation in school for children and youth ages 5–21” (p. 2).</p>
Author’s Conclusion	<p>More rigorous research is needed to support the effectiveness of interventions and to develop occupation-focused measures of educational participation (p. 10).</p>
Overall Relevance to your EBP Question	<p>Overall Relevance of Article: Good</p> <p>Rationale: Our question addresses interventions that support academic achievement in children with ASD, and this article assesses occupation-based interventions to increase children’s participation and learning and school. It is extremely relevant to our EBP question and will be a valuable source throughout this project.</p>
Overall Quality of Article	<p>Overall Quality of Article: Good</p> <p>Rationale: This article effectively evaluates occupation-based interventions that support the academic participation among children with ASD. It clearly states that more research about occupation-based interventions that support educational participation in OT are needed and shows limitations, reliability, and validity.</p>

	Overview of Article
Type of article	<p>Overall Type: Review of Research Study Specific Type: Systematic review “This systematic review organizes the body of evidence for 3 specific approaches (sensory based, sensorimotor, and sensory integration) and questions their efficacy in improving school participation for children with sensory disorders. Two methods were compared: first, a standard systematic review of the literature in 3 databases using appropriate keywords and descriptors, then an original method based on forward and backward citation connections” (p. 1)</p>
APA Reference	<p>Ouellet, B., Carreau, E., Dion, V., Rouat, A., Tremblay, E., & Voisin, J. I. (2021). Efficacy of sensory interventions on school participation of children with sensory disorders: A systematic review. <i>American journal of lifestyle medicine</i>, 15(1), 75-83. https://doi.org/10.1177/1559827618784274</p>
Abstract	<p>“Research demonstrates lower school participation in children with sensory disorders. However, the scientific body of evidence supporting existing sensory intervention modalities is difficult to tackle. More specifically, the literature appears poorly organized, with a highly variable terminology, often with nonoverlapping definitions and lack of good keywords classification that would help organize the diversity of approaches. This systematic review organizes the body of evidence for 3 specific approaches (sensory based, sensorimotor, and sensory integration) and questions their efficacy in improving school participation for children with sensory disorders. Two methods were compared: first, a standard systematic review of the literature in 3 databases using appropriate keywords and descriptors, then an original method based on forward and backward citation connections. A total of 28 studies were retrieved, of which only 7 used the standard method for systematic reviews. For sensory-based approaches, the efficacy of weighted-vest varies according to different factors such as the protocol of use. For sensorimotor approaches, the efficacy of therapy balls, air cushions, platform swing, and physical exercise varies according to the child’s sensory characteristics. The efficacy of the sensory integration approach remains mixed across studies” (p. 1)</p>
Author	<p>Credentials: Béatrice Ouellet, OT Position and Institution: Doctoral student at Laval University, Quebec Publication History in Peer-Reviewed Journals: 25+; extensive</p>
Publication	<p>Type of publication: Peer reviewed journal Publisher: SAGE Publications Other: American Journal of Lifestyle Medicine</p>

Date and Citation History	Date of publication: January/February, 2021 Cited By: 4
Stated Purpose or Research Question	<p>“Sensory modulation disorders can be categorized according to 3 categories of profiles: (1) over responsivity, (2) under responsivity, and (3) seeking, which describes craving of, and interest in, sensory experiences that are prolonged and intense. So it is possible that some particular modalities are more effective for specific sensory profiles. Indeed, the results of our literature review suggest the interesting possibility that children identified as sensory seeking may be the most responsive to sensory-based and sensorimotor approaches.</p> <p>This hypothesis suggests that the child’s particular sensory characteristics should primarily be taken into consideration to identify which sensory intervention modality and approach fit him or her best” (p. not available on nih.gov).</p>
Author’s Conclusion	<p>“Therefore, because the current level of evidence does not point to a specific approach (sensory-based, sensorimotor, or sensory integration) as best practice, the intervention’s objective can be first used to direct the choice of the approach, which then influences the determination of the modality and the establishment of the interventional protocol” (p. not available on nih.gov).</p>
Overall Relevance to your EBP Question	<p>Overall Relevance of Article: moderate-poor</p> <p>Rationale: While the article is relevant to our EBP question as it evaluates different intervention approaches for children with sensory disorders that supports school participation, the evidence is inconclusive. The article states that the efficacy among sensory-based, sensorimotor and sensory integration interventions are not agreed upon.</p>
Overall Quality of Article	<p>Overall Quality of Article: moderate-poor</p> <p>Rationale: The article states that the efficacy among sensory-based, sensorimotor and sensory integration interventions are not agreed upon. Additionally, the limitations of the study are not addressed which caused me to rate the overall quality of the article lower.</p>

	Overview of Article
Type of article	Overall Type: Review of Research Study Specific Type: Systematic review
APA Reference	Miller-Kuhaneck, H., & Watling, R. (2017). Parental or teacher education and coaching to support function and participation of children and youth with sensory processing and Sensory Integration Challenges: A systematic review. <i>The American Journal of Occupational Therapy</i> , 72(1), 1-11. https://doi.org/10.5014/ajot.2018.029017
Abstract	“This systematic review examines the literature published from January 2007 through May 2015 related to the effectiveness of occupational therapy interventions using parental or teacher education and coaching with children with challenges in sensory processing and sensory integration (SP–SI). Of more than 11,000 abstracts and 86 articles that were considered, only 4 met the criteria and were included in this review. Studies of parental training and coaching for children with challenges in SP–SI and comorbid autism spectrum disorder have suggested that educational or coaching programs could result in positive outcomes for both parents and children, often in a relatively short time period. Recommendations include a greater focus on providing educational interventions for parents and teachers and including specific assessment of SP–SI before implementing interventions meant to address those issues. Specific recommendations for future research are provided” (p.1).
Author	Credentials: Heather Miller-Kuhaneck PhD, OTR/L, FAOTA Position and Institution: Associate Professor, Department of Occupational Therapy, Sacred Heart University, Fairfield, CT. Publication History in Peer-Reviewed Journals: 170, extensive
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: American Occupational Therapy Association (AOTA) Other: American Journal of Occupational Therapy (AJOT)
Date and Citation History	Date of publication: December 14, 2017 Cited By: 36, Low
Stated Purpose or Research Question	“The purpose of this systematic review is twofold: 1. To examine the literature regarding interventions that involve training or coaching parents or teachers of children and youth with SP–SI difficulties to provide occupational therapy practitioners with evidence to support their decision making 2. To provide therapists with information to guide interventions that involve training or coaching for parents or teachers of children with SP–SI difficulties to promote the child’s development and growth” (p.2).
Author’s Conclusion	“This review has five primary implications, but much of what may be said concerns the need for further research including parent training and coaching, research in occupational therapy that focuses on the population of children with SP-SI concerns, the occupational therapy base is too narrow and must expand to include studies, effective interventions reported in the literature from parents of children with ASD, ADHD, and other behavioral concerns, and limited literature about the specific characteristics or process of parent trainings” (p. 7).

Overall Relevance to your EBP Question	Overall Relevance of Article: Good Rationale: This article looks well into children with challenges in sensory processing and sensory integration in participation in daily activities and academics (p.1).
Overall Quality of Article	Overall Quality of Article: Good Rationale: This article did well at acknowledging it's limitations as well as focusing on how everyday life has SP-SI challenges on overall occupational performance.

	Overview of Article
Type of article	Overall Type: Review of Research Studies Specific Type: Systematic Review
APA Reference	Bodison, S. C., & Parham, D. L. (2018). Specific sensory techniques and sensory environmental modifications for children and youth with Sensory Integration Difficulties: A systematic review. <i>The American Journal of Occupational Therapy</i> , 72(1), 1-11. https://doi.org/10.5014/ajot.2018.029413
Abstract	“This systematic review examined the effectiveness of specific sensory techniques and sensory environmental modifications to improve participation of children with sensory integration (SI) difficulties. Abstracts of 11,436 articles published between January 2007 and May 2015 were examined. Studies were included if designs reflected high levels of evidence, participants demonstrated SI difficulties, and outcome measures addressed function or participation. Eight studies met inclusion criteria. Seven studies evaluated effects of specific sensory techniques for children with autism spectrum disorder (ASD) or attention deficit hyperactivity disorder: Qigong massage, weighted vests, slow swinging, and incorporation of multisensory activities into preschool routines. One study of sensory environmental modifications examined adaptations to a dental clinic for children with ASD. Strong evidence supported Qigong massage, moderate evidence supported sensory modifications to the dental care environment, and limited evidence supported weighted vests. The evidence is insufficient to draw conclusions regarding slow linear swinging and incorporation of multisensory activities into preschool settings” (p.1).
Author	Credentials: Stefanie C Bodison, OTD, OTR/L Position and Institution: Assistant Professor of Research, Chan Division of Occupational Science and Occupational therapy, University of Southern California, Los Angeles Publication History in Peer-Reviewed Journals: 591, extensive
Publication	Type of publication: Scholarly peer-reviewed journal Publisher: American Occupational Therapy Association (AOTA) Other: American Journal of Occupational Therapy (AJOT)
Date and Citation History	Date of publication: December 14, 2017 Cited By: 69
Stated Purpose or Research Question	“This systematic review was designed to contribute knowledge that will inform occupational therapy practitioners regarding the effectiveness of specific sensory techniques and sensory environmental modifications in improving the functional performance or participation of children and youth with SI difficulties” (p.2).
Author’s Conclusion	“The results of our systematic review revealed several issues that researchers should address to improve the quality of future studies of the effects of specific sensory techniques or sensory environmental modifications on the participation of children with SI difficulties” (p.9).
Overall Relevance	Overall Relevance of Article: Moderate

to your EBP Question	Rationale: This article highly considered environmental modifications for children with sensory integration difficulties. It was sad to see the results of how significantly the children need environmental adaptations.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: This article took in a high consideration of children in their environments with sensory integration difficulties.

	Overview of Article
Type of article	Overall Type: Review of Research Study Specific Type: Scoping review. Establishing a group of guidelines for designing therapeutic gardens.
APA Reference	Barakat, H. A.-E.-R., Bakr, A., & El-Sayad, Z. (2019). Nature as a healer for autistic children. <i>Alexandria Engineering Journal</i> , 58(1), 353–366. https://doi.org/10.1016/j.aej.2018.10.014
Abstract	“The reason for many symptoms of autistic children is sensory integration, it is the power to understand, organize and feel sensory data from the environment and body. The issues surrounding sensory integration are presented in hyposensitive and hypersensitive reactions by children with autism to the vestibular, proprioception, tactile, audio, visual, and olfactory senses. The aim of this paper is establishing a group of guidelines for designing a therapeutic garden for children with Autism Spectrum Disorder to treat the sensory integration problems of children with ASD by designing a sensory garden which should focus on therapeutic interference. By using the elements and principles of design, guidelines for this garden focused on producing calming effects for hyper reactive children with ASD and stimulating effects for hypo reactions.” (p. 353)
Author	Credentials: N/A Position and Institution: Architecture Department, Alexandria University, Alexandria, Egypt Publication History in Peer-Reviewed Journals: This article is limited to two.
Publication	Type of publication: Scholarly Peer Reviewed Publisher: ScienceDirect/Elsevier Other: Alexandria Engineering Journal at the Faculty of Engineering Alexandria University
Date and Citation History	Date of publication: 2019 Cited By: 10
Stated Purpose or Research Question	“Design a sensory garden for children with ASD to test the guidelines that have been confirmed in this study. Post-occupancy study must be completed to determine success in meeting the needs of parents, students, teachers, staff, and therapists” (p. 366).
Author’s Conclusion	“The design is based on information from a variety of multi-disciplinary sources and is intended to provide a basis for forming theory regarding how the outdoor environment can be used in therapeutic ways and the effects of the outdoor spaces on children with ASD, therefore, the Sensory Garden was created as a solution to supplement and utilize the outdoor space of any center, hospital or just a therapeutic garden” (p. 366).
Overall Relevance to your EBP Question	Overall Relevance of Article: Poor Relevance Rationale: Although this journal discusses ASD in children and implementing sensory integration to the environment. This is only a guideline. It is still very helpful, and can be used to briefly mention therapeutic gardening, but it is not recommended for a deep search for children with ASD.
Overall	Overall Quality of Article: Good quality

Quality of Article	Rationale: Provides great graphs and tables for therapeutic gardening suggestions. It breaks down the categories of sensory problems, therapies, and design principles. Excellent visuals and distinguished specific sensory behaviors for children with ASD.
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	Overview of Article
Type of article	Overall Type: Review of Research Specific Type: Class analysis approach
APA Reference	Garcia, J. M., & Hahs-Vaughn, D. L. (2021). Health factors, sociability, and academic outcomes of typically developing youth and youth with autism spectrum disorder: A latent class analysis approach. <i>Journal of Autism and Developmental Disorders</i> , 51(4), 1346–1352. https://doi.org/10.1007/s10803-020-04572-7
Abstract	“To identify profiles of both typically developing (TD) children and children with autism spectrum disorder (ASD) based on health indicators, and academic/social engagement. Latent class analysis was conducted to identify profiles of children from the 2016 National Survey of Children’s Health, based on physical activity, screen time, sleep, and academic/social engagement. A three-profile solution was the best fitting model, with children in profile 3 characterized as having excellent health, and academic/social outcomes, compared to profiles 1 and 2. Compared to TD youth, a greater percentage of youth with ASD fit into the poorer health profiles. Studies should examine whether health interventions for youth with ASD can improve factors, such as academic engagement and social interaction” (p. 1346).
Author	Credentials: Assistant professor Position and Institution: Department of Health Sciences, University of Central Florida, Orlando, FL Publication History in Peer-Reviewed Journals: 4 published articles
Publication	Type of publication: Peer-reviewed, scholarly periodical Publisher: Springer Nature Other: Journal of Autism and Developmental Disorders
Date and Citation History	Date of publication: 2021 Cited By: 5
Stated Purpose or Research Question	“The primary purpose of this study was to identify profiles of children based on health indicators, ability to make friends, and level of school engagement and to then examine the extent to which the proportions of children in the profiles were similar for TD children and children with ASD” (p. 1347).
Author’s Conclusion	“In comparison to TD youth in this study, a greater percentage of youth with ASD fit the profile of poorer health behaviors, more difficulty making friends, and lower levels of academic engagement. Although over 50% of youth with ASD fit the category of poor health, these adolescents did not fit the profile demonstrating the highest levels of screen time. This finding suggests that future interventions should focus on other modifiable behaviors, such as MVPA or sleep quality, to improve physical, social, and academic behavior outcomes” (p. 1351).
Overall Relevance to your EBP Question	Overall Relevance of Article: Good. Rationale: This article relates because it uses the latent class analysis (LCA) to identify health, social, and academic factors in both typically developing youth and youth with ASD.

Overall Quality of Article	Overall Quality of Article: Good Rationale: This article observes children with ASD and their social participation in school while also looking if their engagement were similar with typically developing children.
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Conceptual or Theoretical Articles

	Overview of Article
Type of article	Overall Type: Conceptual or Theoretical Article Specific Type: There is no methods section. The authors are just reviewing Ayres sensory integration theory.
APA Reference	Kilroy, E., Aziz-Zadeh, L., & Cermak, S. (2019). Ayres theories of autism and sensory integration revisited: What contemporary neuroscience has to say. <i>Brain Sciences</i> , 9(3) 1-20. https://doi.org/10.3390/brainsci9030068
Abstract	“Abnormal sensory-based behaviors are a defining feature of autism spectrum disorders (ASD). Dr. A. Jean Ayres was the first occupational therapist to conceptualize Sensory Integration (SI) theories and therapies to address these deficits. Her work was based on neurological knowledge of the 1970’s. Since then, advancements in neuroimaging techniques make it possible to better understand the brain areas that may underlie sensory processing deficits in ASD. In this article, we explore the postulates proposed by Ayres (i.e., registration, modulation, motivation) through current neuroimaging literature. To this end, we review the neural underpinnings of sensory processing and integration in ASD by examining the literature on neurophysiological responses to sensory stimuli in individuals with ASD as well as structural and network organization using a variety of neuroimaging techniques. Many aspects of Ayres’ hypotheses about the nature of the disorder were found to be highly consistent with current literature on sensory processing in children with ASD but there are some discrepancies across various methodological techniques and ASD development. With additional characterization, neurophysiological profiles of sensory processing in ASD may serve as valuable biomarkers for diagnosis and monitoring of therapeutic interventions, such as SI therapy” (p. 1)
Author	Credentials: Postdoctoral Research Associate at University of Southern California Position and Institution: Mrs. T.H. Chan Division of Occupational Science and Occupational Therapy, University Southern California. Publication History in Peer-Reviewed Journals: 20, moderate
Publication	Type of publication: scholarly peer-reviewed journal Publisher: Brain Sciences Other: international journal about neuroscience
Date and Citation History	Date of publication: March 21, 2019 Cited By: 47
Stated Purpose or Research Question	“The first aim of this paper is to review three aspects of sensory processing deficits in ASD that Ayres discussed in <i>Sensory Integration and the Child</i> [8]: registration, modulation and motivation. The second aim is to assess the extent to which current neuroscience research supports Ayres’ postulates” (p. 20).

Author's Conclusion	“Ayres’ predictions about sensory registration, modulation and motivation are strongly supported by the findings of various studies. ... Research is needed to examine whether intervention using a sensory integration approach will help improve sensory registration and/or modulation impairments in ASD by developing a more efficient network connectivity (pp. 12-13).
Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Rationale: The article relates to sensory integration and ASD, but it is not a research study about sensory integration interventions. However, the study may be useful to provide background knowledge.
Overall Quality of Article	Overall Quality of Article: Moderate Rationale: The main author is a postdoctoral research assistant rather than an occupational therapist or health care professional.

	Overview of Article
Type of article	Overall Type: Conceptual Specific Type: A variety of evidence based practices to provide guidance to teachers by providing three research based strategies.
APA Reference	Hart Barnett, J. (2018). Three evidence-based strategies that support social skills and play among young children with autism spectrum disorders. <i>Early Childhood Education Journal</i> , 46(6), 665–672. https://doi.org/10.1007/s10643-018-0911-0
Abstract	“Research demonstrates young children with autism and other developmental disabilities can benefit from participation in play activities with peers. Play provides opportunities to increase social skills across developmental domains in an integrated manner and provides opportunities to develop a sense of belonging and friendship; these goals are critical for young children with disabilities. However, in order for children with disabilities to benefit from the interactions that occur during play and to continue to progress developmentally in play skills, systematic intervention in social skills is needed. A variety of evidence[1]based practices provide guidance to teachers. In this article, three strategies are presented to assist early childhood educators. The three research-based strategies include the use of scripts, video modeling, and embedding choice as part of classroom activities. These practices create a context in which play skills can be developed and used in natural environments, thereby facilitating children’s engagement in play and improving the likelihood for improved interactions with peers” (p. 665).
Author	Credentials: Associate Professor, Arizona State University Position and Institution: Division of Teacher Preparation, Mary Lou Fulton Teachers College, Arizona State Publication History in Peer-Reviewed Journals: Moderate. 7 articles
Publication	Type of publication: Peer Reviewed Article Publisher: Springer Nature Other: Early Childhood Educational Journal
Date and Citation History	Date of publication: 2018 Cited By: 31
Stated Purpose or Research Question	“The limited focus on social communication in early child[1]hood settings of children with ASD is concerning, given the importance of the early childhood years for the development of social skills, and children with ASD often require support to attain social interaction skills (Paul and Sutherland 2005). An emerging set of evidence-based practices to support the social interaction skills of young children with ASD is available” (p. 666)
Author’s Conclusion	“A variety of evidence-based practices provide guidance to teachers. Many of the practices described take advantage of the strengths exemplified by children with ASD, such as visual processing skills and responding well to structured environments. These practices enable teachers to create a context in which play skills can be developed and used in natural environments, thereby facilitating engagement in play and improving the likelihood for improved interactions with peers” (p. 670).

Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Relevance Rationale: This article is a guideline for educators to follow by presenting three strategies; scripts, video modeling, and embedding choice. With these practices, it's hope is to facilitate play and engagement with peers.
Overall Quality of Article	Overall Quality of Article: Moderate quality Rationale: This article gives three strategies to enhance social participation in children with ASD for educators to follow.

	Overview of Article
Type of article	Overall Type: Conceptual Specific Type: A variety of evidence based practices to provide a guidance to teachers by providing three research based strategies.
APA Reference	Hart Barnett, J. (2018). Three evidence-based strategies that support social skills and play among young children with autism spectrum disorders. <i>Early Childhood Education Journal</i> , 46(6), 665–672. https://doi.org/10.1007/s10643-018-0911-0
Abstract	“Research demonstrates young children with autism and other developmental disabilities can benefit from participation in play activities with peers. Play provides opportunities to increase social skills across developmental domains in an integrated manner and provides opportunities to develop a sense of belonging and friendship; these goals are critical for young children with disabilities. However, in order for children with disabilities to benefit from the interactions that occur during play and to continue to progress developmentally in play skills, systematic intervention in social skills is needed. A variety of evidence[1]based practices provide guidance to teachers. In this article, three strategies are presented to assist early childhood educators. The three research-based strategies include the use of scripts, video modeling, and embedding choice as part of classroom activities. These practices create a context in which play skills can be developed and used in natural environments, thereby facilitating children’s engagement in play and improving the likelihood for improved interactions with peers” (p. 665).
Author	Credentials: Associate Professor, Arizona State University Position and Institution: Division of Teacher Preparation, Mary Lou Fulton Teachers College, Arizona State Publication History in Peer-Reviewed Journals: Moderate. 7 articles
Publication	Type of publication: Peer Reviewed Article Publisher: Springer Nature Other: Early Childhood Educational Journal
Date and Citation History	Date of publication: 2018 Cited By: 31
Stated Purpose or Research Question	“The limited focus on social communication in early child[1]hood settings of children with ASD is concerning, given the importance of the early childhood years for the development of social skills, and children with ASD often require support to attain social interaction skills (Paul and Sutherland 2005). An emerging set of evidence-based practices to support the social interaction skills of young children with ASD is available” (p. 666)
Author’s Conclusion	“A variety of evidence-based practices provide guidance to teachers. Many of the practices described take advantage of the strengths exemplified by children with ASD, such as visual processing skills and responding well to structured environments. These practices enable teachers to create a context in which play skills can be developed and used in natural environments, thereby facilitating engagement in play and improving the likelihood for improved interactions with peers” (p. 670).

Overall Relevance to your EBP Question	Overall Relevance of Article: Moderate Relevance Rationale: This article is a guideline for educators to follow by presenting three strategies; scripts, video modeling, and embedding choice. With these practices, it's hope is to facilitate play and engagement with peers.
Overall Quality of Article	Overall Quality of Article: Moderate quality Rationale: This article gives three strategies to enhance social participation in children with ASD for educators to follow.

Appendix B. Critical Appraisals

Primary Research Studies

	Summary
APA Reference	Szabo-Reed, A. N., Willis, E. A., Lee, J., Hillman, C. H., Washburn, R. A., & Donnelly, J. E. (2017). Impact of 3 years of classroom physical activity bouts on time-on-task behavior. <i>Medicine and Science in Sports and Exercise</i> , 49(11), 2343-2350. https://doi.org/10.1249/MSS.0000000000001346
Abstract	<p>“Participation in classroom physical activity (PA) may improve time-on-task (TOT); however, the influence of sustained moderate-to-vigorous PA (MVPA) on TOT is unknown. PURPOSE: To explore the influence of classroom PA delivered with academic lessons on TOT, determine if the relationship between classroom PA and TOT differs by age, sex, race/ethnicity, weight or baseline fitness, and identify the influence of MVPA on TOT when controlling for demographic variables. METHODS: Teachers in intervention schools were asked to deliver two 10-min PA lessons per day, 5 d/wk. PA was observed in both intervention and control schools to determine the amount and intensity of PA. Time-on-task was observed before and immediately after PA. Anthropometrics and fitness were assessed at baseline and end of the school year for 3 yr. Multilevel modeling was used to estimate overall group difference, change over the study, and group difference in change while accounting for covariates. RESULTS: Students who participated in PA lessons engaged in significantly more MVPA than those in the control schools in all 3 yr (all $p < 0.001$). There was a significant linear increase in the percent of TOT before PA lessons for both control and intervention groups over the 3-yr period ($p < 0.001$), with no group difference. The intervention group spent significantly more TOT ($p = 0.01$) after PA than the control group. The percent of time spent in MVPA was significantly associated with the percent of TOT ($p < 0.01$). CONCLUSIONS: Results indicate that children who received PA lessons participated in significantly more MVPA than those who did not and that PA was significantly associated with more TOT. These findings provide support for classroom PA as a means of increasing TOT in elementary age children.” (p. 2343)</p>
Your Focused Question and Clinical Bottom Line	<p><i>Question:</i> Is Time On Task a good measure for classroom engagement?</p> <p><i>Clinical Bottom Line:</i> The Time on Task measurement provides a structured way to evaluate classroom behavior in categories of on-task, motor off-task, noise off-task, and passive/other off-task. This could be an effective way to evaluate academic engagement for children with ASD.</p>
Your Lay Summary	<p>This study seeks to find out if exercise inserted into the school day can help improve school performance for elementary students. The researchers taught teachers how to deliver a short exercise activity for ten minutes two times each day with their students during the school day. This continued for three years. About 450 students completed the study. The researchers observed the school performance and attention skills of the students throughout the study. The results showed an increase in time spent on tasks for students who</p>

	exercised and those who did not. The results show that while exercise in class does not hurt academic performance, which is something people have been concerned about, it may not directly help it. Students did pay attention to their work better immediately after the exercise activity. Knowing that exercise is very beneficial for overall health, this study shows that exercise can be added into the school day of elementary students without hurting school performance.
Your Professional Summary	This study seeks to find out if exercise inserted into the school day can help improve academic performance for elementary students. A longitudinal randomized control study was conducted. The researchers instructed teachers how to deliver ten minutes of physical activity with their students two times each day over the course of three years. About 450 students completed the study. They were selected randomly from 17 elementary schools in northeastern Kansas. The researchers observed the academic performance and attention skills of the students throughout the study. The results showed an increase in time spent on tasks for students who exercised and those who did not. The results show that while exercise in class does not hurt academic performance, which is something people have been concerned about, it may not directly help it. Students did pay attention to their work better immediately after the exercise activity. Knowing that exercise is very beneficial for overall health, this study shows that exercise can be added into the school day of elementary students without hurting school performance. A weakness of the study is that there may have been variability of how each teacher delivered the physical activity. Also, each student was observed only once over the course of the three year period.
	Critical Appraisal
Stated Purpose or Research Question	“Therefore, the objectives of the present investigation were to use data from a 3-yr cluster randomized PA intervention, ‘Academic Achievement and Physical Activity Across the Curriculum’ (A + PAAC, NCT01699295, described below) to: 1) explore the influence of classroom based PA bouts delivered through academic lessons on the proportion of on and off-task behavior; 2) determine if the relationship between classroom PA and TOT differs by age, sex, race/ethnicity, weight or baseline fitness; and to 3) identify the influence of PA intensity for on- and off-task classroom behavior when controlling for key demographic variables.” (p. 2344)
Background Literature	<p><i>Key points of the intro section:</i></p> <ul style="list-style-type: none"> ● Physical inactivity increases health risks for children. Most children do not get the recommended 60 min of physical activity (PA) per week. ● Schools are a good place for children to get PA because they spend so much time there. ● Researchers have already introduced PA interventions at schools that show positive effects on attention: Physical Activity Across the Curriculum, Engergizers, and FUNervals. ● In classroom PA has not been studied over multiple years. <p><i>Theoretical perspective:</i> They did not state a particular theory.</p>

Research Design	<p><i>Research design:</i> “a 3-yr, adequately powered, cluster-randomized, controlled trial” (p. 2344)</p> <p><i>Rationale for the design:</i> “designed to evaluate the influence of classroom based PA lessons on academic achievement.” (p. 2344)</p> <p>Doing a longitudinal study over the course of 3 years could provide important information on the cumulative effects of exercise over a long period of time. This would be very important for school curriculums to know.</p> <p><i>For quantitative primary research, AOTA Level of Evidence:</i> Level 2</p>
Sampling	<p>“The trial incorporated 17 elementary schools from four school districts in Northeastern Kansas.” (p. 2344)</p> <p><i>Sampling method used and the rationale (if given).</i></p> <p>They did not say why they chose those participants. I think it was likely out of convenience because the lead researcher is from the University of Kansas.</p> <p><i>Power/sample size estimate:</i> Not reported.</p>
Sample	<p><i>Number of Participants (Total and Subgroups):</i> “A total of 584 participants began the intervention in year 1 (n = 268 control, n = 316 intervention) and of those, 448 completed the intervention in year 3 (n = 204 control, n = 244 intervention).” (p. 2345)</p> <p><i>Characteristics of the Sample (Gender, Race/Ethnicity, Diagnosis/Disability):</i> “On average the students’ age was 7.6 yr (SD = 0.58) at baseline and did not significantly differ between the intervention and control schools. BMI, height and weight at baseline also did not significantly differ between the two groups. Ethnicity (Intervention = 10.7% Hispanic/Latino, Control = 7.2% Hispanic/Latino), race (Intervention = 85.6% white, Control = 77.1% white), and free or reduced meals (Intervention = 24.1% received free/reduced lunch, Control = 32.8% received free/reduced lunch) did significantly differ, with the control schools having more minorities and a greater percentage of students enrolled in free or reduced meal plans when compared with the intervention schools.” (p. 2345-2346)</p> <p><i>Dropouts:</i> 136</p>
Groups	<p><i>Types of groups:</i> Intervention and control.</p> <p><i>Group one description:</i></p> <p>Intervention: started with n=316, ended with n=244</p> <p><i>Group two description:</i></p> <p>Control: started with n=268, ended with n=204</p>
Method	<p><i>Primary methods to answer research question (e.g., intervention, interview, survey, chart review)</i></p> <p>Intervention</p> <p>“Teachers were asked to deliver two 10-min A + PAAC {Academic Achievement and Physical Activity Across the Curriculum} lessons per day, one lesson in the morning and the other in the afternoon, 5 {days a week}”</p> <p>“For 3 years” “Classroom teachers in the intervention schools were trained by study staff to deliver A + PAAC during two, 6-hr in-service sessions conducted at the school before implementation of the intervention” (p. 2344)</p>
Measurement and Outcomes	<ul style="list-style-type: none"> “To measure the amount of A + PAAC lessons delivered, classroom PA was observed every other week using the activity portion of

	<p>System for Observing Fitness Instruction Time (SOFIT)... Activities were coded on a 5-point Likert scale (1, lying down; 2, sitting; 3, standing; 4, walking; 5, jogging/running in place). ... Of the nine intervention schools, one school was selected at random for observation on a specific day each week. Within the selected school, the classroom to be observed was randomly selected. Finally, the specific students to be observed were randomly selected from the ones that provided consent/assent (approximately 20 per classroom). Each child was observed at least once during the 3-yr period.” (p. 2345)</p> <ul style="list-style-type: none"> • “Approximately five students were observed consecutively, in 20-s intervals for each student, yielding approximately six observations per child over a 10-min period. The total percentage of time each student spent participating in MVPA during each observation was calculated (e.g., 2 min observed with 1 min and 30 s spent in MVPA yielded 75% MVPA). The same procedure was also performed within the control schools to observe the activity that occurred during a normal academic lesson” (p. 2345) • “During each assessment, approximately five students were observed for 5 to 20 min before and 5 to 20 min after the delivery of an academic lesson... Each child was observed for 10 s” then was identified as being “on-task, motor off-task, noise off-task, or passive/other off task.” “Inter-observer reliability for both the SOFIT and TOT across the 3-yr period was 92%.” (p. 2345) • Children were weighed at the start of each day, height was measured, BMI was calculated. • PACER test was given to assess fitness. “There has been considerable work with adults and children (17,18,22) detailing the high reliability and validity of the PACER, which has been administered worldwide and to children as young as 6 yr (25).” (p. 2345)
Results	<p><i>Description of the sample:</i> “A total of 584 participants began the intervention in year 1 (n = 268 control, n = 316 intervention) and of those, 448 completed the intervention in year 3 (n = 204 control, n = 244 intervention). On average the students_ age was 7.6 yr (SD = 0.58) at baseline and did not significantly differ between the intervention and control schools. BMI, height and weight at baseline also did not significantly differ between the two groups. Ethnicity (Intervention = 10.7% Hispanic/Latino, Control = 7.2% Hispanic/Latino), race (Intervention = 85.6% white, Control = 77.1% white), and free or reduced meals (Intervention = 24.1% received free/reduced lunch, Control = 32.8% received free/reduced lunch) did significantly differ, with the control schools having more minorities and a greater percentage of students enrolled in free or reduced meal plans when compared with the intervention schools.” (pp. 2345-2346)</p> <p><i>Analysis:</i> “The participating teachers in the intervention schools reported an average of A + PAAC minIwkj1 across the intervention of 60.8 T 32.3, 54.6 T 34.4, and 49.2 T 33.6 for years 1, 2, and 3, respectively. The control school teachers reported no A + PAAC minutes. The students who participated in A</p>

	<p>+ PAAC lessons engaged in significantly more MVPA during the academic lessons than those in the control schools during each of 3 yr (all P G 0.001, see Table 2 and Fig. 1A). The intervention group performed 52.7%, 58.7%, and 60.1% of observed lesson time each year as MVPA for 3 yr, as compared with 1.6%, 3.6%, and 2.3% in the control group.” (p. 2346)</p> <p><i>Analysis</i> “Multilevel modeling results revealed a significant linear increase in the percent of time spent on-task before the academic lessons for both the control and intervention groups over the 3-yr study period.” (p. 2346)</p> <p><i>Analysis:</i> “Similar to the pre lesson TOT, boys spent significantly less percent of time in on-task behavior after the lesson than girls (P G 0.000). There was no significant effect of age, race, or free/reduced lunch consumption on the postlesson on-task behavior time. In addition, the percent of time spent in MVPA significantly predicted the percent of time spent in on-task behavior (P G 0.01, see Table 5)—that is, the more time spent in MVPA was associated with more time-spent on-task.” (p. 2347)</p>
Authors’ Discussion and Conclusion	<p>“Overall, these findings provide support that physically active classroom lessons do not have a negative impact on classroom attention in elementary age children, which has been found to be a main concern about schools and teachers in this matter.” (p. 2349)</p> <p><i>Idea one:</i> “Overall, findings from this multiyear study are congruent with shorter observational studies, and suggest that classroom based PA has a positive impact on on-task behavior post-PA participation independent of most demographic factors (13,20,21,23).” (p. 2347)</p> <p><i>Idea two:</i> The present findings indicate that the presence of MVPA has a positive influence on post-PA on-task behavior.</p> <p><i>Idea three:</i> “Because this study was initiated when the children were approximately 7.5 yr of age, an increase in attention span and TOT with age was to be expected.” (p. 2347)</p>
Authors’ Limitations	<p>“Despite positive findings, there are several limitations associated with this study. First, a pre-intervention value or true baseline value of TOT was not collected before the students participating in MVPA academic lessons as the intervention began when the school year started. Therefore, future studies should ensure a baseline assessment of classroom on-task behavior before starting the intervention. In addition, students were only observed for a short time period (5 to 20 min) after academic lessons (A + PAAC or control); therefore, we are unable to determine the length of impact PA participation has on TOT in the classroom. Similarly, PA was only measured via SOFIT during the activity lessons and not objectively using accelerometry and an accelerometer during all PA sessions in future studies could provide a more objective/accurate measure of MVPA. However, Honas et al. (14) did measure PA intensity via accelerometer and COSMED energy expenditure on a subsample of children to confirm the SOFIT findings and found the average MET level of the A + PAAC activities delivered to be 4.2 T 0.9, thus confirming the SOFIT findings.” (pp. 2347-2348)</p> <p>“Finally, logistical constraints prohibited daily observation and each child in the intervention was assessed a variable amount of times; however, this was</p>

	controlled by incorporating random effects in the multilevel modeling.” (p. 2348)
Authors’ Implications For Practice and Future Research	<ul style="list-style-type: none"> ● “Overall, these findings provide support that physically active classroom lessons do not have a negative impact on classroom attention in elementary age children, which has been found to be a main concern about schools and teachers in this matter.” (p. 2349) ● Physical activity can be done as part of the classroom without having a negative effect on attention to school work. Studies in the future should look more at PA in the classroom affects TOT and academic achievement to see how sustainable it is in the classroom.

	Summary
APA Reference	Gentil-Gutiérrez, A., Cuesta-Gómez, J. L., Rodríguez-Fernández, P., & González-Bernal, J. J. (2021). Implication of the sensory environment in children with autism spectrum disorder: Perspectives from school. <i>International Journal of Environmental Research and Public Health</i> , 18(14), 1-8. https://doi.org/10.3390/ijerph18147670
Abstract	“(1) Background: Children with Autism Spectrum Disorder (ASD) frequently have difficulties in processing sensory information, which is a limitation when participating in different contexts, such as school. The objective of the present study was to compare the sensory processing characteristics of children with ASD in the natural context of school through the perception of professionals in the field of education, in comparison with neurodevelopmental children (2) Methods: A cross-sectional descriptive study as conducted with study population consisting of children between three and ten years old, 36 of whom were diagnosed with ASD and attended the Autismo Burgos association; the remaining 24 had neurotypical development. The degree of response of the children to sensory stimuli at school was evaluated using the Sensory Profile-2 (SP-2) questionnaire in its school version, answered by the teachers. (3) Results: Statistically significant differences were found in sensory processing patterns ($p = 0.001$), in sensory systems ($p = 0.001$) and in school factors ($p = 0.001$). Children with ASD who obtained worse results. (4) Conclusions: Children with ASD are prone to present sensory alterations in different contexts, giving nonadapted behavioral and learning responses,” (p. 1).
Your Focused Question and Clinical Bottom Line	<i>Question:</i> How do school environments affect sensory processing in children with an Autism Spectrum Disorder (ASD)? <i>Clinical Bottom Line:</i> Children with ASD have greater difficulties in school due to sensory hypersensitivity than children with neurotypical development. Using the Sensory Profile-2, school-based occupational therapists can assess the sensory needs of their client to determine if sensory based interventions are necessary.
Your Lay Summary	<ul style="list-style-type: none"> ● Children with autism spectrum disorders (ASD) are very likely to have some form of hypersensitivity that disrupts their behavior. ● This study’s main purpose was to assess sensory processing characteristics of children with ASD in their natural school environment. ● There were 60 people in the study between the ages of three and 10 years old. ● There were two groups of participants. One group had 36 children with ASD and the other group had 24 children that did not have ASD. ● The study looked at three components of the children’s sensory processing: sensory processing patterns, sensory and behavioral systems, and school factors.

	<ul style="list-style-type: none"> • Teachers used a questionnaire to assess the student's sensory processing of each component. • In all three of those categories, students with ASD showed significantly different behaviors than students without ASD. • The results of this study are similar to results of previous studies on similar topics. • Additional research is required to further the understanding of sensory processing needs and interventions of children with ASD and other diagnoses.
Your Professional Summary	<p>90% of children with ASD have some form of sensory hypersensitivity that disrupts their behavior. The purpose of the study was to assess sensory processing of children with ASD in their natural school setting via the perception of education professionals, and compare it to children with neurotypical development. The study included 60 participants that were between the ages of three and 10 years old and attended the same public school in Burgos. There were two groups of participants. The first group consisted of 36 children with ASD, 29 of which were male and seven were female. The second group was composed of 24 participants with neurotypical neurological development, which included 12 males and 12 females. The study looked at three components of the children's sensory processing: sensory processing patterns, sensory and behavioral systems, and school factors. Educational professionals filled out the questionnaire about their students who were participants. After analyzing data, the researchers found that students with ASD showed significantly different behaviors than students without ASD in all three components. The results of the study are complementary to previous studies that researched similar topics. The study, however, has some limitations. First, there could be methodological biases due to the use of self-administered surveys and nonprobability sampling. Second, the study's low sample size does not represent the general population. Lastly, it is impossible to determine causal relationships due to cross-sectional study. Overall, this study is important because school is very stimulating and students have little control of the environment. However, additional research is required to further the understanding of sensory processing needs and interventions of children with ASD and other diagnoses.</p>
	Critical Appraisal
Stated Purpose or Research Question	<p>"the main objective being to compare the characteristics of sensory processing of children with autism in the natural context of school through the perception of professionals in the field of education, in comparison with neurodevelopmental children" (p. 2).</p>
Background Literature	<p><i>Key points of the intro section:</i></p> <ul style="list-style-type: none"> • People with ASD are prone to sensory alterations

	<ul style="list-style-type: none"> • Sensory processing includes CNS, PNS, and receptor organs and detects sensory information • Up to 90% of people with ASD have some sensory hypersensitivity which can be a main cause of disruptive behaviors • Altered sensory processing can impact a child with ASD participation in school and social situations, ADLs, play, and education. <p><i>Theoretical perspective:</i> not reported</p>
Research Design	<p><i>Research design:</i> descriptive cross-sectional study</p> <p><i>Rationale for the design:</i> The researchers likely used this design because descriptive studies allowed the educational professionals to explain their perceptions on student's sensory processing. Therefore, this method was useful to meet the purpose of the research.</p> <p><i>For quantitative primary research, AOTA Level of Evidence:</i> Level 2</p>
Sampling	<p><i>Sampling method used and the rationale (if given).</i> The sampling method was not explicitly stated. However, all of the participants attended the same public school, and all of the participants with ASD received outpatient services at Autismo Burgos which is in Spain.</p> <p><i>Inclusion criteria:</i> children between the ages of three and 10 years old, enrolled in a public school in Burgos, neurotypical neurological development, diagnosis of ASD</p> <p><i>Exclusion criteria:</i> children with severe disruptive behaviors with a diagnosis other than ASD</p> <p><i>Power/sample size estimate:</i> Not reported</p>
Sample	<p><i>Number of Participants (Total and Subgroups):</i> There were 60 total participants and two subgroups- one group with 36 participants, one group with 24 participants.</p> <p><i>Characteristics of the Sample (Gender, Race/Ethnicity, Diagnosis/Disability):</i></p> <ul style="list-style-type: none"> • Between the ages of three and 10 years old • 41 males, 19 females • Neurotypical neurological development • Diagnosis of ASD <p><i>Dropouts:</i> n/a</p>
Groups	<p><i>Types of groups: (e.g., intervention, sample characteristic):</i> One group of children diagnosed with ASD and one group of children with neurotypical neurological development.</p> <p><i>Group one description:</i> Children with ASD: there were 36 participants between the ages of three and 10 years old, 29 male participants, seven female participants.</p> <p><i>Group two description:</i> Children with neurotypical neurological development: there were 24 between the ages of three and 10, 12 male participants, 12 female participants.</p>
Method	<p><i>Primary methods to answer research question (e.g., intervention, interview, survey, chart review)</i></p> <ul style="list-style-type: none"> • Survey: Sensory Profile-2 questionnaire • The survey was filled out by educational professionals to report each of the participant's sensory processing.

Measurement and Outcomes	<p><i>Measure:</i> Name: Sensory Profile-2</p> <p>Construct: Assesses how processing in different environments interfered with the child's participation.</p> <p>Construct: Assesses frequency of behaviors the child shows in familiar situations and settings via a Likert scale of six response options (5=almost always or always, 1= almost never or never, 0= not applicable).</p> <p>Validity: Based on Dunn's sensory processing model.</p> <p>Validity: Validated in the Spanish population for children between the ages of three and 14.</p> <p>Frequency: This measure was used to assess each participant.</p>
Results	<p><i>Description of the sample:</i> 60 total participants between the ages of three and 10 years old. 36 participants in the ASD group, 29 were male, seven were female. 24 participants in the neurotypical group, 12 were male, 12 were female.</p> <p><i>Analysis/theme one:</i></p> <ul style="list-style-type: none"> • The mean scores in the "sensory processing patterns" category of each group are displayed in table 1. • There was statistical significance in the sensory processing patterns between children with ASD and children with neurotypical neurological development. • Students with ASD had significant sensory processing patterns compared to students with neurotypical neurological development. <p><i>Analysis/theme two:</i></p> <ul style="list-style-type: none"> • The mean scores of the "sensory and behavioral systems" category of each group are displayed in table 2. • There was a statistical significance in the sensory and behavioral systems between children with ASD and children with neurotypical neurological development. • Students with ASD were statistically more dysfunctional than students with neurotypical neurological development. <p><i>Analysis/theme three:</i></p> <ul style="list-style-type: none"> • The mean scores of the "school factors" category of each group are displayed in table 3. • Students with ASD required a greater need for external help, had less awareness and attention to learning, had less tolerance in the learning context, and had less availability to learn. • There was a statistical significance of those four previously mentioned factors between children with ASD and children with neurotypical neurological development.
Authors' Discussion and Conclusion	<p><i>Idea one:</i> This study is important because school is very stimulating and students have little control of the environment. Previous studies showed students with ASD can be more hypersensitive than children with</p>

	<p>neurotypical neurological development. The results of the present study complemented previous studies.</p> <p><i>Idea two:</i> The present study found significant alterations in the four patterns of sensory processing (search engine, avoidant, sensitive, spectator) in students with ASD. These results complement previous studies regarding sensory processing patterns at school for students with ASD.</p> <p><i>Idea three:</i> Students with ASD required a greater need for external help, had less awareness and attention to learning, had less tolerance in the learning context, and had less availability to learn. These factors may be due to the combination of the demands of the school environment and the limited control the student has on their environment.</p> <p><i>Idea four:</i> Children with ASD often present sensory seeking behaviors. Sensory seeking behaviors can be used to decrease over reactivity to stimuli and consequently decrease behaviors that are not safe.</p>
Authors' Limitations	<ul style="list-style-type: none"> ● Methodological biases due to the use of self-administered surveys and nonprobability sampling. ● Low sample size that does not represent the general population. ● Impossible to determine causal relationship due to cross-sectional study.
Authors' Implications For Practice and Future Research	<ul style="list-style-type: none"> ● Future research is necessary so families and professionals understand the sensory processing of their child with ASD before selecting interventions to improve their functional abilities. ● Future research is recommended to assess children with and without various diagnoses and implement interventions in the natural school environment to help students cope with stimuli.

	Summary
APA Reference	Benson, J. D., Breisinger, E., & Roach, M. (2019). Sensory-based intervention in the schools: A survey of occupational therapy practitioners. <i>Journal of Occupational Therapy, Schools, & Early Intervention</i> , 12(1), 115–128. https://doi.org/10.1080/19411243.2018.1496872
Abstract	<p>“Aim: The primary purpose of this study was to investigate the role of sensory-based intervention in school-based occupational therapy. The research questions are: 1. How do school-based occupational therapists (OTs) describe the role of sensory-based intervention (SBI) in an educational setting? 2. Which current practice trends influence sensory-based occupational therapy practice? Methods: Descriptive statistics were generated to summarize current school-based practice trends. Qualitative analysis resulted in the identification of categories related to school-based practice. Participants (N = 94) reported the positive impact of sensory-based interventions in the schools, the challenge of the school context, the value of both teacher and team collaboration, the limitations and challenges to parent collaboration, and the sensory resources within the school context.</p> <p>Results: Results indicate that school-based practitioners should focus on educational and social participation of the students.</p> <p>Conclusion: Outcomes indicate the primary means of improving student participation is via team education and advocacy” (p. 115).</p>
Your Focused Question and Clinical Bottom Line	<p><i>Question:</i> Can school-based occupational therapists enhance student participation in school settings through sensory-based interventions?</p> <p><i>Clinical Bottom Line:</i> School-based occupational therapists can support the child’s role in educational participation, especially in attention and self-regulation. However, there is a need for collaboration with interdisciplinary teams and advanced sensory-based integration to optimize performance and learning for students with sensory processing challenges (p. 124).</p>
Your Lay Summary	<p>This study investigates how school-based occupational therapists view sensory-based interventions (SBI) in an educational setting. This experiment used an electronic questionnaire survey on www.surveymonkey.com, including seven categories. The survey was given to 94 occupational therapists and took about 30-40 minutes. Based on the survey results from the school-based occupational therapists, it concluded that sensory-based interventions have a purpose in school-based therapy and can help a student’s ability to improve on attention, self-regulation, and learning. However, sensory-based interventions in the school setting can be challenging because there is a lack of team support from the administration, teachers, and parents. There is also a lack of resources, such as equipment and physical space, to allow for sensory-based interventions. There is a need to provide additional learning and training for school-based occupational therapists to effectively implement sensory-based interventions so students can do well in schools.</p>

Your Professional Summary	<p>The purpose of this study is to understand the role of sensory-based interventions in school-based therapy. This study wanted to know how school-based occupational therapists describe sensory-based intervention in an educational setting and which current practice trends influence sensory-based occupational therapy practice. This study surveyed 94 occupational therapists, of which the majority of them were from Pennsylvania. The survey was through www.surveymonkey.com and took about 30-40 minutes to complete, and there were a total of seven sections within the survey. Once the survey was completed three researchers independently read and coded the data. Next, a second reading was conducted to determine the interpretations of the data and categories. Lastly, there was a peer debriefing discussion to talk about the data analysis and the determination of categories. The results were organized into seven categories and is listed as: 78% of school-based OTs said <i>Yes to SBI in the Schools</i>, half of the school-based OTs agree that <i>Context Matters</i>, 100% OTs reported that <i>Teacher Collaboration is essential</i>, OTs agreed that <i>Parent Collaboration is Beneficial But Limited</i>, 90% of OTs reported that an <i>Interdisciplinary Team Collaboration Is A Must</i>, OTs reported that there is need for additional <i>Sensory Resources in the Schools</i>, and lastly, OTs identified that <i>Sensory Assessment in the Schools</i> was the highest aspect for understanding a child's sensory needs. The limitations in this study is that the participants did not represent all school-based practitioners making the results not generalizable. In addition, 18.5% of the participants were employed directly by the school and the other participants were either of a private practice, self employed, or employed by an outside agency, making patterns and perceptions vary. The implications of this study is that school-based OTs must promote SBI to increase funds to improve student performance by educating administrators, educators, and parents. In addition, OTs have a role in advocating for their services by having a holistic and client-centered approach through SBI services to help support student performance. Finally, sensory-based training must extend beyond the entry-level curriculum by providing additional training, having interventions in non-traditional ways, and implementing team education and training. This encourages school-based OTs to be an active learner by engaging in conferences, sensory-based courses, books and articles, and receiving mentorship.</p>
	Critical Appraisal
Stated Purpose or Research Question	<p>"The primary purpose of this study was to investigate the role of sensory-based intervention in school-based occupational therapy. The research questions are: 1. How do school-based occupational therapists (OTs) describe the role of sensory-based intervention in an educational setting? 2. Which current practice trends influence sensory-based occupational therapy practice?" (p. 116).</p>
Background Literature	<p><i>Key points of the intro section:</i></p> <ul style="list-style-type: none"> • "School is a primary context for children, and problems associated with sensory processing may become more apparent in the school environment (Burleigh, McIntosh, & Thompson, 2002; Miller &

	<p>Summers, 2001). The environment of a school may highlight the presence of sensory processing difficulties as this type of setting requires increased functional performance and introduces a number of sensory stimuli that can result in significant distress on the child” (p. 116).</p> <ul style="list-style-type: none"> • “Occupational therapists working in the schools frequently use ASI as a guiding principle for intervention. Because of the school context, the ASI approach may be modified though” (p. 116). • “SBI included the use of sensory equipment and methods during direct intervention, in the classroom, and/or sensory strategies carried over by the team” (p. 116). <p><i>Theoretical perspective:</i></p> <ul style="list-style-type: none"> • Ayres Sensory Integration (ASI) is one of several theories used by occupational therapists working in schools to guide practice for making sensory changes to the educational environment to support school function (p. 116).
Research Design	<p><i>Research design:</i> “This study utilized survey research methods. The researchers designed a questionnaire to answer the research questions. Data collected via the survey included demographic information, employment status, and practice patterns utilizing sensory-based interventions. The reason for a survey was to keep all information completely confidential so that the researchers had no direct interaction with any of the participants” (p. 117).</p> <p><i>Rationale for the design:</i> “Descriptive statistics were generated to summarize current school-based practice trends” (p. 115).</p> <p><i>For quantitative primary research, AOTA Level of Evidence:</i> This is a level III, mixed-methods, primary research study</p>
Sampling	<p>“Through purposeful and criterion sampling, participants were recruited via two avenues: first, an electronic email blast via the Pennsylvania Occupational Therapy Association (POTA) and second via recruitment flyers at the POTA State Conference. Ninety-four school-based occupational therapists participated in this study (Table 1). Inclusion criteria included: 1) licensed to practice, 2) a minimum of 2 years of clinical experience in a school setting, 3) at least 10 hr a week working in a school, and 4) an agreement to participate through an electronic consent form” (p. 116-117).</p> <p><i>Sampling method used and the rationale (if given):</i> “electronic email and recruitment flyers at POTA State Conference” (p. 116).</p> <p><i>Inclusion criteria:</i> Inclusion criteria included: “1) licensed to practice, 2) a minimum of 2 years of clinical experience in a school setting, 3) at least 10 hr a week working in a school, and 4) an agreement to participate through an electronic consent form” (p. 117).</p> <p><i>Exclusion criteria:</i> N/A</p> <p><i>Power/sample size estimate:</i> “The size of the sample was very small and does not represent all school-based OTs across the nation, making the results not generalizable” (p. 123).</p>
Sample	<p><i>Number of Participants (Total and Subgroups):</i> 94 participants</p>

	<p><i>Characteristics of the Sample (Gender, Race/Ethnicity, Diagnosis/Disability):</i> No demographics on gender or race of the participants, however, “average age was 39, the OTs current state of practice was in Pennsylvania, most were OTRs, worked at least 10 hours per week in SBOT, Full time OTs, and worked in public schools” (p.117). From the survey, OT’s reported that “96.9% of common diagnoses on caseload was Autism Spectrum Disorder. The next two common diagnoses were Attention Deficit Hyperactivity, and Learning Disability” (p. 119).</p> <p><i>Dropouts:</i> No dropouts in this study</p>
Groups	This is a cross-sectional study, surveying 94 Occupational Therapy practitioners. There is only one single group involved.
Method	<p>“This was an electronic survey through www.surveymonkey.com, and the ethics was approved by the University Institutional Review Board. The survey took about 30-40 minutes to complete and it had a total of sections in the survey”.</p> <ul style="list-style-type: none"> ● “Section 1: gathered demographic data about the participant ● Section 2: related to employment status ● Section 3: gathered information related to professional development (specifically school-based practice) ● Section 4 & 5: asked participants to identify occupational based models and practice models that guide their school-based practice ● Section 6: participants identify assessments measures used for school-based evaluation ● Section 7: provide open-ended questions that relate to sensory-based interventions used in school-based practice” <p>(pp. 117-118)</p>
Measurement and Outcomes	<ul style="list-style-type: none"> ● “Quantitative results were analyzed using descriptive statistics, including means and frequency distributions” (p. 118). ● “Text-based survey data were analyzed using cross-sectional and categorical indexing with a literal and interpretive review of the open-ended responses from the survey and categories” (p.118). ● “Qualitative data were organized by three researchers who independently read and code the data. A second reading was completed to determine the interpretations of the data and categories. Then a peer debriefing discussion among the researchers occurred to talk about the data analysis and the determinations of categories. Categories were developed based on repetitive patterns and triangulations occurred with same categories from both the open-ended probes and the survey” (p. 118)
Results	<p>This survey generated seven following categories for the results:</p> <p>“Yes to SBI in the schools: 78% school-based OTs reported that SBI is appropriate within the school setting because it supports the student role by increasing attention and focus on school tasks and promotes class participation” (p. 120).</p>

	<p><i>“Context matters:</i> Half of school-based OTs agree that SBI addresses client’s sensory needs in educational settings by increasing students’ attention span. However, OTs also describe how SBI is context dependent and relies on the availability of resources, such as equipment and space. OTs also report that SBI lacks carryover in the community and homes” (p. 120).</p> <p><i>“Teacher collaboration is essential:</i> 100% OTs reported that collaboration with special education teachers about sensory processing needs of a child is essential. More than half of the OTs identified that “sensory strategies” was one of the main objectives for OT and special education collaboration” (p. 120).</p> <p><i>“Parent collaboration is beneficial but limited:</i> The participants agree that working in conjunction with parents of children with sensory processing challenges is beneficial but is limited and inconsistent. Despite these challenges, occupational therapists agree that collaboration with parents helps promote carryover of sensory strategies from school to the home environment. Therefore, participants report making an effort to collaborate and educate by sending home resources and handouts with the child” (p. 120-121).</p> <p><i>“Interdisciplinary team collaboration is a must...not just the teachers:</i> Almost 90% of surveyed occupational therapists report the use of interdisciplinary collaboration in everyday practice within the school setting. Communicating and collectively working with other professional team members facilitates carryover and continued use of sensory strategies” (p. 121).</p> <p><i>“Sensory resources in the schools:</i> Participants reported the need to have access to resources. The use of literature such as the American Journal of Occupational Therapy (AJOT), position papers through the American Occupational Therapy Association (AOTA), educational textbooks, and various research databases are highly used to support evidence-based practice. In addition, participants identify continuing education courses and the use of coworkers as resources” (p. 122).</p> <p><i>“Sensory assessment in the schools:</i> School-based occupational therapists identify that sensory input/output pertaining to the sensory systems as the highest reported aspect of sensory processing that is assessed within the school setting. School-based occupational therapists distinguish between the multiple aspects related to assessment of sensory processing to gain a thorough understanding of a child’s sensory needs” (p. 122).</p>
Authors’ Discussion and Conclusion	<p><i>Idea one:</i> “Sensory-based interventions, according to survey participants (87%), have a purpose in contributing to a child’s ability to fulfill the student role by improving areas of attention, self-regulation, and learning/educational participation”</p> <p><i>Idea two:</i> “Participants report sensory-based interventions are an approach that supports the student role and successful function within the school setting. In contrast, 11% of the participants reported that SBI in the schools can be a challenge mostly due to a lack of team support and contextual limitations”</p>

	<p><i>Idea three:</i> “62% of survey participants reported that additional training, beyond entry-level education, in sensory-based interventions within the school setting is necessary to implement these techniques”</p> <p>(pp. 122-123)</p>
Authors’ Limitations	<p>“The participants, 94% from Pennsylvania, are not representative of all school-based practitioners, and therefore the results are not generalizable. Lastly, only 18.5% of the participants were employed directly by the school, while all other participants were employees of private practice, self employed, or employed by an outside agency servicing the school. The participants' employment status could impact practice patterns and perceptions. Having a small sample size also had an effect on the qualitative data analysis and did not truly represent all school-based occupational therapists across the state or nation, skewing the statistics of the research” (p. 123).</p>
Authors’ Implications For Practice and Future Research	<p>There are many implications in this study. The first is that “school-based OTs must educate administration, educators, and parents about SBI to promote and increase funds to better understand how SBI can improve student performance.” Next, school-based OTs can serve as advocates for “holistic and client-centered services” through SBI strategies to help student performance through training and development. “Lastly, sensory-based training specifically in schools needs to extend beyond the entry-level curriculum by having additional training, providing interventions in non-traditional ways, and providing team education and training. This encourages school-based OTs to seek additional education and training through conferences, sensory-based courses, books/articles, mentorship, etc.” (p. 124).</p>

Review of Research Studies

	Summary
APA Reference	<p>Grajo, L. C., Candler, C., & Sarafian, A. (2020). Interventions within the scope of occupational therapy to improve children's academic participation: A systematic review. <i>American Journal of Occupational Therapy</i>, 74(2), 1-32. https://doi.org/10.5014/ajot.2020.039016</p>
Abstract	<p>“Importance: Occupational therapy practitioners evaluate students’ ability to participate in school and may provide services to improve learning, academic performance, and participation.</p> <p>Objective: To examine the effectiveness of interventions within the scope of occupational therapy practice to improve academic participation of children and youth ages 5–21 yr.</p> <p>Data Sources: We searched MEDLINE, PsycINFO, CINAHL, OTseeker, and Cochrane databases for articles published from 2000 to 2017 using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.</p> <p>Study Selection and Data Collection: Within the scope of occupational therapy practice and focused on children ages 5–21 yr.</p> <p>Findings: Forty-six studies were included, based on three themes: (1) interventions to support participation and learning in the classroom; (2) interventions to support motivation and participation in literacy, including combined reading, written expression, and comprehension; and (3) interventions to support handwriting. Low strength of evidence supports the use of weighted vests and stability balls, and moderate strength of evidence supports the use of yoga to enhance educational participation. Moderate strength of evidence supports the use of creative activities, parent-mediated interventions, and peer-supported interventions to enhance literacy participation. Strong evidence supports therapeutic practice for handwriting intervention, and low strength of evidence supports various handwriting programs as replacement or additional instructional strategies to enhance handwriting abilities.</p> <p>Conclusions and Relevance: More rigorous studies are needed that are conducted by occupational therapy practitioners in school-based settings and that use measures of participation and academic outcomes.</p> <p>What This Article Adds: This systematic review provides occupational therapy practitioners with evidence on the use of activity-based and occupation-centered interventions to increase children’s participation and learning in school” (p. 1).</p>

<p>Your Focused Question and Clinical Bottom Line</p>	<p><i>Question:</i> What interventions improve classroom participation for children with ASD?</p> <p><i>Clinical Bottom Line:</i> This systematic review found that yoga interventions are effective to enhance school participation. Additionally, the study found that activity-based interventions can help support creative engagement in literacy and involve parents and peers in enhancing literacy participation. Occupational therapists may also implement interventions that address the legibility of handwriting, cognitive strategies, therapeutic practice, and the delivery of performance feedback. These interventions have been proven effective for children, ages 5-21, to enhance academic participation. Having the knowledge of evidence-based interventions is valuable information as it will direct effective interventions for practice.</p>
<p>Your Lay Summary</p>	<p>The purpose of this paper was to look at studies that support school participation for children ages 5-21. It looked at forty-six studies that fit into the themes: participation in school, learning and reading participation, and handwriting. These studies were done by occupational therapists, professionals in schools, teachers, or other health professionals if the results were within the scope of occupational therapy. Results showed that yoga can be used to increase children's performance in school. The results also showed that activity-based tasks can help increase children's creativity in reading and learning. Before using yoga and activity-based tasks, practitioners need to consider the weaknesses in the study. Due to several limitations within the studies, the results were unclear. Practitioners should be careful to not infer information for all patients. Further research is needed to support the use of these interventions for children ages 5-21 of different abilities.</p>

Your Professional Summary	<p>This systematic review addressed the effectiveness of interventions that claim to enhance children’s academic participation. The interventions that were analyzed were categorized into three themes: educational participation, literacy participation, and handwriting. These studies acknowledged the effectiveness of interventions to improve academic participation, and were conducted by occupational therapists, school practitioners and researchers, or other health professionals, as long as the outcomes of the interventions were within the scope of occupational therapy. The key point and hypothesis that served as the basis of the study is that students with disabilities participate less than students without disabilities in school-related activities. To test the hypothesis, forty-six studies of level of evidence I, II, or III were reviewed within this systematic review. The studies found that yoga interventions are effective to enhance school participation. The study also found that activity-based interventions can help support creative engagement in literacy and involve parents and peers in enhancing literacy participation. The implications for occupational therapy practice and future research are that more rigorous research is needed to support the effectiveness of interventions to develop occupation-focused measures of educational participation. Other implications for practice include being cautious about generalizing the use of stability balls and weighted vests to enhance educational participation in classrooms. Occupational therapy professionals should also consider that this systematic review did not apply all interventions to children with autism spectrum disorder. Therefore, practitioners should be careful not to generalize all the interventions to children with ASD or children with other disabilities.</p>
	Critical Appraisal
Stated Purpose or Research Question	<p>“The purpose of this systematic review was to provide occupational therapy practitioners with evidence on the use of activity-based or occupation-centered interventions to increase children’s participation and learning in school. This study aimed to answer the question, what is the evidence for the effectiveness of interventions within the scope of occupational therapy practice to improve learning, academic achievement, and successful participation in school for children and youth ages 5–21” (p. 2).</p>
Background Literature	<p><i>Key points of the intro section:</i></p> <ul style="list-style-type: none"> • “Students with disabilities participate less than students without disabilities in school-related activities” (p. 1). • “Occupational therapy practitioners evaluate students’ ability to participate in school and may provide a continuum of services to improve learning, academic performance, and participation” (p.1). <p><i>Theoretical perspective:</i> Not reported</p>

Research Design	<p><i>Research design:</i> Systematic review</p> <p><i>Rationale for the design:</i> This systematic review was designed to be a part of AOTA's Evidence-Based Practice Project. I believe they chose to design the research as a systematic review because it identifies and synthesizes other scholarly, peer-reviewed research on the topic of academic participation for children with and without disabilities. Having this information in a systematic review ensures that the data is unbiased and provides evidence for effective interventions for OT practitioners.</p> <p><i>For reviews of research, AOTA Level of Evidence:</i> Level I Evidence</p>
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Method	<p><i>Variables:</i> children ages 5-21, studies included must be levels of evidence I, II or III, studies must fit into the themes of: educational contribution, literacy participation, or handwriting, studies between years 2000-2017</p> <p><i>Keywords:</i> “adolescence, adolescent, child, infant, newborn, teen, teenager, toddlers, young adult, young children, youth, activities of daily living, after-school program, anger management, arts program, attachment behavior, attention training, communication skills training, conflict resolution, co-occupation, coping skills, developmentally supportive care, DIR/Floortime, early childhood transition, early intervention, early literacy, experiential learning, family bonding, family-centered care, family engagement, feeding and eating disorders, friendship, imitation skills, individualized developmental care, infant massage, infant mental health, interprofessional teaming, joint attention, kangaroo care, leisure, meditation, memory training, mental health promotion, NIDCAP, occupational therapy, parent training, positive behavior supports, pre-emergent writing, preliteracy, print awareness, psychomotor performance, relationship-based interventions, religious activities, routines, routines based interventions, school mental health, self-advocacy, social-emotional learning, social skills, tummy time, universal design, Wii, yoga, youth engagement, animal-assisted therapy, bedtime, community integration, community living skills, computer games, driving, executive function, fine motor, gross motor, hand skills, handwriting, individual placement and support, interest development, job coaching, life skills, literacy, manipulation skills, medication adherence, medication compliance, perceptual motor, prevocational, recess, seating, secondary transition, sensorimotor/sensory, appraisal, best practices, case control, case report, case series, clinical guidelines, clinical trial, cohort, comparative study, consensus development conferences, controlled clinical trial, critique, crossover, cross-sectional, double-blind, epidemiology, evaluation study, evidence-based, evidence synthesis, feasibility study, follow-up, health technology assessment, intervention, longitudinal, main outcome measure, meta-analysis, multicenter study, observational study, outcome and process assessment, pilot, practice guidelines, prospective, random allocation, randomized controlled trial, retrospective, sampling, scientific integrity review, single subject design, standard of care, systematic literature review, systematic review, treatment outcome, validation study” (p. 3).</p> <p><i>Databases:</i> MEDLINE, PsycINFO, CINAHL, OTseeker, and Cochrane databases</p> <p><i>Procedures:</i> “46 articles of levels I, II, or III of evidence were included in this systematic review and data was collected through intervention studies conducted by school practitioners and researchers or other health professionals as long as the outcomes were within the scope of occupational therapy;” “included studies needed to use specific outcome measures relating to academic participation,” “assessed the intervention studies for risk of bias</p>
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	<p>using the Cochrane Collaboration tool and the systematic reviews using the AMSTAR tool,” “for quality control, the AOTA research methodologist and project staff reviewed all tables and provided feedback, evaluated the strength of evidence for each outcome theme according to the guidelines from the U.S. Preventive Services Task Force (2018)” (p. 4).</p>
Filters	<p><i>Inclusion criteria:</i> “Articles were required to be published in a peer-reviewed journal; written in English; published between January 2000 and March 2017; Level I, II, or III studies; within the scope of occupational therapy practice; and focused on children ages 5 to 21 yr and must describe intervention studies conducted by school practitioners and researchers or other health professionals, as long as the outcomes were within the scope of occupational therapy. In addition, included studies needed to use specific outcome measures relating to academic participation” (p.2).</p> <p><i>Exclusion criteria:</i> “Studies were excluded from the systematic review if they were dissertations, theses, presentations, or proceedings; published before or after the review range; Level IV or V studies, regardless of outcomes measured; or studies of interventions for parents and service providers with no child-focused outcomes. Studies with outcomes that did not fall within the three outcome themes were not included” (p. 3).</p> <p><i>Screening:</i> “46 studies were analyzed on the basis of level of evidence (design), quality (scientific rigor), and significance of findings and entered our findings in an evidence table (Table A.1 in the Appendix). In addition, we assessed the intervention studies for risk of bias using the Cochrane Collaboration tool (Higgins et al., 2011; Table A.2) and the systematic reviews using the AMSTAR tool (Shea et al., 2007; Table A.3). No overall assessments of risk of bias were identified that might affect the cumulative analysis. For quality control, the AOTA research methodologist and project staff reviewed all tables and provided feedback” (p. 4).</p> <p><i>Total references found:</i> “The initial search returned 89,461 results with dates ranging from 2000 to 2017” (p. 2).</p> <p><i>Process for eliminating references:</i> “After initial review and screening by the AOTA research methodologist, the authors screened 5,310 results for inclusion in the systematic reviews. Hand searching located an additional 12 articles for further screening. Articles were critically appraised using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines” (p. 2).</p> <p>After review of the references, forty-six were selected as they fit the inclusion criteria and also within the three themes of the study.</p>

Results	<p><i>Description of the articles:</i> “Eight articles (4 Level I, 1 Level II, 3 Level III) met the criteria for the review and provide evidence related to activity-based interventions addressing educational participation in school. Risk of bias of these studies ranged from low to high, and findings regarding effectiveness were mixed. Of the 8 studies, only 1 was conducted by occupational therapy clinicians and researchers (Hodgetts et al., 2011); the rest were conducted by exercise physiologists, educational psychologists, physical and recreational therapists, neuropsychologists, and special education researchers” (p. 5).</p> <p><i>Analysis/theme one:</i> “Low evidence from 2 studies addresses the use of weighted vests in the classroom to increase participation and academic achievement. The evidence is insufficient to support weighted vest intervention for children with ASD in the classroom” (p. 5).</p> <p><i>Analysis/theme two:</i> “Low evidence from three studies addresses the use of stability balls in the classroom to increase educational participation” (p. 5).</p> <p><i>Analysis/theme three:</i> “Moderate evidence based on 3 studies supports the effectiveness of yoga interventions to enhance school participation” (p. 5).</p> <p><i>Analysis/theme four:</i> “Strong evidence based on four studies (2 Level I, 1 Level II, 1 Level III) supports the use of embedded creative and engaging literacy activities in classroom and supplemental intervention sessions” (p. 6).</p> <p><i>Analysis/theme five:</i> “Moderate evidence based on 7 studies (3 Level I, 4 Level II) supports parent-mediated literacy interventions” (p. 6).</p> <p><i>Analysis/theme six:</i> “Moderate evidence based on 2 studies (1 Level I, 1 Level II) supports the effectiveness of peer-supported reading programs” (p. 7).</p> <p><i>Analysis/theme seven:</i> “Strong evidence from 3 Level I studies (Chang & Yu, 2014; Denton et al., 2006; Weintraub et al., 2009) and 1 Level II study (Jongmans et al., 2003, who also reported a Level III study; see Table A.1) supports therapeutic practice over sensorimotor approaches or usual classroom activities to improve handwriting legibility for children with handwriting difficulties” (p. 8).</p>
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<p>Authors' Discussion and Conclusion</p>	<p><i>Idea one:</i> "Yoga was found to be an effective activity-based intervention to improve classroom communication and engagement in school" (p. 8).</p> <p><i>Idea two:</i> "The evidence does not support the use of weighted vest or stability ball intervention to increase educational participation for children with ASD" (p. 9).</p> <p><i>Idea three:</i> "The strength of evidence is moderate supporting the effectiveness of activity-based interventions to support creative engagement in literacy and involve parents and peers in enhancing literacy participation" (p. 9).</p> <p><i>Idea four:</i> "This review found moderate evidence to support interventions to address handwriting legibility outcomes, including therapeutic practice, cognitive strategies such as self-evaluation techniques, and the provision of performance feedback" (p. 9).</p> <p><i>Consistent findings:</i> "More research is needed to support the effectiveness of interventions to develop occupational-focused measures for educational participation" (p. 10).</p> <p><i>Inconsistent findings:</i> None noted</p>
<p>Authors' Limitations</p>	<ul style="list-style-type: none"> ● Small sample sizes ● Lack of random sampling ● Lack of a control group ● Research only at levels 1 through III; some level IV studies were excluded and may have provided preliminary evidence on the effectiveness of school participation interventions ● Only a limited number of databases with articles published in English were only included ● "The review did not focus on interventions performed by occupational therapy practitioners, but rather on activity-based interventions that are within the scope of occupational therapy" (p. 10). ● Risk of bias in several of the articles that were reviewed
<p>Authors' Implications for Practice and Future Research</p>	<ul style="list-style-type: none"> ● "More rigorous research is needed to support the effectiveness of interventions and to develop occupation-focused measures of educational participation" (p. 10). ● "Caution must be used in generalizing the use of stability balls and weighted vests to enhance educational participation in classrooms" (p. 10). ● "Interventions that use choice, creative engagement, collaboration with parents, and support by cross-age peers show promise in enhancing children's attitudes toward literacy and participation in literacy activities" (p. 10). ● "Isolated skills training to address prerequisite skills for handwriting does not translate to improved handwriting performance. The use of prerequisite skills in interventions must be directly tied to handwriting tasks" (p. 10).

	Summary
APA Reference	Watling, R., & Hauer, S. (2015). Effectiveness of Ayres Sensory Integration® and sensory-based interventions for people with autism spectrum disorder: A systematic review. <i>The American Journal of Occupational Therapy</i> , 69(5), 1-12. https://doi.org/10.5014/ajot.2015.018051
Abstract	<p>“This systematic review examines the literature published from January 2006 through April 2013 related to the effectiveness of Ayres Sensory Integration® (ASI) and sensory-based interventions (SBIs) within the scope of occupational therapy for people with autism spectrum disorder to improve performance in daily life activities and occupations. Of the 368 abstracts screened, 23 met the inclusion criteria and were reviewed. Moderate evidence was found to support the use of ASI. The results for sensory-based methods were mixed. Recommendations include performing higher-level studies with larger samples, using the Fidelity Measure in studies of ASI, and using carefully operationalized definitions and systematic methods in examination of SBIs.” (p. 1)</p>
Your Focused Question and Clinical Bottom Line	<p><i>Question:</i> What is the effectiveness of Ayres Sensory Integration and sensory-based interventions within the field of occupational therapy for individuals with autism spectrum disorder?</p> <p><i>Clinical Bottom Line:</i> OTs in a clinic setting can use Ayres Sensory Integration intervention to help children with ASD reach goals and improve functional outcomes, however, the child should be assessed for sensory processing deficits before providing the individualized sensory intervention.</p>
Your Lay Summary	<p>This review looked at different articles that studied the effectiveness of sensory interventions used with children with autism spectrum disorder. This review helped make terms used in sensory integration more clear for future research. Researchers used similar definitions that line up with the definitions used by experts. Also, this review updated the 2008 review as part of the American Occupational Therapy Association Evidence-Based Practice Project. After the articles were narrowed down to include relevant articles for the research question, there were 23 articles reviewed. This review found that OTs in a clinic setting can use Ayres Sensory Integration intervention to help children with ASD reach goals and improve functional outcomes. First, an OT must test the child to see if they have sensory processing difficulties before providing the intervention. The review also found that weighted vests and brushing techniques are not research-proven interventions that OTs should use with children who have ASD. Finally, it is the OT’s responsibility to stay up to date on the accurate terms to use when talking about sensory integration.</p>
Your Professional Summary	<p>This systematic review analyzed 23 articles that studied the effectiveness of sensory integration interventions used with children with autism spectrum disorder. This review focused on using consistent and clear terms used in sensory integration and included definitions that align with those used by experts. In addition, the objective of this review was to update the 2008 review as part of the American Occupational Therapy Association Evidence-Based Practice Project. The articles were narrowed down by a faculty member and</p>

	<p>experienced clinician duo to include relevant Level I, II, III, and IV articles to the research question. Researchers found evidence that Ayres Sensory Integration intervention is effective in helping children with ASD reach goals and improving functional outcomes when provided in a clinic setting. However, it is essential to first assess the child for sensory processing deficits before providing this intervention. The review also found that weighted vests and brushing techniques are not research-proven interventions to use with children who have ASD. Finally, it is the OT's responsibility to stay up to date on the accurate terms to use when discussing sensory integration. One limitation is that the review only included English-language articles published from 2006-2013, and the studies often had small sample sizes and lacked long-term follow-up. Although there are limitations, this is a valuable resource because it was designed by a reputable organization (AOTA) and published within the last 10 years by a reputable journal. It relates directly to OT interventions with children who have ASD and uses a clear review process designed to carefully analyze the literature that surrounds this topic.</p>
	Critical Appraisal
Stated Purpose or Research Question	<p>"Sought to clarify inclusion criteria by using clear definitions that align with those in the published literature and that are consistent with definitions used by experts in sensory integration and sensory-based approaches and to update the 2008 review completed as part of the American Occupational Therapy Association (AOTA) Evidence-Based Practice (EBP) Project. The question examined in this review was, 'What is the evidence for sensory integration intervention and SBIs within the scope of occupational therapy practice to improve performance in daily life activities and occupations for children with autism spectrum disorders?'" (p. 3)</p>
Background Literature	<p><i>Key points of the intro section:</i></p> <ul style="list-style-type: none"> • Sensory features such as hand flapping, spinning, withdrawal, rocking, ear covering, and intense staring are present in more than 80% of people with ASD (p. 1). • Unusual sensory processing patterns are associated with sleep difficulty, eating and mealtime behavior, play, and motor skills. The negative impact of these atypical sensory responses on daily life skills and occupational performance has encouraged researchers to identify interventions that address these difficulties to improve performance (p. 2). • Occupational therapy is most often the intervention approach that has made the greatest difference for children (according to parents) and the preferred treatment is sensory integration (according to parents) (p. 2). • Past systematic reviews on this content had a lack of universal definitions, inconsistency in inclusion criteria, and the targeted outcomes were variable. This study works to clarify all of these limitations (p. 3). <p><i>Theoretical perspective:</i></p> <ul style="list-style-type: none"> • Ayres Sensory Integration (ASI)

	<ul style="list-style-type: none"> • The two main approaches to address sensory features are Ayres Sensory Integration (ASI) and sensory-based interventions (SBIs) (p. 2). <ul style="list-style-type: none"> ○ ASI: intervention in clinic settings that works to change internal neurophysiological processing of sensation to promote observable challenges in sensory responsiveness and functional behavior. ○ SBI: an intervention that occurs in the natural environment and often uses sensory modalities such as weighted vests, brushing, bouncing on a ball, and adapted seating devices to help with self-regulation/
Research Design	<p><i>Research design:</i> Systematic Review</p> <p><i>Rationale for the design:</i> The review was supported by AOTA as part of the EBP Project and was meant to clarify inclusion criteria by using clear definitions. This review also was meant to update the 2008 review from the past EBP Project. They chose a systematic review because they wanted to look at the research that has already been completed and clear up confusing/conflicting definitions and provide further areas for research.</p> <p><i>For reviews of research, AOTA Level of Evidence:</i> Level I</p>
Method	<p><i>Primary methods to answer research question:</i></p> <p>The review was conducted through an academic-clinical partnership where a faculty member and experienced clinician worked together to conduct the review. The focused research question was developed for the updated review and appraised by the authors, advisory group of experts in the field, AOTA staff and the consultant to the AOTA EBP Project. A systematic review was conducted to answer the research question.</p> <p><i>Variables:</i></p> <ul style="list-style-type: none"> • English articles published from Jan 2006-April 2013 • Peer-reviewed scientific literature • Included direct service to study participants with ASD • Intervention approaches within the scope of practice of occupational therapy <p><i>Keywords:</i></p> <ul style="list-style-type: none"> • Keywords were developed by a methodology consultant to the AOTA EBP Project and expert practitioners and researchers in an advisory group. They were meant to capture pertinent articles and to ensure the terms are relevant to the specific thesaurus of each database. A medical research librarian conducted the searches, then confirmed and improved the search strategies. <p><i>Databases:</i></p> <ul style="list-style-type: none"> • MEDLINE, PsycINFO, CINAHL, ERIC, OT Seeker, and Cochrane Database of Systematic Reviews <p><i>Procedures:</i> First, A research question and search terms were developed as described above. Then, inclusion and exclusion criteria were developed to narrow down the search. The review was limited to peer-reviewed scientific</p>

	<p>literature that was published in English between Jan 2006-April 2013. The initial search yielded 885 references which was narrowed down to 23 articles to be reviewed. The narrowing of the search is explained in the next section “process for eliminating references.” Finally, both team members reviewed each article independently and rated them according to their quality and level of evidence. The reviewed articles were then abstracted using an evidence table to provide a summary of the methods and findings of the article.</p>
Filters	<p><i>Research Designs included:</i></p> <ul style="list-style-type: none"> • English articles published from Jan 2006-April 2013 • Peer-reviewed scientific literature • Research must include direct service to study participants with ASD • Research must involve intervention approaches within the scope of practice of occupational therapy • Systematic reviews • Randomized controlled trials <p><i>Inclusion Criteria:</i></p> <ul style="list-style-type: none"> • Level I evidence(8 articles) • Level II evidence (1 article) • Level III evidence (2 articles) • Level IV evidence included only when higher-level evidence on the topic was not found (12 articles) <p><i>Exclusion criteria:</i></p> <ul style="list-style-type: none"> • Presentations, conference proceedings, non-peer-reviewed research literature dissertations, and theses <p><i>Total references found:</i></p> <ul style="list-style-type: none"> • Originally 885 references were found, but only 23 articles met the inclusion criteria <p><i>Process for eliminating references:</i></p> <ul style="list-style-type: none"> • The initial search came up with 885 references. The consultant to the EBP Project completed the first step of eliminating references by looking at the basis of citation and abstract. The remaining 368 citations and abstracts were reviewed by both team members independently and any disagreements were resolved through discussion between the two authors. After duplicates were removed and records found through hand searching were added, 320 records were screened for eligibility. 52 studies were selected for full review. The review team determined final inclusion in the review on the basis of predetermined inclusion and exclusion criteria. Finally, a total of 23 articles were included. Each of the 23 articles was abstracted using an evidence table that provides a summary of the methods and findings of the article. AOTA staff and the EBP Project consultant reviewed the evidence tables to ensure quality control (p. 4)

	<ul style="list-style-type: none"> ○ Both team members reviewed each article independently and rated them according to their quality (scientific rigor and lack of bias) and level of evidence.
Results	<p><i>Description of the articles:</i> A total of 23 articles were reviewed. 20 of the articles were intervention studies and 3 of the articles were systematic reviews. These articles were categorized into Ayres Sensory Integration (4 articles) and Sensory Based Intervention (18 articles). In addition, there was 1 article that looked at the modification of sensory environments and the initial AOTA sponsored systematic review of interventions used in OT for ASD. Within the SBI category, the studies were separated into single sensory interventions and multi-sensory interventions. The single sensory interventions were grouped according to the type of sensory intervention such as weighted vests, sound therapy, dynamic seating, and vestibular input and tactile input. The review included a total of 506 participants ranging in age from 2-39 years old, and a majority of them were male. The ASI intervention studies included only children (3-12 years old). A wide variety of assessment tools were used with a total of 15 published tools and use of observational methods. Many of the level IV studies used operational definitions of the target behaviors including “challenging or problem behavior, task engagement, on-task behavior, in-seat behavior, effects on stereotypy, off-task behavior, self-injurious behavior and attending behavior” (p. 5).</p> <p><i>Analysis/theme one: ASI</i></p> <ul style="list-style-type: none"> ● Results from the ASI Level I studies (3 articles) demonstrated the effectiveness of ASI. ASI helped improve individualized goals, improved sleep, decreased autism mannerisms, and reduced caregiver burden. Results from the ASI Level IV study (1 article) found no clear effect of ASI on task engagement or undesired behavior in children with ASD. <p><i>Analysis/theme two: Multisensory Based Interventions</i></p> <ul style="list-style-type: none"> ● Results from the studies on multisensory interventions demonstrated their effectiveness in improving autism symptoms and behaviors when completed in the home or clinic settings. In addition, multisensory interventions lead to improved scores in cognitive and vocabulary testing. One of the studies also reported improvement in motor proficiency and sensory functioning after the clinic-based multisensory intervention that included enhanced vestibular, proprioceptive, and tactile sensory experiences. After independent participation in the multisensory center, there was an increase in sustained focus, a decrease in self-injurious behavior, and increased perceived relaxation and happiness. <p><i>Analysis/theme three: Single Sensory Based Interventions</i></p> <ul style="list-style-type: none"> ● Results from the systematic review of single sensory interventions varied in intervention methods and outcome measures which prevented summing across studies.

	<ul style="list-style-type: none"> • There was no clinically significant effect when examining the effect of dynamic seating on in-seat behavior and engagement. • The studies that looked at weighted vests found mixed results on positive behaviors with some participants who had mild improvement and some participants who had no improvement. • Tactile sensory stimulation (brushing) had no effect on self-injurious behavior in the single participant in the study. <p><i>Analysis/theme four: Modification of the Sensory Environment</i></p> <ul style="list-style-type: none"> • The 1 article found that modifying the sensory environment had no significant effect on attending/non attending behaviors or student perceptions of emotional state.
Authors' Discussion and Conclusion	<p>Caution must be used when drawing conclusions about the effectiveness of sensory interventions used in OT with children with ASD due to the limited amount of rigorous examination of studies. Growth in this area is hindered by a wide variability of how sensory approaches are implemented and variability in the outcome measures.</p> <p><i>Idea one: Ayres Sensory Integration</i></p> <ul style="list-style-type: none"> • 3 out of 4 studies had meaningful and positive effects on individualized goals and reduced autism mannerisms which suggests ASI can promote client-valued outcomes for people with ASI. • "ASI approach targets neurophysiological mechanisms involved in processing sensation, such as arousal, sensory detection and perception, and modulation, that are foundational to observed behavior and that are difficult to measure" (p. 8). <p><i>Idea two: Sensory-Based Intervention</i></p> <ul style="list-style-type: none"> • SBIs must be broken down into categories because of the wide variety of strategies that use sensory input to effect behavior change. The 3 categories included: multisensory, single sensory, and environmental modifications. • "Findings from the 5 studies of multisensory SBIs show that frequent, active participation in multisensory experiences can lead to improvement in autism symptoms, cognitive functions, motor performance, sensory integration function, and focus, suggesting that multisensory interventions may be beneficial for some people with ASD" (p. 8). • "Studies of single-sensory SBIs found very small effects or no effects" (p. 8). • "Findings related to SBIs suggest that active participation in multisensory experiences may be more powerful than single-sensory interventions in affecting functional skills and behaviors characteristic of ASD" (p. 8). <p><i>Idea three: Approach to Investigation</i></p> <ul style="list-style-type: none"> • Only 11 of the studies included an evaluation of sensory processing prior to implementing an intervention. This suggests that studies that did

	<p>not evaluate sensory processing may have included participants who were not appropriate candidates for the interventions they received.</p> <p><i>Consistent findings:</i></p> <ul style="list-style-type: none"> ● Intensive and individualized clinic-based ASI intervention can improve individualized functional outcomes. ● Individual sensory processing patterns should guide the application of sensory integration and SBIs in practice. ● Well-established tools for assessment of sensory processing patterns include the Sensory Profile and the Sensory Processing Measure. ● Personalized measures such as the Goal Attainment Scale (GAS) are essential when applying ASI in an evidence-based manner. However, specialized training is required and accurate use of GAS methods requires significant time. <p><i>Inconsistent findings</i></p> <ul style="list-style-type: none"> ● Effectiveness of weighted vests and sound therapies to target occupational performance outcomes ● Effectiveness of environmental modifications ● Evidence supporting the use of multisensory interventions for children with ASD is mixed
Authors' Limitations	<p>This review was limited to English-language articles published from 2006-2013 and is limited by the quality of evidence being reviewed. The studies about the ASI approach often had small sample sizes and lacked long-term follow-up and there were limited amounts of studies on this subject. The SBI studies used low-level designs, lacked replication, and failed to assess if participants were appropriate candidates for this intervention. There were also limited uses of standardized outcome measures, limited participant descriptions, and the parents who reported were not blinded.</p>
Authors' Implications For Practice and Future Research	<p><i>Implications for future research:</i></p> <ul style="list-style-type: none"> ● Future studies of ASI are needed to confirm the findings from this review and should include larger sample sizes. In addition, they should include well-described participant characteristics, assessment of participant sensory processing, use of a manualized approach to intervention, demonstration of fidelity to treatment, and long-term follow-up. Additional outcome measures should be developed to systematically measure the changes in performance associated with the hypothesized mechanisms of change that are targeted through ASI. ● SBIs that are implemented by parents should be examined in the future and more investigation of sound-based therapies should focus on therapeutic listening and The Listening Program. Further SBI studies should include clear definitions of the interventions being used, study designs that include control participants, measures of fidelity to treatment, and clear outcome measures. More research needs to be completed on sensory diets that are uniquely designed in response to an assessment of sensory processing patterns and include active participation in dynamic activities.

	<p><i>Implications for OT practice:</i></p> <ul style="list-style-type: none">● OTs are responsible for being fully informed on the use of correct terminology when researching and talking about sensory interventions and documenting these interventions.● It is critical to evaluate client sensory processing and integration when deciding if sensory interventions are appropriate. Assessments of sensory processing that are used should be published and standardized.● Sensory interventions are only to be used when the proper assessment (see bullet point above) identifies a need for the sensory intervention. Intervention should be customized to the individual's unique needs.● Weighted vests and auditory integration training do not have evidence documenting their effectiveness in relevance to OT.● OTs should consider incorporating multisensory SBIs into daily routines and home programs because they have a meaningful effect on client behavior and performance.● ASI has meaningful effects on individual client goals. When using this approach, OTs should use the Fidelity Measure to ensure their services adhere to the fidelity criteria and use individualized outcome measures.
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	Summary
APA Reference	Schoen, S. A., Lane, S. J., Mailloux, Z., May-Benson, T., Parham, L. D., Smith Roley, S., & Schaaf, R. C. (2019). A systematic review of Ayres sensory integration intervention for children with autism. <i>Autism Research</i> , 12(1), 6–19. https://doi.org/10.1002/aur.2046
Abstract	“Sensory integration is one of the most highly utilized interventions in autism, however, a lack of consensus exists regarding its evidence base. An increasing number of studies are investigating the effectiveness of this approach. This study used the Council for Exceptional Children (CEC) Standards for Evidence-based Practices in Special Education to evaluate the effectiveness of research from 2006 to 2017 on Ayres Sensory Integration (ASI) intervention for children with autism. A systematic review was conducted in three stages. Stage 1 involved an extensive database search for relevant studies using search terms related to sensory integration and autism, interventions suggesting a sensory integration approach, and high-quality study designs. Searches yielded 19 studies that were evaluated in Stage 2. Six of these met inclusion criteria of being peer-reviewed, written in English, description of intervention this is consistent with ASI intervention, and comparison group design or single subject method employed. Prior to analysis using CEC standards, three articles were excluded because intervention details were not consistent with the core principles of ASI, or because of major methodological flaws. In Stage 3, the remaining three studies were rated using the CEC quality indicators and standards for an evidence-based practice. Two randomized controlled trials respectively met 100% and 85% of the CEC criteria items. One additional study met more than 50% of the criteria. Based on CEC criteria, ASI can be considered an evidence-based practice for children with autism ages 4–12 years old.” (p. 6)
Your Focused Question and Clinical Bottom Line	Question: Is there statistical evidence to support that ASI interventions are meeting evidence-based practice guidelines for children with ASD? Clinical Bottom Line: Researchers have found that there is statistical evidence to support that ASI interventions are meeting evidence-based practice guidelines for elementary aged children with an ASD diagnosis. It was concluded that ASI interventions were showing greater improvement towards children meeting their said therapy goals or Individualized Education Plan goals using ASI intervention than a “normal” intervention.
Your Lay Summary	This study was a review of three different articles that looked at children who have Autism Spectrum Disorder and one specific intervention. The specific intervention was Ayres Sensory Integration. Ayres Sensory integration is a theory of how to help a child improve their sensory regulation during their day. This study examined three articles that divided children into two groups, ASI intervention and a normal intervention for children with ASD. The three articles all had the children participate in therapy ranging from 9 weeks to 9 months. The children were between the ages of 4 and 12 years old. At the end of the

	<p>studies, the results were analyzed by their own researchers. The researchers conducting this study determined that all three articles concluded that the ASI intervention showed better performance for the children with ASD than those who received the normal intervention. From this data, the researchers of this study who completed the review concluded that ASI interventions are a supported intervention for children with ASD.</p>
Your Professional Summary	<p>This systematic review of three articles was conducted by researchers to determine if Ayres Sensory Integration intervention (ASI intervention) was meeting the recent publicized standards of Council for Exceptional Children (CEC). The researchers were specifically looking at if ASI interventions were helping children meet their goals related to educational services. To answer the stated questions above, the researchers did a comprehensive literature review of 4000 plus articles. From the initial search, researchers narrowed their way down to three articles to then analyze that related to ASI intervention for children with ASD. All three articles were randomized, two group control trials that compared ASI and a “normal” intervention on children with ASD ranging from the ages of 4-12 years old. From the three articles that were reviewed, the researchers found statistically significant data to support the ASI intervention for children aged 6-12 with an ASD diagnosis. From this finding, the researchers concluded that ASI interventions are meeting the standards of CEC and are supported evidence-based practices. A limitation of the study was that the conclusions were drawn based on the assumption that the intervention would be given by trained professionals in ASI interventions and the interventions would be for only given to children, ages 6-12 with an ASD diagnosis.</p>
	Critical Appraisal
Stated Purpose or Research Question	<p>“This article addressed the question: Does ASI intervention meet the CEC criteria for an evidence-based practice for children with autism spectrum disorders (ASD)? To answer this question, we conducted a systematic review of research studies that examined the effectiveness of ASI intervention for children with ASD. We then analyzed the quality of each included study using the CEC Standards for Evidence-based Practices in Special Education” (p. 8)</p>
Background Literature	<p>Key points of the intro section:</p> <ul style="list-style-type: none"> ● Recent changes in special education standards in treatment ● Sensory integration one of the most frequently utilized therapies for ASD ● Evidence Based Practice interventions that are not consistent with Ayres Sensory Integration framework <p>Theoretical perspective: Ayres Sensory Integration</p>
Research Design	<p>Research design: Systematic Review</p> <p>Rationale for the design:</p> <p>“To answer this question, we conducted a systematic review of research studies that examined effectiveness of ASI intervention for children with ASD. We then analyzed the quality of each included study using the CEC Standards for Evidence-based Practices in Special Education [Cook et al.,</p>

	<p>2015; Council for Exceptional Children [CEC], 2014]”(p.8) Researchers chose a systematic review of articles to determine if ASI interventions are evidence based. Systematic review allowed the researchers to comb through thousands of articles to find articles that matched what they were looking for.</p> <p>For reviews of research, AOTA Level of Evidence: Level 1</p>
Method	<p>Primary methods to answer research question</p> <ul style="list-style-type: none"> • Systematic review of three articles <p>Variables</p> <ul style="list-style-type: none"> • Children with ASD Diagnosis and IQ of 65 or higher • Ayres Sensory Integration Theory or Intervention • Children age 0-18 years <p>Keywords</p> <ul style="list-style-type: none"> • “Sensory integrative difficulties or sensory processing disorders, e.g., <sensory integrative disorders> OR <sensory processing disorders> OR <developmental dyspraxia>. The intervention content area refers to terms consistent with therapeutic strategies, tools, and constructs incorporated into ASI intervention. Examples of terms used for this content area include <Ayres Sensory Integration> OR <sensory integration> OR <motor planning> OR <play> OR <tactile stimulation>. The study design content area was operationalized using search terms such as <best practices>, <cohort studies>, <case control>, and <nonrandomized controlled trial>” (p.9) <p>Databases: CINAHL, Cochrane Reviews, Cochrane Trials, Embase, ERIC, Medlien, PsycInfo</p> <p>Procedures</p> <p>Step one- “Search Process”</p> <ul style="list-style-type: none"> • The researchers searched the various databases listed above and used the keywords to find articles. The researchers refined the search even more by only looking at articles from 2006-2017 • The researchers narrowed the search even more to articles only “english” and “participants whose age range fell within 0-18 years” (p. 9) • After the initial screening of articles, and only using articles with content on “intervention study that addresses sensory issues of children with autism” 19 studies were left. (p. 9) <p>Step 2- “Study Selection”</p> <ul style="list-style-type: none"> • From the 19 studies, it was filtered down to 6 articles. The researches only used articles that were “ published in the peer-reviewed scientific literature; written in English; consistent with ASI theory; and utilized a group comparison design (with or without random assignment) or a multiple baseline, changing criterion, or alternating treatment single case experimental design.” (pg. 9) • ABA articles were excluded • Articles had to have individuals with an ASD diagnosis • IQ higher than 65

	<p>Step 3- “Data analysis using CEC Criteria”</p> <ul style="list-style-type: none"> ● CEC- “Council for Exceptional Children” ● All reviewers of this process had complete “advanced training in sensory integration theory and intervention” (pg.9) ● Each article was reviewed by at least two reviewers ● 3 of 6 articles were excluded due to not having consistent ASI ● Data analysis left researchers with 3 articles
Filters	<ul style="list-style-type: none"> ● Articles excluded if from before 2006 or after 2017 ● Participants had to be between age of 0-18 years old and have an ASD diagnosis ● Written in English ● Published in a peer review scientific journal ● ASI theory- ABA excluded ● “Comparison group required utilized a group comparison design (with or without random assignment) or a multiple baseline, changing criterion, or alternating treatment single case experimental design” (pg.9) ● 4930 articles- 478 abstract review- 19 for further examination- 6 for CEC analysis- 3 total articles fitting above criteria
Results	<p>Description of the articles:</p> <p>From all of the articles analyzed, the researchers found three total articles to review. The three articles all used Ayres Sensory Integration as a therapy for children with an ASD diagnosis. The intervention time ranged from 9 weeks to 9 months. The ages ranged from 4 years old to 12 years old throughout the three articles. Each studies intervention process was “consistent with the principles of ASI” (pg. 14)</p> <p>Analysis one: The first theme found from all three articles is the statistical support for ASI intervention. All three articles concluded that there was significant statistical evidence to support the ASI intervention compared to the normal intervention. (Iwanga et al., 2014) found “positive and statistically significant gains on five of six outcomes measured” (pg. 15) The second article, (Pfeiffer et al., 2011) found “greater improvement on GAS goals”(pg.15) Lastly, (Schaff et al., 2014) found “statistically significant group differences favoring the ASI group” (pg. 15)</p> <p>Analysis two: A second theme found from the three articles is that the ASI intervention is deemed “strong evidence” by the U.S. Preventive Services Task Force criteria (pg. 16) This means that ASI intervention is an evidence-based supported intervention.</p> <p>Analysis three: A second theme found between all three articles is that the participants were given an assessment before participating in the trials to make sure they fit the criteria for ASI interventions. This was explained further in the discussion session on making sure participants meet the requirements for ASI intervention.</p>
Authors’ Discussion	<p>Idea one: The authors of this systematic review found that “ASI intervention meets criteria for an evidence-based- practice for 4-12 year old children with</p>

and Conclusion	<p>Autism” (pg.15) This was done by a systematic review of one article that met 100% of the criteria for CEC and second 85%. The third study, still relevant, only meets 50% of the CEC criteria. The results concluded significant statistical positive intervention outcomes for children with ASD when ASI intervention is used.</p> <p>Idea two: The authors of this systematic review found that their findings differ from past reviews. They found this because the studies in this review meet the full criteria for ASI intervention, whereas others did not.</p> <p>Idea three: Researchers noted that for the future it is important that participants are given a full sensory integration assessment to ensure they are appropriate for the study. This would give the interventionist a clear picture of strengths and weaknesses of the child.</p> <p>Idea four: The study found that there is sufficient evidence to say ASI intervention can be used in public schools as it helps support a child’s education. It is important to then understand that the intervention is given the correct way to make sure it meets evidence- based practice guidelines.</p> <p>Consistent findings</p> <p>All three articles had statistical evidence to support that ASI intervention is a valid intervention for children with ASD. This systematic review was able to conclude that ASI interventions are meeting the criteria for evidence- based practice.</p>
Authors’ Limitations	<p>There were a few limitations to the study that the authors noted in the discussion section. One limitation to this study is that the interventionist did not specifically state is they “tailored the challenges to assure they are slightly beyond the child’s current level of performance” (pg. 17) Without knowing this, the author are not 100% able to say the ASI intervention was more beneficial than the control intervention. Another limitation is the need for more intervention studies on ASI and other population groups to show the effectiveness of the interventions. The last limitation of this study was that all of the researchers are Occupational Therapists, who have trained extensively in ASI intervention. This could lead to the therapist wanting to find articles to show support of their practice.</p>
Authors’ Implications For Practice and Future Research	<p>One aspect of future research the authors concluded was the need to examine how ASI interventions are effective for children who have other conditions or diagnosis. For future practice, researchers discussed the importance of using ASI interventions in appropriate settings. The authors also concluded that they feel confident in implementing ASI interventions in their practice.</p>

	Summary
APA Reference	Bodison, S. C., & Parham, D. L. (2018). Specific sensory techniques and sensory environmental modifications for children and youth with Sensory Integration Difficulties: A systematic review. <i>The American Journal of Occupational Therapy</i> , 72(1) 1-11. https://doi.org/10.5014/ajot.2018.029413
Abstract	“This systematic review examined the effectiveness of specific sensory techniques and sensory environmental modifications to improve participation of children with sensory integration (SI) difficulties. Abstracts of 11,436 articles published between January 2007 and May 2015 were examined. Studies were included if designs reflected high levels of evidence, participants demonstrated SI difficulties, and outcome measures addressed function or participation. Eight studies met inclusion criteria. Seven studies evaluated effects of specific sensory techniques for children with autism spectrum disorder (ASD) or attention deficit hyperactivity disorder: Qigong massage, weighted vests, slow swinging, and incorporation of multisensory activities into preschool routines. One study of sensory environmental modifications examined adaptations to a dental clinic for children with ASD. Strong evidence supported Qigong massage, moderate evidence supported sensory modifications to the dental care environment, and limited evidence supported weighted vests. The evidence is insufficient to draw conclusions regarding slow linear swinging and incorporation of multisensory activities into preschool settings” (p. 1).
Your Focused Question and Clinical Bottom Line	<i>Question:</i> What intervention could benefit children with ASD best in the classroom based on these studies? <i>Clinical Bottom Line:</i> Based on this study, it may be beneficial for children to try adaptation to their environment such as sitting on a ball or altered seat, having a fidget to play with, altering their sensory related materials such as a grip on their pencil, or anything that may help their focus and overall participation in class. Another intervention that may help would be qigong massage before school daily or half-way through their day as this showed a significant correlation in children with ASD.
Your Lay Summary	The study I read about looked at some ideas for helping younger kids who have autism or who have difficulty paying attention, or sitting still. The readings covered things such as massages that can help make things easier for them such as better behaviors, responses to things they touch, and less stress. Another idea that might help them was wearing heavy vests, but they were found to not help very much, especially in children with autism. The next idea considered was doing a swinging activity before a task to help kids with autism stay on-task, but it didn't really help. The last two ideas were based on changing the kids' environments to help their participation levels. This would be things such as sitting on a ball instead of a chair in class, which was also found to be kind of helpful. Overall this study looked further into things that may help kids do better in school who struggle with sensory problems.
Your Professional Summary	I reviewed a systematic review that looked further into finding sensory based interventions to help improve the participation of elementary aged children with ASD and/or ADHD in school. There were five major studies considered out of the over 11,000 results found using their key terms. The first major intervention

	<p>found was qigong sensory treatment which was completed by the children's parents. The results showed a positive correlation in children with ASD. Another intervention was slow linear swinging which was used to help increase participation following the swinging which showed moderate results. The next intervention was the use of a weighted vest, which mainly focused on children with ADHD, showing minimal effectiveness. The last two interventions were based on altering and adapting the children's environments to increase their participation in the classroom which showed moderate evidence, but had high expectations for future studies. In all five of the studies there was room for improvement of future studies to consider larger population sizes, other demographic areas, terms to consider in finding studies, and more hard evidence in general. The sample sizes varied from a single individual to 140+. Overall the systematic review found one intervention that was confidently positive in effectiveness.</p>
	Critical Appraisal
Stated Purpose or Research Question	<p>"This systematic review was designed to contribute knowledge that will inform occupational therapy practitioners regarding the effectiveness of specific sensory techniques and sensory environmental modifications in improving the functional performance or participation of children and youth with SI difficulties" (p.2).</p> <p>PICO question: "What is the effectiveness of occupational therapy interventions that use specific sensory techniques or sensory environmental modifications to support functions and participation of children and youth who have SI difficulties?" (p.3)</p> <p>"The purpose of this systematic review is to synthesize recent outcomes research related to the effects of these interventions on the participation of children and youth who have SI difficulties" (p.3).</p>
Background Literature	<p><i>Key points of the intro section:</i> This study focused on finding techniques to improve the participation of children with sensory integration. This refers to children who have difficulty organizing and using sensory information to accomplish everyday activities. The prevalence for SI difficulties among children with ASD ranges from 40%-90%. Several studies were considered that looked at many different areas of possible improvement.</p> <p><i>Theoretical perspective:</i> Sensory integration (SI)</p>
Research Design	<p><i>Research design:</i> Systematic Review</p> <p><i>Rationale for the design:</i> This study was designed to consider several areas of possible SI-interventions for children with SI and find which are most beneficial. They chose to do a systematic review to consider the several ongoing interventions in finding which is most beneficial to help children with SI difficulties participate more fully and successfully in everyday life.</p> <p><i>For reviews of research, AOTA Level of Evidence:</i> This study only took in consideration of levels I, II, and III articles. This study itself was level I.</p>
Method	<p><i>Primary methods to answer research question</i></p> <p><i>Variables:</i> Children ages 2-21 with SI difficulties</p>

	<p><i>Keywords:</i> Sensory integration (SI), elementary, ASD, ADHD, sensory interventions, occupational therapy (OT), Qigong massage, weighted vests, slow swinging, and incorporation of multisensory activities.</p> <p><i>Databases:</i> MEDLINE, PsychINFO, CINAHL, ERIC, and OKSeeker.</p> <p><i>Procedures:</i> Practiced the five themes of qigong massage, weighted vests, linear swinging, sensory enrichment, and sensory environmental modifications on children with ASD and/or ADHD.</p>
Filters	<p><i>Research Designs included and not included:</i> Included were levels I, II, and III. Included studies that present levels of evidence, research design, intervention, and control conditions, outcome measure, and results.</p> <p><i>Inclusion and exclusion criteria:</i> Not included were the other levels. Excluded is they examined the outcomes of only ASI intervention. Any other intervention that did not meet their definition of specific sensory technique. Excluded if they were not published after a formal peer-review process or published before 2007 or after May 2015. Excluded if they did not clearly document one group of participants.</p> <p><i>Total references found:</i> 11,619 ; Used 11,436 to be screened; 24 research studies met criteria</p> <p><i>Process for eliminating references;</i> Duplicates, review of abstracts, outcomes to clearly measure child functional performance or participation, and more as seen above.</p>
Results	<p><i>Description of the articles:</i> There were 6 total final articles they used to consider possible sensory based interventions for children with ASD in elementary. These articles each had unique ideas such as tactile, proprioceptive, vestibular and more in order to complete their daily routines successfully.</p> <p><i>Analysis/theme one:</i> Qigong massage had a strong, positive outcome found in the evidence of effectiveness for young children with ASD.</p> <p><i>Analysis/theme two:</i> Weighted vests were found to have limited evidence of effectiveness for children with ASD, and was overall not recommended at all.</p> <p><i>Analysis/theme three:</i> Slow linear swinging showed no significant improvement on the attention span of children performing this before therapy session but was moderately still considered for future studies.</p> <p><i>Analysis/theme four:</i> Sensory enrichment in preschool was found to have no significant difference compared to children not receiving enrichment but is something to still be considered for future studies.</p> <p><i>Analysis/theme five:</i> Sensory environmental modifications were found to have moderate evidence in supporting the use of this to help children with ASD participate in daily routines.</p>
Authors' Discussion and Conclusion	<p><i>Idea one:</i> The first big idea concluded that qigong massage has a strong evidence of effectiveness with preschoolers with ASD. OT's who delivered this intervention had completed 50-80 hours of training before implementation. This was performed on a daily basis. The qigong massage study was only performed on one area demographically and also by the same OT's.</p> <p><i>Idea two:</i> The idea of weighted vests provided limited evidence in general, but specifically to children in the classroom with ASD or ADHD. It was initially proposed to help with deep touch pressure to support the ability of children with</p>

	<p>ADHD to attend to cognitive tasks and help them engage. Future studies proposed was to consider and evaluate whether weighted vests can be used to actually engage participation. This specific study encourages children with ASD to not use this intervention.</p> <p><i>Idea three:</i> Linear swinging had insufficient evidence for the effectiveness of improving children's behavior with ASD to be on-task. This intervention is typically plausible when tailored to the individual at their level of arousal instead of using the same for each child. The linear swinging limited having the children's arousal state assessed before the intervention.</p> <p><i>Idea four:</i> There was limited evidence found for incorporating specific sensory techniques into daily preschool class routines for children with ASD. A limitation of the specific sensory techniques was the very small study, as well that both groups received the same regimen of sensory techniques within the classroom. For future research, it would be helpful to examine what in the classroom would most benefit the children to perform at their most ability.</p> <p><i>Idea five:</i> The sensory environmental modifications was found to be a successful intervention, though was only done in one study so has minimal evidence. It was done in a dental office where the dentist made changes to auditory, visual, as well as to the proprioceptive environment by providing a weighted blanket for deep-touch pressure. Further research should try an array of these in other settings such as a doctor's office.</p> <p><i>Consistent findings:</i> Many of the ideas of new interventions were contributing to adjusting the child's overall state of arousal. The qigong, weighted vest, classroom modifications, swing, and others were all adjusting different areas of the child's sensory level's. Between the five findings there wasn't a common finding between them as they all varied in intervention specifics. If they had less limitations there may have been more similar findings. Only two of the studies were considered to be successful; the qigong and sensory environmental modification both showing positive results. Otherwise, the only consistent findings were the idea and goal of finding an intervention that helped elementary age children with ASD was the idea of adjusting their environments in hopes of a more adequate outcome.</p> <p><i>Inconsistent findings:</i> Multiple studies that they thought would be successful ended up being unsuccessful, which surprised the researchers. Though one sensory intervention worked, the qigong, others didn't, such as the weighted vest and linear swing. Adjusting the environment also was predicted to show positive results but was also unsuccessful, which could be reevaluated in future studies.</p>
Authors' Limitations	<p>Several of the articles found limited evidence. A few of the studies considered ADHD and not ASD. The researchers may not have included some search terms that could have produced more eligible studies. There was no identified biases but it was considered that it could have influenced their conclusions.</p>

Authors' Implications For Practice and Future Research	Evaluate the effectiveness of these interventions. Articulate the underlying mechanism for why the intervention being studied is expected to enhance cold participation.
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