Effectiveness of Cognitive and Occupation-Based Interventions for Children With Challenges in Sensory Processing and Integration: A Systematic Review

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This systematic review examines the evidence for the effectiveness of cognitive and occupation-based interventions to improve self-regulation in children and youth who have challenges in processing and integrating sensory information. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis guided the methodology. Five studies identified through a comprehensive database search met the inclusion criteria and were separated into categories of cognitive and occupation-based interventions. Articles that did not specifically measure sensory integration (SI) or processing challenges were omitted. Synthesis of the articles suggests that self-regulation (e.g., sensory processing, emotional regulation, executive functioning, social function) improved with cognitive and occupation-based interventions. Because the number of studies that measured sensory processing or SI challenges was limited, researchers are encouraged to include these measures in future research to understand the impact of a broader range of cognitive and occupation-based interventions.


Challenges in sensory processing and integration in children exist independently, comorbidly, and as part of various diagnoses (Ben-Sasson, Carter, & Briggs-Gowan, 2009; Cheung & Siu, 2009). Prevalence varies from 10% to 55% in children without an identified disability and increases to from 40% to 88% for children with a diagnosed disability (Ben-Sasson et al., 2009; Cheung & Siu, 2009; Fernández-Andrés, Pastor-Cerezuela, Sanz-Cervera, & Tárraga-Minguez, 2015; Pfeiffer, Daly, Nicholls, & Gullo, 2015). Children with challenges in sensory processing have difficulty with “detecting, regulating, interpreting, and responding to sensory input” (Critz, Blake, & Nogueira, 2015, p. 711), resulting in symptoms that affect participation and function across childhood occupations.

Occupational therapy practitioners assist people with their ability to engage and participate in meaningful occupations (American Occupational Therapy Association [AOTA], 2014b). Children and youth with difficulties processing and integrating sensory information are often referred to occupational therapy because these deficits impede daily life activities such as social participation, attention, and learning. The ability to regulate sensation, emotion, and behavior is known as self-regulation (Shonkoff & Phillips, 2000) and is often used as an outcome by researchers.

Kuypers (2013) outlined four components of self-regulation: sensory processing, emotional regulation, cognitive regulation, and social perspective taking. Sensory processing includes “reception, modulation, integration, and organization of sensory stimuli, including behavioral responses to sensory input” (Miller & Lane, 2000, p. 2), whereas emotional regulation includes being physiologically...
alert to attend to and engage in social and learning activities (Prizant, Wetherby, Rubin, Laurent, & Rydell, 2006). Cognitive regulation (e.g., executive functioning) includes attention shifting, working memory, and impulse control (Kuypers, 2011). Social perspective taking is the ability to understand that other people’s thoughts, feelings, and experiences are different from one’s own and that one’s behavior affects others (Barkley, 1997; Winner, 2000). Any one or more of these components may be ineffective, resulting in occupational performance deficits that require occupational therapy intervention.

Two common interventions used by occupational therapists to address sensory processing and integration difficulties include occupation-based and cognitive interventions. Self-regulation components (attention, response to sensory stimuli, feelings, learning) may also be addressed by either type of intervention. Occupation is defined as “daily life activities in which people engage” (AOTA, 2014b, p. S43) and is considered both an intervention and an outcome. Occupation as an intervention involves the use of daily activities as a means to promote improvements in targeted outcomes. Occupation-based interventions are founded on the premise that engagement in specific types of daily activities will improve participation, quality of life, and well-being.

Cognitive impairments may include issues with attention, memory, problem solving, organization, executive function, and self-regulation. Although cognitive intervention is a broad term that varies in its definition on the basis of the targeted outcome, this type of intervention generally focuses on teaching people processing strategies to achieve successful performance. A substantial amount of research has identified the link between sensory and cognitive function (Edgington, Hill, & Pellicano, 2016; Humes, Busey, Craig, & Kewley-Port, 2013; Koziol, Budding, & Chidekel, 2011). Research with children and youth has identified relationships between challenges in sensory processing and the cognitive functions of attention, self-regulation, and executive functioning (Koziol et al., 2011). For the purpose of this article, cognitive interventions include those interventions and cognitive strategies to improve outcomes in self-regulation.

Cognitive and occupation-based interventions are commonly used in occupational therapy practice to support children and youth with differences in sensory processing. Because of the relationship among occupation, cognition, and sensory processing, a need exists to understand the effectiveness of cognitive and occupation-based interventions to implement best practice when treating children with challenges in sensory processing. Therefore, the purpose of this systematic review was to determine the effectiveness of occupational therapy using cognitive or occupation-based interventions to support self-regulation for children and youth with challenges in processing and integrating sensory information.

Method

This systematic review was completed as one of four reviews of occupational therapy interventions to support function and participation for children and youth with challenges in processing and integrating sensory information under the guidance of the AOTA Evidence-Based Practice (EBP) Project. It is an update of an earlier systematic review of literature published between 1986 and 2006 (Arbesman & Lieberman, 2010). The articles included in this review were the result of database searches on articles published from 2007 through May 2015. In addition, we reviewed bibliographies of selected articles for potentially relevant articles.

The search strategy was initiated by using the following Population, Intervention, Control, Outcome, Study Design question: “What is the efficacy of occupational therapy using cognitive or occupation-based interventions to support function and participation for children and youth who have challenges in processing and integrating sensory information that are interfering with everyday life participation?” After consultation with expert reviewers and project administrators, the terms function and participation were replaced with self-regulation to more accurately reflect the specific outcomes of the studies (e.g., sensory processing, emotional regulation, executive functions, and social perspective taking; Kuypers, 2013) that met inclusion criteria for the review. Search terms used represented the core constructs identified in the definition of self-regulation (see Supplemental Table 1, available online at http://otjournal.net; navigate to this article, and click on “Supplemental”). In addition, we completed an additional search using the term self-regulation, which yielded no new articles.

Search terms for the reviews in this issue were developed by the methodology consultant to the AOTA EBP Project and AOTA staff in consultation with the review authors for each question and the advisory group (Supplemental Tables 1 and 2, online). The advisory group consisted of the authors of the four reviews. The search terms were developed not only to capture pertinent articles but also to make sure that the terms relevant to the specific thesaurus of each database were included. The original search strategy used in the systematic reviews published in 2010 for children and adolescents with challenges related to sensory processing and integration (Arbesman & Lieberman, 2010) also was used for the updated review. Additional search terms were added to...
ensure maximum coverage of those questions in the newer literature. A medical research librarian experienced in completing systematic review searches conducted all searches and confirmed and improved the search strategies.

Databases and sites searched included MEDLINE, PsycINFO, CINAHL, ERIC, and OTseeker. In addition, consolidated information sources providing peer-reviewed summaries of journal articles, such as the Cochrane Database of Systematic Reviews, were included in the search. Reference lists from articles included in the systematic reviews were examined for potential articles, and selected journals were hand searched to ensure that all appropriate articles were included. Articles published between 2007 and 2013 identified for a recently completed systematic review related to autism spectrum disorder (ASD) and sensory processing and integration (Tomchek & Patten Koenig, 2016) were also considered for inclusion in this review.

Articles were limited to peer-reviewed scientific literature published in English. The intervention approaches examined were within the scope of practice of occupational therapy and were focused on children and adolescents with challenges related to sensory processing and integration as determined by either (1) an assessment confirming that the targeted intervention population had challenges in sensory processing and integration or (2) outcome measures that assess sensory processing and integration. Only literature published between 2007 and May 2015 was included in the review. The review excluded data from presentations, conference proceedings, non–peer-reviewed research literature, dissertations, and theses. AOTA uses standards of evidence modeled on those developed in evidence-based medicine. This model standardizes and ranks the value of scientific evidence for biomedical practice by means of a grading system adapted from Sackett, Rosenberg, Gray, Haynes, and Richardson (1996). Studies included in the review were limited to Levels I, II, and III evidence (AOTA, 2014a). Level IV evidence was included if the study had a single-case experimental design with multiple baselines and more than 1 participant.

The methodology consultant to the AOTA EBP Project completed the first step in the review process by eliminating unrelated articles on the basis of a review of titles and article citations. Titles and abstracts of articles were then screened by the authors to determine whether a full review of an article was warranted. Articles that met the initial inclusion criteria through abstract review were reviewed by at least two researchers to determine whether all inclusion criteria were met. AOTA staff, the methodology consultant, and the advisory group were contacted when a consensus on inclusion between the two researchers could not be reached. The final articles determined for inclusion were then reviewed according to their quality (scientific rigor and lack of bias) and level of evidence.

Each article included in the review was abstracted using an evidence table that provides a summary of the level of evidence, design, intervention and control, outcome measures, and results (Supplemental Table 3, available online). AOTA staff and an EBP Project consultant reviewed the evidence table to ensure quality control. The risk of bias of individual studies was assessed using the methods described by Higgins, Altman, and Sterne (2011) that were specifically developed for assessing the risk of bias for systematic reviews.

Finally, the evidence within the two themes of cognitive interventions and occupation-based interventions was evaluated according to the overall strength of the evidence on the basis of guidelines from the U.S. Preventive Services Task Force (2016). The AOTA guidelines were defined as follows:

- **Strong evidence** includes consistent results from well-conducted studies, usually at least 2 randomized controlled trials (RCTs).
- **Moderate evidence** indicates 1 RCT or 2 or more studies with lower levels of evidence. Note that some inconsistency of findings across individual well-conducted studies could preclude a classification of strong evidence and result instead in a designation of moderate evidence.
- **Limited evidence** indicates few studies, flaws in the available studies, and some inconsistency in the findings across individual studies.
- **Mixed evidence** indicates that the findings were inconsistent across studies in a given category.
- **Insufficient evidence** indicates that the number and quality of studies are too limited to make any clear classification.

### Results

Initial search strategies yielded a total of 11,619 citations and abstracts from the MEDLINE (n = 3,255), CINAHL (n = 2,642), ERIC (n = 2,465), PsycINFO (n = 1,319), OTseeker (n = 1,500), and Cochrane (n = 438) databases (Figure 1). The number of duplicates in the review was 205. After the initial screening process, 60 articles were included in the final review: 32 Level I studies, 8 Level II studies, 13 Level III studies, 2 Level IV studies, and 5 Level V studies. Five articles met the full
inclusion criteria after the two researchers reviewed the full-text articles. On the basis of established inclusion and exclusion criteria, 33 articles were excluded because they did not include an assessment or outcome measure of sensory processing or sensory integration; 17 were excluded because the intervention was not cognitive or occupation based or the outcome did not meet the definition of self-regulation; 4 were excluded because they were Level V evidence that did not have an intervention component; and 1 was excluded because the full text was in German. Of the final 5 articles, 2 were Level I evidence, 2 were Level III evidence, and 1 was Level IV evidence, indicating a moderately high level of evidence. All studies are summarized in full in Supplemental Table 3.

Risk of bias was assessed for the studies using guidelines developed by the Cochrane Methods Groups (Higgins et al., 2011; Supplemental Table 4, online). Both of the Level I studies (Bass, Duchowny, & Llabre, 2009; Nash et al., 2015) used random assignment, reported attrition, and discussed all expected outcomes, so they were deemed to have low risk of bias. One of the studies lacked adequate randomization (Bass et al., 2009), and the other lacked sufficient information to determine whether randomization was used. Both Level III studies (Re, McConnell, Reiding, Schweit, & Hendron, 2014; Ward, Whalon, Rusnak, Wendell, & Paschall, 2013) lacked sufficient information to determine attrition or report bias. Because of the design of the Level III and IV studies, randomization was not used. In addition, no blinding of assessors to outcomes measures occurred in the 2 Level III studies (Re et al., 2014; Ward et al., 2013) or the Level IV study (Thompson & Johnston, 2013), although the Level IV study did report attrition and discussed all expected outcomes.

On the basis of the research question, studies were grouped into two themes: (1) cognitive interventions and (2) occupation-based interventions. Although several studies included these interventions, many were excluded because they did not specifically identify processing or integration of sensory disorders in the sample. Key findings are summarized for each theme.

![Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow chart articles for the systematic review.](https://doi.org/10.1371/journal.pmed.1000097)

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<td>Full-text articles excluded with reason (n = 55)</td>
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Cognitive Interventions

Two studies described specific cognitive interventions used with children and youth identified with sensory challenges (Nash et al., 2015; Thompson & Johnston, 2013). Moderate evidence exists for the effectiveness of these types of cognitive interventions in children with challenges in sensory processing. These studies, 1 well-designed RCT and 1 single-case experimental design, adhered to Single-Case Reporting guideline in BEhavioural interventions (SCRIBE) 2016 guidelines (Tate et al., 2016) that support the use of these cognitive-based interventions, although more research is necessary because of the diverse characteristics and variety in types of cognitive interventions used by occupational therapists that result in a lack of coherence in the chain of evidence.

Design and Participants. One study (Nash et al., 2015) was an RCT (Level I) that assigned 25 children with fetal alcohol spectrum disorder between ages 8 and 12 yr to an immediate or delayed treatment group. Alternating sequence was used for group assignment. The 2nd study (Thompson & Johnston, 2013) used a single-case experimental design with multiple baselines across participants (Level IV) to study 3 male preschoolers, ages 3–5 yr, diagnosed with ASD and sensory modulation difficulties.

Outcome Measures. Self-regulation and executive functions, including inhibitory control, social cognition, behavioral and emotional regulation, and externalizing behavior problems, were the targeted outcomes for both studies. One study (Nash et al., 2015) used standardized tests including the NEPSY–II, the Test of Everyday Attention for Children, the Cambridge Neuropsychological Test Automated Battery, and the Behavioral Rating Inventory of Executive Function. Thompson & Johnston (2013) targeted specific desired behaviors representing these constructs and obtained frequency counts through observation.

Intervention. Both studies used cognitive strategies as a core part of the intervention. Nash et al. (2015) implemented 12 individual 1-hr intervention sessions with the treatment group using the Alert Program for Self-Regulation®, which includes metacognitive strategies (considering engine levels), mind–body awareness (understanding the body at different engine levels), and sensory-based coping strategies (engine tools). Interventionists received training directly from the authors of the Alert Program, and fidelity of implementation was ensured by supervision through observation and biweekly meetings. Children in a delayed group began treatment within 1 mo after the immediate treatment group received posttesting.

Thompson and Johnston (2013) implemented a 9-wk intervention in a self-contained preschool program using a Social Story intervention. The intervention included reading and discussing a Social Story targeted to the child’s individual goal and practicing the strategies. The Social Stories included strategies consistent with sensory integration–based approaches and were evaluated by three experts to ensure that the stories met Social Stories 10.0 guidelines established by Gray (2004).

Data Analysis. Data analysis varied on the basis of the study’s design. The Nash et al. (2015) RCT used X² and analysis of variance (ANOVA) to determine any differences between groups at baseline and an analysis of covariance to evaluate short-term efficacy of therapy. Thompson and Johnston (2013) calculated the percentage of intervals in which a child engaged in desired behavior and then divided the total number of intervals in which the child engaged in such behavior by the total number of intervals for each observation session and multiplied the result by 100. A trend line and 2-standard-deviation band method was used to determine significant changes in behavior.

Results. Results from Nash et al. (2015) indicated that the immediate treatment group had significant improvements (p = .01; effect size = 0.283) in inhibitory control and social cognition. The parents of the children in this group reported improved behavioral and emotional regulation, as well as reduced externalizing behavior problems. A 6-mo follow-up indicated that these behavioral improvements and inhibitory control were maintained (p = .01). Thompson and Johnston (2013) demonstrated increases in desired behaviors among all 3 participants. Child 1’s desired behavior increased from a baseline average of 65.3% to 84.5% in the intervention phase and 98.6% in the maintenance phase. Child 2’s desired behavior increased from a baseline average of 57% to 95.4% in the intervention phase and 98.8% in the maintenance phase. Child 3’s desired behavior increased from a baseline average of 9.3% to 62.2% in the intervention phase and 83% in the maintenance phase.

Occupation-Based Interventions

Occupation-based interventions in the articles included a focus on everyday leisure activities such as horseback riding and yoga (Bass et al., 2009; Re et al., 2014; Ward et al., 2013). There is moderate evidence for the use of the specific occupation-based intervention of horseback riding with children who have challenges in sensory processing. One Level I RCT and 1 Level III study found that horseback riding improved social functioning (Bass et al., 2009), social interaction, and sensory processing and reduced ASD symptoms (Ward et al., 2013) in children with ASD. There was only limited evidence for
the use of yoga because of the study design and dearth of research using yoga specific to this unique population. One Level III study (Re et al., 2014) found that yoga improved emotional regulation and self-soothing and decreased emotional distress among adolescents hospitalized for mental health needs. Given the broad range of potential types of occupation-based interventions, note that the research in this review focused only on leisure-based occupations.

**Design and Participants.** One Level I RCT (Bass et al., 2009) and 2 Level III pretest–posttest quasi-experimental studies (Re et al., 2014; Ward et al., 2013) met the criteria for this review. The Level I study used a wait-list control group as the nonintervention group. Two of the studies included children ages 4 to 11 yr diagnosed with ASD (Bass et al., 2009; Ward et al., 2013). The 3rd study included adolescents ages 12 to 18 yr who were either inpatient or partial-hospitalization patients on an adolescent mental health unit (Re et al., 2014).

**Outcome Measures.** All 3 studies (Bass et al., 2009; Re et al., 2014; Ward et al., 2013) used self-report measures as outcome measures; only 1 study (Re et al., 2014) used an additional objective measure. Two of the studies used measures of ASD symptoms: the Social Responsiveness Scale (Bass et al., 2009) and the Gilliam Autism Rating Scale, Second Edition (Ward et al., 2013). Two studies used measures that specifically assess sensory processing, including a self-report tool, the Adolescent/Adult Sensory Profile (Re et al., 2014), and a teacher-report tool, the Sensory Profile School Companion (Ward et al., 2013). Pulse rate collected by nurses was the only objective outcome used in any of the 3 studies (Re et al., 2014).

**Intervention.** Two studies included horseback riding as an intervention (Bass et al., 2009; Ward et al., 2013). In Bass et al. (2009), the intervention group received horseback riding lessons for 1 hr/wk over a 12-wk period by trained instructors at an equestrian center. In the 2nd study (Ward et al., 2013), intervention lesson objectives were created by a school group coordinator and carried out by the therapeutic riding team for 6 wk of lessons, a 6-wk planned break, 4 wk of lessons, a 6-wk planned break, and 8 wk of lessons. The lessons included sensory orientation to the environment, mounting the horse, and riding. The final study used yoga as the intervention (Re et al., 2014). Over a 5-mo period, adolescents participated in at least two yoga sessions taught by a Yoga Alliance–registered teacher. The sessions covered the same procedures in every 50-min class.

**Data Analysis.** A 2 × 2 mixed-design repeated-measures ANOVA was conducted to compare groups in the Level 1 study (Bass et al., 2009). For the other 2 studies (Re et al., 2014; Ward et al., 2013), analysis was conducted using a set of repeated-measures multivariate ANOVAs.

**Results.** Both studies using horseback riding as an intervention demonstrated significant differences in social, sensory, and specific ASD symptoms. Bass et al. (2009) found a statistically significant Group × Time interaction using the Sensory Profile overall score ($p < .002; \eta^2 = 0.26$), and paired-samples $t$ tests indicated a significant increase in the experimental group pre- and posttest ($p < .01; d = –0.059$). Children with ASD who received horseback riding lessons demonstrated significant interaction effects on the following subscales: Sensory Seeking ($p < .01; \eta^2 = 0.40$), Sensory Sensitivity ($p < .01; \eta^2 = 0.50$), Inattention/Distractibility ($p < .01; \eta^2 = 0.40$), and Sedentary Behaviors ($p < .01; \eta^2 = 0.40$). The Group × Time interaction indicated significant changes in social motivation ($p < .038; \eta^2 = 161$). Results of the Ward et al. (2013) study identified significantly increased social interaction ($p < .05$), improved sensory processing ($p < .05$ for the Sensory Profile Registration and Sensitivity subscales), and decreased severity of symptoms associated with ASD after the therapeutic riding intervention ($p < .05$). During the two 6-wk breaks, gains were not consistently maintained but recovered once the therapeutic riding lessons were reinstated. Significant improvements in pulse rate ($p < .001; d = –0.55$) and self-reported distress ratings ($p < .001; d = –1.12$) were identified with yoga interventions in the study by Re et al. (2014) regardless of gender or Sensory Profile levels.

**Discussion.**

Occupational therapy practitioners often provide services to children with challenges in processing and integrating sensory information to enhance self-regulation in daily life activities and routines. Two studies using cognitive interventions and 3 studies using occupation-based interventions within the scope of occupational therapy were reviewed. Four of the studies were Levels I–III and provided a moderate level of evidence.

Broad ranges of different interventions are encompassed under the larger umbrella of cognitive and occupation-based interventions. The 5 studies that met the inclusion criteria for the review represent only a few of the many types of cognitive and occupation-based interventions used by occupational therapy practitioners to help children with challenges in sensory processing. Some of the well-known and extensively used cognitive interventions, including cognitive–behavioral therapy (CBT) and Cognitive Orientation to Daily Occupational Performance (CO–OP), were not represented in this review because studies did not meet inclusion criteria. The most common
reason for exclusion was the lack of an assessment confirming challenges in sensory processing and integration or an outcome measure that assessed sensory processing and integration. CBT focuses on the “development of self-awareness of the interaction between thoughts, feelings, and behaviors in response to environmental triggers” (Edgington et al., 2016, p. 222). A recent study (Edgington et al., 2016) used CBT to treat adolescents identified with sensory processing issues and ASD to decrease behaviors associated with sensory reactivity. Results suggested feasibility of the intervention and qualitative reports of improvements, but quantitative outcome measures demonstrated no significant change, possibly related to the small sample size (N = 7). This study was published after the current review was completed.

In addition, several studies have examined the effectiveness of CO–OP, which uses a problem-solving approach to support learning of skills necessary for occupational performance (Armstrong, 2012; Polatajko & Cantin, 2010); these studies were excluded because they used no inclusionary measures of challenges in sensory processing. Many disabilities, such as ASD and developmental coordination disorder, have a high prevalence of sensory processing and integration challenges, although comorbidity and prevalence of sensory processing challenges is not documented, nor can it be assumed to represent the total population identified with these conditions. Therefore, for studies to be included in the current review, it was essential that they confirm through assessment or outcome measures that study samples had challenges in sensory processing to identify effective interventions targeting the population. Note that the studies on CO–OP targeted outcomes of various components of self-regulation, including emotional and cognitive regulation (Kuypers, 2013). Consistent with articles in the current review, CO–OP has moderate evidence to improve self-regulation.

This systematic review identified 3 studies that examined the effectiveness of occupation-based interventions. According to the Occupational Therapy Practice Framework: Domain and Process (3rd ed.; AOTA, 2014b), occupation includes activities of daily living, instrumental activities of daily living, rest and sleep, education, work, play, leisure, and social participation. Occupational therapy practitioners commonly use all of these types of daily activities in the intervention process. The results of this review represent only occupation-based interventions that are typically classified as leisure activities, such as horseback riding and yoga. These results support previous case reports of horseback riding that found increased social interactions (Johnson, 2007; Ward, Whalon, Stiles, & Smith, 2011). In a similar study, researchers found increased self-regulation skills after horseback riding (Gabriels et al., 2012; Shoffner & Gabriels, 2011). An increasing body of evidence supports horseback riding as an intervention to improve social interactions and sensory processing and decrease symptoms of ASD. The results of the yoga study (Re et al., 2014) support an RCT of mindfulness-based treatment (Kaley-Isley, Peterson, Fischer, & Peterson, 2010) that found yoga to reduce distress and anxiety.

Limitations

A limited number of studies fit the criteria. Many studies used cognitive strategies, but only 2 evaluated the sensory processing abilities of children and youth. Although occupational therapy practitioners use occupation-based interventions, we found only 3 studies that linked these interventions and children specifically identified with challenges in processing and integrating sensory information. In general, there is a dearth of research evidence for the use of cognitive and occupation-based interventions with children whose sensory processing and integration issues are confirmed through appropriate measures. This review includes only 5 articles that address specific types of cognitive and occupation-based interventions. Because there is a broad range of both types of interventions, applicability of this systematic review is limited to the interventions studied within the articles included in the review. There is a clear need to expand evidence for a breadth of different types of cognitive and occupation-based interventions.

The studies included in the review had several methodological limitations. Although 2 of the 5 studies included were Level I RCTs, sample sizes for these studies were small, ranging from 25 to 44 participants. One study had 75 participants, but it was Level III evidence. All but 1 study (Bass et al., 2009) either lacked sufficient information or were not blinded, which can add an element of potential bias, especially when using report measures. All the studies included either observation or some subjective report measure. Only 2 of the studies (Nash et al., 2015; Re et al., 2014) included objective testing measures as outcomes.

Implications for Research and Practice in Occupational Therapy

Occupational therapists evaluate children and youth and provide interventions to promote self-regulation for those with sensory processing and integration challenges. The available evidence provided moderate support for specific types of cognitive and occupation-based interventions that support self-regulation. The cognitive interventions included the Alert Program and Social Stories, both of which are commonly used interventions provided within the
natural context of the child. In addition, all the occupation-based interventions involved leisure activities, which often occur in community settings. In addition, the evidence suggests the following considerations for occupational therapy practice:

- The provision of cognitive and occupation-based interventions that transcend clinical and school settings may result in successful outcomes in the natural home and community settings typical for children and adolescents. This therapeutic consideration is important in treatment planning and determining appropriate service delivery models for occupational therapy services.
- The cognitive and occupation-based interventions included in this systematic review were provided by interdisciplinary teams of professionals, and all included outcomes within the scope of occupational therapy. The interventions involved collaborations with families, educational staff, and other professionals to promote participation in daily life skills. These collaborations should be a priority when implementing these types of interventions.
- The lack of research representing the depth of both cognitive and occupational interventions is an important consideration when applying this systematic review to practice. A vast variety of both types of interventions are not represented in this systematic review. Although it is essential to ensure that participants have challenges in sensory processing and integration, this did limit the amount of evidence available for inclusion in the review.
- Further research that examines the breadth of cognitive and occupation-based interventions with children and adolescents who have challenges in sensory processing is needed; this research should be based on inclusionary measures to guide best practice in occupational therapy.

Conclusion

This systematic review of available evidence of cognitive and occupation-based interventions suggests improvements in self-regulation in children and youth with sensory processing and integration challenges. Results were organized into two themes, cognitive interventions and occupation-based interventions. Cognitive interventions targeting coping and regulation had preliminary support for improvements in executive functioning among children with fetal alcohol spectrum disorders and behaviors in children with ASD. Results also provide preliminary support for occupation-based interventions that include specific leisure activities to improve social, sensory, and emotional outcomes. Additional research is needed to examine a broader range of cognitive and occupation-based interventions and to determine efficacy with different types of challenges in sensory processing and integration. In addition, research studies need inclusionary measures to establish the presence of challenges in sensory processing and integration to ensure results are applicable to targeted populations.

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References


*Indicates articles included in the systematic review.


