Effectiveness of Work, Activities of Daily Living, Education, and Sleep Interventions for People With Autism Spectrum Disorder: A Systematic Review

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OBJECTIVE. To examine interventions addressing work, activities of daily living (ADLs), instrumental activities of daily living (IADLs), education, and sleep for people with autism spectrum disorder.

METHOD. A total of 23 studies were identified, and 9 work-, 11 ADL/IADL-, and 3 education-related interventions were examined. No sleep studies were identified.

RESULTS. Use of mobile and tablet technologies for vocational skills was supported. Support for ADL/IADL intervention is variable, with indications that Cognitive Orientation to Occupational Performance, sensory integration, and contextual interventions may increase occupational performance. Preliminary evidence suggests that daily yoga and brief exercise may improve classroom performance and behavior; group physical activities may assist with school readiness variables. Evidence for using technologies for IADLs was limited, as was evidence determining effective interventions for feeding and eating issues.

CONCLUSIONS. Studies investigating interventions related to sleep are lacking. More studies are needed in all areas, presenting opportunities for the expansion of science-driven occupational therapy practice and research for people with ASD.


Recent prevalence rates indicate that an estimated 1 in 68 children have autism spectrum disorder (ASD; Centers for Disease Control and Prevention, 2012). The Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM–5; American Psychiatric Association [APA], 2013) criteria for an ASD diagnosis specify that a person must present with “persistent deficits in social communication and social interaction across multiple contexts” (Section II: Neurodevelopmental Disorders). Severity levels are specified according to the type and functional impacts of social communication impairments and restrictive and repetitive patterns of behavior.

In addition to impairments in social interaction, communication, and various restrictive and repetitive behaviors, many people with ASD also have comorbid intellectual disabilities, psychiatric diagnoses, and sensory processing difficulties (Ben-Sasson et al., 2009; Gadow, Devincent, Pomeroy, & Azizian, 2005; Kanne, Abbacchi, & Constantino, 2009; Lecavalier, 2006). Because of these issues, ASD is associated with limitations in occupational domains such as activities of daily living (ADLs), instrumental activities of daily living (IADLs), education, work, and sleep (APA, 2013).

Rationale

The role of occupational therapy in the treatment of youth with ASD is to structure interventions that consider their individual needs and skills while...
consistently supporting their increased independence and function in the tasks of daily life. Because ASD can have an impact on many functional areas, skills development for ADLs, IADLs, work, education, and sleep are needed.

Interventions involving ADLs are central to occupational therapy practice. Throughout a child’s entire developmental course, occupational therapists assess ADL skills and promote independence in these occupations. ADLs such as feeding, dressing, and personal hygiene are often priorities for parents of children with ASD because they increase a child’s ability to live independently and decrease the need for one-on-one assistance in the home and community.

Although basic ADLs are fundamental to participation in daily life (American Occupational Therapy Association [AOTA], 2014), IADLs can support participation in more complex tasks and activities in the home and community (AOTA, 2014). Skill in IADLs provides youth with ASD opportunities for increased autonomy and self-efficacy. IADLs such as meal preparation, shopping, home maintenance (e.g., chores, cleaning), health management (e.g., fitness), and communication management (e.g., telephones) are germane to independent living and community engagement.

Foundational skills in ADLs and IADLs allow people to participate in other critical activities such as education and work. School readiness and, as a result, successful participation in formal education creates pathways for children to develop life skills and become active members of the community. For a child with autism, specialized supports or strategies may be necessary to facilitate a meaningful and effective academic experience. Thus, it is necessary to understand which supports and strategies are effective in achieving those outcomes.

Through successful educational experiences and community activity, youth with ASD may gain functional skills for employment. Securing and maintaining employment is associated with a person’s socioeconomic security, health, and quality of life (Butterworth et al., 2013; Eggleton, Robertson, Ryan, & Kober, 1999; Petrovski & Gleeson, 1997). For people with disabilities, such as those that often accompany ASD, it is essential to best outcomes. Currently, many youth and adults with ASD are faced with underemployment or unemployment (Bennett & Dukes, 2013). Occupational therapy practitioners have the skills and expertise to address vocational skills and employment during the middle and high school transition points. The number of interventions for developing vocational skills and engaging in the workplace is vast. Implementing effective interventions will be critical to the economy and workforce as a growing number of young adults with ASD seek postsecondary options.

Last, sleep and rest are crucial to optimal functioning in ADLs, IADLs, education, and work. Between 50% and 80% of children with ASD are estimated to have sleeping difficulties (Richdale & Schreck, 2009). Poor sleep hygiene and sleep patterns may result in decreased attention, daily function, and adaptive behavior. In addition, some research has demonstrated that sleep problems in children with ASD are predictive of maternal stress (Hoffman et al., 2008). Examining the facilitators of and barriers to sleep preparation and participation among youth with ASD will be important to understanding their impacts on daily activities.

For people with ASD, intervention is often needed to facilitate skill acquisition and improved functional performance in ADLs, IADLs, education, work, and sleep. Facilitating independence is the hallmark of occupational therapy theory and practice (Drysdale, Casey, & Porter-Armstrong, 2008), and when people with ASD can fully participate in work and ADLs, they may achieve higher quality of life and improved self-efficacy and self-sufficiency (Drysdale et al., 2008; Dunn, Cox, Foster, Mische-Lawson, & Tanquary, 2012; Gentry, Lau, Molinelli, Fallen, & Kriner, 2012; Taylor et al., 2012).

Interventions targeting increased participation and independent functioning in daily occupations apply a variety of methods and span the work of many professionals. An understanding of the effectiveness of interventions aimed at improving performance in ADLs, IADLs, education, work, and sleep can help to guide treatment of people with ASD and lead to increased application of evidence-based principles within occupational therapy practice.

Evidence-Based Practice Project

Since 1998, AOTA has instituted a series of evidence-based practice (EBP) projects to assist members with meeting the challenge of finding and reviewing the literature to identify evidence and, in turn, use this evidence to inform practice (Lieberman & Scheer, 2002). Following the evidence-based philosophy of Sackett, Rosenberg, Muir Gray, Haynes, and Richardson (1996), AOTA’s projects are based on the principle that the EBP of occupational therapy relies on the integration of information from three sources: (1) clinical experience and reasoning, (2) preferences of clients and their families, and (3) findings from the best available research.

A major focus of AOTA’s EBP projects is an ongoing program of systematic review of multidisciplinary scientific literature, using focused questions and standardized procedures to identify practice-relevant evidence and discuss
its implications for practice, education, and research. An evidence-based perspective is founded on the assumption that scientific evidence of the effectiveness of occupational therapy intervention can be judged to be more or less strong and valid according to a hierarchy of research designs, an assessment of the quality of the research, or both. 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 using a grading system. In this system, the highest level of evidence, Level I, includes systematic reviews of the literature, meta-analyses, and randomized controlled trials (RCTs). In RCTs, participants are randomly allocated to either an intervention or a control group, and the outcomes of both groups are compared. Other levels of evidence include Level II studies, in which assignment to a treatment or a control group is not randomized (cohort study); Level III studies, which do not have a control group; Level IV studies, which use a single-case experimental design, sometimes reported over several participants; and Level V studies, which are case reports and expert opinion that include narrative literature reviews and consensus statements.

This systematic review on ASD was supported by AOTA as part of the EBP Project. AOTA is committed to supporting the role of occupational therapy in this important area of practice. The previous review was completed for the time frame of 1986–2006. This systematic review was updated for the period 2006–April 2013 because occupational therapy practitioners need access to the results of the latest and best available literature to support intervention within the scope of occupational therapy practice.

Research Question

This review was part of a larger systematic review on ASD and occupational therapy. The focused question developed for the updated review on ADLs, IADLs, education, work, and sleep was based on the search strategy of the earlier review. Additional search terms were added to ensure maximum coverage of the research question. The focused question was reviewed by the review authors, an advisory group of experts in the field, AOTA staff, and the consultant to the AOTA EBP Project. The following question guided selection of research studies for this review and the interpretation of the findings: “What is the evidence for the effectiveness of interventions within the scope of occupational therapy practice to improve performance in ADLs, IADLs, education, work, rest, and sleep for people with ASD?”

Procedures

Search terms for the reviews were developed by the methodology consultant to the AOTA EBP Project and AOTA staff, in consultation with the review authors of each question, and by the advisory group. 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. Table 1 lists the search terms related to population (ASD) and types of interventions included in this systematic review. A medical research librarian with experience 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, such as the Cochrane Database of Systematic Reviews, were included in the search. These databases contain peer-reviewed summaries of journal articles and provide a system for clinicians and scientists to conduct systematic reviews of selected clinical questions and topics. Moreover, 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.

Inclusion and exclusion criteria are critical to the systematic review process because they provide the structure for the quality, type, and years of publication of the literature that is incorporated into a review. This review was limited to peer-reviewed scientific literature published in English.

Table 1. Search Terms for Systematic Review of Autism and Occupational Performance

<table>
<thead>
<tr>
<th>Category</th>
<th>Key Search Terms</th>
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<tbody>
<tr>
<td>Sample/client population</td>
<td>Autism (excluding Rett’s syndrome and childhood disintegrative disorder, autism spectrum disorder, Asperger syndrome, pervasive developmental disorder)</td>
</tr>
<tr>
<td>Interventions</td>
<td>Activities of daily living, activity groups, adaptive behavior, adaptive behaviors, assistive technology, authentic settings and routines, bathing, community mobility, dressing, driving, eating, education, feeding, financial management, health maintenance, health management, home management, instrumental activities of daily living, job coach, job training, meal preparation, natural environments, occupational therapy, personal hygiene, rest, safety and emergency management, school, secondary education, self-care, self-management, shopping, showering, sleep, structured work systems, supported employment, transition, transition to work and community, transportation, volunteer exploration, volunteer participation, volunteerism</td>
</tr>
</tbody>
</table>
intervention approaches examined were within the scope of practice of occupational therapy. The literature included in the review was published between 2006 and 2013 and included study participants with ASD. (The earlier review included studies published between 1986 and 2005.) The review excluded data from presentations, conference proceedings, non–peer-reviewed research literature, dissertations, and theses. Studies included in the review were of Level I, II, and III evidence. Level IV and V evidence was included only when higher level evidence on a given topic was not found.

For the question on ADLs, IADLs, education, work, rest, and sleep, 2,649 references were found. The consultant to the EBP project completed the first step of identifying potential references on the basis of citation and abstract. The systematic reviews were carried out as academic partnerships in which academic faculty worked with graduate students to conduct the reviews. Review teams completed the next step of eliminating references on the basis of citations and abstracts. The full–text versions of potential articles were retrieved, and the review teams determined final inclusion in the review on the basis of predetermined inclusion and exclusion criteria.

A total of 23 articles were included in the final review. Table 2 presents the number and levels of evidence for the articles included for this review question. The author and Jane Case-Smith reviewed the articles according to their quality (scientific rigor and lack of bias) and levels of evidence. Each article included in the review was then 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 table to ensure quality control. All studies are summarized in full in Supplemental Table 1 (available online at http://otjournal.net; navigate to this article, and click on “Supplemental”).

## Results

Twenty-three studies published since 2006 met inclusion criteria. Among the included studies, the levels of evidence varied from Level I to Level V. Nine examined the effects of work-based interventions, 11 examined the effects of ADL and IADL interventions, and 3 examined the effects of education–related interventions (see Table 2). Unfortunately, no articles within the scope of occupational therapy practice regarding sleep interventions for children with ASD met the inclusion criteria.

The studies were organized into the following occupational domains, reflecting intervention approaches represented in the literature as they applied to the research question: (1) ADLs, (2) IADLs, (3) education, and (4) work. The ADL results were divided into two subsections, feeding and eating and self-care, and the work results were divided into three subsections, independence in work tasks, supported employment, and technology use for vocational skills.

### Activities of Daily Living

As noted, the literature in this review relating to ADLs was separated into two subsections, feeding and eating and self-care. Of the 6 studies identified for ADLs, 1 was Level I, 4 were Level IV, and 1 was Level V; 2 examined behavior-based interventions for feeding and eating, 1 applied a Cognitive Orientation to Occupational Performance (CO–OP) approach to feeding and eating, 1 literature review outlined behavioral and sensory-based strategies for feeding issues, 1 examined the effects of technology use on ADL tasks, and 1 RCT examined the effects of a manualized sensory integration–occupational therapy treatment of ADL function.

#### Feeding and Eating

Current research has indicated that behavior, sensory, and family-based strategies may be helpful in decreasing the frequency of feeding difficulties and increasing parental strategies during mealtimes. Although picky eating and other mealtime problems occur among neurotypical children, they are often not as persistent and chronic as the feeding difficulties that affect many youth with developmental disabilities, such as autism (Binnendyk & Lucyshyn, 2009). Food refusal, food selectivity, and ritualistic eating patterns are some of the feeding and eating behaviors observed in people with autism (Twachtman-Reilly, Amaral, & Zebrowski, 2008). This review identified 3 Level IV studies (Binnendyk & Lucyshyn, 2009; Rodger, Springfield, & Polatajko, 2007; Seiverling, Williams, Sturmey, & Hart, 2012) and 1 Level V study (Twachtman-Reilly et al., 2008) that examined interventions to improve eating, food acceptance, and participation in mealtimes.

## Table 2. Summary of Study Designs of Articles Selected for Appraisal

<table>
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<tr>
<th>Level of Evidence</th>
<th>Study Design/Methodology of Selected Articles</th>
<th>No. of Articles Selected</th>
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<tbody>
<tr>
<td>I</td>
<td>Systematic reviews, meta-analysis, randomized controlled trials</td>
<td>4</td>
</tr>
<tr>
<td>II</td>
<td>Two groups, nonrandomized studies (e.g., cohort, case–control)</td>
<td>2</td>
</tr>
<tr>
<td>III</td>
<td>One group, nonrandomized (e.g., before and after, pretest–posttest)</td>
<td>1</td>
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<tr>
<td>IV</td>
<td>Descriptive studies that include analysis of outcomes (single-subject design, case series)</td>
<td>15</td>
</tr>
<tr>
<td>V</td>
<td>Case reports and expert opinion, which include narrative literature reviews and consensus statements</td>
<td>1</td>
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The Level IV study by Binnendyk and Lucyshyn (2009) evaluated the effectiveness of multidimensional positive behavioral supports on reducing food refusal in 1 boy (age 6 yr) with ASD. The program included collaborative partnership with the caregiver, mealtime in the home, ecologic assessment of eating and overall function, caregiver training, multiple outcome measures, and strategies to promote long-term or generalized outcomes. Therapist training sessions resulted in increased food acceptance (from 0% to 100% of trials) for five nonpreferred foods. Food consumption with the parent increased (from 0% to 64%), and child participation in a snack-time routine increased to 100%. Another Level IV study, conducted by Seiverling et al. (2012), examined the effects of behavior skills training using taste exposure, escape extinction, and fading as a means of reducing food selectivity. The intervention was successful in improving parent behavior (percentage of correctly performed prompts during taste sessions and probe meals), child bite acceptance, and time to take bite, as well as decreased disruption during meals.

In a Level IV study, Rodger et al. (2007) studied the CO–OP approach to intervention with two siblings with Asperger syndrome (a 9-yr-old boy and an 11-yr-old girl). The CO–OP approach is an occupational therapy intervention in which children or parents identify a goal and then apply a process of goal–plan–do–check, verbal self-instruction, and therapist- and parent-guided discovery to learn targeted tasks. The overall aim of CO–OP is to use problem-solving and domain-specific strategies to acquire and generalize skills. Qualitative analysis of diary entries revealed themes of improved cutting, eating different foods (i.e., increased diet variety), and eating with utensils such as a knife and fork.

Last, because of the limited evidence on feeding and eating interventions, 1 Level V article (Twachtman-Reilly et al., 2008) was included in this review. The review authors determined that this article presented particularly pertinent and encompassing information on feeding and eating interventions, amid a lack of higher level evidence. The Twachtman-Reilly et al. (2008) article is a literature review that includes a case example. It discusses (1) the presentation of feeding difficulties among children with ASD, (2) the complexity of these issues, and (3) recommended feeding assessment and intervention practices. Twachtman-Reilly et al. indicated that many physiological (e.g., sensory processing problems, gastrointestinal issues) and behavioral (e.g., restrictive and repetitive behaviors, executive function, anxiety, social or language skills) factors can contribute to feeding and eating difficulties. They recommended a variety of strategies within the scope of occupational therapy for addressing feeding issues in children with ASD. Helpful sensory-based treatment techniques include use of sensory strategies, oral desensitization, creation of a nurturing environment in which the process can proceed gradually, child-friendly foods (e.g., familiar, small, modeled by peers), modification or monitoring of the surrounding sensory environment, and oral exploration. Behaviorally based treatments include reinforcement, backward chaining, prompting methods, and manipulation of consequences (i.e., contingency management). Twachtman-Reilly et al. also recommended incorporating generalization (i.e., environment and person) into feeding interventions to assist with global application and performance of feeding skills.

The strength of the evidence for feeding and eating interventions for children with ASD is limited. More research is needed in this area, and collaborative and interdisciplinary research on feeding and eating (e.g., speech-language pathology, psychology, caregivers) is most likely to yield interventions that have ecological and social validity, because these difficulties are complex, transcend environments, and are critical to overall child health and growth.

Self-Care. The evidence for utilizing technology, such as computerized prompting devices and personal digital assistants (PDAs), to increase hygiene skills is limited. Only 1 study met inclusion criteria for technology supporting self-care tasks. A Level IV pilot study by Bimbrahw, Boger, and Mihailidis (2012) determined that a computerized prompting device has the potential to improve hand-washing skills in children with ASD. With the device prompting as needed, the children (N = 5) completed 39% of hand-washing steps independently, 78% without parent assistance, and 39% with device assistance and prompts. However, this computerized prompting device is not simple to install or commercially available. Thus, at this time, use of a computerized prompting device may not be useful or necessary for assisting youth with ASD in self-care tasks such as hand washing.

An individualized sensory integration intervention (OT–SI) using a manualized protocol can promote decreased assistance needed for self-care tasks. Sensory processing difficulties, such as hyper- or hyporeactivity, were recently added to the DSM–5 criteria as possible manifestations of restrictive and repetitive behaviors in autism. These sensory processing difficulties are linked to difficulties with eating, sleeping, and daily routines, including bath time and bedtime (Schaaf, Toth-Cohen, Johnson, Outten, & Benevides, 2011). This review identified 1 study investigating the effects of OT–SI on ADL outcomes. To evaluate the effects of OT–SI provided 3 times/wk for 10 wk to children with ASD, Schaaf et al. (2014) conducted a Level I trial. The study randomized 32 children with ASD into...
either an OT–SI or usual-care group. The OT–SI group improved significantly more than the usual-care group on the Pediatric Evaluation of Disability Inventory’s (Haley, Coster, Ludlow, Haltiwanger, & Andrellos, 1992) Caregiver Assistance scale for self-care ($p = .008$). These results indicate that the children participating in OT–SI required significantly less assistance with self-care tasks. Trends toward higher skills in self-care were also observed.

**Instrumental Activities of Daily Living**

Of the 5 articles identified for IADLs, 1 was Level I, 1 was Level III, and 3 were Level IV; there were no Level II or V studies. One study evaluated classroom versus community-based training on IADL tasks, 1 applied a contextual intervention and determined its impacts on communication and health management, 1 studied technology use for cooking, and 2 applied a CO–OP approach to IADLs.

There is preliminary but positive evidence for interventions within the scope of occupational therapy that result in improved IADL performance. In a Level I study by Drysdale et al. (2008), students (children ages 9–11 yr with intellectual disability or ASD) were evaluated on a shopping and telephone task after either (1) classroom-based and community-based training or (2) classroom-based training only. The community-based training group significantly improved performance on a shopping task when tested in the classroom, but not in the community. No significant differences were found between groups on the telephone task.

A Level III study by Dunn et al. (2012) used a contextual intervention to coach parents through strategies that support child participation in family activities and routines. The intervention components include authentic activity settings, the family’s daily routines, and the child’s sensory processing patterns. The intervention was effective in improving home, communication, and health management goals (on the Canadian Occupational Performance Measure [COPM]; Law et al., 1990) such as making the bed, keyboarding, and sports. Children’s participation in these daily activities also increased.

A Level IV study by Mechling, Gast, and Seid (2009) evaluated the ability of students with ASD to complete cooking tasks using a self-prompting PDA. A variety of visual and auditory prompts (no prompt, picture, picture + auditory, or video + voice) were programmed into the device to assist youth with cooking tasks. The results of the study indicated that all students adjusted to the type of prompt they needed, and the PDA was effective in improving the percentage of task steps performed correctly and independently.

CO–OP has produced improvements across a variety of IADL tasks for youth with ASD. Two Level IV studies (Phelan, Steinke, & Mandich, 2009; Rodger, Ireland, & Vun, 2008) showed improvements on IADL-related goals. Phelan et al. (2009) implemented CO–OP with 2 boys (ages 9 and 10 yr) with high-functioning autism who showed improvement on communication and health management goals of shoe tying, keyboarding, sports, and riding a bike. Rodger et al. (2008) evaluated 2 boys with Asperger syndrome (ages 10 and 12 yr) who participated in 10 individual weekly sessions of CO–OP. Results indicated clinically significant increases in performance and satisfaction for all COPM goals (e.g., getting to sleep, making their bed, using cutlery). The overall strength of the evidence for applying CO–OP to achieve ADL and IADL goals is moderate.

**Education**

Of the 3 education studies identified, 1 was Level I and 2 were Level II; no Level III, IV, or V studies were identified for education outcomes. One study examined the effects of daily yoga on classroom behavior, 1 study examined brief physical activity and impacts on classroom task performance, and 1 systematic review examined the impact of physical activity on school readiness skills, such as motor and social skills.

Children begin to participate in physical activities and free play at a young age. Occupational therapy practitioners believe these activities support the development of many school-readiness skills needed for participation in formal education. School readiness skills within the social–emotional and motor development domains are especially important for school participation among children with ASD. Sowa and Meulenbroek (2012) conducted a Level I systematic review and meta-analysis to determine the effects of physical exercise on motor and social proficiency in children and adults with ASD. The types of physical exercise examined included swimming (4 studies), jogging (6 studies), horseback riding (2 studies), cycling and weight training (1 study), and walking (1 study). Participation in physical exercise resulted in an overall improved behavior score of 37.5%, and individual interventions (mean = 48.57%) showed more benefit than group ones (mean = 31.54%) for motor and social skills. Results indicated that no type of exercise was superior to another.

Daily yoga and physical exercise may be useful modalities for occupational therapy practitioners to implement in the school or classroom setting to support various educational outcomes among students with ASD. Koenig, Buckley-Reen, and Garg (2012; Level II) investigated the efficacy of a school-based yoga program for children with ASD ($n = 24$ in the intervention group, $n = 22$ in the control group). After 16 wk of participation in the daily Get Ready to Learn yoga program, students showed improved...
teacher-rated total behavior scores \((d = 1.19)\) on the Aberrant Behavior Checklist–Community (Aman & Singh, 1994), suggesting that daily school-based yoga may be helpful in reducing maladaptive behaviors observed by classroom teachers.

A Level II study by Oriel, George, Peckus, and Semon (2011) examined whether participation in aerobic exercise before classroom activities improved academic engagement and reduced stereotypic behaviors. Compared with no exercise, running or jogging for 15 min before completion of a classroom task resulted in increased correct responses (on a classroom task) for 7 of 9 participants. No significant differences were noted for time on task or stereotypic behaviors between the two conditions.

Because of the variability of interventions and outcomes measured in these studies, it is difficult to draw clear conclusions regarding the effectiveness of occupational therapy–applied yoga, exercise, or visual supports in improving education-related outcomes among children with ASD. Thus, the overall strength of the evidence in this area is limited.

**Work**

Of the 9 studies identified, 2 were Level I and 7 were Level IV; 2 systematic reviews examined strategies for independent completion of work tasks, 6 studies investigated the effects of mobile and tablet technology used to teach vocational tasks, and 1 study examined the implementation of a visual work system. The results were separated into the following subsections: (1) independence in work tasks, (2) supported employment, and (3) technology use for vocational skills.

**Independence in Work Tasks.** Overall, self-management, video modeling, and visual work systems demonstrate the potential for improved on-the-job independence among teens and adults with ASD. A Level I systematic review by Bennett and Dukes (2013) identified 12 studies \((N = 55\) participants) that focused on strategies to increase independent completion of employment tasks or employment-related behaviors. These studies suggest that self-management and video modeling are effective in improving independent task completion and task performance. More specifically, self-management interventions that use Behavioral Skills Training strategies such as instruction, modeling, practice, and feedback as well as materials such as token systems, picture prompts, and PDAs were effective. Similarly, video modeling that uses self-modeling or an adult model to demonstrate specific tasks needed at job sites appears helpful when teaching vocational skills. All but 3 of the 12 studies reported generalization, maintenance of skills, or both. The Level IV study by Hume and Odom (2007) implemented individual work systems with a visual system that communicated (1) tasks, (2) amount of work to be completed, (3) a signal that the work is finished, and (4) instructions for the next activity in the schedule. A single-subject withdrawal-of-treatment design was used for 3 male participants. Participants using the individual work systems showed, through strategically collected observational data, increased on-task behavior and decreased need for prompting during work tasks. These gains were maintained up to 1 mo after implementation. Although this study demonstrated simple, low-cost strategies as well as positive outcomes, no other supporting studies have examined the visual work system, indicating that more research is needed to further determine intervention effectiveness and ability to generalize these results.

**Supported Employment.** Preliminary research has suggested that supported employment promotes improved quality of life, ASD symptom scores, and executive functioning (Taylor et al., 2012). Taylor et al.’s (2012) Level I systematic review identified 5 studies \((n \geq 20\) participants) reviewing vocational interventions for young adults with ASD. All 5 studies examined on-the-job supports (e.g., job coach) as a vocational intervention. Three studies in their review reported increased rates and retention of employment for young adults with ASD; 1 study reported improved quality of life, 1 reported reduced autism symptom scores, and 1 showed that supported employment in the community versus a sheltered workshop yielded improvements on 8 of 12 measures of cognitive performance (e.g., motor speed, spatial recognition memory, and executive functioning). The overall quality of the studies was poor, yet the authors indicated that may reflect that this is an emerging area of research and, to date, few studies have been conducted.

**Technology Use for Vocational Skills.** Mobile and tablet technologies show promise as effective tools for vocational skill development. Six Level IV studies (Bereznak, Ayres, Alexander, & Mechling, 2012; Burke et al., 2013, Gentry et al., 2012; Kellem & Morningstar, 2012; Mechling & Ayres, 2012; Van, Winiarski, Blood, & Chan, 2012) investigated the effects of mobile and tablet technology used to teach vocational tasks. All of the technology studies used video prompting or video modeling (i.e., videos of a model performing or verbally describing each step of a work task). These videos were loaded onto various devices (iPod Touch, iPhone, iPad, PDAs, tablets) and used to guide people with ASD through their vocational tasks. They prompted each step of the task or modeled the entire task. After video modeling interventions, improvements were noted in the percentage of task steps completed correctly (Bereznak et al., 2012; Burke et al., 2013; Kellem & Morningstar, 2012; Mechling & Ayres, 2012; Van et al., 2012), independent functioning (Gentry et al., 2012;
Mechling & Ayres, 2012; Van et al., 2012), and need for onsite supervision or prompting (Gentry et al., 2012; Mechling & Ayres, 2012). Gentry et al. (2012) also used iPod Touch applications such as task reminders, task lists, and way-finding tools to help support people with ASD while on the job. These tools were well received and appeared to be helpful in improving workplace independence and performance. These Level IV studies support the use of technology, especially visual prompts and video modeling, to facilitate vocational independence and performance.

Taken together, the strength of evidence supporting work-related interventions within the scope of occupational therapy is moderate. The strength of the evidence is limited by small sample sizes and the limited number of available studies. This area of occupational therapy practice and research is growing; continued emphasis on research that identifies effective interventions for placing youth and adults with ASD into meaningful, paid employment is needed.

### Sleep

Despite the prevalence of sleep problems and their deleterious effects, efficacy studies supporting occupational therapy interventions for sleep or rest in people with ASD have not yet been published. Sleep hygiene is critical to daily function and mental health. With a focus on habits and routines, it is also an area well suited for the expertise of an occupational therapy practitioner. Research on sleep and rest interventions within the scope of occupational therapy is needed.

#### Table 3. Risk of Bias Analysis

<table>
<thead>
<tr>
<th>Citation</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Performance Bias: Blinding of Participants and Personnel</th>
<th>Detection Bias: Blinding of Outcome Assessment</th>
<th>Attrition Bias: Incomplete Outcome Data Short Term (2–6 wk)</th>
<th>Attrition Bias: Incomplete Outcome Data Long Term (&gt;6 wk)</th>
<th>Reporting Bias: Selective Reporting</th>
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<tbody>
<tr>
<td>Bennett &amp; Dukes (2013)</td>
<td>+</td>
<td>N/A</td>
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<td>+</td>
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<td>Bereznak, Ayres, Alexander, &amp; Mechling (2012)</td>
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Note. + = low risk of bias; - = high risk of bias; N/A = not applicable.
Implications for Occupational Therapy Research and Practice

Occupational therapy practitioners work with people with ASD beginning in early childhood and provide interventions to prepare them for the transition to adulthood. Central to occupational therapy practice is a focus on acquiring, maintaining, and generalizing daily living, school readiness, and work-related skills. Effective skills in work, ADLs, and IADLs allow people with ASD to achieve a life in which they can be self-sufficient and meet their own needs.

The evidence summarized in this literature review suggests the following implications for research and practice:

- Supported self-management, video prompting, video modeling, and supported employment interventions result in moderate effects on work performance.
- Use of mobile and tablet technology to teach vocational tasks is one of the most studied and effective strategies for increasing functional performance and independence in work among people with ASD, and occupational therapy practitioners often provide evaluation, recommendations, and consultation to promote success in using these devices in work and school settings.
- CO–OP, an individualized family- and child-centered approach that uses guided problem solving to assist children and youth to acquire, generalize, and transfer skills, is likely an effective intervention for improving ADL and IADL task performance among youth with ASD.
- Collaboration and a blend of behavior-based and sensory-based interventions can improve feeding skills and behaviors.
- Intensive clinic-based OT–SI can result in more independent ADL performance.
- If yoga is used to increase classroom learning and performance, it should be used daily and in a routine format.
- Brief physical exercise before academic tasks can help with accuracy but not with attention or stereotypic behaviors.
- Individual (vs. group) exercise interventions appear to be more effective in improving motor and social skills (for school readiness) among people with ASD, although few studies of these interventions have been published and more research is needed.
- Research on sleep and rest interventions within the scope of occupational therapy is imperative.

Limitations

The limitations of this systematic review are based on the design and methods of the individual studies, including small sample sizes and limited descriptions of the psychometric properties of outcome measures. Overall, a small number of studies were included in this review, and several lacked methodological rigor, long-term outcomes, nonrandom assignment to groups, masked assessment and scoring, and comparison groups. In addition, many of the studies included in the review used concurrent interventions, and separating the effects of a single intervention may be difficult. Because of the lack of research related to our research question, the majority (n = 15) of the studies included in this review were Level IV evidence, and this factor should be considered when interpreting the review’s conclusions. A risk-of-bias analysis was completed for each of the included studies. The results of this analysis will assist readers in evaluating intervention effectiveness in a more clear and accurate way and can be compared with the results in Supplemental Table 1. The risk-of-bias analysis for each article included in this review can be found in Table 3.

Conclusion

Additional research on interventions relevant to ADLs, IADLs, work, education, and sleep is needed. Occupational therapy practitioners should be aware that many of the interventions presented in this review are part of an emerging body of research, and there are tremendous opportunities for research and practice initiatives in these areas. Occupational therapy practitioners are taught that occupational performance distinguishes us from other health care providers and that it is central to our professional values and vision. Yet more research is needed to support occupation-based interventions in one of the largest and fastest growing pediatric populations—people with autism. As one of the most highly requested services by parents of children with ASD and one of the most common therapies these children participate in, it is our duty to proliferate the research on effectiveness of occupational therapy interventions for ADLs, IADLs, work, education, and sleep.

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References


*Indicates studies that were systematically reviewed for this article.


