Education and Training in Autism and Developmental Disabilities, 2022, 57(2), 196–203

Visual Schedule to Promote Compliance with Bedtime Routine in a Child with Autism Spectrum Disorder

Juliet E. Hart Barnett and
Stanley H. Zucker
Arizona State University

Cori M. More
Eastern Illinois University

Abstract : *Sleep problems are frequently reported by parents of children with autism spectrum disorder (ASD), with prevalence estimates of 44–83%. While it is important to address any underlying medical or psychiatric issues that contribute to sleep challenges, establishing good sleep hygiene is considered a good first step, which often includes establishing a consistent bedtime routine. In this study, a visual schedule was used to facilitate compliance with a bedtime routine in a child with ASD. Using an ABAB reversal design, results indicated positive treatment effects, with an increase in bedtime routine compliance during intervention and maintenance of positive effects over time.*

Sleep problems are frequently reported by parents of children with autism spectrum disorder (ASD) with prevalence estimates of 44–83% (Williams et al., 2004). Recent research in children with ASD shows that poor sleepers exhibit more problematic behavior than good sleepers (Cohen et al., 2014). Moreover, problems sleeping occur more often if the child has restricted and repetitive behaviors, anxiety or sensory problems, and can lead to difficulty with sustained attention, feelings of restlessness, irritability, and tantrums (Goldman et al., 2009). Research has also shown that insufficient sleep exacerbates the severity of core ASD symptoms (e.g., repetitive behaviors, social and communication difficulties; Park et al., 2012) as well as other maladaptive behaviors (e.g., self–injury, tantrums, and aggression; Goldman et al., 2011; Henderson et al., 2011), and is chief among the more worrisome concerns reported by parents of children with ASD (Goldman et al., 2011).

While it is important to address any underlying medical or psychiatric issues that contribute to sleep challenges, establishing good sleep hygiene is often considered a good first step (Lamm, 2021). Good sleep hygiene includes attending to elements such as adapting the environment to ensure the child is as comfortable as possible, having a predictable bedtime routine, keeping to regular sleep/wake schedule, and limiting screen time prior to bed (Lamm, 2021). Incorporating visuals and other concrete supports assists individuals with ASD (Marans et al., 2005) across a number of domains, including following routines. The use of visual supports is a common evidence-based practice that aids students in grasping concepts and comprise concrete cues that provide information about an activity, routine, or expectation and/or support skill demonstration (Wong et al., 2014). These supports are beneficial to students with ASD because they provide cues to aid students when performing tasks (Wong et al., 2014). Visual supports are also identified by the National Professional Development Center on Autism Spectrum Disorder (2016) as an effective evidenced-based strategy for individuals with ASD. In this study, we focused on using a visual schedule to improve compliance with a bedtime routine of a 5-year old boy with ASD who experienced sleep problems and exhibited noncompliance when transitioning to a typical bedtime routine.

Correspondence concerning this article should be addressed to Juliet E. Hart Barnett, Arizona State University, Mary Lou Fulton Teachers College, PO Box 871811, Tempe, AZ 85287-1811. E-mail: Juliet.Hart@asu.edu

Theoretical Framework: Visual Supports and Individuals with ASD

Individuals with ASD require environmental and instructional support that will help them

overcome challenges posed by difficulties in their ability to use and understand language (Rao & Gagie, 2006). Many students with ASD have difficulty understanding, recalling, and using verbal communication (Hodgdon, 1999). These students will often process visual support more easily than other modes of communication (Rao & Gagie, 2006). Therefore, visual supports are recommended for students with ASD because they provide cues to aid students when performing tasks and assist them in processing information, understanding and using language, and understanding and interacting with their physical and social environments (Wong et al., 2014).

'Visual supports' is a collective term referring to items perceived via the eyes and that increase understanding of a particular environment and/or expectations in that environment and which contribute to an understanding of communication by making auditory information available visually (Hume & Smith, 2009). Visual schedules are regularly used as an environmental modification to enable engagement with routines for children with ASD (Goldman et al., 2018). As mentioned, this approach builds on the visual strengths of many individuals with ASD (Ganz et al., 2014) with the goal of promoting their independence (Banda et al., 2009). When children with ASD know what's expected of them, or what's going to happen next, this can reduce feelings of anxiety, decrease transition time and challenging behaviors during transitions, as well as increase children's independence (Dettmer et al., 2000). Moreover, there is strong evidence for the use of visual schedules to increase task completion among children with ASD (Banda et al., 2009) across both age and levels of intellectual functioning (Koyama & Wang, 2011).

Parents are crucial participants in interventions that take place in the home contexts of children with ASD. Training parents to employ evidence-based strategies, including naturalistic interventions for increasing compliance, is also important to the field. Research has demonstrated that parents can learn to implement naturalistic interventions effectively with their children with ASD spanning ages from preschool to high school (Franzone, 2009; Roberts & Kaiser, 2011). However, despite research that confirms the importance of empowering parents with the knowledge and skills to act as intervention agents for their children with ASD, examples of parent-mediated interventions that focus on problem behaviors are limited (Kuravackel et al., 2018). Therefore, the purpose of this study was to determine the effect of a parent-mediated intervention in which a visual schedule was implemented with a child with ASD who displayed noncompliant behavior at bedtime. The research question was, "What is the effect of a visual schedule on compliance with a bedtime routine in a 5-year-old boy with ASD?"

Method

Participant

James was a 5-year-old male with ASD who was struggling with compliance with his bedtime routine. He was diagnosed with autism spectrum disorder at age 2.5 years following a recommendation for evaluation by his pediatrician. He was integrated, with the assistance of an ABA registered behavior technician (RBT), in a half-day preschool program of typical peers in a private school. In addition, he received twice weekly speech, occupational, and physical therapies, as well as ABA therapy 10 hours per week. When he turned 5 years old, James was evaluated by his local school district's multidisciplinary evaluation team (MET), who developed a report of their findings. According to his MET report, James's intellectual functioning measured in the average range, with strengths in visual spatial skills, letter-word recognition, and pre-academic skills. Areas of concern included adaptive skills, functional communication, and social skills. On the DSM diagnostic scale, he received an Elevated to Significantly Elevated score. When prompted, James generally communicated using 3-4-word utterances (e.g., "I want eat banana"), and though his speech was relatively easy to understand, his frequency of initiations was low.

According to parental reports, James would sometimes engage in non-compliant behaviors during bedtime-related tasks (e.g., brushing teeth, putting on pajamas), requiring some verbal redirection and encouragement from his mother. However, following completion of these tasks, James would consistently

cry, tantrum and refuse to get into his bed for up to 30 minutes in the evening. Despite these challenges, his early literacy skills were developing, he was able to read many familiar words, and visual schedules were being used to help him successfully transition between activities in his preschool setting during the day. Thus, a visual schedule, which included pictures enhanced with simple text, was chosen to provide James with an effective step-by-step guide to increasing his understanding of, and compliance with, his bedtime routine.

Setting and Materials

The study took place in the participant's home in the context of targeted routines and corresponding settings. James' bedtime-specific routines were completed in his bedroom and adjacent bathroom. James shared a room with his 7-year-old typically developing sister, and each child had their own bed across the room from one another. The bedroom was well-organized and contained a bookshelf with many books, a toy box, and a closet containing clothing, shoes, and other toys. The bedroom door was closed in the evening and lights were turned off, with natural light from the outside providing some light through a window. Occasionally James' sisters and father were present during a routine, but only his mother interacted with him during study activities.

The family's materials were used to the extent possible for routines (e.g., child's toothbrush) but materials related to the visual support/checklist were provided by the research team. The mother was provided with printed explanations of the intervention procedure for the bedtime routine, to include summaries of prompting procedures (e.g., least to most) and routine-specific steps, which were accessible during the intervention sessions. James' visual schedule was developed in collaboration with his mother and included pictures and text to align with his evening bedtime routine. James' schedule consisted of a vertical, one-page laminated schedule with the header "To Do" on the left and "All Done" on the right. The 'to do' column contained 6 boxes with graphics and simple text representing each component of his routine (i.e., use toilet, take bath, brush teeth, put on pajamas, say good night, go to sleep in bed). Following completion of each corresponding step, each picture was moved to the right column labeled, 'all done.' A paper/pencil data collection method was used to collect data on the target variable.

Experimental Design

A single-subject, ABAB reversal design was used to evaluate the effectiveness of the visual schedule on a 5-year old with ASD who was demonstrating high levels of noncompliance with his bedtime routine. An ABAB design permits the confirmation of a treatment effect by showing that behavior changes systematically with conditions of No Treatment (baseline) and Treatment. Baseline data was collected until James' response to his bedtime routine was stable or descending and lasted approximately 1.5 weeks over six sessions. Intervention data was collected for approximately 5 weeks over 20 instructional sessions. Following 20 sessions of Phase B, the visual schedule intervention was withdrawn to baseline conditions for a total of 8 data points to determine whether compliance with the routine would return to baseline levels. During this time, the visual schedule was removed from the home to ensure it was not implemented in the withdrawal condition. In the second intervention phase (B), the visual schedule intervention was resumed for an additional 6 instructional sessions to ascertain the impact of the intervention a second time. Finally, we conducted probes one and two weeks after the final intervention session to evaluate maintenance of independent schedule use and compliance as an objective measure of social validity (Kennedy, 2002).

Procedure

All baseline and experimental sessions took place in the participating child's home in the context of the bedtime routine. The bedtime routine was chosen based on our initial observations and in collaboration with the mother to identify the greatest area of need. Our initial observations were intended to discuss potential target routines with the caregivers,

observe typical home routines, acclimate the child and parent to our presence, and train data collectors to criterion. In all, six steps were developed to align with James' and his family's existing bedtime routine, and the visual schedule was subsequently developed.

Baseline. During baseline, we instructed James' mother to help him complete his bedtime routine as she typically would, with no additional instruction. During the baseline sessions, which averaged 30-45 minutes, our observations of James during his bedtime routine indicated he was relatively successful completing many of the tasks, with minor physical assistance from his mother with dressing and teeth brushing as is expected for a child of his age. Still, some verbal redirects from his mother were also needed, extending the time to prepare for bedtime to a frustration level for the family. James demonstrated the most difficulty with the final step of his routine, which was getting into his bed. James was observed to actively avoid getting into bed, moving around the room, laying on the floor, or attempting to get into his sister's bed. During this time, James' mother would provide verbal redirection and block access to his sister's bed. When James was prevented from laying on the floor or getting into his sister's bed, he would protest vocally, cry, and tantrum. The end result was James eventually falling asleep on the floor, which then required his mother to carry him to bed after a substantial amount of time. Given that the main behavior to address was James' noncompliance with getting into his bed to sleep, the dependent variable was defined as 'bedtime refusal' and was operationalized as the number of minutes James engaged in tantrum behavior, defined as crying, screaming, moving around the room, laying on the floor, and refusing to comply with the final step of his bedtime routine. During baseline, James demonstrated noncompliant bedtime refusal for a range of 30-34 minutes.

Intervention and parent training. Between the final baseline session and first intervention session, we conducted one 30-minute training session on the intervention procedure. The mother was trained to demonstrate for James how to use the visual schedule, representing each step of the routine (e.g., toileting, taking a bath, brushing teeth, putting on pajamas, saying good night, getting into bed), finishing one step at a time, while checking the visual/textual aid. The aim was to gradually phase out adult help until James could follow the steps independently. Following two sessions with researchers and the mother to develop the intervention and subsequent visual schedule, all baseline and treatment sessions were conducted by the mother in the home during bedtime for approximately 30-45 minutes a day, seven days a week, for approximately six weeks.

Procedural and treatment fidelity. Procedural fidelity was obtained for approximately 30% of sessions across baseline, intervention, and maintenance phases. The sessions that were scored for IOA and procedural fidelity were randomly selected. To assess procedural fidelity, a second independent rater was trained on the visual schedule procedures and given a checklist that explicitly denoted intervention steps. The second rater used this checklist to score procedural fidelity of the same randomly selected recorded sessions used to assess IOA. Each of the six steps was scored as complete or incomplete. In order to be scored complete, a specific step had to be implemented by the mother (or James) successfully every time the step was carried out. Mean procedural fidelity was calculated for each session by dividing the number of complete steps by the sum of the complete and incomplete steps and multiplying by 100. Mean procedural fidelity was 99.8% (range, 91%-100%). As an additional check on the accuracy with which the visual schedule was implemented, the parent also completed a procedural checklist for all sessions. The parent was administered a form with boxes representing the days of the week. The parent was asked to check the box on each day X was shown or was prompted to use the visual schedule (Bellini et al., 2007). The parent reported the child viewed the visual schedule checklist during each day of the intervention.

Inter-observer agreement (IOA) of the dependent variable. IOA data were collected by an independent, trained rater during 30% of the data across each phase (i.e., baseline, intervention, return to baseline, and re-introduction). Given the nature of the intervention, the rater

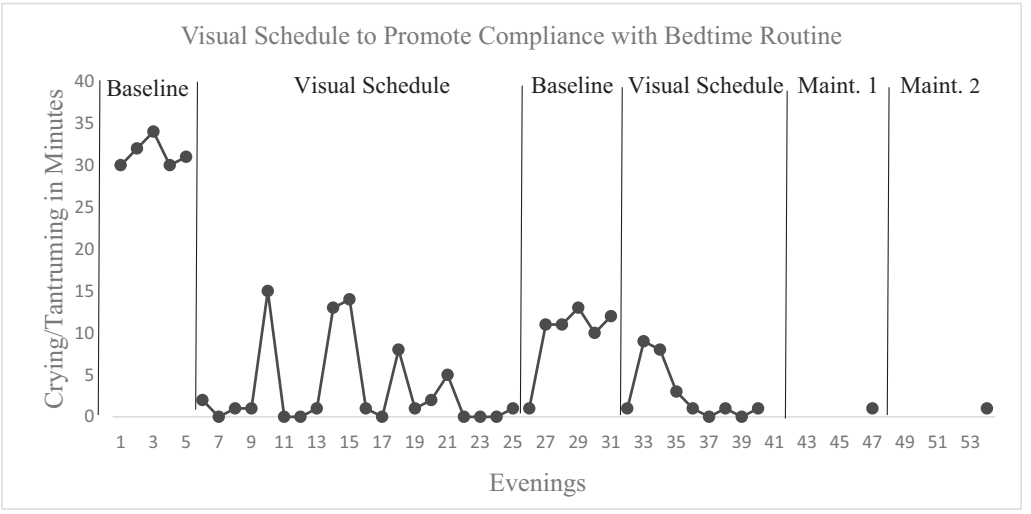

Figure 1. Results of Visual Support Schedule on Bedtime Compliance.

was unable to be blind to the condition. Reliability was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Agreement occurred when both observers independently recorded the same number of responses by type (i.e., schedule use, completion of each step of the bedtime routine, number of minutes elapsed to getting into bed, etc.). The IOA for the target variable (bedtime refusal) was 94%.

Results

A standard line graph was used to display all data for the participant across non-compliant behavior. Using the line graph provides an important advantage for researchers by permitting an initial visual analysis of the data collected during the course of the study. This in turn allows researchers to see whether a participant is indeed making progress. In addition, the line graph has an advantage of showing change over time, and can even show small changes over time.

The results per evening bedtime session are shown in Figure 1. Based on visual inspection of the data, a positive treatment effect is indicated, with a functional relationship demonstrated between the visual schedule condition and James' duration of crying/tantrum behavior, which clearly decreased during both intervention phases (B), and was even maintained, though not at the same level, in the return to baseline condition. To determine whether James demonstrated a relatively decreased level of non-compliance during the return to baseline condition, we obtained two additional maintenance data points one and two weeks after the intervention had been faded to a text-only schedule. In doing so, it was confirmed that James continued to demonstrate a consistent and relatively decreased level of noncompliance at bedtime even after the intervention had been reduced to a text-only activity schedule.

Visual analysis suggests a functional relationship between James's noncompliance and the visual schedule intervention. Specifically, the results indicate that the visual schedule generated considerable improvement or reduction in James's crying and bedtime refusal behaviors. The data show that the visual schedule intervention decreased James's tantrum behaviors from 30-34 minutes down to 1-minute during intervention and maintenance.

Social validity. Prior to the intervention, the mother indicated that she had a little familiarity with using visual schedules as an intervention

for her child with ASD because she had participated in discussions of their development for use during James' transitions at school and observed the occupational therapist using a visual schedule with James during therapy sessions. Following completion of the study, she was asked to complete a checklist in which she indicated the extent to which she agreed, somewhat agreed, or disagreed with the following statements (adapted from Bellini et al. 2007). Her responses are indicated adjacent to each question below:

1. The visual schedule intervention interferes with typical home routines. **Disagree**
2. The visual schedule intervention is distracting to my child with ASD. **Disagree**
3. The visual schedule intervention is distracting to the other children in my home. **Disagree**
4. The visual schedule intervention is easy to implement. **Agree**
5. I believe the visual schedule intervention is beneficial for my child with ASD. **Agree**
6. I notice a difference in my child's compliance with his bedtime routine. **Agree. The visual schedule was simple to implement and didn't take too long to see results. I'm very pleased with how well my son follows his bedtime schedule. I'm even happier with the increased amount of sleep he is getting, which I think helps his overall functioning during the day. Also, the intervention has had a positive effect on our family because we're able to have a quieter, more peaceful evening.**

Discussion and Implications

The purpose of this study was to determine the effectiveness of a visual schedule on the noncompliance (i.e., crying/tantrum/bedtime refusal) of a 5-year-old male with ASD. The visual schedule intervention examined herein was an effective approach for producing positive changes in James's adherence with his bedtime routine and subsequent sleep onset. Moreover, these gains are consistent with previous research conducted with students with ASD that point to the usefulness of visual supports to promote adherence with routines and ease of transitions (Hume, 2008; Rogers & Vismara, 2008).

This study makes several important contributions. This study demonstrates the application of an evidence-based intervention to a population of students and families in need who stand to benefit greatly. Sleep disturbances in ASD result in numerous challenges for affected children and function as a source of serious stress for their families (Goldman et al., 2011). In fact, parents and family members of children with ASD experience more stress than parents of typically developing children as well as parents of children with other disabilities (Hayes & Watson, 2013). Unlike children without ASD, these children often display high rates of tantrum behavior when they are required to transition from one activity to another, such as during bedtime transitions. This study also adds to the knowledge base pointing to the advantages associated with presenting children with ASD visual stimuli in contrast to auditory stimuli to elicit compliant behavior during transition periods (Schmit et al., 2000, p. 132).

Further, the present study more broadly contributes to the growing knowledge base on practical, feasible interventions to address challenging behaviors in younger populations and that can be effectively implemented through parent-mediated approaches. The number of service providers and agencies involved in the education and therapeutic care of students with ASD is growing. To achieve equitable outcomes, early intervention services have sought to address the unique and complex needs that young children with ASD present. Such services are frequently delivered in children's homes or preschools. These services should be collaborative and family centered, and address a wide-range of developmental concerns.

Although sleep problems are common in children with ASD they often can be addressed with the implementation of relatively straight-forward and evidence-based approaches. Better sleep for these children can potentially improve their daytime functioning and performance in school, which is critically important to their teachers. Additionally, families of children with ASD often seek the expertise of educators and other

service providers. Therefore, teacher practitioners need to become conversant with the use of visual supports and other effective practices to assist students with ASD as they transition through daily routines (Wong et al., 2014). Moreover, teachers armed with this information are in a much better position to share it with the families of the students they teach.

Limitations

Specific limitations that may affect the overall interpretations of this study are important to consider. As is characteristic with single subject research, a small sample size was analyzed, and in this investigation, the intervention was explored with only one student. Moreover, only one problem behavior was targeted for intervention. With this in mind, conclusions must be contextualized and interpreted within the study's setting. Additional studies with larger sample sizes are needed and should include analysis of multiple, target variables to replicate and verify the results more comprehensively and validly. Future researchers should consult relevant literature to determine whether visual supports should be implemented alone or which empirically supported practices may enhance their efficacy.

Conclusions

With increasing numbers of children with ASD receiving early intervention services, it is imperative that professionals be knowledgeable in strategies to assist families experiencing challenges, including sleep disturbances in their children. For young children with ASD, visual supports are a comparatively nonintrusive approach that can be individualized easily to encourage appropriate behavior and socialization (Sam & AFRIM Team, 2015). The use of visual supports to navigate schedules in our daily lives (i.e., through use of calendars, maps, watches, to-do lists, etc.) is increasingly commonplace, yet many children in need of such supports are not routinely provided with them. It is incumbent upon practitioners to begin providing such supports more intentionally for children with ASD and for education researchers to investigate their most efficient development and most efficacious implementation. We must also seek to meaningfully collaborate to empower families and work with professionals across a variety of service organizations to examine how to best support parent-mediated interventions to improve outcomes for all children youth impacted by ASD.

References

Banda, D., Grimmett, E., & Hart, S. L. (2009). Helping students with autism spectrum disorders in general education classrooms manage transition issues. *Teaching Exceptional Children*, *41*(4), 16–21.

Bellini, S., Peters, J. K., Benner, L., & Hopf, A. (2007). A meta-analysis of school-based social skills interventions for children with autism spectrum disorders. *Remedial and Special Education*, *28*(3), 153–162.

Cohen, S., Conduit, R., Lockley, S. W., Rajaratnam, S. M., & Cornish, K. M. (2014). The relationship between sleep and behavior in autism spectrum disorder (ASD): A review. *Journal of Neurodevelopmental Disorders*, *6*(1), 44.

Dettmer, S., Simpson, R., Myles, B., & Ganz, J. (2000). The use of visual supports to facilitate transitions of students with autism. *Focus on Autism and Other Developmental Disabilities*, *15*(3), 163–169.

Franzone, E. (2009). *Overview of naturalistic intervention*. National Professional Development Center on Autism Spectrum Disorders, Waisman Center, University of Wisconsin.

Goldman, S. E., McGrew, S., Johnson, K. P., Richdale, A. L., Clemons, T., & Malow, B. A. (2011). Sleep is associated with problem behaviors in children and adolescents with autism spectrum disorders. *Research in Autism Spectrum Disorders*, *5*(3), 1223–1229.

Goldman, S. E., Surdyka, K., Cuevas, R., Adkins, K., Wang, L., & Malow, B. A. (2009). Defining the sleep phenotype in children with autism. *Developmental Neuropsychology*, *34*(5), 560–573.

Hayes, S. A., & Watson, S. L. (2013). The impact of parenting stress: A meta-analysis of studies comparing the experience of parenting stress in parents of children with and without autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *43*(3), 629–642.

Henderson, J. A., Barry, T. D., Bader, S. H., & Jordan, S. S. (2011). The relation among sleep, routines, and externalizing behavior in children with an autism spectrum disorder. *Research in Autism Spectrum Disorders*, *5*(2), 758–767.

Hodgdon, L. (1999). *Solving behavior problems in autism: Improving communication with visual strategies*. Quirk Roberts Publishing.

Hume, K. (2008). *Overview of visual supports*. National Professional Development Center on Autism Spectrum Disorders, Frank Porter Graham Child Development Institute, The University of North Carolina.

Koyama, T., & Wang, H. (2011). Use of activity schedule to promote independent performance of individuals with autism and other intellectual disabilities: A review. *Research in Developmental Disabilities*, *32*(6), 2235–42.

Kuravackel, G. M., Ruble, L. A., Reese, R. J., Ables, A. P., Rodgers, A. D., & Toland, M. D. (2018). COMPASS for Hope: Evaluating the effectiveness of a parent training and support program for children with ASD. *Journal of Autism Developmental Disorders*, *48*-(2), 404–416.

Lamm, C. (2021). *Sleep*. Autism speaks. https://www.autismspeaks.org/sleep

Marans, W., Rubin, E., & Laurent, A. (2005). Addressing social communication skills in individuals with high-functioning autism and Asperger syndrome: Critical priorities in educational programming. In F. R. Volkmar, R. Paul, A. Klin, & D. Cohen (Eds.), *Handbook of Autism and Pervasive Developmental Disorders* (Vol. *2*, 3rd ed., pp. 977–1002). https://doi.org/10.1002/9780470939352.ch12

National Professional Development Center on Autism Spectrum Disorder. (2016). *Matrix of evidence-based practices by outcome and age*. https://autismpdc.fpg.unc.edu/implementation

Park, S., Cho, S. C., Cho, I. H., Kim, B. N., Kim, J. W., Shin, M-S, Chung, U. S., Park, T. W., Son, J. W., & Yoo H. J. (2012). Sleep problems and their correlates and comorbid psychopathology of children with autism spectrum disorders. *Research in Autism Spectrum Disorders*, *6*(1), 1068–1072.

Rao, S. M., & Gagie, B. (2006). Learning through seeing and doing: Visual supports for children with autism. *Teaching Exceptional Children*, *38*(6), 26–33.

Roberts, M. Y., & Kaiser, A. P. (2011). The effectiveness of parent-implemented language interventions: A meta-analysis. *American Journal of Speech-Language Pathology*, *20*(3), 180–199.

Rogers, S. J., & Vismara, L. A. (2008). Evidence based comprehensive treatments for early autism. *Journal of Clinical Child and Adolescent Psychology*, *37*(1), 8–38.

Sam, A., & AFIRM Team. (2015). *Visual supports*. National Professional Development Center on Autism Spectrum Disorder, FPG Child Development Center, University of North Carolina.

Schmit, J., Alper, S., Raschke, D., & Ryndak, D. (2000). Effects of using photographic cueing package during routine school transitions with a child who has autism. *Mental Retardation*, *38*(2), 131–137.

Williams, G. A., Sears, L. L., & Allard, A. N. (2004). Sleep problems in children with autism. *Journal of Sleep Research*, *13*(3), 265–268.

Wong, C., Odom, S., Hume, K., Cox, A. W., Fettig, A., Kucharczyk, S., Brock, M. E., Plavnick, J. B., Fleury, V. P., & Shultz., T. R. (2014). *Evidence-based practices for children, youth, and young adults with autism spectrum disorder*. The University of North Carolina, Frank Porter Graham Child Development Institute, Autism Evidence based Practice Review Group.

Received: 21 July 2021
Initial Acceptance: 2 September 2021
Final Acceptance: 18 September 2021