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**Ashutosh Rajoria**  
Research Scholar, MOT,  
Department of Paediatrics,  
Mahatma Gandhi  
Occupational Therapy College,  
MGUMST, Jaipur, Rajasthan,  
India

**Dr. Neha Jain**  
Associate Professor (OT),  
Mahatma Gandhi  
Occupational Therapy College,  
MGUMST, Jaipur, Rajasthan,  
India

**Dr. SK Meena**  
Principal, Mahatma Gandhi  
Occupational Therapy College,  
MGUMST, Jaipur, Rajasthan,  
India

**Corresponding Author:**  
**Ashutosh Rajoria**  
Research Scholar, MOT,  
Department of Paediatrics,  
Mahatma Gandhi  
Occupational Therapy College,  
MGUMST, Jaipur, Rajasthan,  
India

## The efficacy of visual schedules in facilitating independent toileting skills development in children with autism spectrum disorders: A systematic review

**Ashutosh Rajoria, Dr. Neha Jain and Dr. SK Meena**

### Abstract

**Background:** Autism Spectrum Disorder (ASD) is a neurological and developmental disorder characterized by difficulties in communication, social interaction, and repetitive behaviors. Daily living skills, including toileting, are often impaired in children with ASD, leading to increased parenting stress. Visual schedules have shown promise in improving various skills in children with ASD, but their effectiveness in developing independent toileting skills remains to be thoroughly examined.

**Objective:** This systematic review aims to synthesize the existing literature on the efficacy of visual schedules in facilitating the development of independent toileting skills in children with Autism Spectrum Disorders.

**Methods:** A comprehensive literature search was conducted in electronic databases, including PubMed, Online Journals, Google Scholar, and ResearchGate. Studies were selected based on pre-defined inclusion and exclusion criteria. The PRISMA flow diagram was used to assess article eligibility and ensure the selection of relevant studies. Data extraction included participant characteristics, study design, interventions, and outcomes.

**Results:** Out of the initial 250 potentially relevant articles, 10 studies were included in the review. All included studies were qualitative in nature and were published between 2010 to 2022. Majority of the studies were conducted in hospital settings. The studies focused on the effects of visual schedules on basic Activities of Daily Living (ADL) skills, specifically toileting, in children with mild Autism Spectrum Disorder.

**Conclusion:** This systematic review provides insights into the use of visual schedules as a potential intervention for developing independent toileting skills in children with Autism Spectrum Disorders. However, the limited number of studies and the qualitative nature of the included articles highlight the need for further research in this area. Future studies should explore the effectiveness of visual schedules in diverse settings and populations to establish evidence-based interventions for improving toileting skills in children with ASD.

**Keywords:** Autism, activity of daily living (ADL) skills, visual schedule, systematic review

### Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that affects social communication, behavior, and learning. Symptoms typically emerge in early childhood and can vary widely in their severity and presentation. People with ASD often experience difficulties in communication, social interaction, and may engage in repetitive behaviors. As a result, they may face challenges in various aspects of daily living, including toileting.

Although ASD is a lifelong condition, early intervention and support can significantly improve an individual's quality of life and functional outcomes. However, in very young children, daily living skills, such as toileting, may not receive as much attention as language and social communication deficits in autism. Parents, who often have numerous caregiving responsibilities, may find it easier to perform tasks for their children rather than teaching and encouraging them to do these tasks independently.

Teaching children with ASD to perform simple adaptive skills, like toileting, can have several benefits. It may reduce parenting stress, allowing parents more time and energy to focus on language and core autism symptoms or engage in enjoyable activities with their child and family.

Visual schedules have been used to target a wide range of skills within the domains of social development and play in children with ASD. They have been applied to improve conversational skills, social skills, play-related statements, and social language.

Additionally, visual schedules have been suggested to promote generalization across different settings and conditions.

Considering the potential benefits of visual schedules in enhancing various skills in children with ASD, it is important to explore their effectiveness in developing independent toileting skills. This systematic review aims to synthesize existing research on the use of visual schedules in facilitating the development of independent toileting skills in children with Autism Spectrum Disorders. By examining the available evidence, we hope to shed light on the potential benefits of visual schedules as a therapeutic tool in this specific area of intervention.

**Methods**

The systematic review followed the PRISMA guidelines for conducting systematic reviews. A comprehensive search was conducted in electronic databases, including PubMed, Online Journals, Google Scholar, and ResearchGate, to identify relevant articles. The following keywords were used in the search: Autism, Activity of Daily Living (ADL) skills, Visual schedule. The inclusion and exclusion criteria were pre-defined to ensure the selection of studies that directly addressed the research question.

**Inclusion Criteria**

- Studies focused on children with mild Autism Spectrum Disorder, as determined by the Childhood Autism Rating Scale (CARS).
- Participants aged between 3 to 6 years.
- Studies targeting dependent ADL skills, particularly toileting.

- Both male and female children included in the studies.

**Exclusion Criteria**

- Studies involving participants with an IQ greater than 80.
- Studies not directly related to the use of visual schedules in toileting skill development.
- Articles that did not clearly mention the intervention being used.

Data extraction and quality assessment were performed by two independent reviewers. The selected articles were evaluated for relevance, appropriateness, clarity, and methodology. Articles that did not meet the inclusion criteria were excluded from the review.

**Results**

The initial search yielded 250 potentially relevant articles. After eliminating duplicates and applying the inclusion and exclusion criteria, 10 studies were included in the systematic review. All included studies were qualitative in nature, and the majority were conducted in hospital settings. The studies were published between 2010 and 2022.

The reviewed studies focused on the effects of visual schedules on the development of basic ADL skills, specifically toileting, in children with mild Autism Spectrum Disorder. The qualitative nature of the studies limited the ability to quantitatively assess the effectiveness of visual schedules, but they provided valuable insights into the potential benefits of this intervention.

Table 1: Ten qualitative studies published between 2010 and 2022 were included in the review.

Study/ Author (s)	Year of publication	Research Design	Sample Size	Sample Character	Theme	Sub Theme
Brdly Drysdale <i>et al.</i>	2014	Experimental design	2	ASD	This study explored the effectiveness of video modeling in teaching toileting skills to children with autism—a challenging area for many families. The intervention proved successful, with two children and their families showing improved independent toileting skills.	The study suggests that children with ASD who struggle with memory and imitation tasks may benefit from video chaining. Graphs display prompt occurrence in different study phases: baseline, intervention, and follow-up.
Victoria Knight <i>et al.</i>	2014	Single subject research design	56	ASD	The purpose of this literature review was to update and expand on previous findings regarding the effectiveness of Video Activity Schedules (VASs) for individuals with Autism Spectrum Disorder (ASD). The analysis shows that VAS should be recommended as an Evidence-Based Practice (EBP) for improving various behaviors. Specifically, VAS can be used to: (a) Teach on-task behavior, on-schedule behavior, and appropriate and independent transitions. (b) Improve latency to task completion, percentage of correctly completed responses, and task analysis steps. (c) Decrease the level of prompts required for transitions.	The study indicates that VAS (Visual Activity Schedule) is an effective Evidence-Based Practice (EBP) for individuals with ASD, particularly when combined with systematic instructional methods. VAS can enhance and generalize skills across different ages and settings, from preschool to adulthood.
Avsar Ardic	2014	Multiple probe design	3	ASD	This study aimed to assess the efficacy of a modified version of Azrin and Foxx's (1971) intensive toilet training method for teaching toilet skills to children with autism.	The study showed that the modified Azrin and Foxx method successfully taught children with autism to use the toilet properly. Parents of the participants were highly satisfied with the outcomes.
Majid Naeimi <i>et al.</i>	2013	Randomized control trial	41	ASD	The study indicates that the audiovisual stimulation platform holds promise in enhancing executive function subsets. Moreover, its user-friendly nature seems to protect against early behavioral issues and executive dysfunction in children with autism.	Multivariate analysis revealed that audiovisual stimulation in the study significantly enhanced executive functions (inhibition, shifting, and planning ability) based on the Behavior Rating Inventory of Executive Functioning measures ( $F=5.55, p<0.05, F=15.28, p<0.001$ ).
Wan Fatimah Wan Ahmad <i>et al.</i>	2022	Experimental study	02	ASD	The study aims to introduce AutoVid, a mobile app for teaching daily living skills to autistic children. Results show that the app's audio and visual prompting effectively improves these skills. The	The study's findings confirm the effectiveness of using visual prompting and chaining methods to teach everyday life skills to autistic children, ensuring the

					use of visual prompting based on chaining theory received positive feedback from participants during the activities.	application's suitability for therapeutic goals.
Linda C. Mechling <i>et al.</i>	2010	Experimental design	03	ASD	The study aimed to assess the impact of a multi-level prompt PDA (utilizing pictures, auditory, and video cues) on students with autism spectrum disorder. It focused on their ability to accomplish new tasks, switch between tasks, and self-adjust the prompting level on the PDA. The research used a multiple probe design involving three sets of task boxes and three students with autism spectrum disorder.	In this study: Two out of three students completed more tasks with the picture-based task strip than in baseline conditions. All students showed improved completion of between-task transitions with the PDA. Performance in within-task transitions was similar for both the PDA and the task strip.
Sugi. S <i>et al.</i>	2011	Experimental study	20	ASD	The study found that visual support cues significantly improve toilet indication in children with autism, leading to reduced accidents and improved voiding regularity. Children with autism display superior visual perception and respond well to visual cues, which were implemented in the study through visual prompts and appropriate toilet scheduling.	The study demonstrated that the TEACCH method effectively improved toilet indication in children with Autism. These findings suggest that the visual cue approach can be extended to other self-care activities, fostering communication development in autistic children.
David F.cihak <i>et al.</i>	2010	Experimental design	6	ASD, Special educator	This study aimed to compare the effects of static-picture schedules and video modelling schedules on adolescents with Autism Spectrum Disorder (ASD) during transitional situations. It examined the use of a traditional static picture activity schedule versus a similar video activity schedule.	The findings indicate two key points for teachers: visual schedules aid in smoother transitions, and using diverse schedule types can support a diverse student population's success.
Mohmmad Mouse <i>et al.</i>	2016	Multiple design	3	Down syndrome	The study showed that video modelling effectively teaches pupils with intellectual disabilities how to prepare a simple meal. It is an effective training method, often requiring redirection and repetition. As the pupils become proficient, they can perform the task without external support.	The study found that pupils successfully learned to prepare sandwiches independently through video modeling and receiving verbal praise for correctly following each step of the training. This method proved effective in providing students with opportunities to learn various skills.
Sailendri Dash	2018	Pre-test/ post-test controlled group design	32 children	ASD	This study explores the effectiveness of using a combined visual schedule and SIT to enhance self-care in children with autism. The results indicate a significant improvement in self-care for both groups after a 12-week intervention, as measured by the mean rank score in the Wee-FIM.	The study shows a noteworthy enhancement in self-care activities for autistic children using a visual schedule with SIT. Thus, incorporating visual schedules can improve self-care in children with autism by reinforcing visuo-spatial information for adaptive behavior.

**Discussion**

The systematic review highlights the importance of exploring interventions to improve daily living skills, such as toileting, in children with Autism Spectrum Disorders. Visual schedules show promise as a potential tool to facilitate the development of independent toileting skills. However, the qualitative nature of the studies and the limited number of included articles indicate the need for further research in this area.

Future studies should consider employing quantitative research designs and larger sample sizes to provide more robust evidence on the effectiveness of visual schedules in improving toileting skills in children with ASD. Additionally, exploring the application of visual schedules in different settings and populations could enhance our understanding of its generalizability and effectiveness.

**Conclusion**

This systematic review sheds light on the potential benefits of visual schedules in facilitating the development of independent toileting skills in children with Autism Spectrum Disorders. Although the current evidence is limited to qualitative studies, it suggests that visual schedules may be a valuable intervention to address daily living skill deficits in children with mild ASD.

Further research with rigorous quantitative designs is warranted to establish evidence-based interventions that can significantly enhance toileting skills and overall functional outcomes in this population. Improved daily living skills can lead to reduced parenting stress and improved quality of life

for both the children with ASD and their families.

**Conflict of Interest**

The authors declare no conflicts of interest.

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**Data Availability:** Data sharing is not applicable to this article as no new data were created or analyzed in this systematic review.

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