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## Enhancing Social and Transition Behaviors of Persons with Autism through Activity Schedules: A Review

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*Abstract: Thirteen studies were reviewed that were conducted using activity schedules with persons with autism to improve social interaction skills and decrease problem behaviors. Results across studies indicate that activity schedules enhanced social interactions and on-task and transition behaviors. Also, investigators in some studies used activity schedules to decrease students' tantrums and other problem behaviors during transitions. Furthermore, researchers in several studies that reported generalization indicated that behaviors learned through activity schedules generalized across settings and persons. Implications for practitioners and for future researchers are discussed.*

Individuals with autism often have difficulty with social interactions and communication. In addition, these persons may display deficits in life skills and/or exhibit problem behaviors including stereotypic behaviors, self-injurious behaviors, hyper- or hyposensitivity to sound, taste, smell, etc. (Scheuermann & Webber, 2002; Scott, Clark, & Brady, 2000). A majority of persons with autism have difficulties with social skills, particularly making eye contact, recognizing social cues, and participating in turn taking activities (Jamieson, 2004). Furthermore, they may display unusual characteristics such as resistance to change, either within their environment or within their daily activities (e.g., American Psychiatric Association, 2000; Schreibman, Whalen, & Stahmer, 2000). Issues with routine changes and transitions can particularly be problematic resulting in atypical behaviors such as heightened verbal and physical aggression, tantrums, non-compliance, self-injury, etc. (Schreibman et al.). Difficulty with transitions between and within activities can limit the person's ability to navigate different environments without the adult supervision and guidance (e.g., For-

est, Horner, Lewis-Palmer, & Todd, 2004; Scheuermann & Webber; Schreibman et al.). Because of this, individuals with autism often develop dependence on adult caregivers to provide support to learn new skills, and to stay on-task and on-schedule throughout the activities at school, home, and other community settings (Heflin & Alaimo, 2007; Scheuermann & Webber). Thus, the challenge for parents and teachers is to decrease the dependence on adults and to increase the person's independence in daily living, communication, socialization, and vocational skills.

Researchers have used visual supports (e.g., pictures, videos, activity schedules) to improve various behaviors of persons with mental retardation including transitions during vocational activities and teaching daily living skills (e.g., Anderson, Sherman, Sheldon, & McAdam, 1997; Morgan & Salzberg, 1992; Wacker, Berg, Berrie, & Swatta, 1985). Investigators in recent years have also identified these visual supports, particularly the activity schedules as a promising educational strategy for persons with autism (e.g., Scheuermann & Webber, 2002; Wetherby & Prizant, 2000). In the early nineties, investigators in three studies (Krantz & McClannahan, 1993; Krantz, MacDuff, & McClannahan 1993; and MacDuff, Krantz, & McClannahan, 1993) conducted initial investigations using activity schedules and found that these strategies have increased social initiations, increased on-task

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and on-schedule behavior and decreased disruptive behaviors in children with autism. These initial studies and numerous other investigations that followed them have used activity schedules to teach various daily living, social, and transition behaviors to persons with autism.

An activity schedule is a string of photographs, images or drawings of daily routines that are sequentially arranged on a display (e.g., wall, computer, folder, desk) for the targeted student to follow. These visual supports can be a single picture used as a prompting device, or multiple picture symbols formatted in a sequence. The activity schedule can be used between routines, such as moving from a classroom to a physical education setting, or within the student's daily routines, such as moving from shaving to brushing teeth during a hygiene activity. Activity schedules not only improved transition or daily living skills but have also shown promise in enhancing social behaviors, social initiation, and social interaction in students with autism (Heflin & Alaimo, 2007; Scheuermann & Webber, 2002). Changes that are to occur within the anticipated daily activities can be reflected on the activity schedule, allowing increased time for the child to enhance participation in existing routines or to transition to a new activity (Jamieson, 2004). Activity schedules may be helpful for persons with autism due to several possible explanations.

Individuals with autism may have difficulty processing auditory information, instead responding to visual input as their primary source of information (Quill, 1995). Also, they often prefer objects over people, and when observing another person they tend to focus on physical features rather than attending to the person as a whole (Heflin & Alaimo, 2007). Visual support systems may prompt students with autism to perform a specific action, anything from the next step in a sequenced activity to transitioning to the next class in their schedule. In addition, visual systems may provide predictability and concrete steps that need to be completed within a daily schedule (e.g., classroom transitions) or within a single activity (e.g., brushing).

Although numerous investigators have used activity schedules with persons with autism, there has been no comprehensive review of

these studies. Recently, however, Stromer, Kimball, Kinney, and Taylor (2006) examined several studies that used activity schedules for persons with autism. In their article, Stromer et al. briefly referred to activity schedule studies and presented a case study that addressed computer technology as a way to build on the existing techniques of activity schedules. It is crucial for practitioners and researchers to know the current status of activity schedules in terms of their effectiveness and directions for practice and future research. Thus, the current review seeks to comprehensively analyze the studies that utilized activity schedules with individuals with autism. Specifically, the following research questions were answered in this study: a) Are activity schedules effective with persons with autism to enhance appropriate behaviors and/or to decrease inappropriate behaviors? b) Can the effects of activity schedules be generalized to other activities, persons, or settings? and, c) Are activity schedules socially valid interventions?

## Method

We conducted a computer search using *ERIC* and *PsycInfo*. The key words used to search databases included *autism*, *Asperger*, *activity schedule*, *picture schedule*, and *photographic schedule*. Study inclusion was contingent upon the following parameters: a) the study was conducted with individuals with autism, b) the study involved some form of activity or picture schedule as an intervention, c) the study was data based, and d) the study was published in a peer-reviewed journal. Thirteen studies met selection criteria. One study had a mixed group that contained children who were not diagnosed with autism (Hall, McClannahan, & Krantz, 1995). In this case, only the participant with autism was included in this review. Another study was excluded from final analysis because the data was not presented in an interpretable graph form (Kimball, Kinney, Taylor, & Stromer, 2004). Finally, an ancestral search from selected studies did not reveal any further articles that met the study parameters. All research studies that met the inclusion criteria were reviewed and analyzed to answer the research questions posed in this study. Table 1 shows the summary of activity sched-

**TABLE 1**

**Summary of Activity Schedule Studies with Students with Autism**

<i>Author(s)</i>	<i>Participants Age/Disability</i>	<i>Target Behavior(s)</i>	<i>Type of Schedule(s)</i>	<i>Mode of Presentation</i>	<i>Design(s)</i>	<i>Results</i>
Bryan & Gast (2000)	1. 8y, autism 2. 8y, autism 3. 7y, autism 4. 8y, autism	For all participants: increase on-task and on-schedule behavior	line drawings	one picture per page in photo album	ABAB withdrawal design	For all participants: increased independent on-task and on-schedule behavior
Dauphin et al. (2004)	1. 3y, autism	increase sociodramatic play, on-schedule behavior	computer/video, photographic	computer with embedded video clips, notebook	matrix training	learned social scripts, increased on-schedule behavior
Dettmer et al. (2000)	1. 7y, autism 2. 5y, autism	For all participants: decrease transition time	line drawings	Velcro strips, photo album, note cards	ABCB reversal design	decreased latency time, decreased physical removals
Dooley et al. (2001)	1. 3y, autism	decrease tantrum behavior	line drawings	PECS-based schedule board	A-BC-B	decreased problem behavior
Hall et al. (1995)	1. 7y, autism	decrease transition time	photographs	photo album, 1 photo per page	multiple baseline	increased independent transitions
Krantz et al. (1993)	1. 8y, autism 2. 6y, autism 3. 7y, autism	For all participants: increase social initiation, decrease disruptive behavior	photographs	three ring binders with one photograph per page	multiple baseline across participants	For all participants: increased social engagement, decreased disruption
Krantz & McClannahan (1998)	1. 5y, autism 2. 4y, autism 3. 4y, autism	For all participants: increase participation in social exchanges	photographs paired with textual cues	notebook with one photo per page	multiple baseline across participants	For all participants: increased social engagement
MacDuff et al. (1993)	1. 9y, autism 2. 9y, autism 3. 11y, autism 4. 14y, autism	For all participants: increase on-task and on-schedule behavior	photographs	three ring binder with one photograph per page	multiple baseline across participants	For all participants: increased engagement, independent transitions
Massey & Wheeler (2000)	1. 4y, autism	increase on-task behavior, decrease problem transitions	photographs	photo placed on a folder	multiple baseline across activities	increased task engagement, transitions easier

**TABLE 1—(Continued)**

<i>Author(s)</i>	<i>Participants Age/Disability</i>	<i>Target Behavior(s)</i>	<i>Type of Schedule(s)</i>	<i>Mode of Presentation</i>	<i>Design(s)</i>	<i>Results</i>
Morrison et al. (2002)	1. 4y, autism 2. 5y, autism 3. 3y, autism 4. 6y, autism	For all participants: develop independent play skills	photographs	clipboard with Velcro, photos in envelope on back	multiple baseline across participants	For all participants: on-task and on-schedule play behavior increased
Pierce et al. (1994)	1. 8y, autism 2. 9y, autism 3. 6y, autism	For all participants: develop independent daily living skills	photographs	photo book with one photo per page	multiple baseline probe design across behaviors	For all participants: increase in on-task daily living skills
Schmit et al. (2000)	1. 6y, autism	decrease tantrums during transitions	photographs	photo presented in front of face	multiple baseline across settings	reduced tantrums, increased transitions
Watanabe et al. (2003)	1. 22y, autism 2. 40y, autism 3. 30y, autism	For all participants: increase independence during work routines	text schedule sheet	Schedule sheet with list of nine activities	multiple baseline across participants	For all participants: significant increase in time on task

ule studies conducted with persons with autism.

**Results**

*Demographic Characteristics*

*Participants.* A total of 28 children and three adults participated in the 13 studies. All children were 14 or younger, and 25 were boys and three were girls. The three adult participants were all men from the age of 22 to 40. Ages of all participants ranged from three years to 40 years, with an average age of 8.8 years. The average age for the children alone was 6.53 years. The median age of all participants was seven years. All of the participants had been diagnosed with autism.

*Setting and trainers.* The majority of the studies (7 of 13) were conducted in a classroom setting by psychologists, teachers, and/or graduate assistants. Four of seven studies took place in the general education classroom while three other studies were conducted in self-contained classrooms. Four of

the 13 studies were conducted in the home setting (Dauphin, Kinney, & Stromer, 2004; Dettmer, Simpson, Myles, & Ganz, 2000; Krantz et al., 1993; Pierce & Schreibman, 1994). One of the three home-based studies also included a participant who engaged in community outings as part of the study (Dettmer et al.), and another study included two participants trained at home and one in a clinical setting (Pierce & Schreibman). One of the studies was conducted in a group home setting (MacDuff et al., 1993). The study with adult participants took place in their adult services program building (Watanabe & Sturme, 2003).

*Target behaviors.* Researchers in a majority of the studies enhanced social behaviors in the participants through the use of some form of activity schedule (i.e., photographic, line drawings, video models, computer, text). Researchers in three studies specifically targeted increasing social exchanges and initiations (Dauphin et al., 2004; Krantz & McClannahan, 1998; Krantz et al., 1993). Researchers in two studies focused on decreasing tantrum

behaviors such as hitting, kicking, biting, crying, and screaming in the participant (Dooley, Wilczenski, & Tores, 2001; Schmit, Alper, Raschke, & Ryndak, 2000). Also, researchers in four additional studies targeted problem behaviors during transitions while attempting to increase on-task and on-schedule behavior between activities (Bryan & Gast, 2000; Dettmer et al., 2000; MacDuff et al., 1993; Massey & Wheeler, 2000). Researchers in one study utilized photographs to teach independent daily living skills to three young children with autism (Pierce & Schreibman, 1994), while another study focused on increasing independent play skills (Morrison, Sainato, Benchaaban, & Endo, 2002). Similarly, the remaining two studies both focused on enhancing participation and independence within daily activities, one within the work and writing routines of adults with autism (Watanabe & Sturme, 2003), while the other study targeted decreased time for a young boy with autism to transition from a group activity to working independently (Hall et al., 1995).

#### *Effectiveness of Activity Schedules*

The activity schedules utilized by the researchers were shown to be effective interventions with all 31 individuals with autism. The current review indicated that the activity schedules utilized by the researchers increased various behaviors in a number of skill areas. These behaviors included enhancing social interactions, transitions, and on-task behaviors, and decreasing disruptive behaviors.

Researchers targeting social interactions focused on increasing social exchanges and social initiation in their study participants (Dauphin et al., 2004; Krantz et al., 1993; Krantz & McClannahan, 1998). For example, Dauphin et al. utilized a combination of matrix training and video clips on computer to effectively teach sociodramatic play to the single participant in their study. Results indicated that the child learned new play activities following the introduction of a computer generated activity schedule into his daily routines. The other two studies addressing social interaction skills used photographs as the primary symbol system within the activity schedules. Krantz et al. utilized three-ring binders with one photograph to a page to increase participation in

social exchanges in all three of the children with autism participating in the study. Results revealed that the introduction of activity schedules not only increased social engagement and initiation in the participants, but also decreased disruptive behaviors. These researchers used the same mode of presentation to increase social initiation in three children with autism five years later (Krantz & McClannahan); employing a script-fading procedure, the researchers were again showed an increase in social exchanges.

Researchers in several studies focused on interventions addressing transitions, particularly on-schedule and on-task behaviors and decreasing tantrums (Bryan & Gast, 2000; Dettmer et al., 2000; Dooley et al., 2001; Schmitt et al., 2000; Massey & Wheeler, 2000). For instance, Bryan and Gast enhanced on-task behaviors in four children with autism by utilizing a photo album with one line drawing per page when transitioning between activities in the classroom. These researchers reported that all of the participants not only were able to learn to use an activity schedule quickly but also were able to use the activity schedule independently to stay on-task in the classroom. In a similar study, Dettmer et al. also employed line drawings in both a photo album and on a sequence strip to ease transitions and to decrease transition time in two young children with autism, both at home and in the community. Results indicated a decrease in transition time in both of the participants, and one participant also began to initiate verbal communication by commenting on the activities displayed on his schedule. One study (Dooley et al., 2001) used the Picture Exchange Communication System (PECS; Bondy & Frost, 1993) and a schedule board with a single participant to decrease tantrum behavior during transitions. Results indicated a decrease in tantrum behaviors along with a corresponding increase in compliance. In another study, Schmit et al. also targeted tantrum behaviors during transitions using photos with a child, with results showing a decrease in tantrum behavior in three separate transition settings. Massey and Wheeler used a simplified activity schedule with a single photograph placed on a folder to increase on-task behavior and decrease problems during transitions (e.g., noncompliance, tan-

trums, aggression) in a four-year-old child with autism.

Self-determination for the participants was an important element in many of the studies, and researchers in four studies targeted independence as a central goal of their research (Hall et al., 1995; MacDuff et al., 1993; Morrison et al., 2002; Pierce et al., 1995; Watanabe & Sturmey, 2003). Hall et al. used a photo album with one photo per page to increase participation and independence in a 7-year-old boy with autism during transitions from group work to independent writing; the participant's dependence on adult prompts also decreased during the study. MacDuff et al. also utilized one photograph per page in a three-ring binder to both decrease dependence on prompting and to decrease disruptive behaviors in a number of recreational and daily living tasks for four children with autism living in a group home. In this study, stimulus control was transferred from adult verbal prompts to the photographs incorporated in the activity schedule. In another study, Morrison et al. used photographs and a clipboard to successfully develop independent play skills in the four children participating in the study. A similar study by Pierce et al. used a photo album with a photo to a page to teach morning daily living skills (e.g., getting dressed, setting the table, making lunch) to three adolescents with autism. The single study with adult participants with high functioning autism also focused on increasing independence using a text based schedule sheet during daily vocational training activities (Watanabe & Sturmey). Results showed increased on-task participation in hygiene checks, job searches, and letter writing in all three participants.

### *Components of Activity Schedules*

Activity schedules have several shared components: the use of visuals, modes of presentation, and training strategies. Visual supports including photographs were by far the most common element, and nine of the 13 studies utilized photographs in their activity schedule interventions. These nine studies included 20 participants. This use of photography proved to be an effective strategy, with nine of the participants in these studies showing a marked improvement in the targeted behavior. The

other 11 participants using photographic activity schedules also showed a moderate improvement. The remaining four studies used alternate forms of visual supports (Bryan & Gast, 2000; Dettmer et al., 2000; Dooley et al., 2001; Watanabe & Sturmey, 2003). While only two studies utilized line drawings as the picture symbol within activity schedules, the total six participants in these studies showed marked improvement in the targeted behavior (Bryan & Gast; Dettmer et al.). The one study that used PECS for its activity schedule only showed moderate improvement in the single participant (Dooley et al.). In contrast, Watanabe and Sturmey were the only investigators who used text without any picture support to increase task participation in three adults with autism.

The mode of presentation for each activity schedule was particularly significant, with seven of the 13 studies utilizing some form of folder or picture album with one symbol mounted in the center of each page (e.g., Bryan & Gast, 2000; Dettmer et al., 2000; Hall et al., 1995; Krantz et al., 1993). Within these seven studies, 15 participants showed a marked improvement in the targeted behaviors during the activity schedule intervention phase, while six additional participants improving to a lesser degree. A close comparison to the other studies included in the analysis further indicated that one picture per page folder system as the most effective schedule format for individuals with autism.

### *Generalization*

Researchers in six of 13 studies reported generalization of activity schedule skills across settings (Dettmer et al., 2000; Dooley et al., 2001; Krantz & McClannahan, 1998; Krantz et al., 1993; MacDuff et al., 1993; Pierce & Schreibman, 1994). Dooley et al. reported their participant successfully generalized appropriate transition behaviors across activities for the remainder of the school year through the continued use of the activity schedule. Similarly, Krantz et al. reported that behavior changes resulting from the introduction of an activity schedule within daily routines were maintained for extended periods of up to 10 months in three participants with autism. Krantz and McClannahan also reported that

all the participants in their study were able to generalize their newly learned social initiations across trainers. Likewise, participants in MacDuff et al. were able to follow new unfamiliar activity schedules without any additional training. Pierce and Schreibman also reported generalization across settings and tasks with little additional training, with the participants learning new tasks at a faster rate once the initial training period was completed. On a more anecdotal note, the mother in one additional study (Dettmer et al.) reported utilizing activity schedules with her child across settings that resulted in a steady reduction of latency time between activities.

### *Social Validity*

Researchers in five of the 13 studies reported social validation of the intervention by teachers and parents (Bryan & Gast, 2000; Hall et al., 1995; Massey & Wheeler, 2000; Morrison et al., 2002; Schmit et al., 2000). Bryan and Gast utilized a Likert scale to collect the opinions of the teachers and other professionals who worked with the participants and found that all respondents felt that picture symbols would be a useful management tool for all children in increasing on-task and on-schedule behavior. Hall et al. administered a post-study questionnaire to the teachers, teachers' aides, and integration coordinator involved in the study and all surveyed expressed satisfaction with the program and felt it was a valuable tool for increasing independent transitions in the participant. Likewise, Massey and Wheeler developed and administered a social validity scale to the teachers, mothers and behavior consultant of the participants, and found a similar satisfaction with the intervention, concluding that it was an effective and beneficial intervention for decreasing problem transitions in the participant. Similarly, Morrison et al. employed a checklist with three early intervention teachers to determine the social validity of the study, and all three teachers reported that the intervention seemed effective in improving play behavior of preschoolers with autism. The parents of the participants in this study also reported important positive behavior changes in their children following the study. Finally, Schmit et al. utilized both social comparison and subjective

evaluation to assess for social validity, concluding that reducing tantrum behavior meant meaningful growth for their participant.

### **Discussion**

Of the 13 studies reviewed, all revealed significant benefits to utilizing activity schedules in the instruction of individuals with autism. Researchers in the majority of the studies focused on teaching new social and on-task behaviors and transition skills. Also, researchers in some studies successfully decreased tantrum behaviors in children with autism during transitions. Investigators in less than half of the studies reviewed have examined generalization and social validity indicating that further research in these areas is necessary to support the wide use and benefits of activity schedules for persons with autism.

Results shown in these studies strongly suggest that the use of activity schedules with persons with autism can lead to an increase in several behaviors. There may be several explanations for the improvement seen in the participants. Activity schedules may have provided a predictable pattern of expected behaviors (Bryan & Gast, 2000; Schreibman et al., 2000) in the form of task analysis (e.g., breaking skills into small components for each of the participants). Research supports the assumption that persons with autism and other developmental disabilities (e.g., mental retardation) respond better when behaviors are predictable and presented sequentially in a step-by-step manner (e.g., Heflin & Simpson, 1998; Quill, 1995; Simpson, 2005). Also, each picture in the activity schedule may have served as a discriminative stimulus ( $S^D$ ) or cue for initiating the next behavior in the schedule/activity. Furthermore, it is also highly probable that the activity schedules served as visual prompts for the participants leading to a completion of the target behavior(s). In general, visual prompts are helpful for all persons, with and without disabilities. For example, traffic or road signs and visual directions are helpful for all of us. Specifically, the research on the use of concrete visual supports/prompts for persons with autism indicates that they respond better when activities are presented through visual prompts or pictures

(Quill, 1995). Furthermore, the majority of the investigators in these studies used some form of teaching through modeling and/or prompting. It is unknown whether activity schedules alone in the absence of supplementary instruction or prompts are helpful in acquiring necessary behaviors. Future research should explore the role of instruction when using activity schedules to teach various behaviors to persons with autism. Some progress towards the targeted behavior was made by every participant in each of the studies. However, due to the wide variance in picture types (e.g., photographs, line drawings, PECS) used in these studies, conclusions cannot be drawn as to the comparative effectiveness of the different types of pictures. Thus, future research should also investigate the effects of different picture types (e.g., line drawings vs. photographs) and sizes. In addition, the mode of presentation seems to be a critical component of activity schedules. For instance, using a binder or folder with one page per picture seems to be more useful for students with autism in these studies. It is possible that one picture per page may have provided a better visual clarity and specificity for some participants. It is unclear from this review whether one mode of presentation is superior over the other mode(s) because no comparative research in this area has been conducted. Future research is warranted to study the effects of different presentations on a variety of behaviors in students with autism.

Finally, results of generalization indicate that the effects of activity schedules can be generalized to other settings, activities, and persons. The participants may have been successful generalizing behaviors due to programming common stimuli - use of similar pictures in the activity schedules that are presented in the child's natural environment (Cooper, Heron, & Heward, 2007). Also, the participants may have generalized behaviors learned through activity schedules due to natural reinforcement contingencies or through varied reinforcement schedules. Although generalization results are promising, only less than half of the studies reported data on generalization, indicating that more research is necessary in this area. Specifically, future research should be focused on generalization effects of activity schedules to new behaviors.

### *Implications for Practice*

Several implications could be drawn for practitioners from this review. First, activity schedules are easy to develop and can be used with different routines and in different settings (e.g., school, home, work, and play) for persons with autism. Furthermore, this method could be used by educators to teach any activity that can be broken into sequential steps, from educational games to cooking activities. This review also suggests that each step of the activity or skill would simply have to be represented by some form of picture symbol representing that step, and a manner of display (e.g., folder, wall, computer, and desk). In addition, it is evident from these studies that practitioners need to teach the student with autism to use or follow the activity schedule with a range of prompts based on the student's needs. Without explicit teaching and use of prompts, activity schedules alone may not be sufficient to improve behaviors.

In summary, the reviewed studies support the use of activity schedules as an effective intervention strategy for modifying various social, daily living, on-task, and transition behaviors in persons with autism. Also, the review indicates that the use of activity schedules may decrease problem behaviors during transitions. More studies are needed to further assess the effectiveness of activity schedule systems in persons with other types of autism spectrum disorders, particularly those diagnosed with Asperger's syndrome. Future research with activity schedules should identify the most effective components of the technique, including types of pictures, displays, and size. Finally, future research should continue to investigate the effects of activity schedules on generalization and social validity.

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