Using Picture Activity Schedule Books to Increase On-Schedule and On-Task Behaviors

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Abstract: The purpose of this study was to evaluate the effectiveness of using picture activity schedule books to increase on-schedule and on-task behaviors of children with moderate intellectual disabilities. Four students enrolled in a self-contained classroom participated in the study. Graduated guidance, system of least prompts, and verbal prompting were used to teach students how to use the picture schedules. Percentage of on-schedule steps completed and percentage of intervals on-task were evaluated within the context of an A-BC-B-A-B withdrawal design. Stimulus generalization was assessed with novel activities in a different location and at different times during the academic day. Results showed increases in on-schedule and on-task behavior only when using the picture activity schedules. Students’ on-schedule and on-task behavior generalized to novel activities, settings, and times when using the picture activity schedule books.

While independent functioning is the ultimate goal for the education of students with intellectual disabilities, one cannot ethically ignore that some students will not learn to independently perform certain activities, routines, or skills. It is more beneficial for students with intellectual disabilities to live, function, and participate in the community with support and/or adaptations rather than depending on someone else for total assistance (Wolery, Ault, & Doyle, 1992). Frequently, students with intellectual disabilities have difficulty managing their behaviors independently without the use of external controls (Mechling & Gast, 1997). If educators can provide these students with effective supports, students may decrease their reliance on caregivers and, thus, live more autonomous lives.

In school situations, students frequently move through class periods following some sort of schedule or routine with changes or progression signaled by a teacher or a school bell. Considering this structure, if students do not independently progress from one activity to the next, not only will they have to rely on peers or teachers to assist them, but they may also miss instructional time and opportunities to engage socially with peers. Picture based activity schedules are one way to increase the independence of these students. Further, picture based schedules are not too distant a departure from more traditional supports used by many people without disabilities (e.g., day planners, personal digital assistants).

Visual prompts could take several forms from concrete realistic photographs to cartoons and line drawings. Researchers have used visual prompts presented in forms of line drawings or pictures to teach vocational task completion (Lancioni, O’Reilly, Seedhouse, Furniss, & Cuhuna, 2000), sight word reading (Rivera, Koorland, & Fueyo, 2002), initiating conversation (Spohn, Timko, & Sainato, 1999), and on-task behavior (Bryan & Gast, 2000; MacDuff, Krantz, & McClannahan, 1993). Using photographs, researchers have taught daily living skills (Mechling & Gast, 1997), shopping for groceries (Morse & Schuster, 2000), independent performance of vocational tasks (Copeland & Hughes, 2000), participation in family activities (Krantz, MacDuff, & McClannahan, 1993), task engagement (Hall, McClannahan, & Krantz, 1995; Massey & Wheeler, 2000), task engagement, and activity completion (Bevill, Gast, Maguire, & Vail, 2001). The current study attempts to

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build on the earlier foundations established by the research related to on-task behavior and activity engagement.

Massey and Wheeler (2000) used a combination of a system of least prompts and graduated guidance to teach a four year-old child with autism to use a photographic activity schedule to remain on-task. Once the student attained a targeted level of task engagement, the researchers introduced the photographic schedule during another activity. The student maintained high levels of task engagement once the photographic activity schedules were introduced and his aberrant behaviors decreased. Copeland and Hughes (2000) also evaluated a photographic picture prompt intervention. They used the photographic prompts to improve the task initiation and task completion of two high school aged students with intellectual disabilities who were working on vocational tasks. Students were to look at individual photos in a photo album prior to initiating a task. After they finished the task, they were taught to turn the page of the album to look at the next photo. They learned to use the photo album and improved their task initiation and completion.

Bryan and Gast (2000) expanded on this literature. They examined the use of graduated guidance and picture activity schedules to increase on-task and on-schedule behavior of elementary aged students with autism. Students used photo albums containing line drawings of classroom activities. They were taught to follow the sequence of pictures in the album. All students improved on-schedule and on-task behavior and generalized this to novel activities. The current study was an attempt to further extend the knowledge of picture activity schedules by integrating them into picture activity schedule (PAS) books for middle school aged students with intellectual disabilities. Although there is research showing their effectiveness with other populations, no studies have evaluated the use of picture activity schedules with this population of children. If effective, the findings may encourage use by teachers in middle and high school settings as a means for addressing student’s independence across the school day.

As a systematic replication, the current study differs from Bryan and Gast (2000) in the following ways: (a) ages, functioning levels, and diagnosis of participants; (b) investigator; (c) setting of the study; (d) form of the picture prompts; (e) methods used to teach the use of the picture schedules; and (f) activities completed during the centers. The studies were similar in regards to the dependent variables. The purpose of the current study was to answer the following questions: (a) Will children with moderate intellectual disabilities increase their on-schedule behaviors when using the picture schedules?; (b) Will on-schedule behaviors increase the percentage of time on-task for middle school students with moderate intellectual disabilities?; (c) Will students with moderate intellectual disabilities generalize on-schedule and on-task behaviors using PAS books to novel settings and times of day?

Method

Participants

Four students with moderate intellectual disabilities, ranging in age from 12 years 7 months to 13 years 8 months, participated in this study. All participants received the majority of their special education services in a self-contained classroom and participated independently in a general education homeroom. They received adaptive P. E. and speech/language services on a weekly basis.

Individual students were chosen for this study based on their inability to transition on-schedule independently within the self-contained classroom and their high rates of off-task behavior. All four students demonstrated the ability to identify pictures depicting centers around the room. This was assessed prior to the study by showing each student a picture and having her state what the picture was showing. All four students correctly identified all eight pictures. All students could also perform all the tasks required at each center. All students had limited experience with visual activity schedules at the onset of the study. None of the students previously had formal instruction using graduated guidance or system of least prompts. Table 1 displays psychometric assessment data for each student to supplement the behavioral descriptions below.

Mary was 13 years 0 months old and was in
the eighth grade. She was diagnosed with Attention Deficit Hyperactivity Disorder and took Ativan once a day during the duration of the study. Academically, Mary had a relative strength in sight word reading and reading comprehension but struggled with math topics like money, addition, and time. Her social skills were less mature than other students in the class and she often drew attention to herself. She obsessed over routines in the classroom and worked best with a rigid schedule. Staff reported that Mary liked to know what was expected of her.

Cindy, a 13 year 2 month old female, was in the sixth grade. Cindy had strengths in several math skills and listening comprehension. She had difficulty reading sight words. She was a very social student who was eager to please. She made friends easily, and was very influential over her peers (this influence was not always positive). Cindy often lied to peers about her activities outside of school (drinking, smoking, being pregnant). She frequently complained about being sick and hurt even though there was nothing medically wrong.

Holly was 12 years 7 months old and was in the sixth grade. She had a medical diagnosis of Williams Syndrome and was not taking any medication during the study. Holly was a pleasant student with strengths in social skills. She was well liked by her peers and made friends easily. She would engage in overly dramatic behavior that occasionally disrupted the class. She was easily influenced by others, and, in a group, her feelings were hurt anytime she felt that she did not belong.

Jennifer was a seventh grader who was 13 years 5 months old. Jennifer was an affectionate student who had a strong desire to be accepted. On occasion, she had a tactile obsession with things like newspapers, books, construction paper, etc. She worked hard on school work but became easily frustrated. If she failed to complete a task or felt the teacher was disappointed, she would stop talking and sometimes cry.

<table>
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<td>Socialization: 80</td>
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Settings and Arrangements

The acquisition phase of the study took place in students’ self-contained classroom during a 45-minute block of time where students rotated through independent work activities. Generalization testing took place in the adjacent self-contained classroom, during a different block of time. The classrooms, measuring approximately 10 m x 10 m, were set up to include center-based instruction with tables, desks and chairs, computers and available floor space. Student desks were arranged in a “U” shape in the middle of the classroom facing the front of the room. Students had individual boxes located on a three-tier shelf in the front of the room. The computers were located on two computer tables in the front corner. Math and spelling centers were arranged on small tables near the back of the room, on opposite sides.

Work areas. Four work areas were set up around the classroom: (a) spelling center, (b) computer center, (c) math center, and (d) individual skill center. Each center was labeled with a sign hanging from the ceiling. The spelling center was made up of a round table with 4 chairs. The table was placed toward the back of the room so that it was easily accessible from every side. Materials for the center were located on the table and a large piece of construction paper in the middle of the table displayed the spelling words for the week. The computer center consisted of two IBM student computers located together near the front of the room. The math center was located at a rectangular table near the math manipulative shelf. Math materials for the day were available on the table. The individual skill center was located in the front of the room and consisted of a three-tier shelf with individual boxes labeled with students’ names. Each box contained individualized work for students. Most of this work was vocational in nature (sorting, counting, manipulating money, telling time, etc.). Each location was familiar to students and each center was used in every session. During generalization sessions, the center areas were set up in the same manner, spread around the room and labeled.

After the teacher gave initial instructions, one of the classroom paraprofessionals monitored students’ behaviors and answered questions from students regarding assigned tasks. The other classroom paraprofessional monitored all non-participants. The classroom teacher, trained in the data collection and behavior observation methods, sat in an unobtrusive corner of the room collecting data. The students independently moved around the room among centers.

Materials and Equipment

PAS books. Each student had a PAS book displayed in a 10 cm x 15 cm inch plastic photo album. Four black and white “Board Maker” pictures (5 cm x 5 cm) depicting center activities were inserted, one per page, into the transparent plastic pages in the order to be completed. The last page in the photo album had a card marked “finished” in it. The teacher placed the PAS books on each student’s desk prior to each session. The pictures used during generalization conditions had identical features, with different activities pictured. Students were familiar with all of the pictures.

Center areas and materials. Centers were arranged to accommodate daily activities. The teacher determined the content of the centers based on students’ current Individualized Education Plans (IEPs), present levels of performance, and classroom observations. Center-based materials and equipment reflected daily activities (i.e. math worksheets, manipulatives, computers and computer programs, books, etc.). Specific materials reflected skills that had been acquired by students but required maintenance. All materials used in center areas were materials found in and around the classroom or school library. Materials that students manipulated in the spelling center included, for example: Edmark Level 1 Basic Sight Words, blank printer paper, colored construction paper, and foam letter stamps. Some of the materials used at the computer center included: two Windows computers, Microsoft Word 2000, The Functional Literacy System software: Survival Signs and Words, and Attainment’s software: Dollars Cents Series. The math center materials contained a range of materials including: basic math facts worksheets, Aurora DT 342 calculators, Match Me: Telling Time cards, Money Coin-U-Lator,
Money Station: classroom money tray, and the Clock.O.Dial. Materials located in students’ individual boxes depended on the students’ needs. Some of the materials included: LDA Language Cards: Why? Because; Word Wise cards; and Real Life Reading cards. Materials used during generalization settings included: puzzles ranging from 25 pieces to 100 pieces, books on tape checked out from the school’s library, and teacher-made file folder games copied from *Day-By-Day Math Mats* (Rosenberg, 2002).

**Reinforcers.** The classroom used a token economy. Students earned the same tokens during the study that they earned during their routine school day. After completing a session, students received tokens based on the amount of work completed. Students exchanged tokens on Wednesdays and Fridays for back-up reinforcers that the teacher identified based on previous experience with these students and the token economy.

**Response Definitions and Recording Procedures**

The dependent variables and definitions were the same as those used by Bryan and Gast (2000, p. 556).

**On-Schedule.** Students performed the following task analyzed behaviors in chronological order: (a) remove the current picture activity card from their book; (b) move to the appropriate center; (c) begin work within 10 s; (d) put away center materials when finished with the activity; and (e) put the completed activity card into the “finished” sleeve in the schedule book. A nonoccurrence was recorded if a student failed to complete one of the specified steps within 10 s or made an error while trying into complete one of the steps.

**On-Task.** Students were considered on task if they (a) maintained visual attention to scheduled material; (b) properly manipulated the scheduled activity materials; (c) looked at their schedules; (d) transitioned from one scheduled activity to another; (e) placed a card in the “finished” sleeve in their book; or (f) put their materials away when they completed the activity. A nonoccurrence was recorded if students: (a) attended to non-scheduled activities; (b) used materials improperly; (c) manipulated materials but did not look at the materials; (d) engaged in inappropriate behaviors (e.g. aggression, tantrums, refusals); (e) put their materials away prior to completing the activity; or (f) did not engage in activities or using materials.

**Recording procedure.** An observer recorded occurrence/non-occurrence of on-schedule behavior during the 40 min activity sessions (see response definition above). A variable time sample recording system was used during activity sessions to record on-task behaviors. Intervals varied from 1 to 5 min. Percentages of on-schedule behaviors and time on-task were calculated for each child during each observational period.

Event recording was used to tally the number of adult delivered prompts necessary to maintain a student’s engagement in on-task and on-schedule behaviors during the 40-minute period. The observer recorded six prompt levels: (a) light touches; (b) orienting a student’s body toward material; (c) hand-over-hand physical assistance; (d) gestures; (e) modeling; and (f) verbal prompts. The number of teacher delivered prompts was totaled for each child at the end of each session. These responses were recorded across all conditions.

**General Procedure**

The study spanned five different phases (not including replication of phases): Generalization Pre-Test, No Book (NB), Schedule Instruction, Book Only (BO), and Generalization Post-Test. In each phase, observation sessions occurred daily during students’ scheduled center time (2:40 PM – 3:25 PM). Each session lasted approximately 40 min, with the first 5 min used for giving directions. One activity per center was pre-selected for each session based on students’ current IEP goals and objectives. The order of the selected activities was determined randomly across sessions and participants. All sessions began by the teacher having students return to their desks and then look up at her. The teacher then made the statement, “It is time to begin centers now”; followed by individual center instructions. After each 10 min center period, a timer sounded and the teacher stated, “It is time to change,” without designating where they were to go. This protocol was followed
across all conditions. The teacher and para-
professionals ignored student approaches and
inappropriate behaviors, except for aggressive
behaviors if they were to occur, throughout
the study. The teacher gave descriptive verbal
praise for appropriate behaviors at the end of
all sessions and gave students tokens based
upon their task completion. This routine was
used across all conditions.

Generalization Assessment Procedure
Generalization assessments took place prior to
the first NB or baseline phase and after the
last BO phase. The generalization assessments
were designed to evaluate stimulus generaliza-
tion across activities and times. Generalization
sessions were identical to the BO conditions.
The only variations from the BO phase were
that the PAS books included novel pictures
and the sessions occurred at different times
during the academic day (11:30 AM – 12:15
PM) in a different, but similar classroom. The
novel center activities used during this session
included: (a) puzzle center, (b) listening cen-
ter, (c) reading center, and (d) folders center.
The generalization phase continued for four
consecutive sessions.

No Book Baseline (NB) Procedure
The purpose of the NB phase was to assess
student performance of on-schedule and on-
task behaviors when not using the PAS books.
After the teacher announced that it was time
for centers and provided instructions for the
day’s centers, students transitioned independ-
ently among centers within the classroom.
Activity variation and sequence varied across
students and across days for each student by
picking activities from a box. Correct transi-
tions and on-task behavior were verbally
praised at the end of the 40 min. Tokens were
also given to reward completed work. Student
approaches and incorrect/inappropriate be-
havior were ignored. These baseline proce-
dures were implemented daily for four con-
secutive sessions.

Schedule Instruction Procedure
The purpose of the Schedule Instruction
phase was to teach students how to use their
PAS books to transition between centers
within the classroom. Centers were prepared
prior to the beginning of the session. Each
activity was randomly assigned (drawn from a
box) to a new position in the activity schedule
to avoid satiation and/or memorization of
routine. Graduated guidance was used during
the first session of Schedule Instruction. Fol-
lowing the delivery of instructions for the ac-
tivity center, the paraprofessional waited 10 s
for students to stand and move to their PAS
book. If a student did not stand within 10 s,
the paraprofessional put her hand on the stu-
dent’s shoulder and guided her to her PAS
book. A graduated guidance technique, where
moment-to-moment decisions were made as
to what prompt level a student needed, was
used to help students complete the sequence
of activities in their picture schedules. To de-
crease prompt dependence and avoid provid-
ing reinforcement through adult attention,
physical prompts were given from behind.

Following the same routine sequence to be-
gin centers, a system of least prompts was used
during the second session of Schedule Instruc-
tion. After the specific activity instructions
were given, the paraprofessional waited 10 s
for students to locate and remove the first
picture in their schedules. If a student did not
open their picture schedule within 10 s, the
paraprofessional would gesture toward the
student’s PAS book. The paraprofessional
would then wait 10 s to allow the student to
locate and remove the picture from the book.
The paraprofessional would continue through
the prompt hierarchy until the student lo-
cated and removed the first picture in their
activity schedule. Prompts that were available
during this session included: (a) gesture, (b)
model, (c) direct verbal, (d) orienting student
toward the material, (e) light touches, and (f)
hand-over-hand physical assistance. This sys-
tem of least prompts procedure was used to
guide the students through each step in the
task analysis, giving each student 10 s to initi-
ate each step, beginning with gestures and
increasing a level until the step was com-
pleted. After using system of least prompts
during the second session, all prompts except
verbal were removed. The sessions continued
in the same manner, with verbal prompts serv-
ing as the controlling prompt.

Throughout Schedule Instruction, students
were observed for the 40 min duration scheduled for centers. A timer signaled the end of a 10 min period along with the teacher statement, “It is time to change.” Appropriate on-schedule and on-task behaviors were verbally praised at the end of the 40 min session. Incorrect and/or inappropriate behaviors were ignored. Schedule Instruction continued until students consistently performed on-task and on-schedule behaviors independently for at least three days at 90% or above.

Book Only (BO) Procedure
The purpose of this condition was to evaluate the effects of using the PAS book to increase independence when transitioning between centers within the self-contained classroom. The picture schedules served as the only prompt during this condition (i.e. no prompting from the paraprofessional as in the Schedule Instruction procedures). The teacher initiated center time in the same way as in other conditions. Sessions lasted 40 min with a timer sounding after each 10 min period and the teacher stating, “It is time to change.” The classroom paraprofessional was available to answer questions regarding assigned work. The teacher provided descriptive verbal praise at the end of the session for on-schedule and on-task behaviors. Incorrect and/or inappropriate behaviors were ignored. These conditions continued until 90% or better on-schedule and on-task behaviors were observed for at least three consecutive days.

Experimental Design
A single-subject A-BC-A-B withdrawal design (Tawney & Gast, 1984) was used to evaluate the effectiveness of picture schedules in keeping students on-schedule and on-task during independent centers. The withdrawal design evaluates experimental control by replicating effects through the repeated introduction and withdrawal of the independent variable (Book Only) with a single participant. If the data trends during intervention conditions (B₁ and B₂) increased and decreased under baseline conditions (A₁ and A₂) a functional relationship would be demonstrated between the independent and dependent variables. The conditions in this study occurred in the same order as Bryan and Gast (2000): (a) Generalization Assessment Pre-Test, (b) NB (Baseline), (c) Schedule Instruction to teach picture-activity schedule use, (d) BO (Intervention), (e) NB, (f) BO, and (g) Generalization Assessment Post-Test. This design allowed the evaluation of history and maturation threats to internal validity. If there were no history or maturation effects during the study, student performance would return to baseline (A₁) levels during the second baseline (A₂). External validity was demonstrated to the extent to which these participants differed from one another and from participants in previous studies, and the independent variable was effective across participants.

Reliability
Inter-observer agreement data on student’s behaviors were independently collected by a classroom paraprofessional previously trained on data collection procedures. Specific behavioral definitions and responses, direct observational recording, and specific condition requirements were reviewed prior to each condition with the investigator. Reliability data were collected during 24.3% of all sessions, with at least one observation per condition. Inter-observer agreement estimates were calculated by using the point-by-point method in which the number of agreements were divided by the number of agreements plus disagreements and then multiplied by 100. At least 90% agreement was required in each condition to continue the study without retraining.

Procedural reliability data on teacher behaviors were collected by a paraprofessional previously trained in condition procedures. Procedural reliability checks were made during 21.6% of all sessions, with at least one observation per condition. Procedural reliability estimates were calculated by dividing the number of behaviors emitted by the number of planned teacher behaviors and multiplying by 100 (Billingsley, White, & Munson, 1980). Teacher behaviors that were monitored included: (a) having students come to their seats; (b) gaining students’ attention; (c) providing the instructional cue; (d) providing instructions on each center to be completed; (e) prompting students through each step, if
necessary; (f) setting the timer for 10-minutes so the students knew when to change centers; (g) only providing reinforcement at the end of the 40 minute session; and (h) providing tokens at the end of the session. During each observation, the reliability observer recorded occurrences or non-occurrences of teacher behaviors listed on the procedural plan. The percentage agreement was reported for each teacher behavior listed. At least 90% agreement was required to continue the study without retraining.

**Social Validity**

Social validity data were collected using a survey with a Likert scale. Professionals who worked directly with participants provided feedback on the use of the PAS books. These professionals included a self-contained teacher, self-contained paraprofessionals, Speech and Language Pathologist, Occupational Therapist, and the students’ general education teachers. Each of these individuals had observed a NB and a BO condition prior to completing the survey. Data were collected after the last Generalization Post-test session. Mean scores on the questions are reported along with anecdotal comments.

**Results**

**Reliability**

Mean inter-observer agreement for on-schedule behaviors across all participants and conditions was 99%. Mean agreement for on-task behaviors across all students and conditions was 98%. Mean procedural reliability was 99.85% during all phases, i.e. one procedural error was observed during one session during the duration of the study.

**Effectiveness of Procedures**

**On-Schedule data.** Graphic displays of the percentages of steps completed on-schedule for each participant appear in Figures 1 – 4 (open squares). Direct intra-subject and inter-subject replications were obtained. The withdrawal design allows demonstration of experimental control by the replication of effects via repeated introduction and withdrawal of the PAS book. Student on-task behavior increased during BO phases ($B_1$ and $B_2$), and was low or decreased during NB phases ($A_1$ and $A_2$). There was 0% overlap between BO and NB phase data for all participants.

Mary’s on-schedule data depicted in Figure 1 shows her performance at low levels of on-schedule behavior during both the first NB (baseline) and second NB (return to baseline) phases. Mean performance during both NB phases was 1.25%, with a range from 0% to 5%. After introduction of Schedule Instruction (BC) and the BO Condition, Mary’s data showed an immediate change in level with an accelerating trend that stabilized at or above 90% during four consecutive sessions. Her on schedule performance during the seven sessions of Schedule Instruction was 82.14%, ranging from 40% to 100%. Mary maintained high levels of on-schedule behaviors during both BO phases, with means of 96.25% (range 90% to 100%) during the first BO condition and 98.75% (range 95% to 100%) during the second BO phase.

Figure 2 shows Cindy’s on-schedule data. During the first NB phase, Cindy showed variable performance ranging from 0% to 30% with a mean percentage of 8.75%. Upon introduction of Schedule Instruction, there was an immediate change in level to 85% with an accelerating trend stabilizing at 100% for three consecutive sessions. The mean percentage of steps completed during the five sessions of the Schedule Instruction phase was 96% (range 85 to 100%). Cindy maintained her mean percentage of steps completed at 98.75% (range 95% to 100%) during the first BO phase over four consecutive sessions. Re-introduction of NB resulted in an immediate change in level with the mean percentage of steps completed correctly at 8.75% (range 0% to 20%). Upon reintroduction of BO, Cindy’s on-schedule mean rose to and maintained at 100%.

Holly’s on-schedule data are illustrated in Figure 3. Her mean percentage of on-schedule behavior during the first NB phase was 0%. Upon introduction of Schedule Instruction, there was an immediate change in level to 65%. During this 12-session condition, Holly’s data ranged from 65% to 100% with a variable accelerating trend that eventually stabilized above 90% for four consecutive ses-
During the first BO phase, Holly’s level of on-schedule behavior maintained at or above 90%, with a mean of 96.25%. Upon returning to the NB condition, the mean percentage of steps completed correctly dropped to 1.25% (range 0% to 5%) over four continuous sessions. When the BO phase was reinstated, the mean level of steps completed correctly on-schedule returned to 94%, ranging from 85% to 100% over five consecutive sessions.

Jennifer’s on-schedule data are presented in Figure 4. The mean percentage of steps Jennifer completed correctly on-schedule during the first NB condition was 3.75% (range 0% to 10%) over four consecutive sessions. During Schedule Instruction an immediate change in level occurred with a variable accelerating trend that stabilized above 90% over four consecutive sessions. During the 10 sessions in this condition, the data ranged from 40% to 100%, with a mean of 86%. During the first BO condition, Jennifer’s data maintained at or above 90% for five consecutive sessions, ranging from 90% to 100%. Upon return to baseline, the level dropped and stabilized at 0% over four consecutive sessions. When Jennifer returned to the BO condition, an increase in level to 80% occurred with an accelerating trend that stabilized over 90% for four consecutive sessions. The mean percentage of steps completed correctly during the five sessions in the second BO condition was 93%. There was 0% overlap between the baseline and intervention conditions.

On-Task data. Graphic displays of the percentage of intervals on-task with scheduled materials also appear in Figures 1-4 (closed diamonds). Replication of effects is evidenced through the A-BC-B-A-B design. Data trends during BO conditions (B1 and B2) increased and then decreased under NB (A1 and A2), for all students. Mary (Figure 1) performed at low levels during both NB conditions with means of 1.25% and 4% intervals on task (range 0% to 16%), respectively. Upon introduction of Schedule Instruction (BC), Mary’s performance increased and the trend accelerated until stabilizing at 94% over three consecutive sessions. Her mean percentage of on
task intervals with scheduled materials was 75.28% with a range from 31% to 94%. During the first BO condition, Mary’s on-task behavior remained at or above 94%, with a mean of 97.25% (range 94% to 100%). The second BO condition generated a mean of 98.5% over five sessions, ranging from 94% to 100%.

Cindy (Figure 2) also exhibited low levels of on-task behavior during NB phases with a mean percent intervals on-task of 14% during the first NB phase (range 0% to 31%); during the second NB phase, her mean percent intervals on-task was 20% (range 0% to 53%). When Schedule Instruction was introduced, Cindy’s percentage of intervals on-task rose to 100% and stabilized between 94% and 100% over five consecutive sessions, with a mean of 97%. During the first BO phase, Cindy’s percentage of intervals on-task remained high, with a mean of 98.5% (range 94% to 100%). Similar high levels of performance were recorded during the second BO phase, when Cindy maintained 100% intervals on-task over four sessions.

Holly’s (Figure 3) percentage of intervals on-task maintained at 0% during the first NB phase. Under Schedule Instruction, her on-task behavior immediately increased and stabilized at or above 94% for four consecutive sessions. Her mean percent intervals on-task during this condition was 86.25% (range 59% to 100%). During the first BO phase, Holly showed high levels of on-task behavior with a mean of 98.5% (range 94% to 100%). During the second NB phase, she returned to 0% intervals on-task. Her mean percent intervals on- in the second NB phase was 2.75% (range 0% to 11%). Her level immediately increased to 76% under the second BO phase, where the trend accelerated and stabilized at or above 93%. Holly’s mean percentage of inter-
vals on-task during the second BO condition was 91.4% (range 76% to 100%).

Jennifer’s (Figure 4) on-task data replicate Holly’s data, with decreases in performance during NB phases and increases in performance during the BO phases. During the first and second NB conditions, Jennifer was on-task of 8% (range 0% to 19%) and 0% of intervals, respectively. Introduction of the Schedule Instruction resulted in an immediate increase in level that stabilized at or above 90%. Her mean percent intervals on-task during this phase was 88.1% (range 53% to 100%). During the first BO phase, Jennifer’s on-task behavior remained high, with a mean of 95.4% (range 88% to 100%). The second BO condition yielded similar results, with a mean percent intervals on-task at 92.8% (range 82% to 100%).

In summary, the effectiveness of using the PAS books to increase on-schedule and on-task behaviors was replicated across all four students. Along with inter-subject replication, intra-subject replication was demonstrated with both dependent variables. Clear distinctions are evident between the NB and BO phase. There was 0% overlap between the NB and BO conditions for all four students for both dependent variables.

Generalization Data

During the Generalization Pre-test condition, the mean steps completed correctly on-schedule was 7.8% for all students with a range of 2.5% to 13.75% (see Figures 1-4). During the Generalization Post-test condition, the mean steps completed correctly on-schedule was 96.25%, with a range from 95% to 98.75%. Student performance of on-task behavior yielded similar results. The mean percent of intervals on-task during the Generalization Pre-test condition was 14.3%, ranging from 3.25% to 18.75% across the four students. During the Generalization Post-test condition, the mean percentage of intervals on-task was 96.875% with a range from 95.25% to 98.5%. In summary, inter-subject replication was
demonstrated across participants showing that the effects of using PAS books generalized to novel settings and activity schedules, and that the use of PAS books was not restricted to the activities scheduled during training.

Social Validity

Table 2 presents the mean score for each question, for each participant. Questions were scored using a Likert scale format ranging from 1 (strongly disagree) to 5 (strongly agree). The first question indicated a mixed response from raters that the students really learned academic skills using the picture schedules (mean = 3.47). All raters strongly agreed that students became more independent while using the picture schedules (mean = 5). Most raters agreed that implementing a picture activity schedule in their own classrooms would be feasible (mean = 4.3) and that all children could use these schedules (mean = 4.4). All raters strongly agreed that picture schedules were a useful management tools (mean = 5) and that participants in the study seemed to accomplish more during center-time when they were using the picture schedules, as opposed to when they were not using them (mean = 5). The raters agreed that the picture schedules were responsible for student learning (mean = 4.07). Most raters also agreed that their opinions changed once they observed the participants using the PAS books (mean 4.42).

Discussion

The purpose of this study was to evaluate the effects of using picture activity schedule books on student on-schedule and on-task behaviors. In replicating Bryan and Gast (2000), which was a systematic replication of MacDuff et al. (1993), the current study expands the research on picture activity schedules to middle school students with moderate intellectual disabilities. Although the population in the current study was different from previous studies, the current results were similar in six ways: (a)
students quickly learned the mechanics of the picture schedules; (b) teacher prompting was easily faded; (c) students maintained high levels of independent on-schedule and on-task behaviors with the picture schedule; (d) increase in on-task behavior with appropriate scheduled materials correlated with a decrease in non-scheduled behaviors; (e) sessions to criterion were low; and (f) students generalized the use of the picture schedules to novel activities, settings, and times of day.

Several differences exist between the current study and previously published research. First, MacDuff et al. (1993) evaluated picture schedules with males who had low functioning autism, ages 9 to 14; the participants in the Bryan and Gast (2000) study were children with high functioning autism, ages 7 to 8. Female students aged 12-13 with moderate intellectual disabilities participated in the current study. The current study took place in the students’ local school (similar to Bryan & Gast, except in this case the school was a middle school rather than an elementary school); this contrasts with MacDuff et al. where the researchers conducted the study in a group home. MacDuff et al. focused on using picture schedules during homework and leisure skills whereas Bryan and Gast used picture schedules during literacy-based centers. The current study also targeted center-based skills but included a broader range of activities: math, spelling, independent vocational skills, and computers. These differences help expand the database that exists on picture activity schedules.

Another finding from the current study that other researchers have not noted is student dependence on the picture activity schedules during the second NB condition. Jennifer wandered around the classroom asking, “Where are our books?” Likewise, during the second NB condition, Cindy told the investigator, “I can’t do it without the book, so don’t...
Both students’ remarks were ignored by the teacher but student reliance on these supports was noted. It was interesting to see Cindy change centers and appropriately manipulate materials even though she was off-schedule. She kept looking at the investigator to see if she was being watched. Jennifer and Cindy appeared more comfortable using the picture books than not. Future research on the dependence of the picture activity schedules and how they can be faded while maintaining high rates of on-task behavior is worthy of investigation.

An additional result of the current investigation worthy of mentioning is that like participants in the Bryan and Gast (2000) study, the students’ on-task behaviors with scheduled materials increased during both BO conditions. The difference between the two studies occurred during the NB conditions. In the Bryan and Gast study, participants had low on-task behaviors with scheduled materials but a high occurrence of on-task behaviors with non-scheduled materials. While some on-task behavior occurred with non-scheduled materials in the current study, levels were low.

Some procedural differences between the two previous studies and the current study need attention. The main difference between the Bryan and Gast (2000) study and the current investigation was the procedure used to teach the use of the picture activity books. Systematic replication of the graduated guidance procedures used by Bryan and Gast to teach students how to use the picture schedules was intended. Graduated guidance techniques were planned to help students complete the sequence of activities in their picture schedule books with manual prompts delivered from behind students to decrease dependence on adult assistance and to avoid providing reinforcement through teacher attention. No gestural or verbal prompts were planned. Initially, graduated guidance techniques were to be used until the students acquired the skills necessary to independently use their picture schedules, however, after using graduated guidance for one session, the investigator decided to withdraw the use of graduated guidance based on student responses to the procedure. All four students resisted hand-over-hand assistance, a technique not used on a regular basis in their classroom. Jennifer pulled away, with force, and appeared nervous every time hand-over-hand assistance was provided. Cindy pulled away and laughed, saying, “What are you doing? Are you crazy?”. Mary and Holly also resisted the touches, but were not as obvious as Jennifer and Cindy. After consulting with the classroom paraprofessional, who also observed these behaviors, it was decided that using a system of least prompts procedure would be less intrusive for students.

During the second session of the Schedule Instruction phase, the system of least prompts procedure was implemented. All four students imitated the gestures modeled by the teacher (i.e. pointing to the book) at every step where gestures were required. All four students just stared at the models or if the teacher opened their book and closed it, they would open their book and close it. Verbal prompts were eventually sufficient. This procedural change proved effective in teaching students how to use their picture schedules. The number of teacher delivered prompts decreased over trial and all four students appeared less tense during instruction after the change to the system of least prompts procedure.

Future research could explore the three aforementioned suggestions: (a) how dependence on the books effects generalization and/or student performance in other settings when the book is not present, (b) observational learning regarding the use of picture schedules, and (c) results of giving verbal instructions of how to use the books with no further teacher prompting. Other areas of future research might focus on finding an effective and efficient way to teach students how to use picture schedules in a systematic, replicable way. Maintenance of these skills over periods of time (i.e. summer vacation) and generalization of these skills to areas in the community (i.e. church, stores, and job sites) could be a vital source of information for future research. Since the database is limited with respect to picture schedules and middle school students with moderate intellectual disabilities, further investigation would benefit classroom teachers trying to increase independent functioning with their students.
References


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