Increasing Engagement of Students with Autism at Recess through Structured Work Systems
Meghan O’Hara and Laura J. Hall
San Diego State University

Abstract: Students with autism spectrum disorder (ASD) who attend public schools benefit from supplementary structure throughout their day, including during recess periods on the playground. The following study used a concurrent multiple-baseline design to evaluate the effects of a structured work system taught by the special education teacher using graduated guidance on the engagement of three elementary age students with ASD. Results revealed increases in engagement compared with baseline most clearly for two of the three students. The importance of incorporating prompt fading strategies when implementing any visual support system is discussed.

Considering an estimated prevalence rate of 1 in 68 children (Centers for Disease Control and Prevention, 2014), it is very likely that students identified with autism spectrum disorder (ASD) will be educated in public elementary schools where it will be the responsibility of special education teachers to address the identified challenges associated with ASD. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013), there are two main deficit areas that comprise the diagnosis of autism spectrum disorder: 1) social communication and social interaction across contexts, and 2) restricted, repetitive patterns of behaviors, interests, or activities. Ideally educators will create systems that build skills focusing on ameliorating these areas throughout the school day. Maintaining student engagement in all activities is considered a foundation for preventing challenging behaviors and teaching new skills (Hume & Reynolds, 2010; Mayer, Sulzer-Azaroff, & Wallace, 2014). A typical part of the elementary school day includes one or more recess periods when children are outside and can choose to play on a variety of playground equipment.

During recess and without any form of supplemental intervention or changes to the physical structure of the playground, students with ASD are less engaged in moderate-to-vigorous physical activity than their typical peers (Pan, 2008) and less engaged in social interaction with peers (Lang et al., 2011). A review of the research outcomes from studies taking place during recess time with students with autism spectrum disorders revealed that recess could be used effectively as the setting to teach social skills and reduce challenging behavior (Lang et al., 2011). Strategies have been used in various settings with an aim to facilitate social interaction when students with ASD are on the playground such as video self-modeling (Buggery, Hoomes, Sherberger, & Willliams, 2011), play dates in the home (Frankel, Gorospe, Chang, & Sugar, 2011), and social skills programs with peers (Harper, Symon, & Fre, 2008) including preferred...
peers identified by the child with ASD (Hall & Smith, 1996).

Lang and his colleagues conclude from the 15 studies they reviewed, that students with ASD may need additional supports when on the playground in order to maximize the benefit from social and educational opportunities. Licciardello, Harchik, and Luiselli (2008) incorporated preferred toys and activities and prompts to peers from paraprofessionals to increase social initiations and responses. Two studies revealed positive outcomes for some children with ASD when the playground equipment was modified and redesigned to include music that played from a CD player in a Plexiglas hut containing musical instruments (Kern & Aldridge, 2006), or to include features of the students’ particular interests such as a railway track and placing playground equipment in a circuit with a slide curved to send students to the start of the circuit (Yuill, Strieth, Roake, Aspden, & Todd, 2007).

Most special educators working in elementary schools are not able to physically modify the playground equipment that is used by students in addition to those with ASD. Incorporating a strategy that can provide structure, long known to be helpful for individuals with ASD (Schopler, Brehm, Kinsbourne, & Reichler, 1971), that can be easily implemented by teachers, and results in sustained engagement at recess has the added benefit of being likely to be used by public school personnel. Engagement in an activity by individuals with ASD can provide the context for social interaction with peers and may be considered the first step in promoting active physical and social engagement on the playground. Machalicek and colleagues (2009) used four photographs of playground activities ordered in a schedule, correspondence training taught using graduated guidance, and edibles to increase the play of three elementary students with ASD that attended a private school. Following the selection of a sequence of play activities, students took photographs depicting the selected activities in order and placed them near the playground equipment they chose, and engaged in the play activity for a minimum of two minutes. The authors state that the students continued to require verbal prompts to check their schedules between activities throughout the study, indicating that adult interaction in the forms of prompting and delivering edibles remained integral in order to maintain students’ play.

Sequencing activities and the use of photographic schedules are also components of structured work systems developed by Division TEACCH (The Treatment and Education of Autistic and related Communication handicapped Children). The structured work system is defined as a visually organized area where learners independently practice acquired skills (Hume, Plavnick, & Odom, 2012). Structured work systems are one of the evidenced-based practices identified by the National Professional Development Center on ASD (Odom, Collet-Klingenberg, Rogers, & Hatton, 2010) that has been used effectively to increase on task behavior and reduce adult prompts (Hume & Odom, 2007; Hume & Reynolds, 2010). The following study was designed to evaluate the use of an individual work system on the playground during recess on the engagement of three public elementary school students with autism.

Method

Participants and Setting

The study took place at a public elementary school in the suburbs of a large urban city in California. The participants, three students with autism, were from the school’s self-contained classroom for students with moderate to severe disabilities. This classroom served six students total, ranging from kindergarten to fifth grade. The classroom was staffed with one teacher (first author) and three special education assistants. The classroom teacher was enrolled in a M.A. Degree program with a specialization in autism at the time of the study. This program emphasized the use of evidence-based practices and had a Behavior Analysis Certification Board approved sequence of courses embedded in the program. The classroom was a highly structured setting which incorporated various structured teaching strategies including schedules, visual structure, and independent work systems. All students had been pre-trained on how to manipulate a visual schedule as well as an independent work system in the classroom.
The intervention took place outdoors on an enclosed play area on the campus. The area had a play structure with two slides and monkey bars, and a swing set. Bicycles were kept in a storage closet located in the school building with access from the playground and three or four bikes were placed on or near the bike path prior to recess. Activities were painted on the concrete (e.g., bike path, hopscotch) and there were also two grassy areas on either side of the play area. The three students selected for this study each displayed high percentages of non-engagement during recess and all had a familiarity with visual schedules and independent work systems. All three were using independent work systems in the classroom that had been taught using graduated guidance as recommended by McClannahan and Krantz (2010). The students, two boys and one girl, were all between five and six years of age.

David, age six, used a picture schedule to transition to and from activities in the classroom and on the school’s campus. David could remain engaged in the classroom for up to twenty minutes with prompts. David had some difficulties engaging appropriately with peers. During recess, David would walk the perimeter of the play area, collect leaves, swing on the swings and ride the bikes inappropriately by crashing into objects in the play structure area. David could complete an independent structured work system in the classroom.

Michael, age six, performed best in a highly structured environment with a low student to staff ratio. Michael had difficulties with transitions to academic activities, communication, and social engagement, and engaged in self-stimulatory behaviors. During recess, Michael would walk aimlessly into classrooms or around the perimeter of the grassy areas, briefly use the swing, and play in the dirt. Michael was able to complete an independent structured work system in the classroom setting.

Caroline, age five, had difficulties with communication, engagement, social interactions, and displayed challenging behaviors such as hand-flapping, biting, pinching, and scratching when over-stimulated or when a preferred item was removed. An aide was assigned to work with her to assure she was kept safe from harm. Caroline would also put objects, both food and non-food in her mouth. Caroline used an individualized daily picture schedule to facilitate transition to activities around the classroom. During recess, Caroline would put dirt in her mouth, sit at the top of the slide, sit on the bike backwards, and hang on the monkey bars. She rarely engaged with peers or adults unless prompted. Caroline had been exposed to an independent structured work system in the classroom, but was still receiving light physical prompts at the elbow or shoulder to complete the work system when the study began.

Materials

Students were each provided with an individual “recess schedule.” The schedule was constructed from poster-board and contained five picture/word cards that corresponded with different activities. The cards were attached to the schedule using Velcro. The activities on the schedule were slide, swing, bike, free choice and classroom. The free choice and classroom symbol were always in the last two places on the schedule.

Prior to recess, the playground was set-up with the structured work system. A cone was placed by each of the activities (slide, swing, bike, free choice). The cones had matching pictures of the activities along with a piece of Velcro (for example: the cone with the picture of the slide was placed near the bottom of the slide.) When the student was transitioning to activities during recess, they would remove the card from their schedule and attach it to the corresponding cone and begin the activity. Next to the cone, there was a jig, or a small timer activated by David independently, Michael occasionally, and by the aide for Caroline, in order to structure the activities and indicate when the work was finished.

For the bike path and slide, the small jig consisted of a small piece of sentence strip paper with round, plastic tokens attached with Velcro and a small container with a cover containing a slit in the top that were attached to a small wooden board using Velcro. These items were placed next to the cone of the corresponding activity. When the student began the activity he/she would take a chip from the strip in their hand, complete the activity,
and then place the chip in the “finished” container. The student would continue this pattern until all the chips were gone and at that time check their recess schedule.

Data sheets were created for recording the percentage of intervals students with autism were engaged appropriately with recess equipment/activities using whole-interval time sampling. Engagement was measured over fifteen minute periods of recess, using 30-sec intervals. Each interval on the data sheet contained letters that corresponded to activities (e.g., S for swing, Sl for slide). If a student was not engaged during the interval for longer than two seconds, or if the student received prompts from adults, the interval was scored as non-engaged.

**Dependent Variable**

Student engagement during recess was the dependent variable in this study defined as appropriate play with objects, equipment, activities or walking/running around the play area within the direction toward or from playground equipment. Students were considered not engaged if they were observed walking the playground with no purpose or direction, staring blankly, exhibiting self-stimulatory behaviors, putting objects in mouth (such as food from the trash, leaves, or dirt) as well as inappropriately playing with objects/equipment (such as walking up the slide, riding the bike under the play structure or putting objects down the storm drain) for more than two seconds.

**Independent Variable**

The independent variable in this study is the implementation of the visual schedule and structured work system taught using graduated guidance during recess.

**Design**

A concurrent multiple baseline design across participants was used to evaluate the effectiveness of structured work systems on the engagement of students with autism with playground equipment and activities during recess.

**Interobserver agreement**. Two psychology graduate students who had prior experience working in a school setting with students diagnosed with autism were trained as second observers. Training took place prior to data collection using video recordings of students. The criteria used during training of observers was inter-rater agreement scores with the classroom teacher of 80% or above for two consecutive observations. A second observer was present and independently recorded data during all phases of the study for a total of 28% of the sessions. Inter-observer agreement scores ranged from 86%–99% with an overall mean agreement of 96%. The inter-observer agreement scores for each participant were as follows: for David the mean was 95% (range = 86% to 99%); for Michael the mean was 96% (range = 92%–99%), and for Caroline the mean was 95% (range = 91%–98%).

**Procedure**

**Baseline.** After consent from the school’s administrator, baseline engagement data for each student was taken using whole-interval time sampling. Prior to each session, three bikes were placed near or on the bike path. All three students were observed on the same day, during one period of recess. Prior to the baseline recording session, support staff on the playground were instructed to re-direct students if they were in an unsafe situation (e.g. putting objects in mouth) or in a restricted area (on a hill on west end of the playground or in other classrooms). Playground staff was asked to respond to communications and interactions with students participating in the study as they normally would (e.g. if a student asked for help or requested to be pushed on the swing).

**Intervention.** After baseline data was collected, the intervention was implemented with David. Prior to starting the schedule, students were given a check-schedule symbol with which they were familiar from using structured work systems in the classroom, shown their recess schedule, and told what activities they would be doing during recess. Also, the students were permitted to choose which recess activity they could complete first (excluding free-time and classroom) regardless of how the schedules were set-up initially. The length of the activity selected was individualized according to baseline observations of the
student. For example, Michael could only sustain going down the slide three times, whereas David could sustain going down the slide 5 times. Similarly, Caroline’s swing timer was set from one to three minutes, but Michael’s swing time could range from three to five minutes.

During intervention the students’ recess schedules were attached to a cart that was placed in the same place during every session. Students were given a small check picture symbol to check their recess schedule as they transitioned onto the playground. The teacher used graduated guidance to teach the student the structured work system. During this time, no verbal prompts were be used by the teacher. The graduated guidance prompting for the student began with hand-over-hand. If a student was unable to follow a step of the structured work system during the recess session, the teacher moved to the previous level of prompting (e.g. teacher moved from the elbow prompts back to wrist prompts when a student was unable to follow a step of the structured work system).

During the training of the intervention, Michael’s challenging behaviors increased due to the new task demands placed on him during recess. To address this behavior, a positive reinforcement procedure was implemented during the training phase of the intervention. Initially, Michael was given an edible reward after every activity completed during the training session. Eventually, the schedule of reinforcement was faded and he would receive the edible intermittently and eventually they were faded out completely. This strategy, paired with the graduated guidance, impacted the amount of time it took to implement and fade the intervention for Michael.

Results

Following training, all three students independently followed the work system including transitioning from one activity to another without adult prompts and remained engaged during recess at higher percentages of time compared with baseline (see Figure 1). During baseline David’s engagement was highly variable and ranged from 0% to 93%. After the 6th session there was a decreasing trend in engagement (see Figure 1). Baseline scores for Michael were also highly variable ranging from 0% to 80% but remained below 20% prior to intervention. Baseline scores for Caroline varied from 0% to 53% of intervals (see Figure 1).

During intervention, David was consistently engaged in activities during recess with sessions scored between 87% and 100% (see Figure 1). The data remained stable, with little variability between sessions. Following intervention Michael’s percentage of engagement increased above all but one baseline observation and remained in percentages from 63% to 93%. There was a slight increase in engagement post-intervention for Caroline, when she displayed the highest percentage engagement (67%) compared with baseline, however, her scores revealed the least change in engagement compared with David and Michael (see Figure 1).

Discussion

Results of this study demonstrated that when an individualized structured work system is implemented using graduated guidance during recess in a public school setting, increases in engagement with equipment on the playground occurred for students with autism spectrum disorder. This change is most evident for two of the three participants. For David and Michael, there was a substantial increase in engagement, and a demonstrated functional relationship, when using the structured work system taught with graduated guidance when compared with their baseline data. Caroline displayed the least independence using the structured work system in the classroom, and independence in the classroom may be a prerequisite for engagement at recess.

Students with autism frequently have difficulty organizing their environment and planning activities. Previous studies have also shown that when provided with a structured environment, there was an increase in communication by individuals with autism when compared to an unstructured environment.
Figure 1. Percent of 30-sec intervals engaged in activities during recess.
Several previous studies have evaluated structured work systems in academic and work settings and have concluded that they are an appropriate way to not only increase engagement in students with autism, but to also increase independence (Hume, & Reynolds, 2010). Researchers have recommended additional studies of structured work systems that are conducted in other settings, including the general education environment (Hume & Odom, 2007). This study provides a demonstration of the effectiveness of the structured work system when used outside of the classroom and when taught using graduated guidance.

The incorporation of the plastic tokens to facilitate independent transitions between activities, and the familiarity with structured work systems that require the completion of multiple activities in a sequence from their use of these systems in the classroom, resulted in engagement without the verbal prompts from aides that remained in previous research (Machalicek et al., 2009). It is important for educators to structure the environment and teach the use of any visual support so that students are able to complete the tasks independently. The pairing of the structured work system and graduated guidance was effective in this study. Although the use of visual supports has been determined as an evidence-based practice (Odom et al., 2010), there can be an assumption that it is the visual stimuli that are supporting independent engagement in activities. If the intent is for students with ASD to use visual supports alone to complete tasks independently, then methods of instruction used to introduce visual supports should focus on those that reduce the prompting from adults, such as graduated guidance.

Several limitations of this study should be addressed. The study was conducted on an enclosed playground with only the classroom teacher’s students in the special day class as well as instructional aides. Although staff on the playground were instructed to only communicate if a student engaged them, requested help, or was displaying an unsafe behavior, it is difficult to assess how the presence of the aides facilitated independent engagement. For example, Michael and Caroline required adult assistance to use the bike, and occasionally, the swings. Caroline also always required someone within 5ft of her due to unsafe behaviors on the playground, which could have affected levels of engagement and independence. Other students on the playground occasionally interfered with the work systems (such as removing the chips from the jig), so the materials, as well as the classmates needed to be monitored. Finally, due to the end of the school year Caroline’s post-intervention data was limited.

Future research should continue to investigate the strategies that facilitate independent engagement and transition between activities during recess. Incorporating social interaction with peers in the schedule would provide an opportunity to practice skills that are frequently a challenge for individuals with ASD. The prompt fading techniques should be made explicit in any research that focuses on the use of visual supports. The intervention of the structured work system used in this study could be adapted and evaluated in additional unstructured environments such as the neighborhood park.

References


Increasing Engagement of Students with Autism at Recess / 575


Received: 21 March 2013
Initial Acceptance: 21 May 2013
Final Acceptance: 7 August 2013