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Using Computer-Assisted Instruction to Decrease Transition Times for Students with Autism Spectrum Disorder

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Using Computer Assisted Instruction to Decrease Transition Times for Students with Autism Spectrum Disorder

by

Kristina A. Bewley

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts in Applied Behavior Analysis
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Dedication

I dedicate this manuscript to my husband Ryan and daughters Edrienna and Rylee. Thank you for your encouragement and support throughout my educational career.
Acknowledgements

I would like to acknowledge my thesis advisor Dr. Kimberly Crosland for her time, guidance, and constructive feedback to ensure my success. I would also like to acknowledge my thesis committee and Project ABA grant members for their encouragement throughout this process. Finally, I would like to acknowledge Jessica Moore, Elizabeth Lynch and Kristin More for all the time and effort they put into assisting me. Thank you all for your support.
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Abstract

Transitions within the school setting have been a challenge for school staff working with students with autism spectrum disorder (ASD). Teachers and students lose valuable academic time when the procedures in place are not working to create a quick transition - decreasing problem behavior, and increasing learning time. Students with ASD typically have a difficult time transitioning frequently throughout a school day, and problem behavior can be more apparent during this time. Hine, Ardoin, and Foster (2015) found that a computer-assisted instruction (CAI) based intervention was successful in decreasing classroom transition times for students in general education. The purpose of this study was to evaluate the effects of a similar CAI based intervention to decrease latency to on-task behavior during transitions in a classroom with students diagnosed with ASD. Two different transitions within a classroom were evaluated using the CAI-based intervention with three student participants diagnosed with ASD. Results indicated using a CAI-based intervention in collaboration with teacher input decreased latency to on-task behavior for all three participants for both transitions without the use of a group contingency or reinforcement component. High implementation fidelity and social validity scores demonstrated acceptance of the intervention by both teacher and student participants.
Chapter 1:

Introduction

Classrooms are complex environments which require teachers to implement a variety of management strategies to minimize problem behavior and maximize learning time (Brophy, 1988). Research has shown more time engaged in learning activities is related to greater student achievement (Caldwell, 2007). Transitioning between activities is a common classroom event often associated with off-task behavior which can decrease learning time (Arlin, 1979).

A transition is defined as a discontinuous period of time beginning when a student stops one activity and ending when the student starts the next activity (Arlin, 1979). During a typical school day, a student is required to make multiple, rapid transitions between activities, subjects, and/or teaching formats (Hume, Sreckovic, Snyder, & Carnahan, 2014). Students with developmental disabilities such as autism spectrum disorders (ASD) often have difficulty transitioning between activities, leading to higher chances of problem behavior during these times (American Psychiatric Association, 2013; Strain, Wilson, & Dunlap, 2011). The increased likelihood of problem behavior can cause individuals with disabilities to be excluded from participating in mainstream classroom environments and other school-related events (Strain et al., 2011).

A variety of interventions have been used to target behaviors that occur during transitions such as visual cues (e.g., visual schedules; priming; first/then boards) (Dettmer, Simpson, Myles, & Ganz, 2000; Hume, 2008; Schmit, Alper, Raschke, & Ryndak, 2000), audible cues (e.g., verbal advanced warning; high-probability requests) (Banda & Kubina, 2006; Hume, 2008;
Sainato, Strain, & Lefebvre, 1987), the Timely Transitions Game, explicit timing, and group contingencies (Campbell & Skinner, 2004; Yarbrough et al., 2004). Flannery and Horner (1994) used signals to decrease escape-maintained behavior during transitions with individuals with developmental disabilities. The signals delivered information on tasks that were not familiar, on the sequencing of different activities, and the duration of the activities.

Humpal and Wolf (2003) described music as another way to support students in a successful transition. According to Kern et al. (2007), using music as part of the classroom routine promotes predictability within the structure of classroom activities. Arlin (1979) explained, if transition times have a structured flow, the transition period can resemble structured learning time, decreasing problem behavior associated with unstructured transitions.

Transition signals, visual and audible cues, group contingencies, and explicit timing have been effectively implemented alone or in combination with other interventions; however, due to restrictions on teacher time for training and implementing with fidelity, these interventions are not always feasible for use in the classroom. One way that might help make interventions more feasible is to use technology that provides automated cues and countdown times. By incorporating the use of technology into classrooms, teachers can meet the needs of a variety of students’ learning styles, creating a more efficient and effective learning environment (Thamarasseri, 2014). Classrooms have seen large gains in the use of technology, in the form of the internet and multimedia platforms (Zolfaghari & Kargozi, 2011). Teachers are facilitators of learning and, by using technology, have increased the pace of learning and expanded their lessons beyond the walls of the classroom and into areas inaccessible in the past (Zolfaghari & Kargozi, 2011).
About 93% of classrooms have internet accessible by computers, iPads, and SMART Boards (Domingo & Garganté, 2016; Gray, Thomas, & Lewis, 2010). According to Gray et al. (2010), some of the most commonly used devices in classrooms are liquid crystal displays (LCDs), interactive whiteboards, classroom response systems, and hand-held mobile devices. SMART Board technology is a combination of a white board, projector, computer, and touch screen capabilities in a single system (Martin, Shaw, & Daughenbaugh, 2014). SMART Boards can keep students’ attention longer and engagement and motivation higher than traditional chalkboards and have the capability to access classroom resources immediately (Preston & Mowbray, 2008). Classroom response systems, or clickers, have been shown to increase student participation, understanding, performance, and attendance (Addison, Wright, & Milner, 2009; Caldwell, 2007; Lincoln, 2008; Ueltschy, 2001).

With regard to transitions specifically, Hine, Ardoin, and Foster (2015) evaluated a Computer Assisted Instruction (CAI) program to determine if using a multicomponent package automating components such as explicit timing, transition warnings, and an interdependent group contingency would decrease latency to being on task and increase on task behavior during transition times. The four participants were from first and second grade classrooms, and did not receive any school supports. Auditory and visual cues were used to begin a transition by presenting a video on a screen. After these initial cues were presented, a transition timer was shown on a screen which displayed how long the students had to transition to the next activity. During the transition time, specific rules displayed the behaviors the students should be engaging in at that time (e.g., walking, staying quiet, and getting appropriate materials) on the screen. At the end of a transition, a beep would sound and the teacher would give out points and praise to groups that met the predetermined criteria. The dependent variables included latency to on-task
behavior, on-task behavior, and teacher prompts and praise. The researchers found that CAI was successful in reducing all participant’s latency to on-task behavior, increased time on-task, decreased teacher prompts, and increased teacher praise. These changes created a decrease in the amount of time students spent transitioning, resulting in an increase of classroom instruction time. This study involved multiple components including a group reinforcement contingency. It is unknown if the intervention would be effective for individual students and without the reinforcement component.

Hine et al. (2015) was the only study found that used an automated technology-based system to improve transition times for students. The study also focused on typically developing students in the general education classroom. There are no known studies that have evaluated a similar intervention to manage transitions with students with ASD. Therefore, the purpose of the current study was to expand the literature by evaluating the effects of a CAI-based intervention on decreasing latency to on-task behavior between transitions within the classroom for students diagnosed with ASD.
Participants and Setting

This study was conducted in a private school with elementary-aged students in grades K-12 who had special needs. A teacher was selected based on a principal’s recommendation for a classroom that had students having difficulty transitioning in the classroom. The classroom had 12 students aged 10 through 15 years old. The classroom had one female teacher and a paraeducator, and two students had a behavior therapist working with them throughout their day. The teacher was a 45-years old, and this was her first year as a teacher. She had two years prior experience in the same school as a paraeducator. The school contracted with two different companies that provided applied behavior analysis services to the students needing behavior support.

The classroom had a visual schedule posted on the wall in front of the classroom, listing the daily routine and times each activity started. As the day progressed, the teacher allowed a student to turn over the card for the prior activity on the schedule. The class had their academics in the morning, and after lunch they participated in quiet time, sensory gym, elective, and free time.

After teacher consent was obtained, a preliminary classroom observation was conducted to determine which transitions had the longest duration based on the teacher’s preference for three different classroom transitions (i.e., getting ready to say the pledge of allegiance after
arrival, snack time to reading, and entering the classroom after sensory gym to elective). Three student participants from the same classroom were selected by the teacher as taking the longest amount of time to transition from one task to the next. Each participant met the student participant inclusion criteria of having an ASD diagnosis and being in elementary school age (5 to 11 years old). Informed consent was obtained from the parents prior to the students’ participation. Once the consents were signed and returned to the school, the researcher informed the students about the study and asked the students for verbal assent to participate in the study.

The two transitions that were observed to take the longest amount of time were selected for this study, snack to reading and entering the classroom from the sensory gym to elective. The teacher described to the researcher what her expectations were for the students for each transition, and then an acceptable amount of time was decided by the researcher and teacher for how long the transition should last, which was determined to be no more than a 2-min duration. The teacher expected the students to clean off their desks, sit quietly with listening ears, and to be attending to the teacher or materials for the activity.

**Zach.** Zach was a 10-year-old, Caucasian male student diagnosed with ASD. Zach had a behavior therapist each school day that worked with him in the classroom. He had three different therapists in the classroom during this study that rotated different days of the week. Zach’s therapists were implementing a token board for Zach throughout this study. According to his teacher, Zach was academically on a first-grade level. During transitions, it was observed in baseline that Zach would engage in self-injury in the form of pulling his hair, physical aggression towards others, hiding under furniture, and task refusal (i.e., engaging in any behavior other than what was necessary to perform the task presented).
**Pete.** Pete was an 11-year old Caucasian male student diagnosed with ASD. According to his teacher, Pete was academically at a third-grade level. Pete was also observed during baseline transitions to engage in challenging behaviors including property destruction (i.e., knocking over another student’s Lego structures), physical aggression towards others (i.e., pinching, hitting), and task refusal (i.e., not cleaning off his desk, and being out of his seat).

**Max.** Max was an 11-year old biracial, Hispanic male student diagnosed with ASD. According to his teacher, Max was academically at a first or second grade level. Max was observed during baseline observations being out of his seat and laying on the floor during transition times which resulted in delaying the transition.

**Materials**

Materials for this study included a task analysis for the teacher during the intervention phase, a TV to display the intervention, a wi-fi connection, Chromecast device (a media streaming device that was plugged into the HDMI port of the TV), a stopwatch, PowerPoint to create the intervention videos, and the computer assisted instruction videos created by the researcher (Appendix D).

**Target Behavior and Data Collection**

**Latency to on-task behavior.** Latency to on-task behavior was defined as the total transition time in seconds starting at the end of one activity and ending with the student’s initiation of the next activity. The researcher and teacher collaborated to define what the initiation of each next activity should look like.

**Transition from snack to reading.** The definition for the transition taking place from snack to reading for baseline was defined as beginning when the teacher gave the instruction or
warning that the class would be starting the next period, reading (e.g., “It’s time to clean off your
desks and get ready for reading.” “I need clean desks and you sitting in your chair for reading.”
“Five minutes until I need you sitting at your desks ready to read.”). The transition ended when
the student was sitting in his chair at his desk or designated area with a clean desk, heads and
body up and facing toward the teacher or reading material, and sitting quietly for 3 s. The
definition for the transition during intervention was the same as baseline, except for the
beginning of the transition was signaled by the computer automated voice that announced, “In
two minutes reading will begin. Clean off your desks, sit down quietly on your chair with
listening ears, and be ready to read.” The stopwatch began at the end of the initial announcement
and the time was recorded in seconds from the stopwatch once the participant met the criteria as
defined for ending the transition.

**Transition from entering the classroom after sensory gym to elective.** The definition
for the transition taking place from entering the classroom after sensory gym to elective was
defined as beginning when the teacher gave the instruction or warning that the class would be
starting the next period, elective (e.g., “It’s time to start elective.” “You need to be sitting at your
desks, ready for elective.” “In two minutes, we will be starting elective and you need to be at
your desk.”). The transition ended when the student was sitting in their chair at their desk or
designated area with a clean desk, heads and body up and facing toward the teacher or elective
material, and sitting quietly for 3 s. The definition for the transition during intervention was the
same as baseline, except for the beginning of the transition was signaled by the computer
automated voice that announced, “In two minutes elective will begin. Clean off your desks, sit
down quietly on your chair with listening ears, and be ready for elective.”
**Teacher prompts.** The definition of teacher prompts was defined as any additional instruction provided by the teacher after the initial instruction to begin the transition to the next activity was provided (e.g., “Clean off your desk,” “Hurry up,” “Go sit down,” gesturing to sit down, etc.). Teacher prompts were measured as a frequency count for each transition during all phases.

**Interobserver Agreement (IOA)**

Two research assistants were trained by the researcher to collect data on the participant’s latency to on-task behavior and teacher prompts. The research assistants were graduate students in the Applied Behavior Analysis program at the University of South Florida, and were trained using behavioral skills training (BST). Training was provided until 100% agreement on latency with the primary observer was reached.

A research assistant simultaneously collected data by direct observation for 33-67% of all sessions in each phase and for all participants to assess IOA of teacher prompts and latency to on-task behavior for baseline and intervention sessions, except for the third phase for Max’s transition. Due to him leaving school early, IOA was not collected. IOA scores for latency measures were calculated for each transition observed by taking the shorter latency interval recorded by one observer and dividing over the longer latency interval recorded by the other observer, then converting the number to a percentage by multiplying by 100%. See latency to on-task IOA results in Table 1. IOA scores for the frequency of teacher prompts was calculated for each transition observed by taking the lower number recorded by one observer and dividing over the higher number recorded by the other observer, then converting the number to a percentage by multiplying by 100%.
During the baseline phase for transitioning from snack to reading, IOA was assessed 50% of the time for Zach, 50% of the time for Pete, and 33% of the time for Max. During this phase for the reading transition, the mean IOA score for Zach was 99.6% (range: 99% to 100%), 99.1% for Pete (range: 98% to 100%), and Max had one score of 99.8%. During the initial baseline phase for transitioning from entering the classroom after sensory gym to elective, IOA was assessed 67% of the time for all participants. During this phase for the elective transition, the mean IOA score for Zach was 97.7% (range: 96% to 99%), 99.5% (range: 99% to 100%) for Pete, and 98.5% (range: 98% to 99%) for Max. For Zach and Pete, all IOA for teacher prompts was scored 100%. IOA for teacher prompts for Max was 100% for the snack to reading transition, and the mean IOA score for sensory gym to elective was 98.5% (range: 98% to 99%).

During the second phase for the intervention implemented during snack to reading only, IOA was assessed 33% of the time for all participants. During this phase for the intervention implemented during reading only, the IOA score for Zach was 96.3%, 100% for Pete, and 93.5% for Max. During the second phase the transition from entering the classroom after sensory gym to elective remained in baseline and IOA was assessed 67% of the time for Zach, 50% of the time for Pete, and 33% of the time for Max. During this phase for sensory gym to elective baseline, mean IOA for Zach was 100% (all IOA data scored 100%), the IOA score for Pete was 99.5%, and 100% for Max. During this phase, all IOA scores for teacher prompts scored 100% for all participants.

During the third phase for the intervention continuing for the transition from snack to reading, IOA was assessed 33% of the time for all participants. The IOA score for Zach was 87.5%, 99.3% for Pete, and 99.3% for Max. During the third phase intervention began for the transition from entering the classroom after sensory gym to elective, IOA was assessed 33% of
the time for Zach, 50% of the time for Pete, and 0% of the time for Max due to him being absent on the day a research assistant was available for IOA. The IOA score for Zach was 100%, and 99.4% for Pete. During this phase, for Zach and Pete, all IOA scores for teacher prompts scored 100%.

**Experimental Design**

An alternating treatments design was used to evaluate the effects of a computer assisted intervention on the latency to on-task behavior for two transition periods. A baseline condition occurred prior to an alternating treatments phase comparing the CAI intervention for two different transitions. During the second phase, one transition remained in baseline while the intervention was implemented for the other. During the third phase, the intervention was implemented for both transitions.

**Procedure**

**Baseline.** The teacher was instructed to proceed as she normally did before, during, and after each classroom transition. The beginning of the transition time was recorded after the initial vocal cue the teacher gave to start the transition and the end of the transition time was recorded when the student met the defined criteria for initiating the next activity. The stopwatch began at the end of the initial transition announcement and the time displayed was recorded from the stopwatch once the participant met the criteria as defined for ending the transition. Latency was recorded as time in seconds to complete each transition. Each student-specific prompt given by the teacher during the transition was recorded during each phase. The teacher was instructed to prompt students as she normally would throughout all phases of the study.

**Teacher training.** The teacher was provided with a brief training on the CAI procedure. Training including an overview of the procedures for intervention, modeling, and an opportunity
to ask questions and for feedback to be given. Once the fidelity score was 100%, the intervention was implemented in the classroom. The duration of teacher training was approximately 5 min.

**CAI intervention.**

On the first day of the intervention, a brief instructional video was created by the researcher and shown to the class, for all students to view, instructing the students on the components of the intervention and how they should appropriately and quickly transition between activities. BST took place during and after the video to ensure the participants understood the intervention. The duration of the instructional videos was less than 2 min each, and with BST the total duration of student training for each transition was approximately 10 min.

The teacher displayed the CAI program on the TV by casting the CAI from the researcher’s iPhone using Chromecast. A computer-generated voice announced the beginning of the transition, and a musical interlude began playing the Mission Impossible theme song when the timer began, along with a circle under the countdown clock that faded from green, to yellow, to red signaling it was almost time to begin the next activity (see Appendix E). At the end of the predetermined time of 2 min the music stopped and an alarm sounded to signal the end of the transition period. After consultation between the teacher and researcher, it was determined that 2 min was an appropriate amount of time to set the CAI timer for. The program was stored on a mobile device the researcher removed from the classroom when she was not present. This helped prevent the teacher from accessing the intervention program at any other time except during transitions when the intervention was being implemented.

During intervention, latency was recorded the same as baseline, except the CAI cued the students to transition to the next activity, and ended when the student met the defined criteria for initiating the next activity. To determine the latency to on-task behavior, a stopwatch app on an
iPhone was used to record each participant’s latency to on-task behavior. At the end of each transition, latency was recorded as time in seconds spent to complete the transition. The intervention was implemented for the snack to reading transition while the sensory gym to elective transition remained in the baseline condition. Once decreases were observed for the snack to reading transition, the CAI intervention was implemented for the second classroom transition, sensory gym to elective, while the reading transition remained in intervention. The teacher was instructed to continue prompting or praising as she normally would during the intervention.

**Treatment Integrity**

Treatment integrity of the teacher’s ability to implement the steps of the intervention phase was evaluated by the researcher using a checklist with each step necessary for implementation. The researcher observed implementation of both phases and recorded whether each component was completed or not during the observation using the fidelity checklist (Appendix A). The steps for implementation were (1) Portable media device connected and file open and ready prior to the transition, (2) Volume is checked and set to an appropriate level, (3) To start a transition, the teacher starts the CAI timer program, and (4) At the end of the transition the teacher turns off the timer display. The number of completed components were divided by the total number of components and multiplied by 100%. The teacher fidelity score was 100% for each phase of intervention for each transition.

**Social Validity**

The researcher developed a 5-item Likert questionnaire that was given to the teacher to fill out at the completion of the study using a 1-5 rating scale (see Appendix B). For each question, the teacher checked that she (1) strongly agreed, (2) agreed, (3) neither, (4) disagreed,
or (5) strongly disagreed. The teachers were also given the opportunity to provide additional comments regarding the intervention. For statements 1 (The intervention was easy to implement), 2 (The intervention was successful in decreasing transition times), 3 (I will use the intervention in the future), 4 (The students liked the intervention), and 5 (I will recommend this intervention to others) the teacher checked strongly agree, demonstrating high acceptability by the teacher. The teacher also provided an additional comment to include her anecdotal opinion that the students enjoyed the intervention and she believed it helped them transition to the next activity, and it was very easy for her to use. See the teacher’s responses displayed in Table 2.

The students were provided with a brief researcher developed questionnaire with three items to respond to (Appendix C). Each student was asked to mark which face described his answer best. A smiling face for “yes,” a neutral face for “I don’t know,” and a frowning face for “no.” The students were not capable of reading the statements and the researcher assisted them vocally, and all participants except for Pete were able to circle their response independently. For Pete, the researcher circled his vocal response for him. The responses for items 1 (I liked the intervention), 2 (The intervention helped me), and 3 (I want my teacher to keep using the intervention) for all participants indicated this was highly acceptable by the students as they all circled “yes”. Max added a comment that he would like the intervention to use Mario Brothers characters as well. See each individual student’s response in Table 3.
Table 1.

Interobserver Agreement for Latency to On-task Behavior

<table>
<thead>
<tr>
<th></th>
<th>Zach</th>
<th>Pete</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Snack to Reading</td>
<td>Sensory Gym to</td>
<td>Snack to Reading</td>
</tr>
<tr>
<td>BL (range)</td>
<td>99.6% (99-100%)</td>
<td>97.7% (96-99%)</td>
<td>99.1% (98-100%)</td>
</tr>
<tr>
<td>Sessions of IOA Completed</td>
<td>50%</td>
<td>67%</td>
<td>50%</td>
</tr>
<tr>
<td>Reading only</td>
<td>96.3%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Sessions of IOA Completed</td>
<td>33%</td>
<td>33%</td>
<td>33%</td>
</tr>
<tr>
<td>Reading and Elective</td>
<td>87.5%</td>
<td>100%</td>
<td>99.3%</td>
</tr>
<tr>
<td>Sessions of IOA Completed</td>
<td>33%</td>
<td>33%</td>
<td>33%</td>
</tr>
</tbody>
</table>
Table 2.

Teacher Social Validity Questionnaire Results

<table>
<thead>
<tr>
<th>Item</th>
<th>Teacher’s Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. This intervention was easy to implement.</td>
<td>5</td>
</tr>
<tr>
<td>2. The intervention was successful in decreasing transition times.</td>
<td>5</td>
</tr>
<tr>
<td>3. I will use the intervention in the future.</td>
<td>5</td>
</tr>
<tr>
<td>4. How much time was needed each day for you to carry out this behavior plan?</td>
<td>5</td>
</tr>
<tr>
<td>5. How confident were you that the behavior plan would be effective for this student?</td>
<td>5</td>
</tr>
</tbody>
</table>

Note. * Reverse scored items (i.e., if the teacher scored a 1 it is reported as a 5 in the table)
Table 3.

Student Social Validity Questionnaire Results

<table>
<thead>
<tr>
<th>Statement</th>
<th>Zach</th>
<th>Pete</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I liked the intervention.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2. The intervention helped me.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>3. I want my teacher to keep using the intervention.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Chapter 3:

Results

Student Latency to On-Task Behavior

Figure 1 displays the results for all three participants. During baseline for snack to reading, the mean latency to on-task behavior for Zach was 458s (range: 229s to 571s), 509s (range: 429s to 600s) for Pete, and 506.7s (range: 430s to 614s) for Max. During baseline for transitioning from entering the classroom after sensory gym to elective, the mean latency to on-task behavior for Zach was 238s (range: 53s to 343s), 252.3s (range: 164s to 400s) for Pete, and 292.7s (range: 133s to 402s) for Max.

During the second phase for implementing the CAI for transitioning to reading only, the mean latency to on-task behavior for Zach was 42.3s (range: 0s to 108s), 84s (0s to 140s) for Pete, and 98s (range: 29s to 145s) for Max. During this phase, the transition to elective remained in baseline and the mean latency to on-task behavior for Zach was 199.7s (range: 123s to 326s), 244s (range: 207s to 281s) for Pete, and 264.3s (range: 189s to 384s) for Max.

During the third phase for implementing CAI for both transitions, for the transition to reading, the mean latency to on-task behavior for Zach was 25.7s (range: 0s to 70s), 136s (range: 115s to 150s) for Pete, and 111s (53s to 141s) for Max. For the transition to elective, the mean latency to on-task behavior for Zach was 64.7s (range: 10s to 125s), 146.5s (range: 138s to 155s) for Pete, and 125s (range: 120s to 130s) for Max.

Teacher Prompts
Figure 2 displays the results for teacher prompts for each student. During baseline for the snack to reading transition, the mean number of teacher prompts for Zach was 3.3 instances per transition (range: 1 to 5), 4.3 instances per transition (range: 3 to 5) for Pete, and 5 instances per transition (range: 4 to 6) for Max. During baseline for the sensory gym to elective transition, the mean number of teacher prompts for Zach was 1.5 instances per transition (range: 0 to 2), 3.4 instances per transition (range: 1 to 5) for Pete, and 4 instances per transition (range: 3 to 8) for Max.

During the second phase for implementing the CAI for transitioning to reading only, the mean teacher prompts for Zach was 0.7 instances per transition (range: 0 to 1), 2.3 instances per transition (range: 0 to 4) for Pete, and 1.7 instances per transition (range: 0 to 3) for Max. During the second phase, the transition from entering the classroom after sensory gym to elective remained in baseline, and the mean teacher prompts for Zach was 2.3 instances per transition (range: 2 to 3), 3.5 instances per transition (range: 1 to 6) for Pete, and 2.7 instances per transition (range: 1 to 4) for Max.

During the third phase, CAI was implemented for both transitions. For the transition to reading, the mean teacher prompts for Zach was 1 instance per transition (range: 0 to 2), 1 instance per transition (score of 1 for each transition) for Pete, and 1.7 instances per transition (range: 1 to 2) for Max. For the transition to elective, the mean teacher prompts for Zach was 3 instances per transition (range: 1 to 5), 1.5 instances per transition (range: 0 to 3) for Pete, and 2.5 (range: 2 to 3) for Max.
Figure 1. Direct Observation Data of latency to transition for all participants. Latency to on-task behavior recorded in time as seconds for all participants.
Figure 2. Effects of CAI intervention on the mean number of teacher prompts for each phase, and the range listed above each bar for all participants.
Chapter 4:

Discussion

The purpose of this study was to expand the literature by evaluating the effects of a CAI-based intervention on decreasing latency to on-task behavior between transitions within the classroom for students diagnosed with ASD. This study also assessed if a CAI-based intervention would decrease teacher prompting for students with ASD, and the social validity of using a CAI-based intervention. Results from this study indicate that using a CAI-based intervention for transitions within the classroom for students with ASD could decrease the amount of time spent transitioning in the classroom, agreeing with the results found by Hine et al. (2015). However, this study found the CAI-based intervention was effective alone, without the use of a group contingency or reinforcement component as in Hine et al, except for Zach who had a token economy in place throughout the study. The current study found that teacher prompts decreased for some but not all participants and transitions. Social validity scores indicate the CAI-based intervention was highly acceptable to the teacher and students. This was the first known study to look at using a CAI-based intervention for transitions in a classroom with students diagnosed with ASD.

The results from this study demonstrated that using a CAI-based intervention in a classroom with students diagnosed with ASD may decrease latency to on-task behavior when transitioning. The decrease of time to transition may allow teachers and students more time for learning activities and less time spent managing problem behavior in the classroom. Students with ASD are more likely to be excluded from the mainstream classroom and participating in
school-related events due to the likelihood of problem behavior that can arise during transitions (Strain et al., 2011). The current study supports a CAI-based intervention being a feasible option for teachers to use in a classroom with students diagnosed with ASD. Using this technology in the classroom could be a feasible and low response effort intervention for teachers that could easily be implemented with fidelity since it utilizes automated cues and countdown times.

For Zach, during baseline he was observed pulling his hair or laying under his desk or chair during the time to transition from snack to reading and transitioning from sensory gym to elective. He had a behavior team that consisted of a one on one behavior analyst or registered behavior technician that worked alongside him in the classroom each day. The behavior team was implementing a token economy with Zach to earn recess for work completion. The token economy was being implemented before and during the current study. Once the intervention was implemented for reading only there was an immediate decrease in the latency to on-task behavior for Zach during that transition, a difference on average of 7 min from baseline levels. The time to transition from sensory gym to elective was a shorter duration than the transition to reading in baseline, averaging between 3 to 4 min. Once intervention was in place for the transition to elective, Zach’s average time was approximately 1 min. His results show that he could potentially gain 8 additional min in a school day for academic time if the teacher continued using the intervention for these two transitions only. During the intervention phases for each transition teacher prompts slightly decreased for Zach during the transition to reading, but on the first day of intervention for the elective transition there was a greater amount of prompting. This was possibly due to his therapist not implementing the token board he had in place, as she later reported she did not want to prompt him right away to see if the CAI intervention alone would work, changing the procedure that had taken place during all other sessions. If this is the cause, it
may be possible that this intervention may not have been as successful without the reinforcement component for Zach. Zach’s problem behaviors observed during baseline transitions were not observed during intervention.

For Pete, during baseline he was observed to physically aggress towards the teacher, and knock over a peer’s Lego structures during both transitions. Pete had no additional classroom supports, but would occasionally leave the classroom for speech therapy. Once the intervention was implemented for reading only there was an immediate decrease in the latency to on-task behavior for the transition to reading, a difference on average of 6 to 7 min from baseline levels. Once the intervention was implemented for both transitions, there was a difference of close to 2 min from the baseline level for the transition to elective. Pete’s results show he could potentially gain up to 9 min in a school day for academic time if the teacher continued to use the intervention for these two transitions only. Teacher prompts for Pete showed a decrease for both transitions from baseline levels. During the intervention, Pete would stand in front of the TV to watch the screen and had to be prompted for all but one transition in each phase to sit down, but he would immediately comply with the prompt and completed the transition more quickly. Pete’s problem behaviors observed during baseline were not observed during either transition when the intervention was implemented.

During baseline for Max, he was observed to hide stuffed Mario Brothers character dolls in and on his desk, or he would lay on the floor or on another piece of furniture during transitions. Once the intervention was implemented for reading only, Max’s latency to on-task behavior decreased immediately from an average of 8 min to an average of less than 2 min, with a difference of approximately 7 min. Once the intervention was implemented for both transitions his average time was approximately 5 min to transition to elective decreased to an average of 2
min. For Max, there was a decrease in the average number of prompts for the transition to reading. Teacher prompts for the transition to elective decreased from the first baseline phase to the second baseline phase, but no change was observed from the second baseline phase to the third phase when the intervention was implemented. During both intervention phases Max was observed to put his Mario dolls away, but he still had to be prompted most days to clean off his desk. He was not observed to lay on the floor during any of the sessions, once the intervention was in place.

**Limitations and Future Directions**

There were some limitations for the current study. First, transitions were based on teacher recommendation for the class as a whole, and only three transitions were selected to choose from. Future studies may benefit by identifying individual students in different classrooms to determine the effects on an individual level, or by completing direct observations for all transitions in a school day. Second, the study took place in a special needs private school. Future studies may benefit by expanding the population to public school, mainstream, inclusive classrooms to compare the transition times between students with developmental disabilities or ASD with their typically developing peers. For the current study, the researcher consulted with the teacher to determine a time the teacher felt was appropriate for her students. It would add to the literature to evaluate at what time typically developing peers transition, which may further improve the contextual fit of the intervention. Third, the current study and previous study by Hine et al. (2015) were completed with elementary-aged students. Future studies may want to investigate the effects on older student populations with and without developmental disabilities. Fourth, the current study was completed in the last few weeks of school and due to end of year events and absences we were unable to collect more than two data points for Pete and Max.
during the second and third phases when transitioning to elective. Lastly, this study was conducted during the last two months of a school year. Conducting a study at the beginning of the year when students are not as familiar with the classroom routine would be interesting to see if there would be as great a change in behavior with no reinforcing component for students diagnosed with ASD. However, it is notable that this simple CAI intervention was effective in decreasing transition times for students whose teacher indicated they had struggled the entire school year with transitions.
References


Appendices
Appendix A: Data Sheet

Data Sheet for Latency to On-Task Behavior and Teacher Prompts

Participant: ____________________________________________

Transition: ____________________________________________

<table>
<thead>
<tr>
<th>Date</th>
<th>Start Time</th>
<th>End Time</th>
<th>Total Latency (s)</th>
<th>Frequency of Teacher Prompts</th>
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</thead>
<tbody>
<tr>
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</tbody>
</table>
Appendix B: Implementation Fidelity

Teacher Fidelity Checklists for CAI Implementation

Date: ___________________________  Transition: _______________________

Please check yes or no for each step as the intervention is implemented.

<table>
<thead>
<tr>
<th>CAI Implementation</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Portable media device connected and file open and ready prior to the transition.</td>
<td></td>
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</tr>
<tr>
<td>2. Volume is checked and set to an appropriate level.</td>
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</tr>
<tr>
<td>3. To start a transition, the teacher starts the CAI timer program.</td>
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<tr>
<td>4. At the end of the transition the teacher turns off the timer display.</td>
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</tbody>
</table>
Appendix C: Social Validity-Teacher Version

A Teacher Social Validity Questionnaire

Date:_____________________  Teacher’s Name: __________________________

Please answer the following questions by checking in the appropriate circle.

<table>
<thead>
<tr>
<th></th>
<th>The intervention was easy to implement.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
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<td>Strongly Agree</td>
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<td></td>
<td>2</td>
<td>Agree</td>
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<td>3</td>
<td>Neither</td>
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<td>4</td>
<td>Disagree</td>
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<td></td>
<td>5</td>
<td>Strongly Disagree</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>The intervention was successful in decreasing transition times.</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td></td>
<td>2</td>
<td>Agree</td>
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<td></td>
<td>3</td>
<td>Neither</td>
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<td></td>
<td>4</td>
<td>Disagree</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>5</td>
<td>Strongly Disagree</td>
<td></td>
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</tbody>
</table>

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<tr>
<th></th>
<th>I will use the intervention in the future.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
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<td>Strongly Agree</td>
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<tr>
<td></td>
<td>2</td>
<td>Agree</td>
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<td></td>
<td>3</td>
<td>Neither</td>
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<td></td>
<td>4</td>
<td>Disagree</td>
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<td></td>
<td>5</td>
<td>Strongly Disagree</td>
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<thead>
<tr>
<th></th>
<th>The student’s liked the intervention.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<td>Agree</td>
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<td>3</td>
<td>Neither</td>
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<td>4</td>
<td>Disagree</td>
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<td>5</td>
<td>Strongly Disagree</td>
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<thead>
<tr>
<th></th>
<th>I will recommend this intervention to others.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Strongly Agree</td>
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<td>2</td>
<td>Agree</td>
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<td>3</td>
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<td></td>
<td>4</td>
<td>Disagree</td>
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<tr>
<td></td>
<td>5</td>
<td>Strongly Disagree</td>
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Additional Comments:
### Appendix D: Social Validity-Student Version

**Student Social Validity Questionnaire**

Date:__________________  Student’s Teacher: ______________________

Please answer the following questions by circling the most appropriate face.

<p>| | |</p>
<table>
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</thead>
<tbody>
<tr>
<td>1. I liked the intervention.</td>
<td>Yes</td>
</tr>
<tr>
<td>2. The intervention helped me.</td>
<td>Yes</td>
</tr>
<tr>
<td>3. I want my teacher to keep using the intervention.</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Additional Comments:
Appendix E: Computer Assisted Instruction Intervention Screen Shots
Appendix F: IRB Approval Letter

October 5, 2016

Kristina Bewley
ABA: Applied Behavior Analysis
Tampa, FL 33612

RE: Expedited Approval for Initial Review
IRB#: Pro00027100
Title: Using Computer-Assisted Instruction to Decrease Transition Times for Students with Autism Spectrum Disorder

Study Approval Period: 10/4/2016 to 10/4/2017

Dear Ms. Bewley,

On 10/4/2016, the Institutional Review Board (IRB) reviewed and APPROVED the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):

Thesis Protocol Version.doc

Note: no research activities can begin without you receiving the required letter of support from the school district and receiving an approval through the Amendment process.

Consent/Assent Document(s)*:
Parent Informed Consent.doc.pdf
Teacher Informed Consent.pdf
Assent Form.doc (not a stamped form)

*Please use only the official IRB stamped informed consent/assent document(s) found under the “Attachments” tab. Please note, these consent/assent document(s) are only valid during the approval period indicated at the top of the form(s).

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review
research through the expedited review procedure authorized by 45 CFR 46.110. The research proposed in this study is categorized under the following expedited review category:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

This study involving child participants falls under the minimal risk category 45 CFR 46.404: Research not involving greater than minimal risk.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) calendar days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

John Schinka, Ph.D.
Chairperson
USF Institutional Review Board