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Teaching Independent Transitioning to Young Children with Autism Using Video Self-Modeling with Video Feedback via iPads

Lema Kabashi[1*] & Ann M. Epstein[1]

[1] Educational Studies, University of Wisconsin-La Crosse, La Crosse, Wisconsin, United States

[*] Lema Kabashi, E-mail: lkabashi@uwlax.edu

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Abstract

This study investigated the efficacy of Video Self-Modeling (VSM) with video feedback using iPads to improve independent transitioning of two young children, a first grader and a preschooler, with Autism Spectrum Disorder (ASD) across play activities and school routines. It was hypothesized that participants would transition independently through play activities and daily routines after watching their exemplary behaviors on an iPad. Teachers and teacher assistants delivered the intervention in inclusive classrooms. An A-B-A-B research design was used with the first grader whereas an A-B-A design was implemented with the preschooler. Findings show that both participants improved targeted behaviors. Independent transitioning skills were also maintained for both participants one month after the intervention was withdrawn. Social validity results show that parents of participants and their teachers favored and recommended the video self-modeling with video feedback intervention for other children with autism.

Keywords

autism, children, transitions, video self-modeling, video feedback, iPad

1. Introduction

The core features of Autism Spectrum Disorder (ASD) consist of significant deficits in social communication and interaction and the presence of repetitive and restricted interests and activities (APA, 2013). In addition to these core features, children with autism may display other behaviors that make their learning difficult. Unusual patterns of behavior and learning differences make ASD even more perplexing (Marks et al., 2003). Transitioning across activities and settings poses a significant challenge for children with autism (Hume, Screkovic, Snyder, & Carnahan, 2014; Mechling & Savidge, 2011). Transition difficulties may be a result of a child's resistance to changes, confusion stemming from

unpredictability, avoidance of undesirable tasks, or attempts to reestablish a terminated activity (Banda & Kubina, 2006). Difficulties with transitions often lead to severe problems including noncompliance, crying, aggression, and other inappropriate behaviors (Schreibman, Whalen, & Stahmer, 2000).

The number of identified children with autism has increased from one in 2,500 thirty years ago to one in 68 children today (CDC, 2014). Today's general education teachers are likely to have children with autism in inclusive classrooms (Harrower & Dunlap, 2011; Leach & Duffy, 2009). Thus, there is a need for specialized strategies that will decrease challenging behaviors and increase appropriate behaviors associated with transitioning across activities and settings as well as with different people (Cihak, Fahrenkrog, Ayres, & Smith, 2010).

Video-Based Interventions (VBIs), an evidence-based practice that meets the Council for Exceptional Children guidelines (Buggey, Hoomes, Sherberger, & Williams, 2011; Gelbar, Anderson, & McCarthy, 2011), is a specialized strategy that promotes target behaviors in children with autism by observing video footage of their own behavior, other models, or from a person's point of view (Goodwyn, Hatton, Vannest, & Ganz, 2013). The Point-of-View Video Modeling (POVM) involves recording the video from the vantage point of the one carrying out the task (Mason et al., 2013). VBIs are associated with Bandura's observation based theory of social learning (Hitchcock, Dowrick, & Prater, 2003). Learning through observation is based on the suggestion that an individual can gain knowledge or change their behavior by simply observing other people engaged in similar behaviors (Gül & Vuran, 2010).

Video self-modeling, one of the approaches of VBI, allows individuals to observe their own performance of the targeted behavior(s) and then imitate the behavior(s) in a similar situation (Bellini, Akullian, & Hopf, 2007). When individuals see themselves successfully perform a target behavior that has not previously occurred and that may be slightly above their abilities, known as feed forward, they will have the necessary information to perform the targeted skills. Feed forward presents "a future action of skills to achieve a valued goal" (Smith, Hand, & Dowrick, 2014, p. 928). In addition, individuals' beliefs of their capabilities (self-efficacy) will strengthen (Hitchcock et al., 2003). Watching one's successful behavior can also have a positive impact on attention and motivation (Bellini & Akullian, 2007).

Cihak (2011) and Cihak et al. (2010) used video self-modeling and point-of view modeling to improve transitioning skills of individuals with autism. While both studies implemented video self-modeling and point-of-view modeling, only the second study used iPods. Both studies provided 10 transitioning opportunities per day and used a system of least-to-most hierarchy; the first study assigned five transitions to picture activity schedules and the other five to video based schedules. Participants who did not display target behaviors were prompted by the teacher to view the video or picture again. If they were still unsuccessful, least-to-most prompting was implemented. All participants in Cihak et al. (2010) had more successful transitions when the intervention was applied and returned to previous levels when the intervention was withdrawn. Two participants in Cihak's later study (2011) had better outcomes with static-picture schedules and one made better progress using a video based schedule.

Video priming, another VBI approach which focuses on previewing future events to increase

predictability, was used by Schreibman et al. (2000) to decrease challenging behaviors of three children with autism. Researchers purposefully selected POVM to eliminate the impact of models. Participants' challenging behaviors decreased, resulting in improved transitions.

With the exception of social initiations (Deitchman, Reeve, Reeve, & Progar, 2010), the use of video feedback to assist children with autism has not been investigated thoroughly. In video feedback, a child and an adult first view video footage of the child's performance, then the child evaluates his own performance using a self-management program, and finally a rewards system based on accuracy of the child's self-evaluation is applied (Deitchman et al., 2010).

This study differs from the Dietchman et al. (2010) study in several key ways. The participants did not view non-edited videos of their inappropriate and appropriate behaviors; they viewed only the videos of their exemplary behaviors. Also, they were not asked to evaluate their own performance nor was a self-management program used. Instead adults provided feedback on their exemplary behaviors. Finally, no reward system was implemented.

The purpose of this study was to examine the efficacy of video self-modeling with video feedback using iPads to improve independent transitioning of children with autism across daily activities. This investigation was conducted in two different settings, a first-grade general classroom and an early childhood classroom. Both settings were inclusive and the participants had access to the general education curriculum.

2. Method

2.1 Participants

Two young children with autism, a first grader and a preschooler, participated in this study. Participants were selected based on the following criteria: a) diagnosis of autism spectrum disorder, b) age between 4 and 8 years, c) inability to transition from one activity to another independently, and d) display of one or more of the following behaviors when transitioning from one activity to another: whining, crying, screaming, pulling, verbal resistance, dropping or wandering around.

The first participant, Dylan, was a 7-year-old first grader with a diagnosis of autism. Dylan's Individualized Education Program (IEP) indicated both behavioral and academic difficulties. Dylan demonstrated adequate language ability but he often used inappropriate words with school professionals. One IEP goal targeted behavioral skills to increase his overall performance, specifically in his general education classroom. A "Request for Assistance" form was completed by Dylan's teacher indicating her concerns about his behaviors. In addition, further information was collected by interviewing teachers and teacher assistants who worked with Dylan. The data revealed that Dylan displayed one or more of the challenging behaviors listed in the inclusive criteria when he transitioned from one activity to another.

The second participant, Alan, was a 5-year, 3-month-old boy at the start of the study and was diagnosed with autism spectrum disorder as well as speech and language impairments. Both diagnoses were documented in his Individualized Education Program (IEP), however researchers were not given access

to evaluation documents so there is no information on the severity of the conditions. Teachers indicated that Alan understood and followed directions and he also had a strong sense of humor. He had significant delays in auditory comprehension and expressive communication skills. Interacting with peers and adjusting to new places and routines were quite difficult for Alan. Researchers met with teachers to identify Alan's current behaviors and to determine appropriate goals. Teachers stated that Alan displayed aggressive behaviors, would leave the classroom, and run outside. Classroom observations by researchers confirmed that he displayed one or more of the following inappropriate behaviors when transitioning from one activity to another: stomping his feet, verbal resistance, dropping to the floor, or wandering around.

Dylan's teacher, who had a Master's degree in elementary education and 10 years of teaching experience, and his Teacher Assistant (TA) implemented the intervention, whereas an Early Childhood Education (ECE) teacher, an ECE special education teacher, and a TA implemented the intervention for Alan. Both teachers had a BS in elementary education with a minor in early childhood education and 5 years of teaching experience. The ECE teacher also had a Masters' degree in reading whereas the ECE special educator held additional certification in early childhood special education. The TA held a BS in psychology and had 2 years of experience.

2.2 Setting and Materials

Dylan was included part-time in a first-grade general education classroom from 7:45-10:30 AM. The study was conducted in his general education classroom during this time. Alan was fully included in an early childhood preschool classroom and the study was conducted during free play time.

2.2.1 Materials

A video camcorder and a tripod were used to videotape video vignettes for both participants. They were also used for data collection and reliability purposes. An Apple laptop was used to edit out prompts and create the video vignettes, which were then uploaded on iPads. In addition, two iPads were used by the participants to view their video vignettes.

2.2.2 Video Vignettes

Prior to the start of the study, the principal investigator created seven video vignettes (27-51 seconds), one for each of Dylan's classroom routines. Since Dylan was the primary model, video vignettes were edited to remove the adult's prompts and depict only his exemplary behavior. Video vignettes displayed the teacher giving a signal (e.g., song, cue, etc.) for the upcoming activity (e.g., small group reading, morning meeting) and Dylan transitioning independently to that activity.

The same procedures were used for creating Alan's video vignettes, however the content was different. Video vignettes showed Alan transitioning independently to the activity of his choice. He first picked up his nametag from a play area (e.g., library), walked to another play area of his choice (e.g., sensory table), and put his nametag in the designated place for this play area. Then, the video showed him playing with a peer and/or engaging appropriately in that play area. Video vignettes of both participants ended with special effects congratulating them (e.g., "Great job Alan/Dylan!") and an applauding audio cheering

themon their exemplary behaviors.

2.3 Pre-Experimental Procedures

2.3.1 Assessments

An assessment was conducted to evaluate Dylan's self-recognition abilities. He and a peer were videotaped for a minimum of one minute. When asked to identify people seen in the video on the iPad, Dylan named himself and provided names of his peers, demonstrating self-recognition abilities. Alan participated in another study conducted by the principal investigator using video self-modeling shortly before this study began. Alan's ability to recognize himself was confirmed in this earlier study. Both participants were also able to attend to their videos for at least one minute. Lastly, they displayed a strong interest in the iPad, which suggested that the device itself was highly motivating.

2.3.2 Training of School Professionals

The principal investigator and the second author trained four school professionals at both sites (the elementary school where the inclusive first grade classroom was located and another elementary school where the inclusive preschool was located) to implement the intervention. They modeled procedural steps and then engaged school professionals in a role-play for practice. School professionals were provided with procedural steps that they needed to follow during role-play. Researchers observed them role playing and recorded "yes" or "no" if the procedural steps were followed and implemented accurately. The training continued until school professionals demonstrated 90% accuracy in the implementation of procedural steps across three consistent trials.

2.4 Experimental Design

This study investigated the efficacy of video self-modeling with video feedback using iPads to improve transitioning skills of two young children with autism. An A-B-A-B research design was utilized to demonstrate experimental control and establish a functional relationship between the independent and dependent variables for the first grader. The A-B-A-B design included (a) baseline I, (b) intervention I, (c) baseline II, (d) intervention II, and (e) maintenance. An A-B-A research design was utilized to demonstrate experimental control and establish a functional relationship between the independent and dependent variables for the preschooler. This was comprised of (a) baseline I, (b) intervention, (c) baseline II, and (d) maintenance.

2.5 Measurement

2.5.1 Dependent Variable

The dependent variable, independent transitioning, varied slightly for each of the participants. Independent transitioning consisted of the first grader starting to walk independently to a large group or small group/play activity, as directed by the teacher (e.g., in response to a verbal signal), within 30 seconds of watching the video on the iPad and completing the transition within the next 30 seconds. A correct response was scored even if the participant displayed inappropriate behaviors, verbal or motor (see Table 1), while transitioning from point A to point B.

Table 1. Coding of Dylan's Target Behaviors

	Target Behaviors	Definitions
Independent Transitions	Independent Transitioning	Participant starts to walk independently to a large group or small group/play activity, as directed by the teacher (signal, verbal) and/or as selected by the child, within 30 seconds of watching the video on the iPad (first viewing or after video feedback) and complete the transition within the next 30 seconds. He doesn't display any inappropriate behaviors (verbal/motor) while moving from point A to point B and while in the activity for a total of 3 minutes
	Independent Transitioning Plus Inappropriate Behaviors	Participant starts to walk independently to a large group or small group/play activity, as directed by the teacher (signal, verbal) and/or as selected by the child, within 30 seconds of watching the video on the iPad (first viewing or after video feedback) and complete the transition within the next 30 seconds. He displays inappropriate behaviors (e.g., verbal, motor) while moving from point A to point B and/or while in the activity for a total of 3 minutes.
Unsuccessful Transitions	Delayed transitioning	Participant starts to walk independently to a large group or small group/play activity, as directed by the teacher (signal, verbal) and/or as selected by the child, after 30 seconds of watching the video on the iPad (first viewing or after video feedback) and will complete the transitioning within 3 minutes OR if the participant start to walk within 30 seconds but will not complete the transitioning within the next 30 seconds. He may/may not display inappropriate behaviors (verbal or motor) while moving from point A to point B and/or while in the activity for a total of 3 minutes.
	Incomplete transitioning	Participant starts to walk independently within 30 seconds of watching the video on the iPad (first viewing or after video feedback), after being directed by the teacher (signal, verbal) and/or as selected by the child, but he will not join completely a large group or small group/play activity. He will not approach the activity (large/small group) closer then 1 meter and/or doesn't stay in the activity for a total of 3 minutes.
	No	Participant will not start to walk independently to a large group

	transitioning/assisted transitioning	or small group/play activity, as directed by the teacher (signal, verbal) and/or as selected by the child, after 30 seconds of watching the video on the iPad (first viewing or after video feedback) and will complete the transitioning within 3 minutes. No transitioning from point A to point B within 3 minutes. After 3 minutes the TA prompts him verbally/physically. He may/may not display inappropriate behaviors (verbal or motor) during these 3 minutes.

The dependent variable for the preschooler began with him starting to walk independently to a play area that he selected, pick up his name tag, and put it in that play area within 30 seconds of watching the video on the iPad and then completing the transition within the next 30 seconds. As with the first grader, a response was scored as correct even if the participant displayed inappropriate behaviors while transitioning from point A to point B or while in the activity for a total of 3 minutes. Data were also collected on unsuccessful transitions including delayed, incomplete, and assisted transitions (see Table 2).

Table 2. Coding of Alan's Target Behaviors

	Target Behaviors	Definitions
Independent Transitions	Independent Transitioning	Participant starts to walk independently to a play area that he selected, get his name tag and puts it in that play area, within 30 seconds of watching the video on the iPad (first viewing or after video feedback) and complete the transition within the next 30 seconds. He doesn't display any inappropriate behaviors (verbal/motor) while moving from point A to point B and while in the activity for a total of 3 minutes.
	Independent Transitioning Plus Inappropriate Behaviors	Participant starts to walk independently to a play area that he selected, get his name tag and put it in that play area, within 30 seconds of watching the video on the iPad (first viewing or after video feedback) and complete the transition within the next 30 seconds. He displays inappropriate behaviors (e.g., verbal, motor) while moving from point A to point B and/or while in the activity for a total of 3 minutes.
Unsuccessful Transitions	Delayed transitioning	Participant starts to walk independently to a play area that he selected, get his name tag and puts it in that play area, after 30 seconds of watching the video on the iPad (first viewing or

		after video feedback) and complete the transition within 3 minutes OR if the participant start to walk within 30 seconds but will not complete the transitioning within the next 30 seconds. He may/may not display inappropriate behaviors (verbal or motor) while moving from point A to point B and/or while in the activity for a total of 3 minutes.
	Incomplete transitioning	Participant starts to walk independently to a play area that he selected within 30 seconds of watching the video on the iPad (first viewing or after video feedback), but doesn't get his name tag and put it in that play area. He may go to the play area or may not approach the play area (large/small group) closer then 1 meter and/or doesn't stay in the activity for a total of 3 minutes.
	No transitioning/assisted transitioning	Participant will not start to walk independently to a play area that he selected, doesn't get his name tag and put it in that play area, within 30 seconds of watching the video on the iPad (first viewing or after video feedback). No transitioning from point A to point B within 3 minutes. After 3 minutes the TA prompts him verbally/physically. He may/may not display inappropriate behaviors (verbal or motor) during these 3 minutes.

Criterion performance differed slightly for each participant due to specific aspects of transitioning skills required in the preschool vs the first-grade classroom. Dylan's criterion performance consisted of independent transitioning through morning activities for five consecutive sessions. Alan's criterion performance consisted of independent transitions displayed across three play areas per day for five consecutive sessions.

2.5.2 Data Collection

All sessions were videotaped for data collection and reliability purposes. Data was collected using flip cameras for both participants. For the first participant, the teacher/TA engaged the camera by rotating it toward the participant as he transitioned across morning activities. The camera was located at the end of the classroom and mounted on a rotating tripod. The second author video recorded the second participant as he transitioned to three different areas during free play throughout each condition of the study. The principal investigator transferred the videos from the cameras to her laptop each day to collect data, monitor both participants' progress, and to assure treatment fidelity.

The principal investigator was the primary data collector for the first participant whereas the second author collected data for the second participant. The data was collected by reviewing the videos each day

and recording the frequency of both independent and unsuccessful transitions. Tables 1 and 2 provide full descriptions of coding and performance criteria for independent and unsuccessful transitions.

2.5.3 Inter Observer Agreement (IOA) and Procedural Fidelity

Video recordings from days that the first participant was not in his general education classroom for the whole morning were used for reliability training. The operational definitions of the target behaviors and a scoring protocol were provided to the reliability observer. Initial training consisted of the reliability observer engaging in a practice session during which she identified and recorded target behaviors while watching the video recordings as described above. Her recordings were compared to recordings of the principal investigator. Training continued in this fashion until 90% agreement for the target behavior was reached on three consecutive sessions between the reliability observer and the principal investigator. This reliability observer withdrew midway through the study; a new reliability observer was trained using the same inter-observer and formula procedures as described above. Inter-observer agreement was calculated by dividing the total number of agreements by the total number of agreements plus disagreements multiplied by 100. The reliability observer randomly selected and independently scored 33-40% of video sessions from each condition for both participants. The mean total agreement for Dylan was 100% across conditions. The mean total reliability agreement for Alan was 96.5% (ranging from 86-100%).

To determine whether the intervention procedures were implemented accurately and consistently, procedural reliability data sheets were developed for each condition. The same faculty member served as the treatment fidelity observer and reviewed the video recordings using a checklist to evaluate whether the intervention was implemented accurately and consistently. The reliability observer recorded “yes” or “no” if the steps were followed and implemented accurately and “N/A” if any steps were not applicable. Treatment fidelity for both participants was calculated for each session as follows: total number of steps completed accurately divided by the total number of steps completed accurately plus the total number of steps completed inaccurately/missed multiplied by 100. For Dylan treatment fidelity for 33-40% of the sessions for each condition ranged from 85% for intervention to 100% for both baselines and maintenance, whereas for Alan the mean total agreement was 98.2% (ranging from 95% to 100%).

2.6 Experimental Procedures for Participant I

2.6.1 Baseline I

For the first participant, baseline data were collected only on days he was in the classroom for the entire morning session. The teacher gave a signal/cue (e.g., a song) to the whole class. The participant’s behavior was observed for 3 minutes. No prompts were delivered during that time. Depending on daily schedules, the number of transitions ranged from five to nine per session. Data was collected by continuously recording morning activities.

2.6.2 Video Self-Modeling with Video Feedback I

The intervention consisted of the participants watching their own video of transitioning independently to a specific activity. For example, with the first participant, the TA, knowing that students would need to transition to morning meeting upon hearing the morning meeting song, would identify the appropriate

video vignette and bring the iPad to the participant, wherever he was in the classroom. The TA invited the participant to view the video vignette by saying (e.g., "Dylan, let's watch the video"). While watching the video, she commented on the participant's exemplary behaviors (e.g., "Dylan, you walked nicely to the carpet"). After watching the video, the TA invited him to transition to the activity by saying, "Do the same as in the video". If he did not transition within 30 seconds after watching the video for the first time then the TA showed him the video one more time, emphasizing his appropriate transitioning to the activity. No prompts were delivered for 3 minutes after the participant watched the video for the second time.

2.6.3 Baseline II

Baseline data were collected after the intervention was withdrawn. The same procedures were followed as in the first baseline.

2.6.4 Video Self-Modeling with Video Feedback II

The intervention was reinstated for the first participant after the second baseline was completed. The same procedures used in the first intervention were followed during this condition.

2.6.5 Maintenance

Maintenance sessions, which were identical to the intervention sessions, were conducted 1 month after the treatment was withdrawn. The participant was observed across morning activities for three consecutive sessions.

2.7 Experimental Procedures for Participant II

2.7.1 Baseline I

For the second participant, baseline data points were collected while observing his transitions to three different play areas during a free play session. The teacher/TA offered the participant choices among his preferred play areas and then his behaviors were recorded for 3 minutes. If after 3 minutes he still did not transition to a play area, the teacher/TA prompted him. He was then videotaped for 3 minutes in each of these three different play areas.

2.7.2 Video Self-Modeling with Video Feedback I

The teacher/TA offered the participant picture choices to select a play area. Then the teacher/TA, who had the video vignette of that specific activity ready on the iPad for him to watch, invited him to view the video by saying, "Alan let's watch the video". While watching the video, she commented on his exemplary behaviors (e.g., "Alan, you got your name tag and placed it in the correct play area"). After viewing the video, he was invited to "do the same as in the video". If he did not transition within 30 seconds after watching the video for the first time then the teacher/TA showed the video one more time while emphasizing his appropriate behaviors. No prompts were delivered at any time during these 3 minutes.

2.7.3 Baseline II

Baseline data were collected after the intervention was withdrawn. The same procedures were followed as in the first baseline.

2.7.4 Maintenance

Maintenance sessions, which were identical to the intervention sessions, were conducted 1 month after the treatment was withdrawn. The participant was observed during free play to assess if treatment gains were maintained over time.

2.8 Social Validity

For the first participant, results were reported in a school staff meeting upon completion of the study. Twenty teachers and other professionals ($n = 20$) participated in the social validity assessment. A 5-point Likert rating scale (1-strongly disagree to 5-strongly agree) was used to rate one baseline and one intervention video. Faculty members rated the participant's transitioning skills before and after the intervention, his motivation, generalization of skills, feasibility and importance of the intervention as well as recommending the intervention for other children with autism.

Upon completion of the second participant's study, his classroom teacher, special education teacher, and two educational assistants ($n = 4$) completed a social validity assessment. They also answered four Yes/No questions regarding whether the participant displayed all steps comprising independent transitioning during baseline and intervention. The same 5-point Likert rating scale implemented in the first experiment was used to rate pre-and-post treatment videos.

2.9 Data Analysis Procedures

The effect of the independent variable (video self-modeling with video feedback) on the dependent variable (independent transitioning) was determined through visual inspection of graphic representation of the data. The average level of independent transitioning was calculated by summing the scores of the dependent variable for all sessions within that condition and dividing them by the total number of sessions conducted in that condition. Visual analysis, which included level stability, level change, trend direction, and Percentage of Non-Overlapping Data (PND), were conducted based on recommendations of Gast (2010). To determine the variability of the data or range in data-point values, a stability envelope using 80%-20% criteria, meaning that "if 80% of the data points of a condition fall within a 20% range of the median level of all data point values of a condition" (Gast, 2010, p. 202) was utilized. The magnitude of the intervention (the level change) was analyzed using a relative level change within a condition. Trend direction, analyzing whether there is a therapeutic or contra therapeutic slope, was determined using a split-middle method. Finally, the effect size of the intervention was calculated using Percentage of Non-Overlapping Data.

3. Results

3.1 Participant 1

The frequency of independent transitions and unsuccessful transitions displayed by the participant during five conditions for the first participant (baseline I, intervention I, baseline II, intervention II and maintenance) is presented in Figure 1.

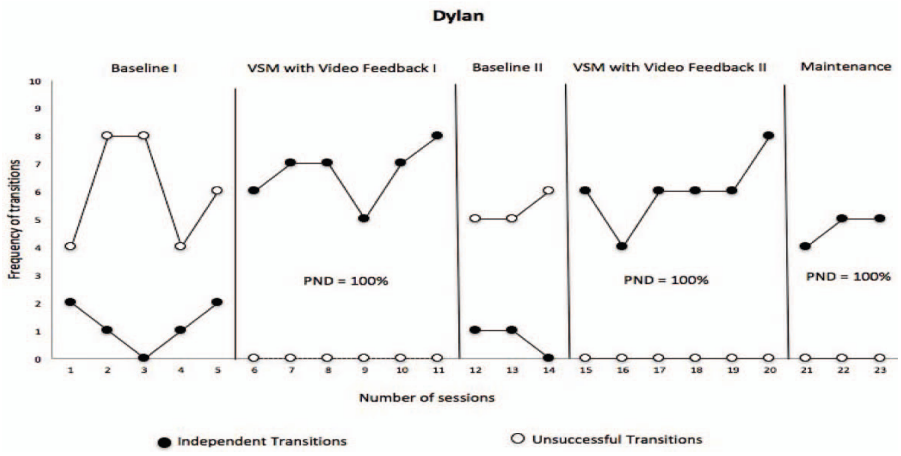

Figure 1. Frequency of Dylan's Independent Transitions

Throughout the first baseline condition, Dylan demonstrated limited independent transitioning skills. The number of morning activities differed from day to day, ranging from five to nine. Dylan demonstrated an average of 1.2 (range 0-2) or 16% independent transitions from one activity to another. He displayed an average of 7.2 (range 4-8) or 83% unsuccessful transitions.

As displayed in Figure 1, Dylan's independent transitions increased dramatically when the intervention was introduced. The number of total transitions ranged from five to eight per session ($M = 6.6$). Dylan transitioned independently from one activity to another 100% of the time. He did not display any unsuccessful transitions during this condition ($M = 0$).

Dylan's independent transitions declined when the intervention was withdrawn. The number of transitions in this condition consisted of six transitions per session. Dylan transitioned independently once per session in two out of three sessions ($M = .66$, range 0-1). An average of 5.3 (range 5-6) or 88% of transitions were unsuccessful.

When the intervention was reinstated the frequency of independent transitions increased, as it did during the first intervention condition. The number of transitions across six sessions ranged from four to eight. He transitioned independently 100% of the time. There were no unsuccessful transitions when the intervention was reinstated ($M = 0$).

Given that 83% of the data fell within a 20% range of the median value, there was low variability of the data showing a level stability of the data for both intervention I and II. A relative level change within a condition demonstrated that there was a level change in the independent transitions as a result of the intervention. The split-middle method showed trend direction of the independent transitions accelerating for both interventions, intervention I and intervention II, and decelerating for unsuccessful transitions. Treatment Percentage of Non-Overlapping Data (PND) was calculated at 100% for independent and unsuccessful transitions for both intervention I and II, indicating a highly effective intervention on increasing independent transitions and decreasing unsuccessful transitions.

Maintenance results across three sessions were similar to Dylan's performance during the intervention

conditions. The number of transitions ranged from four to five transitions per session. He transitioned independently from one activity to another 100% of the time. There were no unsuccessful transitions during this condition ($M = 0$). Maintenance PND was calculated at 100%, indicating that the intervention was highly effective in maintaining independent transitions one month after the intervention was with drawn.

3.2 Participant 2

The frequency of independent and unsuccessful transitions displayed during four conditions (baseline I, intervention I, baseline II, and maintenance) for the preschool participant is presented in Figure 2.

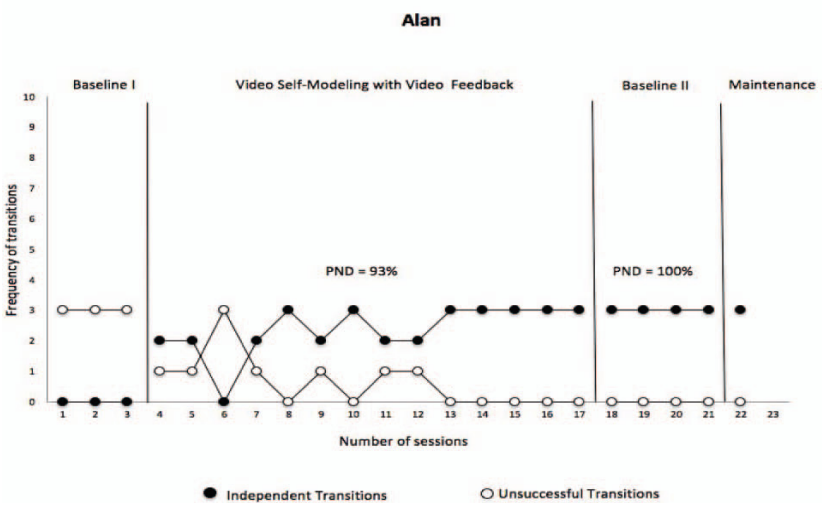

Figure 2. Frequency of Alan's Independent Transitions

During three baseline sessions, Alan did not demonstrate any independent transitions ($M = 0$) as he transitioned to three different play areas. All three transitions per session were unsuccessful (e.g., delayed, incomplete, or needed teacher/TA's assistance, $M = 3$).

In the video self-modeling with video feedback condition, Alan was able to transition successfully to two out of three play areas during the first two sessions. However, for the next seven sessions, he either did not transition successfully or he was successful for two out of three transitions. Alan began transitioning successfully to all three play areas on his 10th session. Across the 14 intervention sessions, Alan transitioned independently 67% of the time ($M = 2$). An average of .64 or 17% of his transitions were delayed, incomplete, or needed teacher/TA assistance. He reached criteria (5 consecutive days of three successful transitions each day) on the 14th session.

Low variability of the data was noticed for Alan as well. Approximately 92% of data fell within a 20% range of the median value, indicating a level stability of data for the intervention. A level change in the independent transitions as a result of the intervention was calculated using relative level change within a condition. Trend direction for Alan also showed an increase of independent transitions, accelerating, and a decrease of unsuccessful transitions, decelerating. Treatment Percentage of Non-Overlapping Data

(PND) was calculated at 100% for independent and unsuccessful transitions, indicating that the intervention was highly effective on increasing independent transitions and decreasing unsuccessful transitions.

In the second baseline condition, Alan was able to transition successfully during the three opportunities in each of the three sessions (M = 3). He was successful 100% of the time.

A maintenance session was carried out 1 month after Alan's second baseline. He had one transition opportunity per day (rather than three as in other conditions). Alan transitioned independently during each of the three sessions in his maintenance condition. Maintenance PND was calculated at 100%, indicating that the intervention was highly effective in maintenance of independent transitions one month after the intervention was withdrawn.

3.3 Social Validity

Ninety-five percent (n = 20) of teachers and other professionals who participated in Dylan's social validity assessment indicated that the intervention was socially acceptable and recommended it for other children with autism. All teachers strongly disagreed that Dylan transitioned independently from one activity to another during baseline (M = 1). Eighty-five percent noticed an increase in his independent transitions during the intervention (M = 4.1, range 2-5). In addition, 95% found the target skills very important for children with autism to learn (M = 4.94) (range 4-5). Eighty percent of respondents indicated that Dylan not only learned through watching his video on the iPad (M = 4.6, range 2-5) but also appeared to enjoy watching himself in the video (M = 3.75, range 1-5). A strong majority (85%) thought that the intervention seemed to be easily implemented in an inclusive classroom (M = 3.16, range 1-5). Fifty percent commented that they would implement the intervention in their classrooms if they had extra assistance (e.g., teacher assistant, aid). One of the respondents added in the comments section: "I definitely plan to use this strategy in the future!" Only 10% of the respondents thought this intervention might be time consuming.

To assess social validity for the second participant (Alan), respondents (n = 4) watched a baseline and an intervention video of his transitioning through three different play areas. All respondents agreed that he did not complete the four steps comprising independent transitioning during baseline (M = 0), but they all agreed that he completed all steps (M = 4) during the intervention in each of the three play areas.

All four respondents strongly agreed (M = 5) that Alan watched the video and appeared to enjoy it. Nearly all strongly agreed that the skills targeted in this study are important for children with autism to learn (M = 4.5, range 4 -5). Social validity participants expressed the lowest level of agreement regarding ease of implementing video self-modeling with video feedback (M = 3.75). However, his preschool teacher noted the ease and the speed with which Alan learned to use his nametag. Both of Alan's EAs commented on the ease of using iPads to show the videos. His primary EA noted the overall effectiveness of the intervention.

Ninety percent (90%) of respondents (M = 4.5, range 4-5) strongly agreed that they would recommend using video self-modeling with video feedback for other young children with autism. Eighty percent

(80%) strongly agreed that Alan's transition skills generalized to other situations (M = 4.0, range 3-5).

4. Discussion

The purpose of this study was to examine the efficacy of video self-modeling plus video feedback using iPads to improve independent transitioning from one activity to another for two young children with autism in two inclusive classrooms. We hypothesized that both children would increase their rates of successful independent transitions as a result of the intervention. The results of this study suggest that viewing exemplary behaviors (i.e., transitioning independently from one activity/play area to another) on an iPad can help children with autism learn target behaviors.

Prior to the current study, both participants required one-on-one assistance from a teacher or TA to successfully complete the intended task. As seen Figure 1, Dylan displayed a maximum of two successful transitions during baseline but neither of them were transitions to academic activities. Once the intervention was introduced, he immediately increased the frequency of his independent transitions and his unsuccessful transitions decreased to zero. When the intervention was withdrawn, the only independent transition was to snack time; all other transitions were unsuccessful. His independent transitions spiked with reinstatement of the intervention, demonstrating a functional relationship between video self-modeling with video feedback and independent transitioning through morning activities. Alan, as seen in Figure 2, displayed no independent transitions during baseline. Once the intervention was introduced, he immediately carried out two independent transitions followed by one unsuccessful transition. He only needed five sessions of video self-modeling with video feedback to independently transition from one play area to another. Compared to Dylan, it appears that he reached the criterion performance more gradually (after 9 sessions). However, when the intervention was withdrawn, he maintained the skills. In Alan's case, a functional relationship between video self-modeling with video feedback and independent transitions is demonstrated by his immediate improvements in independent transitioning as a result of the intervention. He maintained the skills during the second baseline (when the intervention was withdrawn); however, this could be interpreted as a strength of video self-modeling with video feedback because once he learned the skills he continued to transition independently even when the intervention was withdrawn.

Consistent with Cihak (2011) and Cihak et al. (2010), our data suggest that video self-modeling may increase independent transitions for children with autism in general education classrooms. The present study also used video self-modeling while targeting independent transitions. However, there are several differences between this study and the Cihak studies. In addition to VSM, least-to-most prompting was used in both Cihak studies; in the present study only video self-modeling with video feedback was utilized. The use of iPads instead of iPods was another difference. The present study provides clear evidence of the effectiveness of video self-modeling with video feedback using iPads implemented by teachers without other additional strategies seen in the Cihak (2011) and Cihak et al. (2010) studies.

The treatment efficacy in this study may be associated to specific features of the intervention. First, the

feed forward feature allowed participants to see themselves performing skills that were not yet acquired or demonstrated. Video vignettes showing the participants transitioning independently and engaging actively increased confidence in their ability to successfully transition from one activity/play area to another. Prior to the study, Dylan frequently made comments such as, "I cannot do it" when asked to transition to an activity (e.g., reading, math). Once the intervention was introduced, such comments decreased dramatically and by the end of the intervention Dylan no longer made such comments.

Second, participants may have acquired target skills because of video feedback. Video feedback emphasizing their exemplary behavior allowed participants to discriminate between independent transitions and delayed or unsuccessful transitions. When the participants displayed inappropriate behaviors, teachers or TAs provided video feedback emphasizing the targeted appropriate behavior. This provided meaningful examples of what participants should do in the upcoming transitioning opportunity. In addition, video feedback may have had an effect of errorless learning, which allows the child to minimize errors by ensuring correct production of the behavior followed by reinforcement (Donaldson & Stahmer, 2014). Video self-modeling with video feedback minimized the chance of participants failing to transition successfully. They learned how to transition by watching their own videos on an iPad, which was reinforcing in itself.

Third, technological devices such as iPads, iPods, and iPhones have demonstrated positive effects when used with individuals with autism. A review of 15 studies (Kagohara et al., 2013) using iPods and iPads indicated that individuals with autism can be taught to use these devices and they enjoy learning with them. Watching video vignettes on iPads may have operated as a positive reinforcement for increasing independent transitioning skills, especially since playing iPad games was one of the most preferred activities for the participants.

4.1 Limitations

Several limitations must be addressed when drawing conclusions from the present study. First, the number of participants in this study is low, only two. However, a single subject design typically includes two to 10 participants (Gast, 2010), allowing researchers to employ experimental conditions to study specific interventions with a small number of participants. This study began with three participants, one of them started displaying the target behaviors during the baseline so he was withdrawn from the study. Since a potential maturation and attrition are threats to internal validity of a single subject research design, a minimum of four participants should have been considered. That way, the loss of one participant would have had less impact on the generalization of the independent variable. The second limitation concerns the dependent variables. The dependent variables for each of the participants was comprised of slightly different features. These features differed based on the participants' ages (i.e., preschool vs first grade) and the specifics of the activities (i.e., morning routines vs free play). The third limitation is related to the type of research designs employed for each participant. An A-B-A-B research design was employed for Dylan whereas an A-B-A design was used for Alan. While Dylan's performance decreased when the intervention was withdrawn, Alan maintained his target behaviors. This could be seen as compromising

the design, however as Kratoch will et al. (2013) noted both A-B-A-B and A-B-A designs are "problematic in drawing firm conclusions" (p. 30). They argue that neither design is able to establish functional relationship between the Independent Variable (IV) and the Dependent Variable (DV) while addressing other external factors related to the IV.

Several external factors may have contributed to Alan's maintenance of successful transitions after the intervention was withdrawn. One may speculate that the play-based nature of his preschool classroom, the power that comes with children making their own choices, opportunities to select preferred activities over non-preferred activities, and on-going exposure to watching peers transition successfully across play activities resulted in maintaining his skills once they were learned. For example, he transitioned from the sensory table, which was one of his preferred play areas, to the book area, which was another high interest area.

In addition, video self-modeling with video feedback was integrated into Alan's play activities which makes the intervention an activity-based intervention. It is well established that activity-based interventions are effective (Pretti-Frontczak & Bricker, 2004) due to the following characteristics: children are purposefully engaged, activities address multiple domains of development, children's natural interest in play is emphasized, and generalization and maintenance of skills is enhanced. Children in Alan's inclusive preschool classroom had on-going opportunities to select toys and learning activities; Alan's peers provided on-going models of this process. Moving from one play area to the next was not regulated by the teacher. Rather, children had unlimited opportunities to choose among a wide variety of toys and activities.

VSM appears to have provided Alan with an effective means of learning to transition successfully from one play activity to the next. Once learned, Alan consistently selected his next play activity and placed his nametag in the correct area. In addition, Alan was allowed to select highly preferred activities which supports previous findings regarding the power of choice to assist children in the successful completion of activities and maintenance of on-task behaviors (Ulke-Kurkcuoglu & Kircaali-Iftar, 2010). In contrast, Dylan's transitions were predetermined and he did not have the option of selecting preferred activities over those he did not prefer. While requiring a design shift from A-B-A-B to A-B-A, Alan's successful transitions after Baseline II do not necessarily weaken efficacy of VSM with video feedback. Rather, his success points out the need to confirm effectiveness of this intervention with additional research.

Although there was high agreement that teachers/TAs implemented the intervention consistently and accurately, there were a few occasions when they delivered prompts, which may be considered a fourth limitation. However, viewing video data every day served as a means to monitor accuracy and consistency of the intervention. When prompts were noted the principal investigator reminded teachers/TAs to refrain from prompting, observed intervention delivery and confirmed the absence of prompting, thus ensuring accurate and consistent treatment fidelity.

A final limitation of this study involved the process used to assess maintenance of Alan's transitioning skills. Teachers assessed maintenance of his target behaviors during one session per day, rather than 3

sessions, across 3 successive days. Although Alan was able to transition successfully each of these 3 times, we cannot say with certainty that he maintained target skills for 3 out of 3 play opportunities per day.

5. Conclusion

Additional research is needed to confirm the positive impact of video self-modeling with video feedback using iPads to support young children in transitioning successfully. The current study did not differentiate components of independent transitioning. For example, the percentage of transitions that included inappropriate behaviors was not determined for either participant. Particularly during early sessions of the intervention, Dylan and Alan displayed inappropriate verbalizations and/or reluctance to move on to another activity even though they did transition independently. Future studies that target decreasing inappropriate behaviors associated with transitioning from one activity to the next appear justified.

The high interest and positive response from typically developing peers to Dylan and Alan's iPad videos suggests another important avenue for further research. How can video self-modeling with video feedback via iPads be used in inclusive classrooms to encourage peer acceptance of children with ASD? While peer response to VSM and video feedback was not a focus of this study, it was a positive and somewhat unexpected outcome, deserving further examination.

Independent transitioning is an essential skill for children with autism to be fully included members of a classroom. Teachers seek strategies to help children learning to transition independently without using any reinforcements (e.g., edibles, tangibles). Results from this study suggest that video self-modeling with video feedback using iPads is effective without tangible reinforcements or prompting or other self-management strategies as employed in other studies (Cihak et al., 2010; Deitchman et al., 2010). In addition, this intervention used iPads, a portable and amusing device for children with autism. Teachers or TAs can show children their iPad video vignettes anywhere in the classroom.

It is encouraging that, during Dylan's social validity assessment, many school professionals (n = 20) stated that they would implement video self-modeling with video feedback in their classrooms if they had additional assistance. The principal of Dylan's school further stated that she sees potential for this intervention district-wide. In addition, viewing video vignettes on iPads allowed TAs to implement the intervention accurately and consistently. This suggests that TAs could assume a larger role in implementing evidence-based strategies.

A major contribution of this study is that the intervention emphasized participants' exemplary behaviors. No reward system was used at any time during the intervention. Dylan's teachers were particularly surprised that he learned to transition independently without any additional reinforcement.

Teaching young children with autism is a continuing challenge, particularly as numbers increase. Learning to transition independently in inclusive classrooms can be frustrating for both children and their teachers. However, video self-modeling with video feedback offers a positive, even enjoyable

opportunity to learn this skill. Both participants enjoyed watching their videos. In fact, Alan often snuggled into the lap of his teacher/TA when she invited him to watch his video. Results from this study of a first grader and a preschooler who both learned to transition in their inclusive classroom are heartening. While additional research is needed to confirm the results of this study, video self-modeling with video feedback has the potential to help children with autism become independent, successful members of their classrooms.

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