Effects of a Peer-Mediated Literacy Based Behavioral Intervention on the Acquisition and Maintenance of Daily Living Skills in Adolescents with Autism

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Abstract: Many adolescents with disabilities do not independently perform the daily living skills needed to be successful in typical community environments. Literacy Based Behavioral Interventions have been effective in promoting skill acquisition and maintenance in some learners, but have yet to be implemented to teach basic self-care skills. Also, LBBIs to date have only been implemented by teachers, job coaches, or other adult professionals. In this study, peer partners were taught to deliver an LBBI story involving making a sandwich to four adolescents with autism. Results showed that the students' accuracy with the task increased dramatically after reviewing their stories about sandwich-making with the peers. These skills maintained after the peers stopped reviewing the LBBI stories with them. This study extends previous research on LBBIs by incorporating the stories into efforts to teach new skills, and by enlisting peers into the intervention.

Many adolescents with autism and other moderate to severe disabilities do not have the daily living skills needed to help them live and perform well in typical community environments. Regardless of specific disabilities, independence in such basic skills as grooming, dressing, hygiene, and meal preparation opens many doors to typical community routines, environments, and social relationships. Conversely, difficulty with these very basic life skills decreases positive post-secondary, employment, and community living outcomes (Carter, Austin, & Trainor, 2012) and increases the challenges that many adolescents and adults experience with peer social relationships (Miller & Chan, 2008).

Fortunately, the intervention literature holds a number of effective interventions that have proven effective when skilled teachers have targeted these skills for instruction. Four decades of intervention research has shown the effectiveness of individual and small group instruction using a variety of graduated guidance and prompting systems (Lent & McLean, 1976; Manley, Collins, Stenhoff, & Kleinert, 2008), permanent prompts (Alberto, Sharpton, Briggs, & Stright, 1986), behavior skills training applications (Fetherston & Sturmey, 2014; Rosales, Stone, & Rehfeldt, 2009; Shayne & Miltenberger, 2013), and numerous types of picture and video models and prompts (Cihak, Alberto, Taber-Doughty, & Gama, 2006; Lasater & Brady, 1995; Spriggs, Gast, & Ayres, 2007). The recent attention to video modeling and prompting interventions delivered by cell phones, PDAs, and tablets demonstrates that researchers continue to seek effective interventions in an attempt to increase access for these learners to enabling environments and relationships (Bereznak, Ayres, Mechling, & Alexander, 2012; Mechling & Savidge, 2011; Van Laarhoven, Kraus, Karpman, Nizzi, & Valentino, 2010). As Mechling (2008) pointed out, the instructional technology for teaching self-care skills is encouraging and continues to evolve.

One instructional intervention has included

the use of story scripts in which learners can view a sequence of pictures and written scripts that provide examples and directions for completing a skill. These Literacy Based Behavioral Interventions (LBBIs) provide guided instruction within a literacy context using print or pictures as an instructional medium. LBBIs include a wide variety of literacy interventions, including social scripts (Krantz & McClannahan, 1998), social narratives (Collet-Klingenberg, & Franzone, 2008), picture activity schedule books (Spriggs et al., 2007), comic strips and cartoon representations of students (Daly & Ranalli, 2003), Social Stories™ (Gray, 1998), and other interventions that present opportunities for instruction and rehearsal through print and pictures (Weiss & Harris, 2001). These LBBIs incorporate instruction with sentences, phrases, written reminders, and stories along with photographs, drawings, comic strip illustrations, or other visual media. Integrating written instruction with visual cues reduces the abstract nature of learning for many youngsters (Quill, 1997), and integrating instruction in a social context further increases meaning. Far from relying on a specific formula for creating this learning media, most LBBIs are notable in their adaptability to the needs of learners, adapting the stories, language, and visuals to the learning characteristics of students.

To date, various LBBIs, and Social Story™ interventions in particular, have been reviewed to establish whether their efficacy matches their promise (Ali & Frederickson, 2006; Bucholz, 2012; Kokina & Kern, 2010; Sansosti, Powell-Smith, & Kincaid, 2004; Styles, 2011; Test, Richter, Knight, & Spooner, 2011; Weiss & Harris, 2001). These research reviews point out that the empirical studies have most frequently targeted problem behavior reduction, with a few targeting social communication skills. The Social Stories™ studies typically targeted difficulties that students had making activity transitions, including noncompliance, tantrums, and various forms of aggression. As a behavior reduction procedure, the intervention has been reasonably effective. Few studies, however, have examined the efficacy of these interventions to teach new skills and behaviors. In addition, these interventions typically target elementary-aged children and are implemented by teach-

ers, although other adults (including parents) have delivered the instruction in a few investigations. Bucholz and her colleagues have expanded the application of LBBIs in particular by targeting employability outcomes, including adolescents and adults with intellectual disabilities in her studies, and delivering interventions in small group contexts instead of the typical 1:1 instructional formats (Bucholz, Brady, Duffy, Scott, & Kontosh, 2008; Keeter & Bucholz, 2012).

The purpose of this study was to explore ways to expand further the use of LBBIs, specifically to investigate whether the intervention might increase the positive adaptive behavior of adolescents with disabilities who will soon enter post-school roles and environments. We specifically sought to examine the efficacy of an LBBI to promote adaptive daily living skills, in this case, making a peanut butter and jelly sandwich. Next, we wished to explore whether LBBIs might be effective when delivered by similar aged peers. If so, this could take on characteristics of a naturalistic and effective teaching procedure that relies less on a direct instruction technology, and more on a peer social context. We posed two research questions:

1. Will a Literacy Based Behavioral Intervention delivered by peers increase the acquisition of daily living skills by adolescents with moderate to severe disabilities?
2. If so, will these improvements maintain when the peers remove the LBBI story and intervention?

Method

Participants

Four adolescents with moderate to severe disabilities, who attended a public charter school for students with autism spectrum disorders (ASD), served as the target students. Each attended classes that utilized a standards-based curriculum. Each had an eligibility of ASD based on various evaluation instruments, and each indicated ASD as their primary disability on their Individualized Education Plans. Christian, Mark, and Craig were students in the same classroom. Mary and Mark also received occupational therapy.

TABLE 1

Participant Characteristics

Student (Peer Partner)	Ages	Eligibility and Services	Assessment Summary
Christian (James)	17 (16)	ASD; Language Impairment	DAR: Grade 2; FAA Reading Performance Level 4 (Emerging)
Mark (James)	16 (16)	ASD; Language Impairment; Received Occupational Therapy	Full Scale IQ (UNIT): 41 DAR: Grade 1; CARS: Severe Autism; ADI-R: Met Autism Criteria; ADOS-2: Met Autism Criteria FAA Reading Performance Level 2 (Participatory)
Craig (Michael)	14 (16)	ASD; Language Impairment	Full Scale IQ (Stanford Binet): 46 GARS: Probability of Autism: Very Likely; FAA Reading Performance Level 2 (Participatory)
Mary (Gina)	15 (16)	ASD; Speech Impairment; Received Occupational Therapy	Brigance Grade 1; FAA Reading Performance Level 3 (Participatory)

Note. FAA is Florida Alternate Assessment in Reading ("Participatory" indicates need for frequent prompting and limited depth of knowledge; "Emerging" indicates limited independent performance of preliminary skills); DAR is Diagnostic Assessment of Reading; CARS is Childhood Autism Rating Scale; ADI-R is Autism Diagnostic Interview - Revised; ADOS - 2 is Autism Diagnostic Observation Schedule; GARS is Gilliam Autism Rating Scale.

Three other adolescents from the same school served as peer partners. The target students and peers were familiar with one another through participation in school-wide activities, such as school dances, lunch, and recess. All three peers had a primary eligibility of ASD. Peers were selected based on the following criteria:

- Reading levels were close to grade level;
- Followed teacher requests consistently;
- Academic work was up to date;
- Showed an interested and willingness to participate

In addition, James was classified with a specific learning disability and emotional behavioral disorder; Gina was also classified as having a language impairment. Michael was the only peer earning a standard diploma while James and Gina were earning a special diploma. All target students and peers provided assent to participate, and parents provided consent prior to initiating the study. Participant characteristics and student-peer dyads are summarized in Table 1.

Task and Setting

A daily living skill was selected based on three criteria. First, parents, teachers, and students were asked to nominate up to three skills that they wished to learn to perform independently. Second, the tasks were matched to each student's IEP to verify the need for and importance of the skill. Finally, skills were examined for the practical aspects of instruction by peers in a school setting. Because food preparation was identified as a priority need and a preferred skill by each student, making a peanut butter and jelly sandwich was selected as the daily living skill. All instruction took place in one of two areas of the school that contained an area for meals and meal preparation. The first location was the school lunchroom, an area containing tables with benches, a sink, refrigerator, cabinets and drawers. All materials necessary for the task were placed on the countertop before the sessions began. The second area was in a vocational area of the school designed to replicate a restaurant. This area contained a table with benches and a cart with restaurant supplies such as napkins, forks, and knives. The

setting was chosen each day based on availability of the location, and all baseline, intervention, and maintenance measures were collected in these two settings.

Behavioral Measure, Data Collection, and Interobserver Agreement

A task analysis was the behavioral measure for each student. The task analysis contained 14 steps and, in turn, was used to construct the LBBI story that formed the basis of instruction. Data were collected individually for each student by observing the student build the sandwich, and scoring each step as (a) correct and independent, (b) incorrect, or (c) correct but accompanied by peer coaching or guidance. Coaching and guidance was defined as a peer delivering a prompt in response to a student making an error or not initiating a step within 30 seconds. Steps did not have to be performed in a strict order, although some steps required an inherent order (e.g., the jar had to be opened before peanut butter was spread on the bread). Only steps that were correct and independent were used for instructional decisions.

Data were collected using paper-pencil recording sheets by one to two observers stationed away from the students, yet still within range of sight and hearing. Typically, the distance between observers and students was between 5–10 feet. Both observers were experienced teachers attending a graduate program in special education. Both observers were trained to use the data collection system and practiced using the data sheets prior to the study.

On 42% of the sessions both observers recorded performance simultaneously for purposes of assessing interobserver agreement. This accounted for 40% of the sessions for Christian, 38% for Mark, 44% for Craig, and 54% of the sessions for Mary. Agreement across all students was 99%.

Development of the LBBI

Prior to baseline, and after the sandwich-making skill was task analyzed, a story book depicting how to build the sandwich was constructed. Although the task analysis contained 14 separate steps on which we collected performance data, we combined several of the

steps so that the actual story book contained only 8 pages. Each page consisted of one to two photographs of a student performing steps from the task analysis, taken from a point-of-view perspective. That is, each photograph showed a skill from the perspective of the student performing the task (Schreibman, Whalen, & Stahmer, 2000). At the bottom of the page, a sentence or phrase was typed describing what the student in the picture was doing. The length of the story ranged from 7 to 12 words for page (M = 9.6 words per page). Pictures were approximately 6 x 8 inch color photographs; all words used Calibri 44 size font. Each page was held in a laminated sleeve, and the story pages were collected in a 1 inch, 3-ring binder. A summary of the story book for making a peanut butter and jelly sandwich is found in Table 2.

Experimental Procedures

During baseline, the peer stood next to the student who made the sandwich. A researcher asked the student to "make a sandwich" and data were recorded based on steps completed correctly and independently. Sessions ended when students stated or otherwise indicated that they had completed their sandwich. During baseline, the peer was present but did not interact with the student during the session.

Prior to the intervention, training on the core elements of the LBBI was conducted with each peer. This peer training was conducted for approximately 20 minutes, for 2 days for James and 3 days for Michael and Gina. The peers were taught to read, point to, pause, practice, and provide reinforcement for each step that was completed correctly. Peer training concluded when they demonstrated the procedure twice with 100% fidelity with an experimenter.

When the LBBI was implemented, the peer sat next to the student with the book on the table in front of them. The peer then read the story, using the additional components of the LBBI (point, pause, practice, and reinforce), to the student. Once all the pages of the story were completed the peer asked the student to "make a sandwich." While the student made the sandwich the peer stood within 5 feet to prompt if necessary. If the student

TABLE 2

Summary of Students' LBBI

Page & Story Content	Pictures
1. Get out 2 pieces of bread. Put them on your dish.	Two photos are present on the page. One photo shows a loaf of bread. The other photo shows 2 slices of bread on a plate.
2. Open the jelly. Open the peanut butter.	Two photos are present on the page. One photo shows a picture of a hand opening a jar of jelly. The other photo shows a picture of a hand opening a jar of peanut butter.
3. Get out one scoop of peanut butter. Spread it on the bread.	Photo shows a hand spreading peanut butter on a slice of bread.
4. Get out one scoop of jelly. Spread it on the bread.	Photo shows a hand spreading jelly on a slice of bread.
5. Put one slice of bread on top of the other.	Photo shows picture of an open sandwich and another picture of a closed sandwich.
6. Close the jelly. Close the peanut butter.	Page contains a picture of a hand closing a jar of jelly and another picture of a hand closing a jar of peanut butter.
7. Cut your sandwich or ask your friend to cut it for you.	Page shows photo of a sandwich being cut in half and another photo of a sandwich in two pieces.
8. Give ½ to your friend and eat your sandwich.	Page contains a photo of a sandwich with a bite missing.

made an error or did not initiate a step within 30 seconds, the peer provided a prompt by opening the story to the corresponding page in the LBBI, and re-reading the page and pointing to the picture.

Finally the LBBI was removed for each student to evaluate whether any gains would maintain in the absence of instruction. Our criterion for removing the LBBI was that the students would complete at least 93% of the steps accurately, without prompts, as long as their performance demonstrated that they could indeed build a complete and edible sandwich. The LBBI was removed for Christian after 12 sessions, with follow-up observations 10, 23, and 30 days after the last intervention. This pattern was repeated for each student. The LBBI was removed after 14 sessions for Mark, 13 sessions for Craig, and 11 sessions for Mary. Follow-up observations were held 9 and 16 days after the LBBI for Mark, 11 and 27 days after the LBBI for Craig, and 7 and 30 days for Mary.

Experimental Design

All baseline, intervention, and maintenance observations were collected during a single session each day. A multiple baseline design across participants was implemented to assess the effects of the LBBI with each student. The design incorporated multiple probes during baseline to avoid exposing students to extended period of practice without intervention. For each student a follow-up condition without the LBBI was implemented to assess potential maintenance several weeks after the instruction was removed.

Results

The effects of the peer-mediated LBBI are shown in Figure 1. During baseline, none of the students demonstrated the ability to make the sandwich accurately and independently. For Christian, Mark, and Craig, each baseline probe was stable and below 35%. Mary's baseline accuracy was higher, but never exceeded 73%. When the peer-mediated LBBI was implemented, all students improved their accurate and independent performance substantially. Christian achieved a stable 100% responding starting on his sixth intervention session. Mark immediately improved his performance, remained above 90% on 9 intervention days, and reached 100% on 3 days. Craig took three intervention sessions to exceed 90%, then remained there for the rest of his
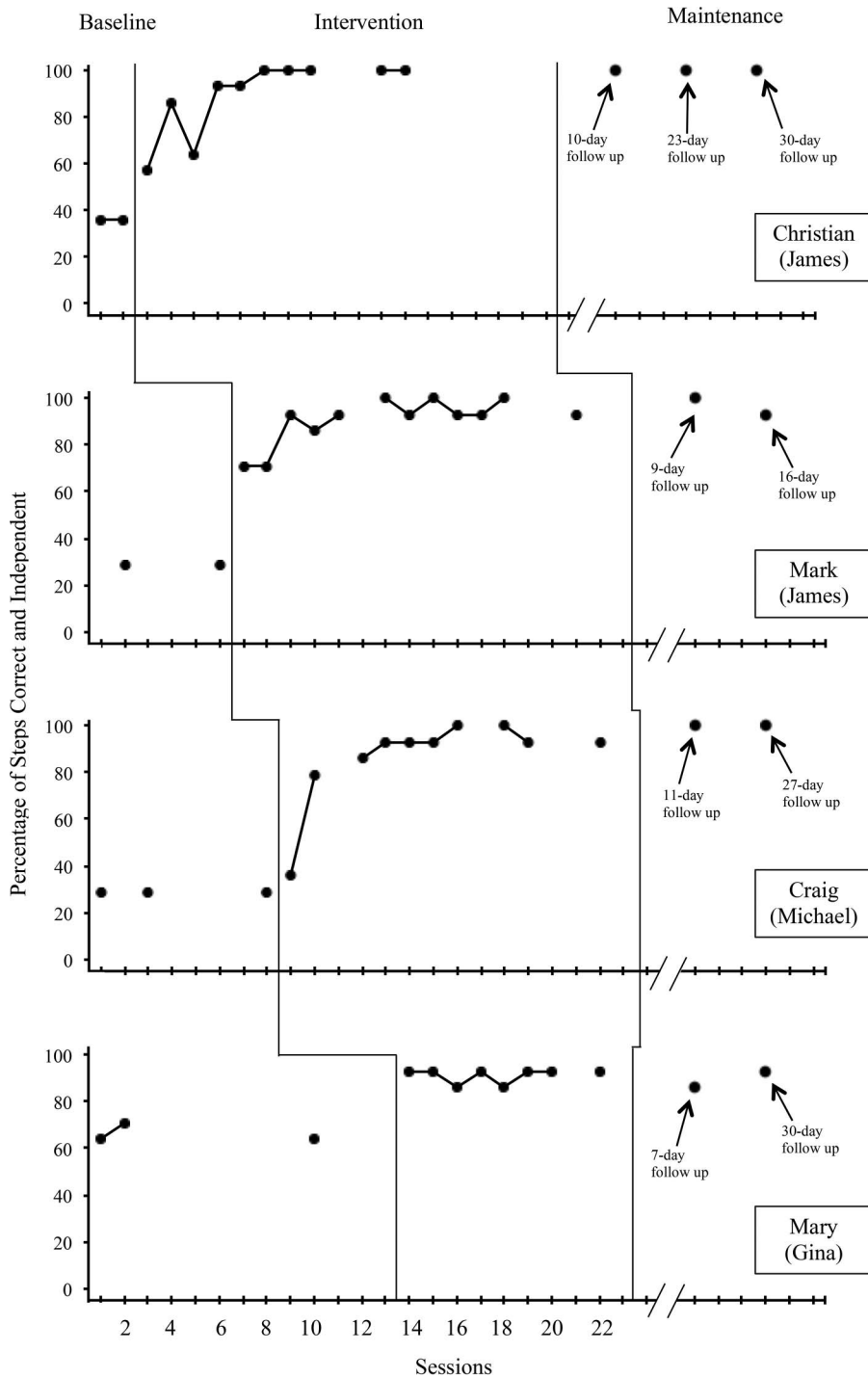
Figure 1. Percentage of correct and independent steps of the task analysis for making a peanut butter and jelly sandwich.

intervention sessions. Mary also showed an immediate increase in her performance, exceeding 90% on her first day of using the LBBI with her peer, and remained above 90% on 6 days.

When the peers stopped delivering the LBBI Christian maintained his sandwich making accuracy at 100% on each follow-up observations across the next 30 days. Mark and Craig also maintained their skills, demonstrating 100% independent accuracy on 1 of 2 observations across the next 16 days for Mark, and 2 of 2 observations for Craig across the next 27 days. Mary's performance during the follow-up observations was somewhat more variable, with scores between 86% and 93% across the next 30 days.

Discussion

Each of the four students who received an LBBI delivered by a similar aged peer increased the ability to perform the daily living skill. Each student also maintained the new skill during follow-up observations 9 to 30 days after the peers stopped delivering the intervention. The findings strengthen the evidence base for using LBBIs to promote daily living skills, and extend the efficacy of the intervention by including peers in the delivery. Also, improvements in student responding were rapid, with all students making sandwiches independently within 4 days of their first exposure to instruction. As such, it appears that the peer-mediated LBBI holds potential as a teaching procedure for some students with autism and other moderate to severe disabilities.

As Bucholz et al. (2008) pointed out many LBBIs include a host of procedures that combine to create an effective package of instruction. For example, the peer-mediated LBBI in this study incorporated imitation and discrimination training with picture models for each step in the task analysis. For example, on each page of the story the peer showed the student how to perform steps of the skill using verbal instructions and modeling, followed by corrective feedback and/or praise (e.g., an open vs an unopened jar). Also, the pictures and text gave a structured sequence for the skill, and peers encouraged the students to rehearse the skill as they worked through the

pictures and text. These procedures are common to most behavioral skills training protocols (Fetherston & Sturmey, 2014; Shayne & Miltenberger, 2013), and are also commonly found in direct instruction demonstrations common to daily living skill interventions (Cihak et al., 2006; Mechling, 2008). In this study we did not attempt to isolate various instructional procedures that might be most efficacious, but instead sought to establish whether the intervention package would be effective when delivered by peers. Also, we did not investigate the relative effectiveness of peers *versus* adults in delivering the LBBI; rather, we sought to learn only whether similar-aged peers might play an effective role in delivering this intervention. Since peer-mediated interventions require a good deal of social awareness and observational learning, it was not clear whether this approach would be effective for learners with autism. It is possible that certain components of the intervention (e.g., picture models and rehearsal) enabled the peers to be effective, and our future studies will pursue this possibility.

Like all studies this one had limitations. First, all of the students were taught the same daily living activity. This limits any demonstration of effectiveness to a single skill; certainly a study in which multiple skills were selected would have strengthened the outcomes greatly. Second, we did not assess any generalized outcomes beyond skill maintenance. Given the generalization difficulties faced by most students with autism and other moderate to severe disabilities, it would be important to examine whether an LBBI that is peer-delivered might lead to generalization of newly learned behavior to other children or adults. Any evidence that a peer-mediated LBBI might produce generalized learning across other people would be an encouraging outcome. Third, for two of the four participants, we collected only two baseline sessions before implementing the LBBI. Additional baseline probes would add greater confidence in the stability of these adolescents' baseline performance. Finally, we note that 3 of the 4 students did not consistently perform 100% of the steps in this task. While they demonstrated 13 of the 14 steps consistently, these students sometimes failed to perform all steps to independent mastery. A post-hoc analysis of the

data shows that the students sometimes failed to complete the skill of cutting the sandwich in half once they finished making it. We also observed a frequent error in spreading the peanut butter to cover all areas of the bread. Although these performance errors appear relatively minor and did not interfere with task completion, they showed that some steps might require additional training power which might include additional pictures, rehearsal, or peer guidance.

Perhaps the variance observed here is a natural phenomenon, reflecting the *personal preference* of individuals (see Bannerman, Sheldon, Sherman, & Harchik, 1990), or the *form versus function* phenomenon long identified as a critical consideration when establishing performance parameters (White, 1980). Mary's performance should be considered with both of these caveats in mind. Although Mary's baseline performance exceeded that of the other students, she never completed 100% of the steps accurately and independently during the intervention or maintenance. Each error during intervention was relatively minor, and none precluded completion of the actual skill. In fact, Mary appeared to enjoy the LBBI activity and interaction with the peer, and always ate the sandwich at the conclusion of the activity. A critical visual analysis of Mary's sandwiches might conclude that some had a minimal amount of jelly, while on others she failed to spread the peanut butter evenly in all quadrants of the bread. From this perspective, inconsistencies in the *form* of the performance (e.g., not spreading the peanut butter on [3/4] of the bread) sometimes penalized her performance score, although the *function* of the performance (making and sharing a snack with a peer) clearly met expectations. From a research perspective however, this variance demonstrates that the peer-mediated LBBI had a robust influence on, but not complete experimental control over, students' performance.

Although these limitations lead to future research possibilities, there are other research questions suggested by our findings. First, it is not clear whether peer-mediated LBBIs might be effective for other student outcomes. Research syntheses to date show that LBBIs, and Social Stories™ in particular, typically have been employed for problem behavior reduc-tion, and exclusively delivered by adults (Kokina & Kern, 2010; Sansosti et al., 2004). Using LBBIs to teach new skills and routines has been pursued by very few researchers (Bucholz, 2012; Test et al., 2011). The promise of this class of interventions as a form of naturalistic instruction for other daily living routines, language and academics, and other adaptive behavior is encouraging, and our future studies will indeed target these outcomes. Second, we believe that LBBIs also hold promise as a tactic for promoting generalized learning. Because most LBBIs incorporate multiple teaching components it is possible that an intervention could include at least one or more tactics that frequently produce generalized learning (e.g., common stimuli, multiple training examples, indiscriminable contingencies). Finally, a natural progression of this research would be to extend the format of the LBBI to other media for delivery, including tablets or other portable electronic devices. With the increasing availability of such technologies it is possible that integrating an LBBI into an electronic medium would enable teachers and others to produce stories with design features that enhance the realism of the skills and routines that are targeted for training (Mechling, 2008). These evolving technologies also could increase the portability of the LBBI so that instruction could be delivered in a range of community sites.

As the evidence base for effective interventions expands, investigators will continue to explore novel ways to implement interventions in hopes of finding ever more robust tools that promote learning and performance in students with autism and other moderate and severe disabilities. Incorporating peers into the delivery of LBBIs appears to hold promise as an effective strategy for teaching daily living activities. We believe it should be explored as a promising practice for other positive outcomes as well.

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