Behavior Analysis in Practice (2018) 11:315–326
https://doi.org/10.1007/s40617-018-0225-0

RESEARCH ARTICLE

A Comparison of Modeling, Prompting, and a Multi-component Intervention for Teaching Play Skills to Children with Developmental Disabilities

Jennifer Quigley[1] · Annette K. Griffith[1] · Kelly Kates-McElrath[1]

Published online: 5 March 2018

Abstract
Play skills are an essential component of a learner's repertoire, allowing access to social interactions with peers and adults. Children with developmental disabilities frequently require explicit teaching to acquire play skills rather than acquiring them through natural learning opportunities. Without targeted practice, these deficits could continue to expand, separating the children from their typically developing peers. This study aimed to teach three children with developmental disabilities independent play skills in the form of building blocks with a diagram. We evaluated three methods of teaching play skills, prompting, modeling, and a multi-component approach, within an alternating treatment design to determine which, if any, is most effective. Each teaching strategy included a three-step prompting hierarchy and was paired with an edible reinforcer delivered following independence. Successful responses at the targeted prompt level resulted in verbal praise. Following intervention, the rate of successful responses and independent responses increased across all three participants.

Keywords Play acquisition · Modeling · Prompting · Developmental disabilities

Children with autism spectrum disorder (ASD) and other developmental disabilities may have difficulty learning the skills required for independent play. Deficits in play skills could impact social interactions with peers and decrease opportunities to practice these skill areas (Jung & Sainato, 2013). Insufficient language within play may also lead to insufficient language required for later academic skills (Conner, Kelly-Vance, Ryalls, & Friehe, 2014). Without targeted practice, these deficits could continue to expand, separating the children from their typically developing peers.

A review of current methods for teaching play skills found that behavioral interventions, based on the principles of applied behavior analysis (ABA), could be effective for improving performance across multiple play skill targets, including functional play, sociodramatic play, independent play, and pretend play (Lang, O'Reilly, Rispoli, & Shogren, 2009). Although the authors reported a lack of research examining the effectiveness of individual components within an intervention, a plentitude of articles were identified evaluating modeling, prompting, and reinforcement as separate and combined techniques.

Modeling as a method of teaching play skills has been frequently discussed in the literature (e.g., Bourdreau & D'Entremont, 2010; MacDonald, Sacramone, Mansfield, Wiltz, & Ahearn, 2009; Sancho, Sidener, Reeve, & Sidener, 2010). It can be implemented in various forms such as video modeling, peer modeling, or adult modeling. When implementing modeling as a teaching technique, the skill being targeted is demonstrated by the identified medium. Accurate demonstration of the modeled skill is then reinforced. Although modeling is not typically implemented apart from other teaching techniques such as reinforcement, script training, or prompting (Lang et al., 2009), it can be implemented individually to assess its effect on acquisition.

Specifically, MacDonald et al. (2009) utilized video modeling and peer modeling to teach pretend play skills to two children with autism. All participants, including the typically developing peers, acquired the targeted verbalizations and additional, unscripted verbalizations following treatment. This is consistent with the findings of Bourdreau and D'Entremont (2010); they also implemented a video modeling intervention

✉ Jennifer Quigley
JQuigley@ego.thechicagoschool.edu

[1] Department of Applied Behavior Analysis, Online, The Chicago School of Professional Psychology, Chicago, IL, USA

to teach play skills to two young boys with ASD. In this study, modeling was successful in increasing the frequency of play actions, which increased further following the addition of reinforcement. An additional study by MacDonald, Clark, Garrigan, and Vangala (2005) also evaluated video modeling across multiple targeted play skills. Like the previous studies, they found video modeling to be an effective technique to teach play skills to children with ASD. Collectively, these studies indicate that video modeling can be an effective teaching method.

Modeling can also be evaluated by making a comparison between modeling and a second teaching technique. Sancho et al. (2010) compared two video modeling interventions in teaching play skills to two children with autism. One treatment included video modeling only while the second treatment was a multi-component intervention consisting of video modeling combined with prompting and reinforcement. Results were varied; one participant mastered play skills equally across both teaching strategies while the second participant mastered play skills more quickly following the multi-component treatment. In another comparison of two interventions, Cardon and Wilcox (2011) compared imitation training to video modeling to evaluate the effectiveness of a play skills intervention. Both treatments were effective in teaching the targeted play skill repertoire, though the rate of acquisition varied across interventions. Palechka and MacDonald (2010) compared instructor-created video models to commercially available children's video models to assess acquisition of play skills. Two of the three participants learned more quickly with the instructor-created video modeling. The third participant acquired skills equally across both teaching techniques, though it is important to note that all participants had a history of learning via video modeling prior to the assessment which may have impacted the acquisition rate.

Similar to research on modeling, very few studies have addressed the effects of prompting as a sole intervention on skill acquisition. Research that has exclusively implemented prompting typically identified specific prompting hierarchies to be implemented, and may have included verbal, model, gesture, or physical prompts (e.g., Morrison, Sainato, Benchaaban, & Endo, 2002; Sabielny & Cannella-Malone, 2014). For example, Goldstein and Cisar (1992) utilized prompting to teach theme-related social behavior to children with and without disabilities. Following prompt delivery, which consisted of script training utilizing verbal and gestural prompts, all children demonstrated the targeted behaviors. The researchers concluded that prompting with the utilization of scripts was effective in teaching sociodramatic play skills.

Although a handful of studies exist that examine prompting as a sole intervention, most of the research has focused on the effects of prompting combined with some other teaching methodology. Specifically, Morrison et al. (2002) evaluated prompting in the form of activity schedules and correspondence training on the acquisition of play skills. They found that following correspondence training, prompting was effective in teaching play skills and that it could be faded successfully. Following the intervention, the participants no longer required prompting to perform the targeted skills.

Comparisons of prompting strategies may also be used to evaluate the effectiveness of the methodology. Sabielny and Cannella-Malone (2014) compared two types of prompting procedures rather than evaluating a prompting hierarchy. Like the other studies, both prompting techniques, physical prompting and combined physical and verbal prompts, were successful in teaching students the targeted skills. Libby, Weiss, Bancroft, and Ahearn (2008) compared most-to-least prompting to least-to-most prompting when teaching independent play skills. This study found that most-to-least prompting evoked fewer errors, but required more training sessions to mastery. Though acquisition rates varied, least-to-most prompting was more efficient across all participants. Lifter, Ellis, Cannon, and Anderson (2005) utilized prompting within direct instruction as the method for teaching play activities to children with pervasive developmental disorder, though it was mentioned that modeling was incorporated loosely into the first treatment condition. Targets were chosen based on results of a play assessment. Participants acquired an average of 85% of 40 play targets following the intervention (Lifter et al., 2005). Similar to modeling, studies utilizing prompting as the primary teaching strategy have found prompting to be an effective teaching strategy for play skills.

Rather than choosing one specific teaching technique, other studies have explicitly implemented a multi-component intervention to target play skill acquisition. Yanardag, Akmanoglu, and Yilmaz (2013) utilized modeling, prompting, and reinforcement to teach aquatic leisure skills to children with autism. All participants mastered the targeted leisure skills following intervention, and parents of the participants rated the intervention with high social validity scores. Similarly, Conner et al. (2014) analyzed the effectiveness of a multi-component intervention targeting play skills including modeling and contingent reinforcement. Participants receiving the intervention increased their pretend play skills in comparison to the control group.

Both prompting and modeling with various schedules of contingent reinforcement have been successful in teaching play skills, but few studies have completed further evaluation to determine which may be the most efficient method of teaching. Ulke-Kurkcuoglu (2015) evaluated the effectiveness of prompting in comparison to video modeling when teaching play skills. Pretend play skills were taught utilizing an alternating treatment design to compare the two teaching strategies. Both strategies were found to be successful, though

prompting was identified as more efficient for two of the three participants. Further research is needed to assess any significant difference in efficiency between the teaching strategies.

The current study aimed to extend the research on teaching play skills to children with developmental disabilities by completing a comparison of prompting and modeling to identify which interventions are most beneficial for successfully teaching independent play skills. A multi-component treatment package including modeling, prompting, and contingent reinforcement was broken down into three teaching procedures: modeling with contingent reinforcement, prompting with contingent reinforcement, and modeling with prompting and contingent reinforcement. An alternating treatment design was implemented to determine the effectiveness of each component on the acquisition of independent play skills across multiple children with developmental disabilities.

Method

Participants

Three school-age children diagnosed with developmental disabilities and ASD participated in this study. All participants were recruited from a private residential school. All students who attend this school were placed due to serious challenging behavior, and all were receiving direct instruction from trained staff members. Participant 1, Ike, an 8-year-old child diagnosed with ASD and intellectual disability was verbal and spoke in 1- to 3-word phrases. Maria, a 10-year-old female diagnosed with ASD and severe intellectual disability also participated. She communicated primarily via an augmentative communication system on a tablet and in 1-word verbal statements. Jada, a 12-year-old female was the third participant. Jada communicated primarily via an augmentative communication system on a tablet and via gestures and modified sign language.

Levels of communication and compliance varied across participants. Scores on the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP) assessment (Sundberg, 2008) were utilized for inclusion and exclusion criteria. The VB-MAPP is a verbal behavior-based language assessment and curriculum that can be used to assess children's developmental ages from 0 to 5 years old (Sundberg, 2008). Inclusion criterion included a score of at least 5 across Level One of both the independent play and imitation sets of the VB-MAPP demonstrating basic play and imitation skills (Sundberg, 2008). Exclusion criterion included color-blindness and cortical-blindness, as this may prohibit the student from identifying the correct placement of the colored blocks as the colors on the blocks aligned with the colors on the diagram.

Participants were recruited through the private residential school program discussed above. The researcher met with the three teachers to identify potential participants based on a description of the inclusion and exclusion criteria and the goals of the study. Following potential participant identification, consent was obtained from each of the student's parental guardians. The assessment was reviewed, and an allergy assessment was filled out following parental consent. The allergy questionnaire obtained information to better inform the preference assessment utilized to identify potential reinforcers. Inclusion criteria were then assessed through direct conversation with the teachers and parents and review of the current VB-MAPP assessment completed for each potential participant.

Setting

All sessions took place in the participants' designated classrooms after school hours to reduce the likelihood of peer distraction and extraneous variables. The classrooms contained a desk for each student, a teacher's desk, multiple book shelves with academic and leisure activities, and two play corners containing mats, yoga balls, and a computer. A desk was placed in front of the two-way mirror for all sessions. This was to minimize distractions and signal a different expectation than the typical classroom activities. The therapist sat next to the student, and all materials were placed on the students' desks within arm's reach. Data were collected by the therapist via video recordings following each session. The video camera was placed within 3 ft of the desk and diagram to sufficiently measure accuracy.

Materials

Ten building blocks with one of three corresponding diagrams were utilized across all three targeted teaching strategies. Each teaching strategy was paired with one block diagram to signal the type of teaching strategy to be implemented for each participant. The assigned teaching strategies to diagrams were counter-balanced across participants. All diagrams required the same quantity and type of blocks to control for difficulty. These include three yellow octagons, three red parallelograms, and four blue diamonds. Each diagram required the same number of blocks to balance across all teaching strategies. Each diagram displayed the pattern to be replicated.

Experimental Design

An alternating treatment design was utilized, counterbalanced across teaching strategies and participants. The study included four conditions: (a) baseline, (b) modeling with reinforcement, (c) prompting with reinforcement, and (d) multi-component package with reinforcement. The interventions

were implemented following steady-state responding during baseline, as described by Johnston and Pennypacker (2009). Steady-state responding describes stable levels of responding across multiple opportunities. The teaching strategies were counter-balanced across targeted skills for each participant to demonstrate experimental control as displayed in Table 1. Each targeted skill was instructed by a different teaching strategy supporting that any change in acquisition is due to the teaching method implemented instead of the targeted task.

Dependent Variables and Response Measurement

Three dependent variables were measured for this assessment: independent responding, successful responding, or unsuccessful responding. Independent responding included any responses emitted prior to an intervention strategy being implemented. Successful responding included any correct responses emitted within 5 s of a teaching strategy being implemented. Unsuccessful responding included any responses in which the step was not completed following the three prompts, any response in which the student refused to participate, or any response in which the student placed the block incorrectly and did not correct. This enabled the clinicians to determine the percentage of steps completed without assistance of the teaching method, completed following the teaching method, and steps not completed regardless of the teaching method implementation.

Task analyses were developed by the researcher and were verified by a trained Board Certified Behavior Analyst (BCBA®). Task analyses for each targeted skill consisted of ten steps and included operational definitions for each included step. For each step, one of three scores would be recorded: independent, successful, or unsuccessful. Independent was scored as completion of a step within 5 s of the initial direction or completion of a step prior to the teaching strategy being implemented for that step. Completion was defined as the block being placed on the matching shape on the diagram with no more than one corner of the shape misaligned.

Successful responses were scored as completion after implementation of the teaching strategy. If the therapist implemented any degree of modeling or prompting, per the implemented hierarchy, and the participant completed the step, the step was scored as a successful response. If no responding occurred or the step was completed inaccurately following the third intervention, the step was scored as unsuccessful.

Table 1 Counter-balancing of diagrams across participants

	Modeling	Prompting	Multi-component
Ike	Diagram 1	Diagram 2	Diagram 3
Jada	Diagram 3	Diagram 1	Diagram 2
Maria	Diagram 2	Diagram 3	Diagram 1

Unsuccessful responding was also scored if the participant actively resisted the third implemented model or prompt for 2 s or engaged in challenging behavior which precluded the opportunity to implement the teaching strategy. Challenging behavior included physically resisting the teaching strategy for 2 or more seconds, leaving the work area, or disrupting the work materials. Data were recorded using pencil and paper recording. Each session was recorded on the session log including the participant, session number, and teaching strategy implemented. Session data were recorded via video observation immediately following each session block.

Interobserver Agreement

Interobserver agreement (IOA) data were scored using whole interval recording with each of the ten steps serving as one interval. IOA data were collected by a doctoral student in The Chicago School of Professional Psychology Applied Behavior Analysis program via videos of the recorded sessions. The student divided the total intervals of agreement by the total number of agreement and disagreement to calculate IOA. IOA data were collected across a minimum of 25% of sessions to ensure frequent assessment of reliability. A score of 80% or higher for calculated IOA was the goal across the assessment (Poling, Methot, & LeSage, 1995).

IOA data varied across participants. IOA was calculated for 37% of Ike's sessions with an agreement of 85% (range 60–100%). IOA data were collected across 33% of Maria's sessions with an agreement of 91.8% (range 60–90%). For Jada's sessions, IOA data was collected across 30% of sessions with an agreement of 81.1% (range 70–100%). Varied agreement may have been due to several factors that will be discussed.

Procedure

The researcher spoke to the primary caregiver(s) of each participant to gain consent prior to implementation. An in-person meeting was held with each parent of potential participants to discuss the study. The caregiver provided a signature confirming written consent was received on a consent form summarizing the research. The consent form included a summary of the intervention, benefits and risks to the participant, and a statement clarifying the right to discontinue the intervention at any time. Participant assent was not collected due to the inability of the participants to understand the implications of their participation in the study or what it means to voluntarily participate in an activity. All potential participants had a diagnosis of severe intellectual disability that impacts their ability to assent to their daily programming. Participants were included based on the above VB-MAPP criteria, a deficit in play skills as reported by their teachers and caregivers, and their ability to participate consistently in intervention. The ability to participate consistently was operationally defined

as participating in a table-top task for 5 consecutive minutes without problem behavior across four opportunities. This requirement was tested for, following consent. Participants not meeting the designated criteria were not included in the study.

Experimental sessions were conducted two to three times per week per participant. A maximum of three sessions took place consecutively, and no condition was repeated across the three sessions. For example, one session might include (1) prompting condition session, (2) modeling condition session, and (3) multi-component condition session. Following three consecutive sessions, a minimum 10-min break was provided for the participant to take part in his/her typical programming such as a familiar and preferred task. No more than six sessions, two blocks of three, took place in one day. Session length was 5 min, completion of 100% of the steps, or the teaching strategy being implemented across all ten steps, whichever occurred first, across all conditions.

Reinforcement Prior to the study, a paired choice preference assessment was utilized to identify three preferred edibles per participant to be used as potential reinforcement (Lavie & Sturney, 2002). Prior to each session, the three-identified potential reinforcers were offered, and the chosen reinforcer was utilized as reinforcement. The potential reinforcer chosen for each session was recorded to assess for any patterns of responding associated with the reinforcer in place. The availability of the same reinforcers across all teaching strategies is included to control for reinforcer effects.

During baseline sessions, no reinforcement was available regardless of responding. During intervention, edible reinforcement was delivered following two schedules. For independent responses, two pieces of edible reinforcer were delivered and in response to successful responses, one piece of edible reinforcer was delivered.

Following Session 30 for Ike, Session 21 for Jada, and Session 18 for Maria, the reinforcement schedule was modified. This change included the delivery of one piece of edible reinforcer for independent responding. Verbal praise was delivered in response to successful responding. This change was made to assist the participants in differentiating between independent and successful responses. Since independent responding is the terminal targeted response, edible reinforcers were delivered for this response only. During reinforcement delivery for Ike, the edibles were placed in a cup and Ike gained access to the edibles following the session end. Maria and Jada received the edibles immediately following each independent response.

Baseline During baseline, the participant was presented with one of the diagrams and the set of colored blocks and given the verbal cue, "Copy the picture," which served as the discriminative stimulus (S^d). Following the S^d, the therapist did not make any verbal statements. No prompts or other interventions occurred. No consequences for independent or unsuccessful matching were given. Following the completion of the block diagram or 5 min, whichever occurred first, the session ended. The blocks presented during baseline looked identical to the blocks presented across all three teaching conditions. Baseline was completed for all three diagrams and block sets (i.e., Diagram 1, Diagram 2, and Diagram 3) across participants. Baseline sessions continued until steady-state responding or a decreasing trend occurred (Johnston & Pennypacker, 2009).

Intervention During training sessions, one of three teaching strategies was implemented. The diagram and block set were placed on the desk in front of the participant. The diagram corresponded with the teaching method that would be implemented and served as a signal of the condition in place. The S^d of "Copy the picture" remained consistent across all teaching strategies. Independent responding across any of the steps, of any targeted skill, resulted in access to the edible reinforcer. Responding within 2 s of the implemented teaching strategy (i.e., 1 s following the gesture prompt) resulted in a small piece of the edible reinforcer or, following the reinforcement change, verbal praise.

During modeling sessions, the therapist presented the S^d of "Copy the picture." Following a 2-s delay, the therapist demonstrated the first step of the task analysis. The model consisted of the therapist picking up the block and placing it on the diagram in the correct location for 2 s. Following 2 s, the block was removed and replaced in front of the participant. The model was repeated up to two more times, if the participant had not yet completed the step. If the participant did not complete the step following the third model prompt, the step was left uncompleted. Due to the nature of the block diagram task, completion of each step is not dependent on the completion of the previous step. Following completion of the first step, or three model prompts, the second step was modeled as described above. This continued until all steps had been modeled and/or completed.

During prompting sessions, the session starts with the S^d, "Copy the picture." Least-to-most prompting was implemented across all prompting sessions. Least-to-most prompting was chosen due to its inclusion in Ulke-Kurkcuoglu's (2015) study, which was extended with this additional research, as well as the current goal of the study of increasing independence within the targets skills. Following a 2-s delay, the therapist implemented a verbal prompt. The verbal prompt consisted of the therapist stating the shape of the block and the targeted location of the block (e.g., "Put the triangle on the bottom corner"). Following a 2-s delay without completion of the step, a gesture prompt was implemented. The gesture prompt consisted of the therapist pointing to the targeted block and then pointing to the location on the diagram that the block should be placed. If the step was not completed by the

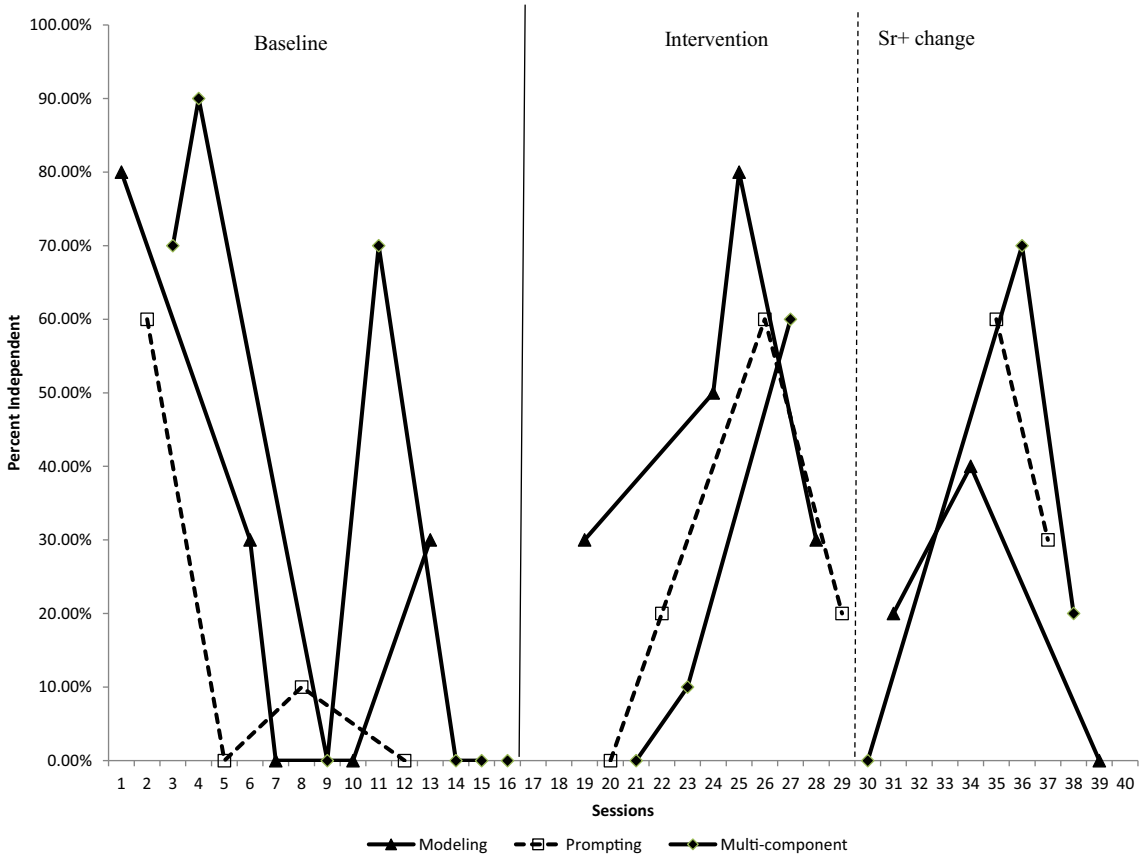

Fig. 1 Ike's independent responding during baseline and intervention conditions

participant within 2 s, a physical prompt was implemented. The physical prompt consisted of the therapist placing his/her hand over the participant's hand, picking up the block, and placing it on the correct location of the diagram. No verbal statements occurred during the gesture or physical prompts.

During the multi-component intervention, sessions started with the same S^d as the other sessions. Following the S^d, the first step of modeling and prompting were combined. For example, the therapist stated, "Put the triangle on the top corner" while simultaneously moving the triangle block on to the top corner. The block would then be replaced in front of the participant. A 2-s delay was then implemented. If the participant completed the step, the therapist moved on to the second targeted step. If the participant did not complete the step within 2 s, the therapist presented a second combination prompt consisting of a model immediately followed by a verbal prompt, both as described previously. A 2-s delay would then occur where the participant had the opportunity to complete the step. If the step was not completed, a third and final combination was presented, including a verbal and physical prompt. This consisted of the therapist stating the step, which was immediately followed by a physical prompt. If the student resisted the physical prompt or engaged in challenging behavior which precluded the ability to prompt the response, the step was scored as unsuccessful.

Treatment Integrity

Treatment integrity measures the accuracy of the implementation of an assessment or protocol. Accurately measuring treatment integrity of a protocol increases the validity of the assessment's results (Sanetti & Kratochwill, 2014). Treatment integrity was measured using a treatment integrity form created specifically for this study. Treatment integrity was assessed across a minimum of 30% of the total sessions. Thirty percent was chosen as it is the current standard within the clinical program where the study will take place. The treatment integrity form was created by modifying the dependent measure into a checklist format. It was modified to include each independent variable as well additional session requirements such as setting up appropriate materials and recording data.

Treatment integrity checks were completed by a doctoral student currently enrolled at The Chicago School of Professional Psychology (TCSPP). The student was trained by (1) hearing a verbal description of the study and the specific treatment conditions and (2) watching a video of two sessions, one without errors and one session with programmed errors, that they had practice scoring.

Treatment integrity levels were calculated by total correct divided by total number of opportunities converted into a percentage. The acceptable score for treatment integrity was 90%

or higher. Following treatment integrity checks, feedback was provided to the therapist and modifications to training and the protocol were made as appropriate. If the therapist did not score at least 90%, the session was discarded, and direct training was implemented prior to the therapist running further sessions. All sessions scored between 91 and 100% accurate implementation. On average, Ike's and Maria's sessions were implemented with 97% accuracy and Jada's sessions were implemented with 100% accuracy.

Results

Ike

Figure 1 displays Ike's independent responding during baseline and intervention conditions. During baseline, Ike's levels of independence varied across all three diagrams. His responding ranged from 0 to 90% during baseline with at least one 0% session occurring with each diagram. This would suggest a lack of motivation rather than a skill deficit with this targeted skill.

During the modeling intervention, Ike's levels of independence increased slightly with a range of independent responding from 0 to 80%. During the prompting intervention, Ike's levels of independent responding presented at a more consistent level with a range from 0 to 60%. In the multi-component intervention, Ike's responding remained highly variable with a range of 0–70%.

Figure 2 displays successful responding following the implementation of a teaching intervention (i.e., modeling, prompting, or multi-component). Ike responded more consistently to the prompting and multi-component teaching strategies than the modeling intervention with ranges of 20–80% and 30–70%, respectively. During the modeling intervention, three sessions of no successful responses occurred in comparison to successful responding occurring across all sessions of the prompting and multi-component interventions. No clear level change in independent or successful responding was observed following the reinforcer schedule change. During this research, Ike was off campus for two weeks during the intervention phase which led to fewer data points than would be needed to make inferences based on his responses during intervention.

Jada

Figure 3 displays Jada's rate of independent responding during baseline and intervention. Jada demonstrated low to zero levels of independence across the three diagrams during

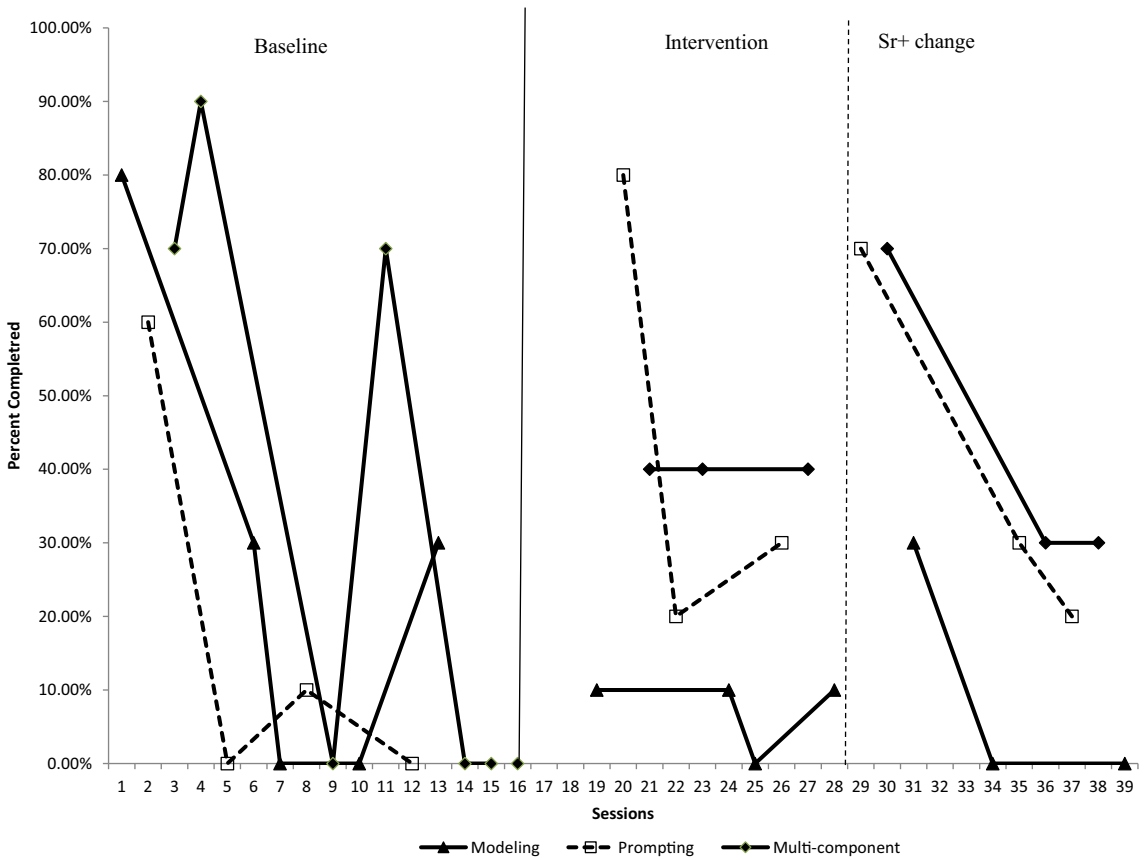

Fig. 2 Successful responding following the implementation of a teaching intervention (i.e., modeling, prompting, or multi-component)

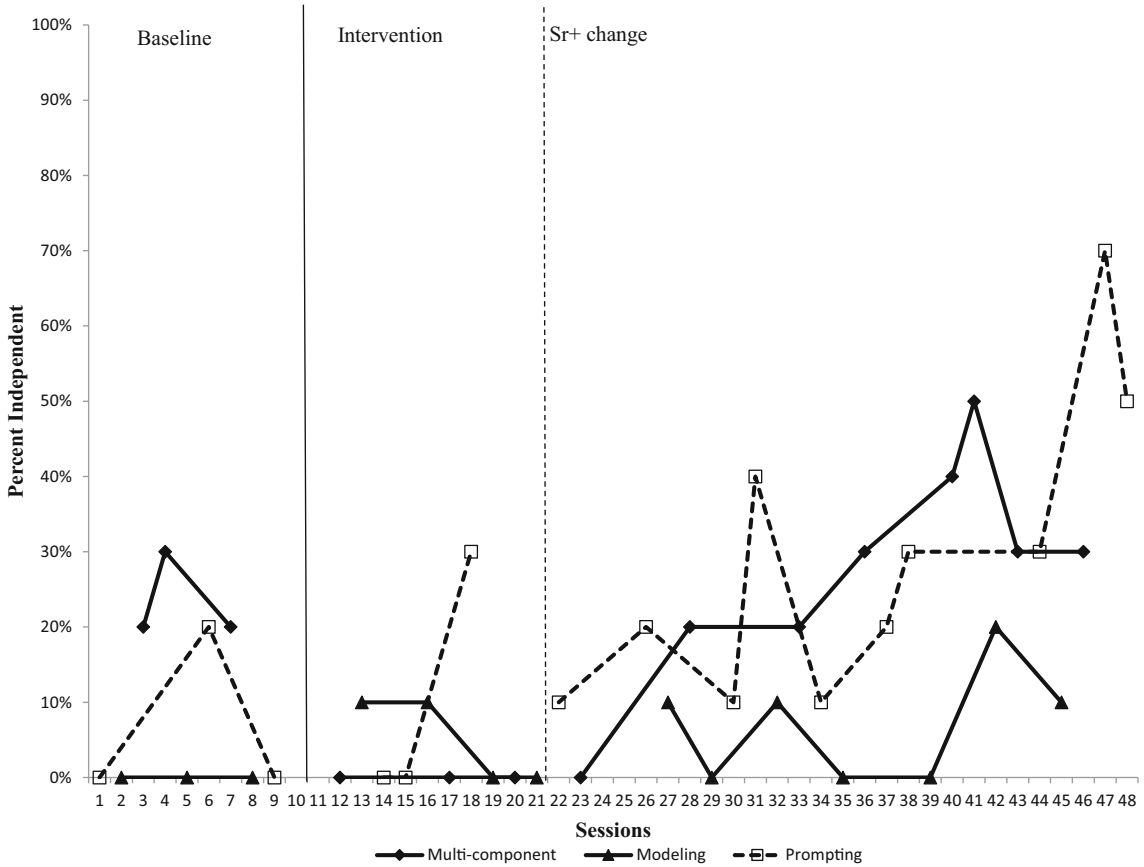

Fig. 3 Jada's rate of independent responding during baseline and intervention

baseline sessions. Following the implementation of the teaching strategies, no change in independent responding was observed. After the reinforcement change, an increase in independent responding was observed across teaching conditions.

During modeling baseline, Jada did not complete any of the steps independently. Following intervention, the number of steps completed successfully with the modeling intervention increased with a range of 0–60% as displayed in Fig. 4. Percent independence remained low despite the reinforcement change with a range of responding from 0 to 20%.

Following the introduction of the prompting intervention, her rate of successful responding increased. Also, more consistent independent responding occurred, though it remained at low levels. After the reinforcement change, levels of independence followed an increasing trend consistently across the remainder of the sessions while percent successful remained stable.

During the multi-component baseline, Jada's levels of independence presented at stable levels with a range of 20–30%. Following the intervention, percent of successful responding followed an increasing trend while percent independence dropped to zero. Following the reinforcement change, percent independence followed an increasing trend, ranging from 20 to 50%, with percent of successful responding stabilizing at an average of 40%.

Maria

During Maria's sessions, performance during baseline sessions presented following stable or decreasing trends at low levels of independence as displayed in Fig. 5. No change was noted following the implementation of the intervention. Following the reinforcement change, the level of overall responding increased and continued to follow an increasing trend with a range of 10–90%. Figure 6 displays the percentage of steps completed successfully following the implemented teaching strategy. Higher percentages of successful responding were demonstrated in the prompting and multi-component interventions than in the modeling intervention.

During the modeling intervention, levels of success increased to 50%. Percent independence remained low. Following the reinforcement change, percent independence followed an increasing trend with a range of 10–90%. Maria displayed 90% independence during the last session completed.

During the prompting and multi-component intervention, Maria's responding followed the same pattern. Maria's percent successful displayed at high levels following the implementation of the interventions. Following the reinforcement change, percent independent increased in level, ranging from 10 to 70%.

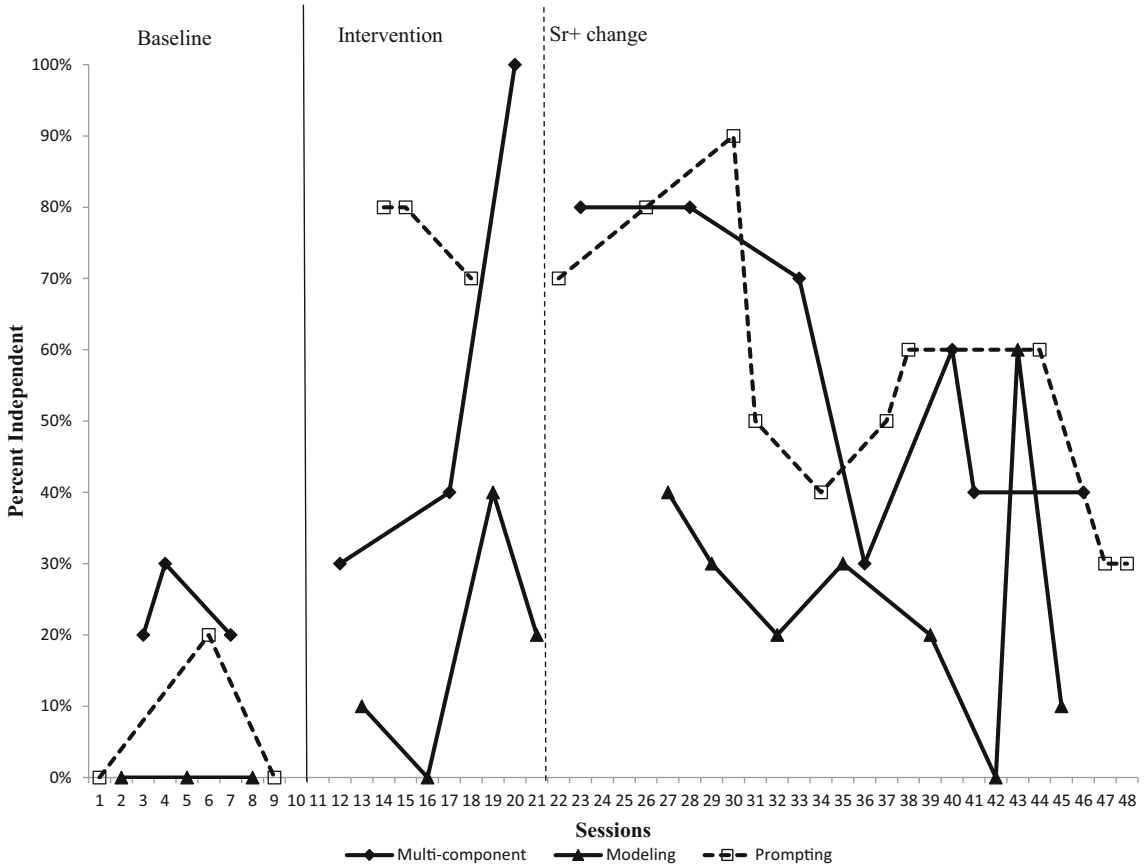

Fig. 4 Successful responding following the implementation of a teaching intervention (i.e., modeling, prompting, or multi-component)

General

During intervention, all participants demonstrated an ability to successfully respond following implementation of the targeted intervention and participated in more of the steps than completed in baseline. Levels of independence remained stable across all three participants following the implementation of the teaching strategies. When the schedule of reinforcement changed for independent and successful responses, increases in independence across all teaching strategies was observed for two of the three participants. Individual differences across levels of responding were observed.

Though improvement was noted across all participants, one teaching strategy was not more effective or efficient than the others across participants. Modeling was observed to be the least effective across participants. Ike's independence was highest during baseline in comparison to the other two participants. There was also the least amount of change noted following the reinforcement change within Ike's data in comparison to Maria and Jada. Both Jada and Marie were successful in completing most of the steps following the inclusion of the teaching strategies, but independence increased only following the reinforcer change.

None of the participants reached mastery criterion of 100% independence within the trials completed. Independence for two of the three participants presented following increasing trends prior to the end of the study. Due to time constraints, fewer sessions were conducted with each participant than was planned.

Discussion

Play skills are an important developmental skill for children with developmental disabilities. Following acquisition of play skills, children may show improvements in social interactions and decreases in inappropriate behavior (Jung & Sainato, 2013). When teaching these skills, methodologies vary frequently, but there is often no empirical reason for why one methodology is chosen over another (Lifter et al., 2005). There is sufficient research supporting that play skills can be taught using prompting, modeling, or a combination of the strategies, but the research is unclear as to what is the most effective method.

The current study supported Ulke-Kurkcuoglu's (2015) findings that modeling and prompting are both effective teaching strategies when teaching play skills. All three teaching strategies were effective in increasing the successful completion of steps for all three participants. The teaching strategies, independently, were not sufficient in increasing levels of

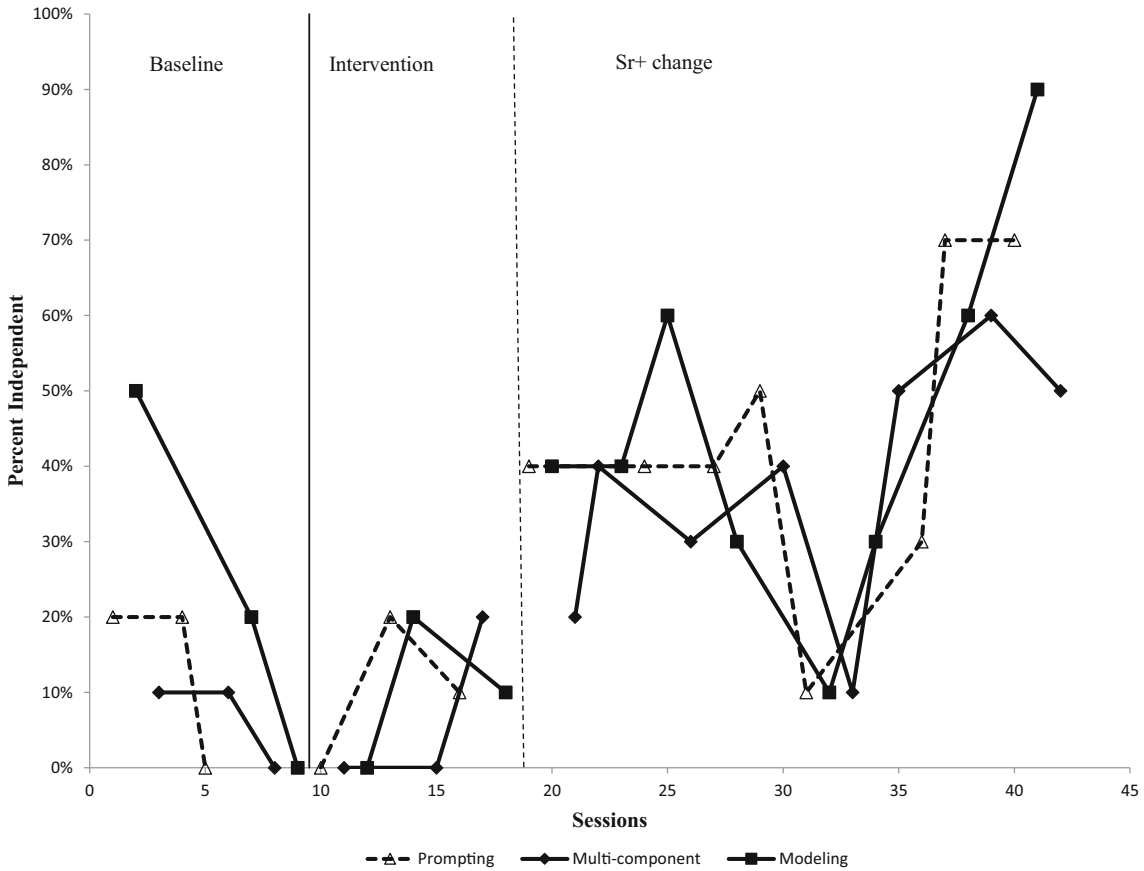

Fig. 5 Maria's independent responding during baseline and intervention conditions

independent responding. Independence only increased following the reinforcement change as described previously.

Upon implementation of the instruction prior to the reinforcement change, the percent of successfully completed steps increased across all three participants. This demonstrates the effectiveness of the teaching strategies in effectively demonstrating the steps and the ability of the students to follow the teaching strategy. Maria and Jada displayed similar patterns of responding supporting consistent responses by students who do not previously display the targeted skills. Ike's responding did not change drastically throughout the intervention. The absence of an increase in independent responding following the interventions may have been due to ineffective reinforcement instead of a skill deficit. Ike was the only participant who could demonstrate moderate levels of independence during baseline. The intervention had little to no effect on his levels of independence though he began completing more steps following the teaching strategies during intervention.

Prompting and multi-component instructions were both effective in increasing the percent of successfully completed steps. Modeling was less effective in increasing the percent of successfully completed steps for all participants. The program in which all three participants were enrolled at the time of the study utilized least-to-most prompting as the primary instructional method. This may have led to increased efficiency and effectiveness of the prompting and multi-component interventions. Learning history of participants should be evaluated and potentially included as an inclusive or exclusive criterion for future studies. Future research could compare the different types of modeling to determine which modeling strategy is most effective and efficient.

Overall, this study added to the research on teaching play skills in that all three teaching strategies were effective in increasing percent of successful completion and independent completion following the addition of differential reinforcement. The value of successful completion of steps in comparison to the value of independent responding should be evaluated. If teaching strategies only increase successful completion consistently, strategies for increasing independence need to be identified. Future research could target whether these results could be replicated across different types of play skills and children with varying prerequisite skills.

Several limitations can be identified within this study. First, due to the specificity of this task, it cannot be assumed that the efficiency of a teaching strategy within this task will be replicated across other tasks including other types of play skills. Further research should apply these empirically supported teaching strategies to a range of tasks to assess for consistent success. Second, variations in communication skills and rates of compliance were not controlled for across participants.

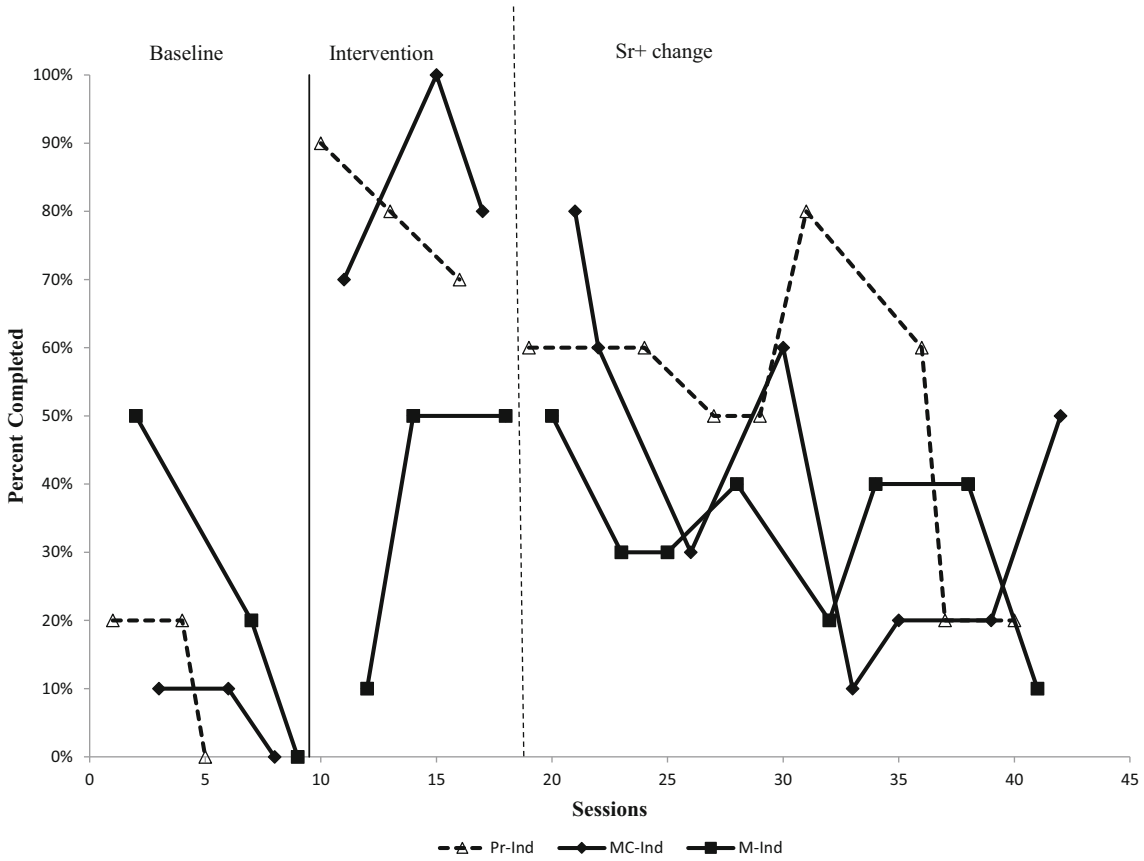

Fig. 6 Successful responding following implementation of a teaching intervention (i.e., modeling, prompting, or multi-component)

These variations may impact the efficiency of the teaching strategies being implemented. Third, the number of sessions across participants could have been extended to further evaluate any trends. Since none of the participants reached mastery within the sessions completed, maintenance and generalization probes were excluded.

The inclusion of Ike as a participant during the intervention phase could also be argued being that he displayed variable levels of independence across all three diagrams in baseline. This variability may have been due to a skill deficit in being able to complete all ten steps of each diagram or weak motivation to complete all ten steps of the task. Ike's success and independence were also the least effected by the change in reinforcement schedule.

Also, the IOA data had slight inconsistencies across the participants. Following a training session to review data collection with the second data collector, several issues were noted that may have contributed to the IOA data. First, it was difficult to determine when the opportunity to complete the targeted step successfully started and finished, specifically in the model condition. Also, the participant's ability to complete a step independently as a step was simultaneously being instructed made it difficult to discern what to score. The materials utilized also potentially added to the inaccuracy due to the difficulty in identifying when blocks were placed accurately on the board. Utilizing other materials including blocks that did not move as easily once placed would assist in scoring the participant's response. When disagreement was noted, it occurred between independent and successful responses within the teaching intervention. For example, a participant placed a new block on the board while the therapist was prompting to place another block on the diagram.

Future research could address the relation between compliance and effectiveness of teaching strategies. Research could also replicate this study to determine whether these findings occur consistently across children with developmental disabilities with a variety of learning histories including various forms of instruction. Another extension of this research could examine the effect of different materials on the efficiency and effectiveness of the teaching strategies. Implementing a reinforcement-only condition could allow researchers to evaluate the effect of an effective reinforcer prior to additional components being added. Finally, variations exist within each of the teaching strategies examined. For example, modeling can be delivered by peers, adults, or videos. Following the determination of an effective teaching strategy, it may be beneficial to examine the variations within the teaching strategy to determine if effectiveness varies within the teaching strategy itself.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Statement of Human Rights All procedures performed in this study involving human participants were in accordance with the ethical standards of The Chicago School of Professional Psychology's Institutional Review Board and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participant's guardians included in the study.

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